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CONDUCTED BY

DR. E. EMMONS AND A. OSBORN, ESQ.

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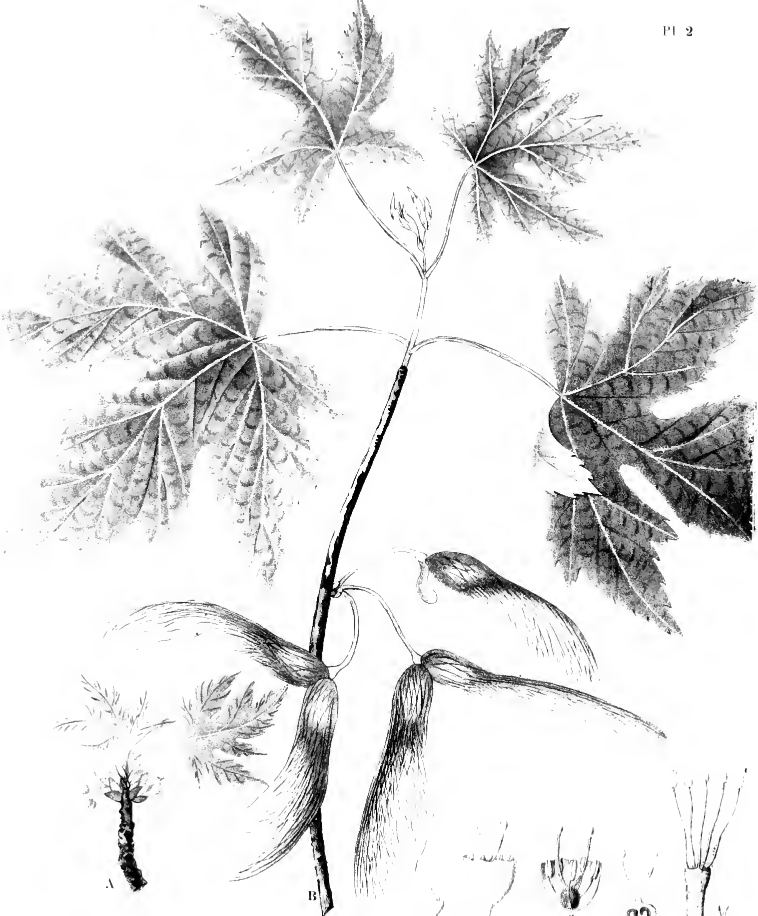

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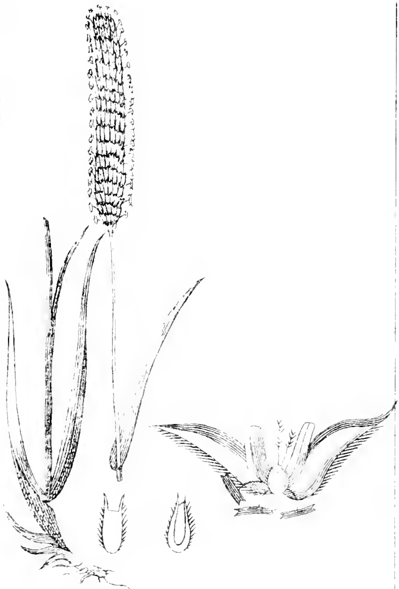
Pl. 1.



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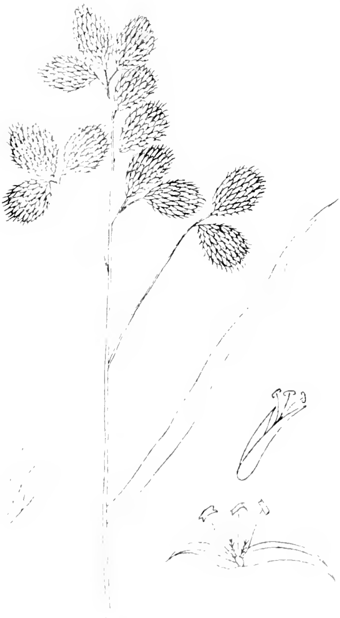

Dactylis Glomerata.

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AGRICULTURE AND SCIENCE.

No. IX. JANUARY, 1847.

INSECTS INJURIOUS TO VEGETATION.—No. V.

BY ASA FITCH, M. D.

THE HESSIAN FLY.—(*Continued.*)

Its Characters, Transformations, and Habits.

As a general rule, the Hessian fly passes regularly through two generations annually. The first of these occupies the autumn, winter, and fore part of the spring, and is reared at the roots of the young grain, slightly below the surface of the ground. The second occupies the remainder of the spring and the summer, and is chiefly nurtured at the first and second joints of the straw. The time when its several transformations occur, is not perfectly uniform, being varied by the climate, the state of the weather, and perhaps other contingencies; and it is not improbable that individual specimens, placed in circumstances unfavorable to their development, have their growth retarded so much as to require even a whole year to complete their metamorphoses.

First Generation.

THE EGG. *When and where deposited.*—The eggs of the first generation are deposited chiefly in the fore part of September. Dr. Chapman says the deposit is made from the latter end of August till the 20th of September, and most other accounts coincide with this, though some extend the time into October. On the 8th of October the fly was seen ovipositing in Eastern Pennsylvania, in 1819, and it had wholly disappeared on the 11th. (*Am. Farmer*, ii., 180.) The deposit is doubtless made later at the south, than in this vicinity. Mr. Tilghman's description of this process (*Cultivator*, viii., 82,) will convey so much more distinct a view to the general reader, than any other that has ever been published that we here insert it. He says, "By the second week of October, the first sown wheat being well up, and having generally put forth its second and third blades, I resorted to my field to endeavor to satisfy myself by ocular demonstration, if I could do so, whether the fly did deposit the egg on the blades of the growing plant. Selecting what I deemed to be a favorable spot to make my observation, I placed myself in position, by reclining in a furrow between two wheat lands. It was a fine, warm, calm forenoon; and I had been on the watch but a minute or two, before I discovered a number of small black flies, alighting and setting on the wheat plants around me; and so strong seemed to be their predilection for the wheat, that I did not observe a single fly to settle on any grass, or any thing within my view, but the wheat. I could distinctly see their bodies in motion when settled on the leaves or blades of the wheat, and presently one alighted and settled on the ridged surface of a blade completely within my reach and distinct observation. She immediately commenced disburthening her apparently well stored abdomen, by depositing her eggs in the longitudinal cavity between the little ridges of the blade. I could distinctly see the eggs ejected from a kind of tube or sting, or by the elongation of the body; the action of the insect in making the deposit, being similar to that of the wasp in stinging. After she had deposited, as I supposed, some eight or ten eggs, I easily caught her, upon the blade, between my finger and thumb. . . . . After that, I continued my observations on the flies, caught several similarly occupied, and could see the eggs uniformly placed in the longitudinal cavities of the blades of the wheat; their appearance being that of minute reddish specks.

Its appearance and characters..—The account of the eggs, and also of the worms of the Hessian fly, as given by Mr. Herrick, is drawn up with such scrupulous care, and is so full and definite in every particular, that we are constrained to enhance the value of this essay, by presenting it entire. He says, "The eggs are laid in the long creases or furrows of the upper surface of the leaves of the young wheat plant. While depositing her eggs, the insect stands with her head towards the point or extremity of the leaf, and at various distances between the point and where the leaf joins and surrounds the stalk. The number found on a single leaf, varies from a single egg up to thirty, or even more. The egg is about a fiftieth of an inch long, cylindrical, rounded at the ends, glossy and translucent, of a pale red color, becoming, in a few hours, irregularly spotted with deeper red. Between its exclusion and its hatching, these red spots are continually changing in number, size, and position; and sometimes nearly all disappear. A little while before hatching, two lateral rows of opaque white spots, about ten in number, can be seen in each egg. In four days, more or less, according to the weather, the egg is hatched."

