Again, as the leaves and stems of plants, while green, contain sugar and other carbonaceous materials for nourishing the seeds and bringing them to maturity, it follows that, if they are in this state ploughed down into the soil, they must greatly enrich it with all the products ready prepared for the nourishment of plants.

It has been proved, indeed, by other experiments previous to those of M. Biot, that the leaves and all the green parts of plants, decompose the carbonic acid gas of the air, appropriating the carbon and setting free the oxygen; and hence it has been inferred, that the carbon thus derived contributes to form their mass of sugar and gum, additional to the sap absorbed from the soil by their roots. This view is corroborated by the difference which M. Biot has shewn between the composition of the leaves of wheat and the stem, which is more especially supplied from the soil. If, then, a portion of the solid frame-work of plants is derived from the air in the form of carbon, the ploughing down of green crops for the purposes of manure, gives to the soil more than the plants, while growing, had extracted from it.

We may well conclude with M. Biot, that "every positive determination in science is susceptible of progress and of useful application, though these may be distant. A microscopical observation, or an optical property, which at first appears only curious and abstract, may thus in time become important to agriculturists and manufacturers."

HORTICULTURE—ON THE CULTURE OF THE ONION, THE LEEK, AND THE EARLY POTATO.

By Mr Towers, Author of the Domestic Gardener's Manual.

1. The Onion.—The onion, in whatever point of view we consider it, is truly valuable; it is required in all gardens, but to the cottager it is all but indispensable. Not only is it hardy, of easy culture, and abundantly prolific; but it may be rendered a source of considerable profit. As a culinary vegetable it has its faults, for, not to dwell upon peculiar odour, which to some is very disagreeable, it produces in some constitutions a sort of feverish heat, which is attended with considerable restlessness and irritability; but this effect appears to be of rare occurrence, for it is generally found to stimulate the circulation healthily, to

promote general warmth, and to prove one of the most effectual preventives of cold or chill, in situations of exposure, which might otherwise be productive of serious mischief.

Its natural history will occupy only a few lines, but it is interesting. The native country of the bulbing onion is not clearly ascertained, nor is the date of its introduction. The onion is referred by modern botanists to the natural order *Asphodeleæ*, of which asphodel is the type; these natural orders, till they be better understood, or, in other words, more simply and perspicuously described, tend to confuse and perplex the student, —the Linnæan artificial arrangement, with all its defects, can be applied, by the mere tyro, and with the best effect. We find onion—*Allium cepa*, in the 6th class, 1st order, *Hexandria Monogynia*, because it has six stamens and one pistil. The flowers are produced in a clustered umbel, at the summit of a hollow or tubular, somewhat conically swollen stalk. These numerous flowers are protected by a sheath, or *spathe*, which in due time opens and discloses them; the flowers are greenish-white, each individual is 6-parted; it has what botanists term a *perianth* of six lobes; the capsule or seed-vessel has three angles, three valves, and three cells. The root is a tunicated or coated bulb; and this body, for root-proper it is not, is formed during the growth of the first year by the leaves—as itself in the *second* year—that is, during the processesof fructification, becomes the origin or source of the leaves. The development of the onion is perfectly wonderful; it claims the most minute and scentific investigation, especially when we view its progress from the seed, and compare *that* with the phenomena of the secondary growth. The real roots are fibres sent forth from the base of the coated bulb, but they are connected with germs of future bulbs, which are marked by the coats of the parent. Without dwelling longer on these mysteries, I shall endeavour to elucidate them by the facts, which the first mode of culture, now to be described, will elicit. I trust that they will be practically investigated by many acute botanists.

Summer Onions.—According to the stock required must be the preparation; and the first step to be taken, is the selection of an appropriate plot of ground; but this requires much consideration. It has been correctly stated, that bulbs, in general,

