AGRICULTURAL.

[From the Genesee Farmer.]

ROTATION.

We observe with pleasure, in many parts of the country, an increased attention to thorough farming, particularly to raising large crops by copious manuring; but there is one essential point which is still greatly neglected, *a general and regular system of rotation*. The great advantage which might result from this practice, is very strikingly exhibited in a cornfield now growing, a part of which was last season occupied with a crop of ruta baga, and the remainder with corn. The whole field was equally covered with manure, before the crop was planted. The result is, that the part of the crop of corn growing where the ruta baga stood, promises to be at least double in amount that which follows the part of the field occupied with corn last year, though it had no other advantage whatever, over the other part, than that of having been preceded by a crop properly adapted to a part of a course in rotation.

Suppose that on an average twenty-five per cent. is gained by rotation, over the common practice where this is not attended to, that a Farmer's annual crops are worth one thousand dollars, and that all his expenses are six hundred, his net profits of course are four hundred; if now his crops are increased twenty-five per cent. by rotation, his profits (no additional expenses whatever being in this case required,) are immediately raised to six hundred and fifty dollars. It is believed that the difference in these two modes would generally be much greater, if the best system of succession was attended to; nor is this the only advantage; for while improper culture tends constantly to impoverish soil, a good course of rotation is constantly increasing its fertility.

SCIENTIFIC GARDENING.

GARDEN CHEMISTRY—CONCLUDED.

Heat.—As it has been shown that the food of plants, in order to be available, must be fluid; and as heat is the cause of fluidity, its primary importance to vegetation must be obvious, for no plant could take up frozen liquids. The processes, moreover, of fermentation and putrefaction, by which are produced the supply of carbonic acid gas, humic acid, and nitrogen, indispensable to vegetation, cannot go on without warmth. It is well known, for instance, that beer cannot be brewed in frosty weather, because a due degree of fermentation cannot be effected on account of the cold.

The effect of heat on plants is very beautifully proved by the experiment of Du Hamel, on rising of the sap in vines in spring. On a frosty day, when the sun shone on a cut vine, the sap flowed on the south side exposed to the sun, but not on the north side where it was in the shade. In Canada also, where the frost is long severe, maples, when wounded, begin to bleed with the first thaw, but stop again should frost recur, though on the south side the bleeding goes on, at least during sunshine. It is on this account in some northern climates, where the long sunny days succeed in thawing of the snows, as in Norway and Russia, that the gardeners are said to shade their wall-trees from the mid-day sun in the spring, to prevent the sap being prematurely raised and again checked by the certain cold of the succeeding night, a contrivance which also retards the flowering till there is less danger from spring frosts. Such shelter will also be beneficial in protecting from the dry winds of spring.

Did these effects of heat, which must also in part be attributed to light, require any proof, it may be shown by two wine-glasses, the one filled with hot and another with cold water, in each of which is placed a similar hollow straw, so as to discharge the water, when it will be seen that the hot water flows more rapidly than the cold.

The soil in this country, below where the frost usually penetrates, averages a temperature of forty-eight degrees, or fifteen degrees above freezing, which is the reason why springs do not freeze, and not any quality in the spring water, which will freeze readily enough when taken from the well.

It is of the utmost importance to be acquainted with what is termed the *radiation*, that is the spreading of heat, which arises from heat passing from a hot body to a colder one near it, as uniformly as water runs down a slope. This spreading of heat takes place between the surface of the ground and the air; and when the air is cold, though the soil be warm, it soon loses its heat, and dew or hoar frost is formed on the grass by the moisture diffused in the air, though previously invisible, becoming condensed or frozen. But when the sky is covered by clouds, the spreading and the loss of heat is in a great measure prevented, and hence there is no dew or hoar frost formed on a calm cloudy night, as was first remarked by Aristotle.

It is on this principle, that garden plants are protected by matting, which stops the heat of the soil from spreading about and being lost in the air. Dr. Wells proved this principle by stretching a very thin cambric handkerchief two feet square, six inches above a grass plot; and he found on one night that it was five degrees warmer under the handkerchief than the rest of the grass plot; and on another night there were eight degrees of difference. Hence great thickness does not seem to be so important in such cases, as the interposition of any screen whatever between the soil and the sky, provided always that the screen does not touch the soil or the plants to be protected. In this case it might carry off heat by conduction.