THE LARVA. *Growth of the worm, or active larva.*—Mr. Herrick's excellent description is continued as follows, "The little winged maggot, or larva, creeps out of the delicate membranous egg skin, crawls down the leaf, enters the sheath, and proceeds along the stalk, (see fig. *m*,) usually as far as the next joint below," (fig. B. §§,) or, in other words, *to the base of the sheath*, which in the young autumnal wheat, is at the crown of the root (fig. A. §). "Here it fastens, lengthwise, (fig. *n* and *o*,) and head downwards, to the tender stalk, and lives upon the sap. It does not gnaw the stalk, nor does it enter the central cavity thereof; but, as the larva increases in size, it gradually becomes embedded in the substance of the stalk. After taking its station, the larva moves no more, gradually loses its reddish color, and wrinkled appearance, becomes plump and torpid, is at first semi-translucent, and then more and more clouded with internal white spots; and when near maturity, the middle of the intestinal parts is of a greenish color. In five or six weeks (varying with the season,) the larva begins to turn brown, and soon becomes of a bright chestnut color, bearing some resemblance to a flax-seed," &c.

Its characters.—When freshly taken from the root of the wheat the mature worm (fig. *g*) measures about fifteen hundredths of an inch (0.15) in length, by about 0.06 in breadth. It shows no signs of life when placed upon paper and turned over with a needle-point. It is soft, glabrous, shining, white, oval and apparently composed of but nine segments, although twelve can often be distinctly perceived before its growth is completed. These are quite slightly marked by faint transverse lines of a greenish-brown hue. Its under side is flattened, and has an ablong grass-green cloud or spot in the middle, placed longitudinally. No regular contractions or crenatures occur along the margin to mark the segments, though after the worm has laid exposed to the air an hour, the color of the transverse lines above spoken of becomes bleached out as it were, and then, perhaps from the worm's having become somewhat dried, faintly impressed transverse lines are perceptible at the junction of each of the nine segments: faint longitudinal striæ are also discernable, as though produced by the pressure of the parallel veins or ribs of the sheath and culm, between which the worm had laid.

Its mode of feeding. We have hitherto sought in vain to ascertain, by ocular and microscopic examinations, how it is that the worm imbibes its nourishment from the stalk. To expose it to view, we are obliged to place it in circumstances so unnatural to it, that it apparently refrains from feeding. That it "gnaws" the stalk, as some writers in our agricultural papers, and some compilers of popular treatises inform their readers, is an error so gross as scarcely to deserve notice. Some have supposed that it absorbs its nourishment through the pores of its skin; but we incline to the belief that Dr. Lee's opinion is nearest the truth of any that has been hitherto advanced—that it takes in its nourishment by suction, in a manner more analagous to the leech than any other familiar object. (*Gen. Farmer*, vii. 225.)

Its effects upon the crop. The autumnal attack of the fly is in a double sense a *radical* one. Each particular shoot at whose root one or more of these larvæ nestles, is commonly destroyed by the time the worm has attained its growth. The presence of these worms is therefore readily detected by an examination of the young wheat in October or November. Individual shoots will be found here and there in the field, withered and changed to a light yellow color, (fig. A†.) strongly contrasting with the rich green of the vigorous uninjured plants. (fig. A*.) The frost or some other casualty may cause the ends of some of the other leaves to be of a pale yellow color, but here the whole plant is of that hue; and where a field is badly infested this yellow "sickly" aspect is perceptible from a distance. On examining the withered plants, the worm, or flax seed if it has advanced to that stage, can be readily found. It is situated a short distance below the surface of the earth, at the crown of the root (fig. A§). One or two radical leaves start from this point, their bases forming a cylindrical sheath around the central or main shoot, which as yet is but in its infancy. It is within this sheath, at its base, that the worms repose, one, two, three, or more, and by imbibing the nutricious juices of the young shoot, cause it to wither and die. The mechanical pressure of the larvæ, so frequently spoken of as impeding the circulation of the fluids of the plant, and hereby causing it to perish, I think has had too much importance assigned to it, the young plants being so soft and pliant that they would readily accommodate themselves to this pressure, if they received no molestation beyond this.

Is the crop ever benefitted by it? The vigor and luxuriance of the uninjured shoots from the same root, contrasts so strongly with the wilted and feeble appearance of those attacked by the worm, as to have led some to believe that the unaffected shoots were stimulated to a more rapid and robust growth in consequence of the *pruning* given by the fly; and that a better crop is thus sometimes produced, by the presence of a moderate number of these worms among the wheat plants. The correctness of this opinion we very much doubt. The worm is nourished and reared upon those very fluids that are absorbed by the plant and elaborated for its own sustenance and growth. Every particle of this nutricious juice, therefore, that is consumed by the worm, is a direct loss of just so much material that would otherwise become straw and grain. At all events, we think our farmers generally will prefer that nature should be left to her own undisturbed course in rearing their wheat plants, and will be by no means solicitous to have this renowned guest take any part in the operation.

Its change to a "flax-seed" or dormant larva. When the worm, or active larva, has fully completed its growth, a slight diminution in the dimensions of the inner soft parts of its body commences, in which the outer and harder skin does not participate, this latter retaining its original full size. The result of this contraction is, that the worm gradually cleaves from its outer skin. If examined with a microscope when this change has recently commenced, a slight translucent space is observable at the head end, and a larger and more obvious one at the pointed or tail end, plainly indicating that the enclosed worm does not entirely fill its outer skin. This contraction continues, until the worm becomes entirely separated from its outer skin, and lies within it like the finger within a glove. The outer skin at the same time changes in color. From its original whiteness and transparency, it gradually becomes opake, brown, and finally of a dark bay or chestnut color. Though *much less flat* than a flax seed, its resemblance in color, size and form to that familiar object, is so striking as at once to be remarked by every one.

Characters of the flax seed, or larva case. Different specimens of these flax seed like larva cases (fig. *h. i. j.*) vary in length from 0.13 to 0.19 and in breadth from 0.05 to 0.08. They are shining, cylindrical-oval, more obtusely rounded at the lower or head end than at the other, which is generally attenuated into an acuminated point or small projecting papilla. They are commonly composed of but nine obvious segments, and these are but slightly indicated by very faint acutely impressed transverse striæ—a similar transverse stria, but still more faint, being sometimes perceptible (fig. *h.*) across the middle of some of the segments. Longitudinal impressed striæ are sometimes present, (fig. *j.*) more conspicuous than the transverse, and reaching a part or the whole length of the worm; and between these the surface is minutely acuducted (i. e. appearing as if lightly scratched by the fine point of a needle) longitudinally — all these longitudinal impressions being perhaps caused by the pressure of the veins and fibres of the plant, against which the worm has been imbedded. On the under side, (fig. *i.*) towards the head end, the case is flattened, as if pinched together, so much so that the anterior segment seems a mere empty fold of the membrane, without any inflation sufficient to make room for internal viscera. At this end is often observable one or two little brush-like granules, resembling those on the soles of the feet of some carabidous insects. (One of these is indicated on the anterior edge of fig. *i.*) Are these the relicts of the suctorial mouth of the larva? This larva case is comparatively tough and leather-like at first, but becomes more brittle and also darker with age.

Character of the dormant larva. On carefully opening the larva case just described, a worm (fig. *k.*) is found within it, scarcely different in any respect from what it was immediately before entering upon this flax seed state. It has the same oval form, opake milk-white color, and green, cloud-like visceral spot or line beneath. The nine segments into which it appears divided, however, are now much more distinctly marked than they previously were, the transverse lines being more deeply impressed, and the margins showing corresponding crenatures. No traces of the members of the future fly are yet discernible. The insect now undergoes no further change, for a period of five months or more. Enveloped in its flax seed like mantle, and reposing at the root of the now lifeless grain, it is buried beneath the snows of winter. Over one half of its entire term of life is therefore passed in this state.