like a great supply of water, but it must not lie about and swamp the bulb itself; tulips, hyacinths, narcissuses, grow well and bloom in glasses, without the presence of a particle of earth; but the bulbs are not immersed; they are supported by the contracted neck of the glasses, and the fibrous roots only are suffered to reach the water. The object in open ground culture is to confine the bulb to a light, dry, and rich surface soil, abounding with free, open sand, and at the same time to provide a copious supply of moisture at a considerable depth below the surface, for the nutriment of the roots. The Dutch attain this object readily by natural locality, but with us the case is very different, and we must find substitutes for underground irrigation. Onions send their roots deeply into the subsoils, and to do them justice, this must be properly prepared. Chemistry teaches us that decaying vegetable matter yields the elements of water very copiously, and at the same time deposites a quantity of carbonaceous matter exactly suitable to the nutritive organs of the plant. The science of horticulture adduces a volume of facts which prove that the decomposition of vegetable putrescent substances, and the simultaneous formation of nutritive sap, are effected, with great energy, by the vital vegetative principle. Thus, causes and effects are ever in active operation. Upon this theory it is that I recommend the introduction of decayed leaves of trees, either alone, or in union with a third or fourth part only of stable manure (both reduced to a blackened mass), in preference to spit-dung only, whenever it is intended to counteract the effect of parching drought. I write practically, as I shall hereafter evince, under the head Early Potato; but now for *onions*, I would advise that all the soil of the plot to be cropped, be taken out to the depth of eighteen inches, or two feet, if possible; that the bottom be rammed and made solid; and that a twelve inch bed of the leafy manure above named be put upon the solid ground. This vegetable mass would be a source of moisture [illegible] for several years; in the first instance it should be moistened by a sprinkling of salt, to the extent of a peck to a [illegible] upon this lowest stratum a second, consisting of equal portions of garden soil, and of the leaf compost well mixed, would be deposited to half the depth of the first bed. The [illegible] upper stratum should consist of the lightest sandy and

turfy loam, made still lighter by fine sand or wood ashes, and enriched with one-third part of perfectly reduced manure of the farm. The bed cannot be too deep, or too well prepared; but eight or ten inches of the fine sandy soil are amply sufficient. I have stated what I judge to be the best preparation; it may not suit the convenience of nine out of ten growers to adopt it; but of this every one may be assured, that, the deeper his bed of decomposable vegetable matter, the more certain will be his supply of permanent, underground moisture. Well trenched, highly enriched, light, garden soil, will, in most seasons, yield good onions; but perfection can be attained only by the most deeply prepared soil.

This preparation is suitable to every method of growing onions, and therefore I shall not dwell upon it again. Every species of bulb prospers most under the powerful action of solar light; therefore, when the full exposure of the plants can be made consistent with that radical supply of water which the plant revels in, the bed cannot command too much sun.

Season of Planting.—In February, or very early in March, a number of small onions of the variety called *Spanish* or *Reading*, should be collected, the bulbs not to exceed an inch and a half in diameter; those of one inch will do very well, but they ought to be round, flattish, perfectly formed, and not in a growing state. It must be remembered that each of the onions should produce two, three, or four new ones, and the calculation might be founded upon this probable return. The upper soil of the bed, if it be dry, should be sprinkled, and then beaten with the flat side of a spade, to a firm and level surface; it is then to be set out in squares, by means of a line, and any sharp-pointed tool which will simply mark the surface; the angles of the squares to be nine inches apart. Some persons might prefer to stretch the line, and to plant row after row, the onions to stand in quincunx or alternate order; but whatever be the mode adopted, the surface should not be broken up, and an onion is to placed *on the soil*, at every angle of the squares, or at an equal distance, along the line, and firmly pressed down till it be half immersed. Care must be taken also to let the root be fixed straight, so as to send its fibres perpendicularly downwards; the growth of the plant will then from the first be quite upright, and

the bulb will be fixed firmly in its place; whereas, if the bulb lie on one side, it is very liable to be displaced. Worms are troublesome visitors on these occasions; therefore soot, air-slaked lime, or wood-ashes, should be dusted freely over the surface; the operator must also be on the alert to refix any bulb which may be disturbed.

If the weather be early dry and parching in March, water may be safely given by making holes, sloping diagonally, from the centre of the intervals towards the lines of bulbs, but to at least four inches below them, and in these, water may be freely poured. In frosty weather, of course, nothing of the kind will be attempted, but in dry warm seasons, too much water cannot be given to the under strata; the surface soil, on the contrary, should be as dry as possible.