It is on this same principle that snow affords a protection from the severity of frost, the plants under snow having been found by Dr. Darwin to indicate forty degrees, that is eight degrees above freezing; hence some Alpine and Siberian plants, such as auriculas, do not bear exposure to frost when unprotected by snow, so well as those which are natives of a warmer and require artificial shelter.

It may be remarked, that hoar frost is never seen on a sloping hedge bank, on the side of an earthed-up row of celery, nor close to a garden wall, unless when the surface is already frozen, and that such places are always the first to thaw, beginning with the summit of a slope, evidently because the slope is unfavourable to the spreading of heat, while the garden wall stops it, in the same way as Dr. Wells's handkerchief did. Hence broad coping-stones on walls are excellent for protecting wall trees.

Another reason for a slope or a hill being warmer than a valley, is that cold air being heavier than warm air, the coldest air always rolls down to the lowest situation; but if there be a brisk running stream in a valley it will prevent in some measure, the stagnation of cold air; injurious, because the greatest cold always occurs in air having the least motion. Professor Daniell says he has seen a difference of 30 degrees on the same night between thermometers, one placed on an elevated situation and another in a sheltered valley. The shelter of walls may, therefore, it would appear, be so arranged as to prove injurious rather than beneficial, by causing the air to stagnate and become cold, as it does in sheltered valleys during the night.

The evaporation of water is so strongly productive of cold, from the water requiring much heat to expand it, which it of course carries off into the air, that in the hot climate of India, ice is, for the purposes of luxury, actually procured in considerable quantity, by exposing unboiled pump water in broad shallow earthen pans placed on dry straw on calm cloudless nights, to the open sky.

It is from rapid increase of cold by evaporation, that we account for the injury produced by watering plants when a warm dry wind blows, or during bright sunshine, which is popularly termed *scorching*, though it is not the heat that affects them, but the cold caused by the water carrying off the heat as it arises in form of vapour into the air. Miller is undoubtedly wrong in supposing it to be occasioned by the sun's rays being brought to a focus, as in a burning glass, by the small globules of water, for these globules, from their touching the plant, cannot bring the rays to a focus.

The injury caused by the melting of hoar frost or frozen rain on plants arises from a similar cause, the carrying off a portion of heat from the plant in order to render the frozen water fluid.

The amount of evaporation depends on the quantity of moisture in the air, and the rapidity of its motion, or, in other words on the velocity of the wind. Over the first the gardener has little or no control; but he can by means of walls, palings, hedges, and other screens, obstruct or stop the current of the wind; or natural shelter may be found in uneven ground. Professor Daniell states that the same surface which, in a calm state of air, would give, off 100 parts of moisture, would yield 125 in a moderate breeze, and 150 in a high wind. The dryness of the air in spring renders the effect most injurious to the tender shoots of this season, when it is desirable to shelter gardens from the easterly and northerly winds in particular, by means of high walls placed not too far asunder.

I need scarcely allude to the extensive use which is made of artificial heat in rearing the plants of warm climates, as well as in the various modes of forcing, for proof of its being of the first importance for every gardener to study the laws by which its distribution is regulated, and the means by which this may be artificially economised in gardens both in the open ground and in plant houses.

Electricity.—Electricity is in several circumstances similar to heat. Its great influence on vegetation is proved by electrified seeds germinating sooner than those not electrified; upon which principle Bertholon proposed its being employed in gardening. But this has been less followed up than it probably deserves to be, as in the more delicate management of green-house and stove plants, it might probably be of considerble use.

Injurious Substances.—Plants are precisely similar to animals in respect to injuries caused by too much or too little food, as well as by what is of a deleterious or poisonous quality.

It is accordingly found that among the substances already mentioned as constituting the wholesome food of plants, they are injured by too much or too little water, and by too much or too little carbonic acid gas, and by too much or too little light or heat. Saussure found that when he confined plants in carbonic acid gas, they were as much injured as the consumptive patients whom Dr. Beddoes caused to breath oxygen, which, in due quantity, is indispensable to health. Food indeed, which is rich, concentrated, and without a due mixture of what is less rich, is injurious to plants and animals; and, hence, plants will not thrive on distilled water largely mixed with carbonic acid gas without atmospheric air, or at least its nitrogen to qualify it; any more than a