Error in previous accounts. This is the stage of this insect, which has been spoken of by all preceding writers as its pupa or chrysalis state. Upon a close observation of the *Cecidomyia tritici*, the writer succeeded in discovering that that species had, what some had conjectured, but none had actually observed, a regular pupa form, identical with that of other species of Cecidomyia, whose metamorphoses had been fully described. It hence appeared necessary to distinctly mark that long period of inactivity which intervenes in the wheat fly, after the larva has completed its growth, and before it enters its pupa state; it was therefore, during this state of its life denominated a dormant larva, in my essay upon that species. It occurred to me whilst writing out that essay, that the dormant larva state of the wheat fly, was exactly analagous to the flax seed state of the Hessian fly, and in a note, my suspicions were expressed that the real pupa of the Hessian fly had never been detected. The ample opportunities which I have since enjoyed for investigating this species, have enabled me fully to trace out this point in its transformations, and to show that it is not till near the close of its flax-seed period of existence that the Hessian fly puts on its pupa form. In penning the note just alluded to, I had overlooked a passage in Mr. Herrick's last paper, from which it is obvious that he has seen the real pupa of the Hessian fly, although he still speaks of its pupa state as commencing when the worm becomes a flax seed. Inaccuracies of this kind, which to the general reader appear so trivial as scarcely to require correcting, are liable to lead to important errors. Of this, we have a striking illustration in this very instance. Mr. Westwood, on opening the flax seeds contained in the wheat straw from Germany, came upon "the larva," where, according to all the accounts of the Hessian fly he ought to have found *the pupa;* he therefore at once draws the important inference, that the German insect cannot be the Hessian fly of America. Indeed it is surprising, that so plain a fact as this, that it is a worm and not a pupa which is enveloped in the flax seed case of our insect, has been so wholly overlooked by every one who has hitherto written upon this subject.

THE PUPA. *When formed.*—On the access of the first warm days of spring, as soon as the weather becomes sufficiently genial for some of our earliest plants to put forth their blossoms, the larva of the Hessian fly is rapidly stimulated to maturity. The present year, so early as the 21st of April, most of the insects were found to have taken on their pupa form. As this season was more forward than usual, this may prove to be an earlier date than is common for this occurrence; a more accurate criterion by which to indicate it definitely, is no doubt by a reference to the progress which vegetation has made at this time. We may therefore state, that in all parts of our country, the Hessian fly will probably be found in its fully formed pupa state, about a week after the liverwort, (*Hepatica triloba,*) the trailing arbutus (*Epigœa repens*), and the red or swamp maple (*Acer rubrum,*) first appear in bloom, and simultaneously with the flowering of the dry strawberry (*Comaropsis fragarioides*), the common five-finger (*Potentilla canadensis*), the hill-side violet (*Viola ovata*), &c. It continues in this state about ten or twelve days, and then sends out the winged fly.

Its characters.—The flax seed shell has now become quite brittle, breaking asunder transversely if rudely handled, and one of its ends slipping off from the inclosed pupa like a thimble from the end of the finger. On removing the pupa (fig. *l*) from its case, it is found to be 0.13 long by 0.05 broad, of an oval form, with rounded ends, and having its limbs and body enveloped in separate membranes. The thoracic portion is slightly narrower than the abdominal. The wings do not quite attain the middle of the length of the body. The outer pair of feet come out from under the tips of the wings, and reach to the anterior margin of the penultimate abdominal segment, slightly curving inwards at their tips. The next pair of feet are somewhat shorter, and the inner pair are shorter still. They all lie in contact with each other, and in a direction nearly parallel with the body. The abdominal segments are distinctly marked by strongly impressed transverse lines, and are of a milk-white color, the thorax and head being of a delicate pale pink-red, and the feet translucent-white. On the anterior margin is a chestnut-brown crescentiform mark. It will hence be perceived, that in all the details of its form, the pupa of the Hessian fly coincides precisely with those of the other species of this genus which have been described.

Its change into a fly.—The time for its final transformation having arrived, the pupa breaks open and crawls from its puparium or flax seed case, and works its way upwards within the sheath of the leaf, until it arrives at some cleft in the now dead, brittle and elastic straw; through this cleft it gradually, by bending from side to side, crowds its body until all except the tip of the abdomen is protruded into the air, the elasticity of the straw causing it to close together upon the tip of the abdomen, so much as to hold the pupa in this situation, secure from falling to the ground; and as if to preserve the body in a horizontal position, the feet are slightly separated from the abdomen, and directed obliquely downwards, with their tips pressed against the side of the straw, thus curiously serving, like the brace to the arms of a sign post, to support the body from inclining downwards. Thus securely fixed, and now freely exposed to the drying influence of the atmosphere, the outer membrane of the pupa speedily exhales its moisture, and as it becomes dried, cracks apart upon the back part of the thorax; out of this cleft the inclosed fly protrudes its head and thorax more and more, as it gradually withdraws its several members, the antennæ, wings and legs, from the cases in which they are respectively enveloped—a process analagous to that of withdrawing the hand and its several fingers from a tight glove; until at length entirely freed, the now full-fledged and perfectly formed fly leaves its pupa skin and mounts into the air.

Peculiarity in its metamorphoses.—It is sufficiently apparent from the account that has now been given, that the Hessian fly differs notably from all its congeners in one important point in its transformations. From all the observations that have been hitherto made, the cecidomyians correspond with the other tipulides in this prominent particular—that their pupæ are naked. Other species, at least many of them, after completing their growth, cleave from their skins in the same manner that the Hessian fly does, but when the separation is formed, the inclosed worm invariably crawls from and forsakes its larva case. It is thus, even, contrary to what has been hitherto supposed, with the *C. tritici.* Since my essay upon that species was published, I have clearly ascertained that the mature or dormant larva does cast its skin. So far as I am aware, moreover, the cast skins in the several species are translucent, and of a membranous texture. In the Hessian fly, however, it becomes opake, changes its color, and is of a firm or coriaceous texture. The inclosed worm, also, does not leave it, but remaining, eventually changes within it to a pupa, the same case thus forming its puparium. Its metamorphosis thus approximates it to the Muscidæ or true flies, the Stratiomidæ or soldier-flies, &c. and its pupa, in technical language is "coarctate" and not "incomplete" like the pupæ of the other cecidomyians. Should usage therefore settle down upon the name *midge* as distinctive of the minute tipulides, there will still be a marked propriety in continuing to this species its old name, Hessian *fly*.*

THE FLY. *Its Characters.*—In the female, (fig. 3,) the *head* is flattened globular, and black throughout. The *antennæ* (fig. *e*,) are about half as long as the body, and composed of sixteen joints, each of a cylindric-oval form, the length being about double the diameter; each joint is clothed with a number of hairs, of which those towards its base are slightly more robust and longer, about equalling the joint in their length, and surrounding it in a whirl. The joints are separated from each other by very short translucent filaments, having a diameter about a third as great as the joints themselves. The terminal joint is at least a third longer than the preceding ones. The two basal joints of each antenna are globular, and compact or not separated by an intervening filament, and exceed the following joints in diameter. The *palpi* (fig. *f*,) consists of three obvious joints, clothed with very short minute hairs. The two last joints are cylindrical, nearly equal in size, and about twice as long as broad: the basal joint is more short and thick. The *thorax* is oval, broadest immediately back of the wing-sockets, and black. The *scutel* is of the same color, projecting, and slightly polished, with the suture surrounding it sometimes fulvous. The *poisers* are dusky. The *abdomen* is elongate-ovate, its broadest part scarcely equalling the thorax in diameter; it is of a black color above, more or less widely marked at the sutures with tawny-fulvous, and furnished with numerous fine blackish hairs. The *ovipositor* is rose-red, and slightly exserted commonly in the dead specimen; it is susceptible of being protruded to a third of the length of the abdomen. The *wings*