Under favourable circumstances, growth will be rapidly established, and the gardener will have to observe many interesting and beautiful phenomena. Leaves will at first be developed, but these are not now the organs of nutrition to the parent bulb, from the coated layers of which they indeed proceed. A system of foliage is indeed vitally required, but its energy, in the present instance, can be diverted from that course which nature ordains it to take. In this second year, the leaves are destined to nourish the progressing organs of fructification, and it will be observed that each bulb, sooner or later, produces a flower-stalk, with its umbel of flowers concealed within their spathe at the summit. *As soon as this head at the point of the flower-stalk shall be distinctly seen, it must be pinched or cut off.* Upon this operation depends the entire success of the plantation; for if the flowers develope, and the seed-vessels enlarge, the bulbs will have no successors. A second, perhaps a third, flower-sheath may appear, and must be immediately obliterated; this done, the leaves become stronger, and their laborated juices are instantly diverted, and called in aid of those germs of young bulbs which lie in embryo, and would perish with the parent, were the seed-bearing processes allowed to be carried on to any considerable extent.

After the final excision of the flower-stem, a singular change, or rather a new development, takes place in the bulb. From being soft and spongy, owing to the previous exhaustion of the

layers, they begin to re-acquire solidity,—that is, they appear to acquire it, for the phenomenon is in reality dependent upon the progressive, but almost secret, production of one or more new bulbs. Nothing can be more impressive than this mysterious development; its course can scarcely be traced. I do not dare to assert, that a practised eye, gifted with a peculiar quickness in discerning physiological mutations, may not mark and detect *those* which are wrought in the formation and enlargement of the new onions; but I do say, that among above ninety plants which I obtained last summer, neither I myself nor a youth who planted the old bulbs, could trace the progress of the new ones. I may be excused for quoting the passage which I wrote in my diary, because it may be considered more simply true to the *then* observed facts, than any thing I could now pen from recollection.

"As the leaves advanced, the bulbs became soft and exhausted; as flower-heads rose, they were pinched off and gradually new bulbs formed, two, three, and four to each, the old bulb and skin vanishing in a way not to be detected."

I admit that I have adopted this mode of planting but once, and therefore may have been in some degree misled. A future experiment will perhaps lead to more correct observation. I hope, however, that numbers may be induced to inquire for themselves; they will assuredly be recompensed by a very excellent crop of good onions, of a medium size, either in June or July. Mine of 1835 was retarded by the extreme drought and piercing nights of May, and I had not attended to the previous preparation of the bed. I have expressly selected the Spanish or Reading onion for this summer crop, because it is mild and pleasant in flavour, and may be grown to greater perfection at the season; the process is worthy of the variety, and the variety is adapted to the process. The summer onions do not keep very long, nor is the Spanish a long keeper at all; hence particularly improper for the full winter crop, which ought to be hardy and of higher flavour. I might have chosen the *Tripoli*, which produces the largest bulbs, so large, indeed, that Mr Knight assured me he had grown several bulbs that weighed more than two pounds each, but it is very apt to decay. Many gardeners affect the variety termed the underground or *potato*

onion, but the process I have described furnished, I think, an excellent substitute for it, especially as the flavour of the Spanish is far more delicate than that of the underground bulb. I claim none of the merit of discovering the foregoing method of multiplying the bulbs; but am certain that if practised by any, it is known to very few persons, and my remarks will tend to diffuse the knowledge of it.

Seed-crop.—These fine large onions may be raised pure to their originals, by planting imported bulbs in a warm situation, exposed to the sun. The season might be the same as that of planting for a summer crop, and the soil a rich, mellow, sandy loam, well manured. The foregoing process for bulbs is adapted to the culture of seeding onions, with this especial exception, that the flower-heads must be encouraged, and each stem supported by a stake, as it advances in height. I am inclined to believe that were the imported bulbs of the Tripoli, Spanish, and Portuguese planted, one in a large pot of very rich soil, about the first week of January, protected under glass in a common garden-pit or vinery, not in action, and finally transplanted, with the ball of fibres entire, when all danger from severe frost had ceased, a month would be gained, which in the north might be found of some consequence, as the seed would be matured by an August sun.

Crop for the Winter, from Seed.—The preparation of the ground ought to be as complete as that for bulbs, above detailed; but if certain obstacles to it are found insurmountable, the grower ought to spare no labour or reasonable expense to trench and enrich the plot intended for the seed, to the depth of at least eighteen inches. If the subsoil be a heavy clayey earth (which soil ought never to be brought to the surface), it will be right to add materials at the top, and these ought to be of a rich light quality. A free black garden soil, replete with vegetable remains, must tend to produce fine solid bulbs.

The *variety* I recommend is the *Strasburg* (Flemish or Dutch, by some persons called also the Essex onion); it is a good keeper, the skin of a reddish-brown, the figure a pointed oval, the greatest diameter being, from root to point, precisely the reverse of that of the Spanish onion. The bed may be prepared late in the preceding autumn, or at any time between Ja-

nuary and the middle of March, provided the weather be fine. Drill-sowing is greatly preferable to broad-cast; a bed four feet wide will contain seven or eight rows, six inches asunder, and the Strasburg onions may stand only four inches apart in the rows. It is customary to scatter the seeds over the surface, and rake them in; or to draw drills half an inch deep, and trickle the seeds along them to the extent of about four in an inch. I mention these methods that the reader may form a choice; but the philosophical mode of proceeding—that which is dictated by the structure of the onion—is the following:—After the soil of the bed has been fully prepared, and made also extremely rich with very rotten manure at and below the surface, to the depth of four inches, it is to be beaten with a turf-beater till it becomes quite solid and compact. Lines are then to be scratched on this surface just deep enough to receive the seeds, about three in an inch; a very little light sandy earth is then to be sifted over the bed, merely to cover the seeds. An ounce of seed will sow a bed, broad-cast, twenty-four feet by five feet; half the quantity will suffice for drill-sowing.

It is indispensable that the ground be moist, though not wet; and if the winds and sun of March, or early in April, tend to parch the surface, the bed must be covered during the day with mats, and the ground sprinkled freely at night, if the weather be mild, till the onions rise. When they have grown three inches, the plants should be thinned, by hand, to two inches apart; and as they advance, numbers may be drawn as young onions, till they stand at the prescribed distance for bulbing. I may remark, generally, that this method of sowing is equally favourable to the large growing varieties, or even more so than to those with smaller bulbs.

The *course of culture* consists in lightly pushing the Dutch, or thrust hoe, along the earth between the lines, not to raise it, but to kill the weeds. Onions like rain, and if favoured with a frequently recurring supply of it, in moderate quantity, followed by intervals of bright sunshine and a generally warm temperature, they will begin to form bulbs in June; these will enlarge rapidly, and attain their full dimensions in August and September.

Many persons twist the stems a little above the neck of the bulbs, as soon as the upper part of the leaves become yellowish. I believe that this operation, by destroying the vitality of the leaf, tends to abridge the period of maturing, but that it never does, nor can transform a long and ill-shaped onion into one of good growth and figure, by diverting more of the sap to the bulb.

When the leaves decay and shrink, the onions are to be drawn up, and laid to dry on the surface of a compartment of ground or gravelled spot, more of the sap exposed to the full sun; an airy shed, open to the south sun, is excellent, as no rain can fall on the bulbs, which ought to be often turned, so as to become quite dry, speedily.

To *preserve the onions* during winter, they may be either tied compactly, in neat order, to ropes of straw, or be laid on the floor of an airy loft. Frost does not appear to injure them, nor will the *searing* of the part with a red-hot iron, whence the fibres emerge, which, if carried to the extent only of burning off the mere tips of the root-processes, will prevent the early sprouting of the leaves, without causing decay.

The peculiar excellence of the foregoing process is this,—it constrains the onion to become a *surface-bulb*, which rests and flattens upon the hard ground, if it be by constitution a broad variety, without becoming what is called "*bottle-necked.*" If, like the Strasburg, the bulk naturally affects an egg-like figure, it acquires a tendency to increase in horizontal bulk, hence to acquire solidity in lieu of sponginess. The roots proper push downward, and feed upon the moisture-yielding aliment; and, if favourably started at first, the plant never flags. Even without attending to the under-surface preparation, I have procured bulbs, the major part of which averaged eight or nine inches in circumference; many individual bulbs measured much more.