*I doubt, however, whether the Hessian fly will continue to be the sole member of this genus having a coarctate pupa. Quite recently a species has occurred to my notice, analagous to the Hessian fly flax seed in every point that I have been able to detect, except that its larva case is of a pale brown color, untinged with rufous or castaneous. It infests the *Agrostis lateriflora?*, numbers dwelling together in an imbricated gall, somewhat resembling the fertile aments of the hop, though larger, and connected with the main stalk by a short pedicel which is inserted into one of the lowest joints of the culm. From the coriaceous texture of the larva case, I suspect the inclosed worm will not leave it, until transformed to a pupa and upon the point of evolving the perfect fly.

are slightly dusky, and fulvous at their insertion into the thorax. Their form and neuration is identical with that of the other species of this genus, except that the slight connecting nerve between the mediastinal and postcostal is commonly wanting, and the medial and forks of the anal nerves are extremely faint for a species of Cecidomyia so large as this. The legs are pallid-brown, the tarsi black, the femurs paler at their bases. The several pairs of legs equal each other in length, being about 0.24 long when extended, of which length the tarsus embraces one-half. The several joints of the tarsus are of the same relative length as in other species; the short basal joint however, is much more indistinct than usual, insomuch that a minute examination of several specimens is required ere one is met with showing this joint distinctly.* This character, and also the neuration of the wings, clearly shows that this species belongs to the genus *Cecidomyia*, and not to Macquart's genus *Lestrimia*, nor Meigen's *Lasioptera*.

In the male, the *antennæ* (fig. *d*,) are three-fourths of the length of the body, with the joints of a short oval and nearly globular form, the diameter hardly equalling the length: each joint is surrounded with a verticil of longish hairs. The terminal joint does not differ from the preceding ones. The two basal joints are compacted together as in the female. The antennæ diminish very slightly in diameter towards their tips. The filaments separating the joints are smoky-translucent, nearly as long as the joints, and about one-third of their diameter. The *abdomen* (fig. 2,) is cylindric or slightly tapering towards its tip, and consists of seven joints beside the terminal one, which (viewed from beneath, vide fig. *c*,) consists of a transversely oval joint, giving off two robust processes, armed with incurved hooks at their tips; and between these processes at their base are two exceedingly minute papillæ. As ordinarily seen, in the living specimen, the abdomen is of a brownish-black color, more or less widely marked at the sutures with pallid fulvous or smoky whitish lines. In all other points the male coincides with the female in its characters.

Its duration.—That the fly which comes out in the spring continues but a very short time, I infer from the following data. A number of wheat plants, containing pupæ, were transplanted into a box of earth, April 21st, and inspected daily. On the morning of May 1st, about half of them were found to have sent out the perfect fly within the preceding twenty-four hours. On repairing to the field whence these plants were taken, the fly was found to be out in large numbers. At every step, a dozen or more would

* How well the engraver has executed his task will be obvious by passing a magnifier over the plate. The joints of the tarsi in fig. 3, and other minute details, scarcely, if at all perceptible to the naked eye, will then be distinctly recognised.

arise from their coverts, sluggishly fly a few feet, and alight again. In other fields, where none of the flax seeds could previously be found, an occasional fly was met with, on the same day. A week after this, on a thorough examination, no flies could be found, nor were but two specimens afterwards met with, until the coming out of the summer brood.

Second Generation.

After the full details that have already been given, but a few words will be required under this head. About the first of May the fly appears, and deposits its eggs upon the same crop of grain that has already reared one brood, and also upon any spring wheat that is sufficiently forward for its purposes. The radical leaves of the winter wheat are now more or less withered, and the fly therefore selects the more luxuriant leaves that have put forth above these. The worm hatches, and again makes its short journey to its future home, at the base of the sheath; it consequently now nestles at the first and second joints of the young stalk, and is sometimes, though rarely, as high as the third joint. Even before the worm reaches the base of the sheath, it has frequently grown nearly to its full size (as shown, fig. *m.*) The stalk has now attained such vigor and hardiness that it is seldom destroyed by this spring attack. A slight swelling, immediately above the joint, (fig. B. §§,) commonly indicates the presence of the larva beneath. This is a fact which has been overlooked, or at least not distinctly stated by writers hitherto. We only find it noticed by Mr. Bergen, (*Cultivator*, viii., 133,) who informs us that in a crop of barley which was destroyed by the Hessian fly, many of the stalks were "at the joints as thick as a man's finger." The insect is therefore a true *gall*-fly, although when but one larva succeeds in reaching the joint, the swelling caused by it is but little if at all apparent. More commonly however, the straw becomes so weakened, that it is unable to sustain the weight of the wheat head, and it accordingly bends down (as represented, fig. B. ††,) with the force of the wind and rains. The appearance of a badly infested field, as harvest time approaches, cannot better be described than in the words of M. Köllar. The grain looks as though a herd of cattle had passed through it, so broken and tangled together is the straw. The worm attains its growth and enters its flax seed state about the first of June, and the flies of this second generation commonly come forth about the last of July and in August.

Miss Morris's theory.—We do not deem it necessary to go into a detailed examination of the theory revived by Miss Morris in 1840, that the eggs of the Hessian fly are deposited in the grain, and that the larva lies in the centre of the culm. We suppose this theory to be abandoned by its late advocates, from the fact that for four years past, we have met with no farther attempts to sustain it. To us it appears manifest that the lady was widely misled at the very outset of her observations by an error in Mr. Say's account, to wit, that "the perfect fly appears early in June." Were this the case she might well enquire, "Where are the eggs placed? Surely not in the old and dying stalk . . . . and there is no young wheat growing from June until September." The flies which Miss M. saw in June, 1836, "in countless numbers, hovering over and settling on the ears of wheat," we cannot but suspect were the same species which in this section of country appears in such swarms upon the heads of wheat about the middle of June, that it has been for years mistaken hereabouts for the wheat fly or midge. (Vide *Quarterly Jour. Agriculture*, vol. ii., p. 238 and 243.) In size and color it does closely resemble the Hessian fly, and might readily mislead any one just commencing their observations. That occasional specimens of the Hessian fly may be taken in June we do not doubt; but that the main brood comes out, deposits its eggs, and disappears, a month earlier than this, we are quite confident, from our own observations as already related, as well as from the testimony of almost every writer who speaks definitely upon this point. Those few larvæ which have been found in the centre of the wheat culm, were not unlikely of some other species, since in this particular its habits correspond with those of the *Cephus pygmæus*, the *Chlorops pumilionis*, &c. That the Hessian fly larva resides in the sheath of the culm, and not in its centre, we feel confident Miss M. has herself become convinced ere this day:—so earnest and candid an enquirer after truth, and one so capable of giving to every fact its due weight, cannot long remain in error, upon a point so susceptible of demonstration as this.

Its Parasites.

It is well known that one of the most effectual means for keeping the Hessian fly in check and preventing it from literally *swarming* all over our land, has been provided by nature herself. Other insects have been created, apparently for the very purpose of preying upon this, and thus preventing it from becoming inordinately multiplied. The world is indebted to Mr. Herrick for much interesting information respecting these insects, the result of his own accurate and patient investigations. As we purpose, should we succeed in more fully tracing out the history of these and other Cecidomyian parasites, making them the subject of a separate memoir at some future day, we refrain from devoting to them any considerable space in the present paper. The general reader, however, will scarcely pardon us, if we omit all allusion to them.