Crop by Transplantation.—There are two methods of thus obtaining very large onions. The *first*, I cannot better describe than by referring to the observations of T. A. Knight, Esq. because they give an insight into the rationale of the process. Every bulbous-rooted plant, it is stated, "generates, in one season, the sap or vegetable blood which composes, in a great measure, the bulb; and the quantity accumulated, as well as

the period required for its accumulation, varies greatly in the same species of plant, under more or less favourable circumstances. Thus, the onion of the south of Europe acquires a much larger size during the long and warm summers of Spain and Portugal, in a single season, than in the colder climate of England; but under the following mode of culture, which I have long practised, *two summers* in England produce nearly the effect of one in Spain and Portugal, and the onions assume nearly the form and size of those thence imported. Seeds of the Spanish and Portugal onion are sown at the usual period in the spring, *very thickly*, and *in poor* soil; generally under the shade of a fruit-tree; and, in such situations, the bulbs, in the autumn, are rarely found much to exceed the size of a large pea. These are then taken from the ground, and preserved till the succeeding spring, when they are planted at equal distances from each other, and they afford plants which differ from those raised immediately from seed, only in possessing much greater strength and vigour, *owing to the quantity of previously generated sap being much greater in the bulb than in the seed.* The bulbs thus raised often exceed five inches in diameter, and being more mature, they are with more certainty preserved in a state of perfect soundness through the winter than those raised from seed in a single season."

The following remarks, under the head "*Allium*" of the *Penny Cyclopædia*, by an eminent phytologist, are pertinent. The method to procure large bulbs is, to "take the small onions of a late sown crop of the previous year, and to plant them in rows in the beginning of April, laying them on *the surface of the soil*, each surrounded with about a handful of decayed and nearly dry manure. All the time that is usually lost in seed-sowing is thus avoided, and the moment the bulbs push forth new roots, they find themselves in the midst of an abundant store of food, which continues to supply them with nutrition during the whole of the growing season. As they advance in size, the soil round the bulbs is frequently disturbed by the hoe, for the sake of exposing, as much as possible, the carbonaceous matter of the manure to the action of the atmosphere." (Reference for further information is made to the *Horticultural Trans.* vol. i. p. 158; vol. iii. p. 67; vol. iv. p. 138.)

On the foregoing I observe, that the period termed a *late* sowing ought to have been specified; for a sowing made in the summer-produced plants, which my garden, at this time (December 21.), exhibits standing, as thickly as possible, and green as grass, fit to draw for salading; and these young, unbulbed onions will, I little question, if they survive the degree of frost which *may* visit us, furnish a capital bed of very large bulbs, by removal to a well prepared plot in April. The writer, I believe, labours under a mistake if he supposes the manure *on* the surface and around the bulbs to be decomposed by atmospheric influence, in a way and time most suitable to the organs and functions of vegetable nutrition. It is to the vital electrical energy of the roots that we must look, if we hope to discover the causes of the *production of sap*. Whatever may be the decomposition *superficially* effected by atmospheric divellent attraction, the products of it will be borne away on the wings of the wind, in the forms of carbonic acid and hydrocarbonates. But enough, and not to be hypercritical, I think that if any clever gardener will deliberately combine the two processes of *transplantation*, and of solidifying the surface by the turf-beater, he will procure a finer set of bulbs, true to their original type, with greater facility, and fewer sources of disappointment, than by any other mode hitherto described.

The *second method of raising a transplanted crop*, and by which Mr Knight assures me he obtains his immense Tripoli onions, is to sow in a gentle hot-bed in January, and to remove the small plants to their summer garden plot during April. In my soil I could not during the droughts of the last two years cause the plants to take sufficient root, so as to elevate themselves from a horizontal position in time to prevent their destruction by parching heat and wind, or by worms. I cannot, therefore, practically write in confirmation of the practice. However, when a garden furnishes a rich, sandy, or peaty soil, which abounds in vegetable matters, and to which water can be conveniently and duly supplied, there can be no reasonable doubt of success.

2. THE LEEK, *Allium porrum*, is one of the same family as the onion, and, in common with it, the origin is unknown. It does

not produce a bulb; its body or stem is composed of a number of broad, juicy leaves, the bases of which are white and tender, and enclose each other in alternate order. This leafy stem can be made to enlarge very considerably, insomuch that a large leek will measure from two to three inches, and being perfectly blanched to the length of six inches or more. Two methods of planting are adopted; one of which, the *old method*, consists in sowing very early in the spring (not later than the middle of March), in beds of very rich, light earth. Drills, seven or eight inches apart and half an inch deep, are to be drawn or pressed on the level surface, the seeds scattered along them, covered with light, fine earth, which is to be pressed gently upon them; for it should be always remembered that nothing tends more to promote vegetation than the close contact of the earth. The plants are thinned out to three inches apart in the rows, and the earth kept clean and open by occasional gentle hoeings. If a due supply of rain fall, the leeks will be as large as a quill soon after midsummer; and if the soil be very good, they may be much larger.