We therefore subjoin a brief sketch of the contents of this part of Mr. Herrick's article.

The Hessian fly is preyed upon and devoured by at least four other insects. When its eggs are laid upon the wheat leaves, they are visited by an exceedingly minute four winged fly, (a species of *Platygaster,*) which punctures the egg and deposites in it four or six eggs of its own: the Hessian fly worm hatches, grows, and passes into its flax seed state with these internal foes feeding upon it: it now dies, and its destroyers in due time escape from the flax seed shell. Three other minute four winged flies, or bees as they would be called in common language, destroy the fly when in its flax seed state. The most common of these, by far, is Say's *Ceraphron destructor.* Alighting upon the wheat stalks, instinct informs them precisely where one of these flax seeds lies concealed. They thereupon "sting" through the sheath of stalk, and into the body of the worm, placing an egg therein, which hatching to a maggot, lives upon and devours the worm. Such are the means which nature has provided for preventing this pest from becoming unduly multiplied. And so efficient and inveterate are these foes, that more than nine-tenths of all the Hessian fly larvæ that come into existence, are probably destroyed by them, Mr. Herrick thinks, and we have strong reasons for believing that his estimate is within the truth.

From the date given by Mr. Herrick of his first discovery of the egg parasite, we know that the first or autumnal generation is attached by it. Whether it preys upon the second or spring generation also, does not so clearly appear. From our own observations, and the well known habits of the other parasites, it would seem to be principally upon the second or spring generation which they prey. Indeed we can scarcely conceive it possible for them with their short ovipositors, to reach the flax seeds of the first generation, buried as these are beneath the surface of the earth and reposing at the roots of the young wheat. That these parasites are surprisingly abundant, and destroy immense numbers of the spring generation, any one can easily ascertain by collecting the infested straw at harvest time, and securely enclosing it, to preserve all the insects which hatch from it. He will thus obtain parasites in abundance, and only occasionally a Hessian fly. On the other hand, numbers of the young plants taken up by us in April, evolved nothing but Hessian flies. The observations of a single season, we are aware, cannot be relied on for establishing a point like this. But they force upon us the suspicion that it is chiefly the second generation that is infested by parasites, and that the first is comparatively free from them.

Remedies.

"An *effectual remedy*" against the Hessian fly, which has been so much enquired after and talked about, and by which term we suppose is meant some *specific* which will infallibly destroy or drive away the insect, or protect the crop from its ravages, never has been and probably never will be discovered. In truth, we regard the idea that a remedy of this character exists, as being equally absurd with a belief in the philosopher's stone. There is probably no such thing as sure and infallible specifics against any of the insects which invade our crops, any more than there is against those diseases which attack our persons. Still, believing this, we also believe that there is no noxious insect but what, when we closely study into its habits we can invariably discover some one or more ways of opposing it, by which we can with certainty to a great extent, if not entirely shield ourselves against its depredations. Thus is it with the insect under consideration. There is no remedy with which we can "doctor" it away—no charm with which we can say to it, "vanish, presto:" yet there are measures, which employed, will guaranty fair crops, when if not resorted to, no wheat will be gathered. Of this fact we are well convinced, both from personal observations, and the concurrent testimony of a cloud of witnesses.

A consideration of the various remedial measures which have been proposed, is therefore a subject of surpassing interest to every cultivator of the soil. We shall hence proceed to review them in detail, treating first of those, which, after a careful consideration of this topic, we regard as the most important.

1. *A rich soil.*—This is a safeguard which has been strongly urged by almost every one who has written upon this insect. Indeed an inspection of different fields of wheat in a district where this enemy is present, cannot fail to impress upon the observer the utility and importance of this requisite. Other things being equal, the crops on impoverished lands invariably suffer the most. Hence those on sandy soils, which retain the strength of fertilizing agents less than other soils, have in numerous instances been remarked as most severely devastated. A striking contrast, even, may very often be perceived in different parts of the same field. The summits of the knolls and ridges, situations where the soil is the most meagre, almost invariably show the greatest amount of damage; whilst the intervening hollows, to which the fertilizing matters are washed from the surrounding acclivities, sustain a comparatively slight if at all sensible injury. Yet the latter situations are the very ones which insects of this family are known to be most

prone to frequent, being more low, shady, and damp. There can be no doubt, therefore, but the fly is as numerous in the hollows of a grain field, as upon its ridges; and that it is only in consequence of the greater fertility of the former situations, that the crop there is enabled so effectually to withstand this enemy. Indeed, the farmers themselves, in districts where the fly has prevailed, have all learned from experience, that it is only upon fertile lands that it will do to sow their wheat. Hence Ezra L'Hommedieu long ago intimated that the Hessian fly on Long Island, by driving the farmers to manure their lands, instead of a curse had actually been *a blessing*. He says, "the land in Suffolk county and other parts of Long Island, was easily tilled, and by continual cropping with wheat was so reduced, that on an average not more than five or six bushels was raised to the acre. This mode of husbandry was still pursued, and although the land was gradually impoverished, the farmer found the crop, although small, more than would pay for his labor and expense. The Hessian fly put an end to this kind of husbandry, and in that respect has proved a blessing instead of a curse; no other way being found to prevent the injury done by this insect, but by highly manuring the land." (*Trans. N. Y. Soc. for Prom. Agric., &c.*, i., 57.) A writer in Delaware also states that the universal predilection there, was to have *large* rather than *rich* fields of wheat; that this insect was counteracting this, by compelling them to cultivate less land, in order to cultivate it well; and that its tendency consequently was, to make our population more dense, by making it the interest of every man to own no more land than what he could manure highly and till carefully. (*Carey's Museum*, xi., 301.) We thus have, even in the devastations committed by this destroyer evident indications of that

"All partial evil, universal good,"

which is every where manifest in the works of the Supreme Architect of nature. It is doubtless the additional strength and vigor enjoyed by plants growing upon a rich soil, which enables them to withstand the depredations of this insect. Those shoots which are first sent up from a kernel of seed, are the ones which are commonly attacked and destroyed, and in an impoverished soil the seed itself thereupon perishes; whilst in a rich soil, its vitality continues, and other shoots are sent forth by it, which grow vigorously and unmolested. In the spring attack also, the weak and slender stalks growing upon a poor soil, are much more liable to become broken and fail of maturing any grain, than the large, robust, well nourished stalks of a fertile soil. Hence a rich soil enables a plant to elaborate a sufficient amount of fluids for its own sustenance, in addition to that which is abstracted from it by a few of these insects. We therefore regard this as a primary and indispensable measure and one which must accompany others next to be considered, in order to their full success.

2. *Late sowing.*—This measure also comes to us sanctioned by the almost unanimous recommendations of writers; and we regard it as one of the most efficient, as it certainly is the most facile of any that can be resorted to. It is universally admitted that it is the earliest sowed fields that are always the most infested; and we cannot but suspect that the present visit of this enemy to this section of the country, after so long an absence, has been invited by the general practice of early sowing, resorted to by our farmers under the probably incorrect idea of hereby escaping from the depredations of the wheat fly. Just before harvest, our attention was directed to two contiguous fields of wheat in the town of Stillwater, one of which was seriously injured by the Hessian fly, whilst in the other not a solitary straw broken by the insect could be found. The only cause to which this striking contrast could be imputed, was, that the latter field had been sowed a fortnight later than the former one. Analagous instances have often occurred to the notice of every observing person living in districts where the fly has been present. Such cases, however, must not be deemed to prove so much as they at first view appear to. It is not probable that the fly had entirely ceased from depositing its eggs before the second of the above fields had become forward enough for its purposes. Had the sowing of the first field been delayed a fortnight, both fields, it is probable, would have suffered equally. The whole injury that fell upon the first field, would thus have been divided between it and its neighbor. And so in all cases, we presume that the field which is the earliest, attracts all of the insects in its immediate vicinity, and these finding all the accommodations they desire there, have no occasion for going elsewhere. For a more extended elucidation of this topic, see the *American Farmer*, vol. ii., p. 167. Two objections have been urged against late sowing; the liability of the young plants to "winter-kill," and of the crop when near maturity to be attacked by "the rust." There is little danger of the fisst of these casualties, we suppose, upon porous soils, it being a disaster almost peculiar to stiff clays, which retain a large amount of moisture at their surface. In such soils, therefore, it may be advisable to resort to the plan employed in some parts of England, namely, sowing only on a newly turned over sward, the grass roots in which serve to bind the soil together in such a manner as to retard its "heaving" by the frost. (*Fessenden's Complete Farmer*, p. 114.) This disaster, moreover, is guarded against in a great degree by sowing only upon a very fertile soil, whereby a quick and vigorous growth is secured, and the young plants are thus enabled to

acquire sufficient strength of root to withstand the winter's frosts. The same expedient, also, by insuring a rapid growth and an early maturity of the crop is the best safeguard against the rust, a disaster to which late crops only are ordinarily liable. Upon rich land, therefore, scarcely any scruples need be entertained with regard to late sowing. If a neighboring field has been already sowed, and the season is favorable for its vegetation, it will be safe to commit the seed to the ground within a week or two thereafter, as all the insects in the vicinity, unless they are present in immense swarms, will be attracted to and remain in the earlier crop. About the last of September is probably as late as it will be judicious to defer sowing wheat in this climate; and in most seasons this will secure it from any serious attack of the fly. Although when it comes forward, the season for the deposition of the eggs of the fly may not in some years be entirely over, it must be rare that a number of these sufficiently large to be materially injurious, will be laid; but should that at any time be the case, other remedies still can thereupon be resorted to, to counteract the evil.

3. *Grazing.*—This measure is alluded to as worthy of attention, in the first account of this insect published in this country, where the fact is stated, that "by feeding the crop very close in the winter and spring, if the land is rich it will again spring up, and the worms do not much injure the second growth." It is plain that a close fed crop will furnish few leaves for the fly to place its eggs upon, and these leaves will be commonly consumed before the eggs are hatched. Gen. Cocke directed public attention strongly to this measure in 1817, and six years subsequently states that full experience had amply confirmed him in his estimate of its efficacy. (*Amer. Farmer*, v., 241.) If in autumn it be omitted till after the eggs are hatched, and the worms have descended to the root, it can obviously be of little or no service. When, therefore, an attack of the fly is feared, as the exact time of the deposition of the eggs is somewhat variable in different seasons, it will be necessary to watch the young wheat, as soon as two or three blades from each root appear; and if the fly is discovered profusely depositing its eggs, sheep or other stock should at once be turned upon it, in such numbers, if possible, as to eat down the crop in a few days. The eggs will thus be destroyed, and the favorite nidus of the fly for continuing this deposite, will be effectually broken up: it will thus be compelled to resort to other quarters. The same process may also be repeated in the spring, if found necessary. No injury to the crop need be apprehended from its being thus grazed down, if the soil is of due fertility—it soon and entirely recovers from this operation. Moreover, if the soil is poor and impoverished, the fly will be sure to injure it far more than what the sheep will do. We cannot, therefore, but regard this as a most

judicious and important measure, if seasonably resorted to. The intelligent wool grower, will scarcely require to be informed, that sheep taken from their ordinary walks, should at first remain upon the rank feed of the wheat field but an hour or two of a day.

4. *The roller.*—Passing over the grain with a heavy roller, is a remedy in commendation of which several writers concur, supposing that many of the eggs upon the leaves will thus be crushed. Col. Morgan was in the habit of both rolling and grazing his wheat fields, before the Hessian fly appeared in his vicinity; and as his crops were much less injured than those of his immediate neighbors, he attributes his escape to these causes. If there be any foundation for Mr. Smeltzer's opinion, that certain varieties of wheat are fly proof, because their leaves grow horizontally instead of inclining upwards, assuredly by a repeated use of the roller every kind of wheat may be made fly proof. No doubt this measure is a judicious one, particularly on fields that are so smooth and free from stones that almost every plant will receive a firm pressure by the operation. If resorted to, it should obviously be done at those times when the eggs are newly laid upon the leaves. After all, is not the efficacy of the roller, at least in part, owing to its loosening and dislodging the eggs from their position and causing them to drop to the ground, where the worm, hatching, is unable to find its way into the sheath of the young plant? This point merits investigation; for if there is any truth in the suggestion, sweeping the plants with a broom or some similar implement, will probably brush off much greater numbers of the eggs than passing a roller over them can do.

5. *Mowing.*—Mr. Goodhue, of Lancaster, Wisconsin, in a communication in the fifth volume of the *Prairie Farmer*, suggests that the larvæ concealed within the bases of the leaves, may be destroyed by mowing the wheat, and feeding it to the stock. We deem this proposal a valuable one for exterminating the second or spring brood from a wheat field. In those cases where the worms are discovered in the month of May, to be fearfully numerous at the joints of the young stalks, there can be little doubt but that on smooth grounds the scythe may be so used as to take off almost every spear below where the larvæ are lodged; and that thus a second growth of stalks will be produced, quite free from these depredators. The following facts incline me to believe that on a fertile soil, wheat may be thus mowed, with little if any eventual injury to the crop. Portions of a field of my own, the past season grew so rank, that deeming it would become lodged and mildewed, by way of experiment a space in it was mowed down after the plants were two feet in height, and another after the heads had begun to put forth. Though not so early in ripening, the appearance of these two patches at harvest, indicated, so

far as a single experiment could do, that wheat might be mowed at the former period without any diminution of its productiveness, whilst at the latter, both the straw and heads would be of a more slender and feeble growth.

6. *Fly proof wheats.*—That there are any kinds of wheat which are perfectly "fly proof," (to use a common and expressive term,) as has been sometimes stated, we wholly disbelieve. At times when the fly is so excessively numerous as to attack barley and rye, it is not probable that any of the cultivated species of the genus *Triticum* can entirely withstand its attacks. But that there are kinds of this grain, that escape with little injury, when other kinds are almost wholly destroyed, is a well established fact. What the peculiar properties possessed by these varieties are, that render them thus singularly invulnerable, has never been investigated with that degree of accuracy which so interesting and important a subject well merits. Mr. Worth supposes that fly proof wheats must have smooth leaves, affording no grooved or channeled surface to hold the eggs of the fly. (*Amer. Far.*, ii., 181.) Mr. Smeltzer thinks the leaves of such wheat stand out horizontally from the stem, or incline downwards, instead of being erect, and that the egg is thus washed to the ground by rains. (*Patent Off. Report*, 1844, p. 434.) The Hon. J. Taliaferro regards the immunity as proceeding from the strength and vigor of the roots, whereby the plant continues to grow, notwithstanding the exhaustion of its juices by the worm. (*Patent Off. Report*, 1842, App. No. 1.) This theory appears to us more plausible and more in accordance with the facts recorded with regard to these varieties, than any other which has been proposed. Other opinions less specific, might be alluded to, but all of them are opinions merely, as we discover no evidence of their having been substantiated by a diligent investigation of this point. The reputation of the Underhill wheat has already been sufficiently shown. This was a bearded white-chaff, with a plump yellow berry, requiring to be thoroughly dried before grinding, and then producing flour in quantity and quality equal to the best of the other varieties. Its fly proof quality was by many supposed to be owing to the hardness or solidity of its straw. The fly freely deposited its eggs upon this wheat, but it was seldom, if ever, materially injured by it. The Spelter wheat (*Triticum spelta*, Linn.,) was also long since remarked as never having been injured by the fly. This is so very inferior a species, that it is but little in use in this country, and only cultivated because it will grow well on the poorest soils, whether the season be wet or dry, and is free from all maladies. It has a long, slender, beardless head, with the chaff so firmly attached to the grain, that it can only be separated by passing through a mill, and yields a yellowish flour. It is more high-