In July, deep drills are made in another plot of ground much enriched, two feet asunder, and along these the leeks are planted by a setting-stick, after their roots have been curtailed to within an inch of the stem, and the top of the leaves trimmed off. The leeks are fixed firmly in small holes, just deep enough to receive the roots and the base of the stem, but no more. They soon lay hold of the soil, and, as they advance, the earth on each side of the furrow is drawn to them; and this moulding up is repeated from time to time by drawing earth from the intervals. By the month of October the leeks attain their full size, and will remain firm and good during any ordinary winter.

The second, or *modern method* of culture, is ably described in its essentials, under the head *Allium* of the *Cyclopædia*, before alluded to. After detailing the structure of the leek and its stem, it proceeds thus:—

"As the excellence of the leek depends entirely upon the large size of this part, the attention of the cultivator is exclusively directed to that, before all other considerations. It has been found that there is no method so successful as to sow the seed early, in a light and well manured soil, and then when the young leeks have arrived at the thickness of the little finger, or even sooner, *to drop them into holes* about 2½ or 3 inches wide, and 6 inches

deep, in the bottom of which some very fine manure has been deposited. By this means the young plants are copiously supplied with moisture, have abundant food round their young roots, are attracted upwards by the light, and are enabled to develope themselves with rapidity, from the absence of all pressure from the surrounding earth; and when they fill up the whole cavity of the hole, as they will in time, they then blanch themselves in all the most valuable part of their stem." (Vol. i. p. 354.)

The leek benefits greatly by transplantation, and it derives nutriment by the resolution of hydro-carbonious substances into their elements through the energy of its vital principle exerted by the roots. The deeply-buried *stratum of manure* mentioned in the first part of this article, would furnish a constant supply of nutritious fluid, and increase the bulk of the stems. The portion of manure deposited in each hole acts a corresponding part in the first instance; but as it is the radical fibre, and not any portion of the base of the leaves, which becomes the organ of absorption, it would be wise, at the moment when the transplanted leek is dropped into its hole, to support the plant perpendicularly, while a quantity of soft water is poured into the hole sufficient to reach an inch up the stem. This stream, as it soaks through the manure, will wash in and puddle it, and some earthy particles also among the fibres; thus giving them the means to fix themselves at once into the medium of their immediate nutriment.

It is not stated above whether the roots are curtailed or not, but they are apt to grow to a great length, and if placed entire in the hole, would be distorted and bent upward. The leaves, however, will require no abridgment, as the moisture afforded by the first watering, and the complete shade and shelter given by the sides of the sheath of earth, will combine to prevent any degree of check which transplantation too frequently occasions.

Every one knows the use of leeks in soups, &c.; but perhaps many may not be aware that if simply boiled till quite tender, they become a very excellent vegetable dish, to be eaten with boiled [illegible].

5. EARLY POTATOES.—An early crop of really fine potatoes is a very pleasant circumstance, but if with superior flavour are combined the essential qualities of mealiness and great durability, we obtain a real treasure. So many persons know how

to cultivate the potato, that farther directions may be considered superfluous. It is not, however, my intention to follow in the beaten track, but to describe the progress and results of an experiment conducted by me in the spring of last year, which has produced a very large crop of a variety so perfectly good, that I should deem myself remiss, were I to withhold that information which might enable others to profit by it as well as myself. Perhaps some gardeners or private individuals may have adopted a somewhat similar practice, but I have never yet seen potatoes so grown. I therefore hope that I have discovered a method of culture which may be beneficial to the domestic economy of many.

The plan had its origin in the injury which was found to result from the severe drought of 1835, and from observing the astonishing efficacy of a mass of decaying vegetable matter in counteracting its baneful effects.

A plot of ground had, in 1835, been set out in deep trenches; the bottoms of these were amply supplied with decaying compost, over which several inches of garden mould were placed for the reception of a crop of Indian corn. The mould in the trenches was at least three inches below the level of that in the intervals, and the trenches were a yard asunder. The success of the plantation was perfect, the verdure intense; in fact, without one application of water, the corn went through all its stages most luxuriantly. I dwell a little on this first preparatory stage, because the extent of the manuring may thus be made apparent.

In the third week of March I received from a neighbour a small quantity of potatoes, which he called the *Ash-leaved kidney*. They certainly had the form of that choice variety, but appeared to be generally larger. The weather during March had been so unusually wet and cold, that I dreaded a recurrence of spring frosts, as well as a protracted period of parching winds whenever the dry season might commence. To guard equally from both enemies, I dug and manured the intervals, which had already become a sort of trenches, in consequence of having earthed up ridgeways the growing corn with the mould of the spaces between the rows.

Thus, then, in March 1836, the ground was laid out in *ridges* one yard asunder, resting upon the *manured* trenches of

1835, and the trenches or low spaces between these ridges were digged and manured for the crop of summer potatoes. The weight of the potatoes above mentioned (for which two of the spaces were allotted) was 8½ lb.; the tubers were planted standing upright, and quite entire, four or five inches apart. They were placed upon a little earth that was drawn over the centres of the hollows, so that they were not in actual contact with any portion of the manure. Fine earth was then gradually brought down from the sides of the ridges, and placed against the upright tubers till it covered them to the height of an inch, or rather more, above the row's ends. Thus the potatoes were planted in manure trenches, a yard asunder, protected right and left by six-inch high ridges. The direction of the rows was from N. N. W. to S. S. E.; and therefore the sun, about eleven of the forenoon, shone nearly along their entire extent.

This direction, or one more perfectly corresponding with full exposure to the sun at noonday, appears the most congenial to the potato, as the haulm is thereby maintained more upright at all times. If the broadsides of the rows are presented to the south, the plants are too powerfully attracted, and become liable to fall over, in which case, the foliage derives little benefit from the solar light, and the juices are imperfectly laborated.

The plants soon rose, but their summits were greatly defended from cold by the high ridges, and enjoyed to the utmost the midday sun. However, by the time they became three inches high, the nights were so cold that I drew earth down from the ridges, till the leaves were nearly covered with it. Here another advantage was derived from the mode of planting, for I was enabled to protect, by new and dry soil, and yet to avoid burying the sets too deeply. In a flat bed, the potatoes are planted at once from four to six inches below the surface, but in the ridge and trench method, the slight covering first given is sufficient to ensure the first vegetation, and earth in the best possible condition is at hand to be brought against the rising stems. Thus shelter, shade, and defence, each the most suitable to the desired object, are amply provided for.

The progress of the plants was such as to justify the prudence of the means adopted; not a leaf was injured, though several frosts of severe character occurred, as, for instance, on the

29th and 30th April. They were moulded up twice or thrice, and, finally, the stems had about six inches on each side of them. This finely wrought soil operated also as an attractive medium for the development of surface roots; and the verdure of the foliage afforded ample proof of the rich supply of food which the roots imbibed.

I soon perceived that my neighbour had mistaken the variety, for these plants remained green, and the tubers immature, above a month after the haulm of some rows of *ash-leaved*, of true character, had entirely died away. I conjecture that the plants in question were the *walnut-leaved kidney;* and this the specimens I enclose to the Editor of this Journal, for inspection, may tend to verify or disprove. Be that as it may, the tubers were not ripe till Michaelmas; they were subsequently digged for table use, as required; and the remainder, finally, for stock, on the 5th of November. The eight pounds and a half yielded 120 pounds. Another row had been planted, expressly for seed, but in another plot of ground, not prepared so richly, and the row pointing east and west, *three pounds* were set, and on the 24th of October *thirty-nine pounds* were digged up. This variety is excellent, either when cooked fresh from the ground, or at the present time, after having been kept in an open cask, in a cold out-house, with no other covering than a folded garden-mat. I tried the quality in March last, when I received the seed, and have every reason to believe that the potato is superior at all seasons.

As a comparative experiment, I beg to cite the results of four rows of true *ash-leaved* kidneys, set also in trenches, in the third week of March. 12¾ lb. produced 74 lb. 12 oz. only. The ground had been less prepared, and had little vegetable matter in masses within reach of the roots; the plants also being more exposed to the sun during the protracted dry weather, suffered from paucity of moisture. The potatoes were taken up as required, from July 11. to August 10. I ardently desire to recommend the fine potato, which produced so abundantly, because, among seven varieties, early and late, which I grew in 1836, I found that the bulk yielded surpassed, by more than cent. per cent., that of the very best of its competitors.

Kalendar of Miscellaneous Operations. — The months of