ly esteemed in Germany than in any other country, being there preferred even to all other kinds of wheat. The CHINA WHEAT, said originally to have been found in a crate of imported China ware, branches and grows very much like rye, ripens at least a week earlier than other varieties, yields largely, (forty or fifty bushels per acre it is said,) and has never been known to be injured by the fly. (*Pat. Off. Report*, 1844, p. 43.) The MEDITERRANEAN WHEAT, in such high repute for its fly proof and other qualities, was introduced into Maryland in 1837. It is a light red-chaff, having a long stiff beard, a long, red, and very flinty berry, and ripens about ten days earlier than other varieties. Mr. Garnett, in his Fredericksburg address, considers its only title to be designated as fly proof, is, that it recovers better than other wheats from the depredations of this insect. In the *South. Planter*, (vol. ii., p. 243,) it is said to be a coarse dark grain, much like rye, and yielding such indifferent flour, that some of the merchants had announced they would buy no more of it. Its straw too, when grown upon a fertile soil, is said to be too weak to support the head. Mr. R. L. Wright, in the *American Agriculturist* of 1843, and others, state that it improves by cultivation. As it becomes fully acclimated, it will, we doubt not, lose its most objectionable traits; but will it not with them also lose its fly proof and other qualities, which are its main recommendations at present? On the whole, this variety is so very prolific, and so exempt from all diseases, that we are not surprised at the marked favor it has received. It is admirably adapted for securing a premium in our agricultural societies, where, "the largest crop, raised at the least expense" receives the prize; but its grower will be reluctant to inform his neighbors, that he sells it in market at six cents per bushel under the current price. In fine, we think this noted variety can never come into general favor in those districts where choicer kinds can be successfully cultivated. The ETRURIAN WHEAT, brought home by Com. Stewart, so far as yet appears, possesses all the most valuable qualities, and none of the defects of the Mediterranean. This is a bald variety, having a strong and vigorous stalk, a beautiful long smooth head, yielding a round, plump, white kernel, with a remarkably thin bran. It is very prolific, and quite as early as the Mediterranean, (Rev. D. Zollickoffer and others in the *American Farmer*,) and has thus far resisted the attack of the fly. We are gravely told by an anonymous writer, that "this wheat was not, as its name would indicate, brought from the little Island of Etruria." In what creek this "little island" is situated, we have been unable to discover, but with such a decided negation, we are driven to the inference that the grain in question was derived from a territory which we *moderns* call Tuscany. The WHITE FLINT WHEAT, one of the choicest varieties of western New York, withstands the attack of the fly better than any of the other kinds there in use. For a full account of it, see Gen. Harmon's paper in the *Trans. N. Y. State Agric. Soc.*, 1843, p. 217. In conclusion of this branch of our subject, we would observe, that we should by no means be solicitous of procuring any variety of wheat, *merely* because of its fly proof qualities, believing as we do, that in all ordinary visitations of the fly, other measures are a sufficient safeguard. If vigor of root firmness of stalk, and rapidity of growth, are, as would appear, the points which render these varieties fly proof, a fertile soil will certainly go far towards imparting to most other varieties the same quality.

7. *Steeps for the seed.*—These have been recommended with a two-fold view. 1st. To destroy the eggs; decoction of elder, juice of elder, boiling water, &c. These assume the erroneous position that the eggs of the fly are deposited upon the grain; it is manifest therefore that they can be of no utility. 2d. To insure a quick and vigorous growth of the young plant. Where sowing is deferred until late in the season, it may be judicious to resort to some measure of this kind to stimulate the seed to a more speedy and rapid germination and growth. In *Carey's Museum*, (vol. xii., p. 182,) an experiment of a Poughkeepsie farmer is related, who had soaked his seed wheat in a solution of saltpetre, four ounces being dissolved in water sufficient to wet a bushel. After soaking twenty-four hours, it was spread out and dried twelve hours, and then sowed, so late as the first of November. Early in the following June, this crop is reported as being in advance of neighboring ones which had been sowed early. This experiment, and others of a similar character, strikingly indicate that it lies much within the compass of human instrumentality to accelerate the growth of vegetation, by measures of this kind.

8. *Oats as a decoy.*—It has been recommended, to furnish a crop of young or of "volunteer" oats to the insect, on which to deposit its eggs; and when it has nearly or quite completed this operation, plowing the oats under, thus burying the eggs and larvæ, and then sowing the wheat upon their graves. To us, this appears only as "a tub to amuse the whale;" or, in other words, an admirable project for wheedling honest "Farmer John" into late sowing, upon an enriched, well pulverized soil. We have no clear evidence that the fly will deposite its eggs upon oats. It certainly will not be inclined to do so if there is any young wheat, barley, or rye in the vicinity to which it can resort.

9. *Wheat as a decoy.*—The preceding measure suggests to us another, which is well worthy of the attention of the agriculturist. The facts recorded respecting this insect, clearly show that it is the earliest sowed and most forward fields of grain that are most

infested. The fly is attracted to these fields, and finding a more luxuriant vegetation, and a more shady covert here than elsewhere, and meeting with all the accommodations which it desires, it here remains, even though adjoining fields separated only by an open fence, have come forward sufficiently to afford at least a part of the brood, quarters equally as comfortable. To us it appears evident, from these premises, that if one or two acres across the middle of a large field be sowed with wheat about the middle of August, all the flies in the vicinity will be attracted to this point, and there retained; so that it will be perfectly safe to sow the remainder of the field by the middle of September. If the Hessian fly is common in the neighborhood, the early sowed strip will be badly infested. If so, let it be turned under by the plow, either after two or three severe frosts have rendered it certain that the season for depositing the eggs is fully past, or early in the following spring—resowing it with winter wheat in the former case, or with spring wheat in the latter. By this procedure all the larvæ will be buried and perish. Only in one contingency, as we can perceive, will this plan be inexpedient or liable to fail, namely, when the flies are present in such vast numbers, that the decoy thus prepared is inadequate fully to accommodate them. Upon this point, the amount of damage done at the preceding harvest, will enable the cultivator to judge with a considerable degree of certainty. The advantages which this plan promises, are, that it draws all the insects of the neighborhood together, and destroys their entire progeny; it enables most of the grain to be sowed as early as is desirable; and finally, there will no second or spring generation come forth in the field to attack any part of the crop. This measure therefore, should receive a fair trial from some intelligent wheat grower in a district suffering under this pest.

10. *Deeply covering the seed.*—From the letters of A King William Farmer, and from the specimens furnished by him to Mr. Garnett, which are figured in the *American Farmer*, (vol. ii., p. 174,) the following facts would seem to be conclusively established, to wit;—That when a kernel of wheat is buried to the depth of about three inches, it sends a single stem upwards, which, within an inch of the surface forms a crown, sending from that point a tuft of fibrous roots downwards, and a tuft of blades upwards; these become the main roots and stalks, if undisturbed. But if these be destroyed by the fly, a new set of shoots and roots start directly from the deep buried kernel, and these latter shoots are never attacked by the fly. A kernel but slightly covered, on the other hand, sends up its blades at once directly from the seed; if these be attacked therefore, the whole is destroyed. Such is a brief but plain statement, we believe, of the argument of the King William Farmer. In other words, seed slightly

covered can send up but a single set of shoots, and being attacked by the fly, the whole perishes; but seed deeply buried can send up a double set of shoots; those first appearing are attacked and destroyed; those which thereupon start directly from the seed are never infested by the fly. Admitting the facts to be as set forth, it amounts to this, that by deeply covering, the same quantity of seed in reality produces two crops; one, which is speedily harvested by the fly; and the other, gathered at a later day by human hands. To this procedure we have two objections. By adopting it, you do nothing whatever towards destroying the insect or frustrating it in the least in its operations. On the contrary, you aim to provide food for it. You cherish it. You in effect say to it "be fruitful, multiply, and replenish the earth." True, by giving it what it wants, it leaves us as much more. But it is rather humiliating to us "lords of creation" to rear crops "at the halves" and place ourselves in the rank of mere tenants to so ignoble a landlord! Again, this measure only shields us against the autumnal attack. It does nothing against that of the following spring. Nay, by providing so well for the first generation, it tends to make the second generation more numerous, and the spring attack consequently more severe. Thus much upon the supposition that the facts are precisely as set forth by the King William Farmer. That he sincerely believed them to be correct, and that he was perfectly honest in the selection of the specimens which he forwarded to Mr. Garnett, we do not in the least doubt. Indeed the encomium which Mr. G. has written upon the character of his friend, must forever place him above all suspicions of insincerity or of any thing approaching to chicanery. But our own observations impress upon us strongly the conviction that he is in error in one most important point in his argument, namely, that seed slightly covered, dies whenever its blades are destroyed by the fly. It is only in an impoverished soil that it thus dies; in a rich soil, as has been already stated, its vitality continues, its roots are so well surrounded with nutriment that they readily sustain it, and its first shoots being destroyed, it sends up a second set which grow unharmed. It thus performs the same operation which the King William Farmer contends it can only do when deeply buried. Our specimen, from which the drawing (fig. A,) was taken, plainly shows this fact. The illustration is an exact copy from nature, of two shoots which were separated from a tuft of similar ones, all growing from one shallow covered seed; and in every infested field which we have examined, myriads of similar specimens might have been gathered, whilst commonly only on knolls and other barren or dry parts of the fields were the plants found to be wholly destroyed, as they were represented in the figures of the *American Farmer.* A fertile soil therefore insures the same results which are claimed for a deep covering of the seed. In both cases, the shoots which first appear are destroyed; another set appear afterwards, which are unharmed—not because the seed is buried too deep for the worms to crawl down to it, as the King William Farmer seems to infer, but because there are no flies any longer abroad to deposite their eggs upon the leaves. The exact truth then, with regard to this matter, we are firmly persuaded is as follows. In a meagre soil, the seed will die, whether it be covered slightly or deeply. In a less impoverished soil, *if the weather be dry* in September, as it frequently is, seed near the surface will often perish, when that which is deeply buried will survive. In a fertile soil the seed will survive, whether it be covered shallow or deep. That suits of specimens can therefore be easily procured which will appear to demonstrate a state of things in every particular the very reverse of those figured in the *American Farmer*, scarcely admits of a doubt. Our conclusion then is, that the King William Farmer is measurably correct in his position, but by no means correct to the extent contended for. When the Hessian fly is present in any district, deeply covering the seed, especially if it be early sowed, will in most cases be an additional safeguard against its destruction. The measure therefore is good as a subordinate one, but it must fall far short of ranking as a primary one.

11. *Procuring seed from uninfested districts.*—This measure also, is based upon the erroneous supposition that the eggs are deposited upon the grain. It can consequently be of no utility whatever as a safeguard against the Hessian fly. The measure has been fairly tested in several instances without success.

12. *Sun-drying the seed.*—Mr. W. H. Hill, in the *Nashville Agriculturist* of 1842, states that for fifteen years his wheat crops had not been injured by the Hessian fly, whilst those of his neighbors had suffered more or less. This immunity he attributes to two causes; exposing his seed to the sun for two days previous to sowing it, and sowing none but the largest and fullest grains, the others being separated by a sieve. Doubtless stronger roots and a more vigorous growth is obtained by sowing large, plump seed. We think that effectually drying the seed in the sun can have but one effect, that of retarding its germination a short time—an end that may be equally as well attained, and with less trouble by deferring the sowing until a somewhat later period.

13. *Drawing elder bushes over the young plants.*—We have here one of the fancies of a former day, it being supposed that elder possessed an odor or some more occult property, which rendered it peculiarly repulsive to insects. A trial of it against the Hessian fly, however, soon demonstrated that it possessed little or no virtue of that kind in reference to this insect. If any

benefit ever resulted from it, it was probably only by dislodging and brushing off some of the eggs from the blades of the wheat.

14. *Sprinkling fine salt, ashes, or caustic lime over the young plants.*—The first of these measures was proposed, from its appearing at one time that wheat growing upon points of land exposed to the sea air was less injured than that growing back fiom the coast. Neither of these remedies however, have been attended with success, in any case on record, and they probably are of no service whatever, except as they may slightly increase the fertility of some fields. There is no likelihood that the fly, its eggs, or larvæ can be materially discommoded by them.

15. *Burning and plowing up the wheat stubble.*—This measure was originally proposed by judge Havens, and has been unanimously approved of and strongly urged by several of the most intelligent writers since. Indeed, a slight examination can scarcely fail of impressing upon every one its utility, independent of the sanction of authority. Whoever will at or soon after harvest inspect the stubble of a field that has been badly infested by the Hessian fly, will find these insects in their flax seed state lying one, two, three or more, at the joints of perhaps half the straws of the field. What a trifling labor, or rather what a pastime will it now be to set fire to this dry stubble and hereby inevitably consume countless thousands of these destroyers. This point appears so plainly evident, that no one we think will hesitate in pronouncing this remedy decidedly the most important and valuable of all. But a thought breaks in upon us, of such fearful import, that fancying we see the burning brand extended, in an instant more to send a sheet of vivid flame, leaping, hissing, and crackling over the fated field, we involuntarily shout

"Stop! or thy tread is on an empire's dust!"

of a truth, what a short sighted mortal is man, and how often are the words of the poet verified, that "a little knowledge is a dangerous thing." Seeing his enemy chained to the stake, he exultingly rushes at once to fire the faggots, and lo, a dozen of his friends are immolated upon the same pyre! Is it not a fact, that whilst by this measure we consume the Hessian fly by hundreds, we inevitably destroy its mortal foes by thousands? And that the very means which we thus resort to for averting a future calamity are the surest means that could be devised for bringing that calamity upon us! If nine tenths of every generation of the Hessian fly are destroyed by three or four other insects, who can calculate the value of the services which these latter are yearly rendering us. And who, then, will be so inconsiderate and ruthless as to destroy *nine* of these useful parasites, in order to exterminate *one* Hessian fly! Yet this must in most cases be the result of burning the stubble of the wheat field. We commenced our account of this remedy impressed with a belief that it was the best that had ever been proposed; we close it, persuaded that it is the very worst.

Brief Summary of the preceding History.

The Hessian fly (*Cecidomyia destructor* of Say,) is a European insect, and has been detected in Germany, France, Switzerland and Italy, where it at times commits severe depredations upon the wheat crops. Its ravages are alluded to so far back as the year 1732. It was brought to this country, probably in some straw used in package by the Hessian soldiers, who landed on Staten and the west end of Long Island, August 1776, but did not become so multiplied as to severely injure the crops in that neighborhood, until 1779. From thence as a central point, it gradually extended over the country in all directions, advancing at the rate of from ten to twenty miles a year. Most of the wheat crops were wholly destroyed by it within a year or two of its first arrival at the given place, and its depredations commonly continued for several years, when they would nearly or quite cease; its parasitic insect enemies probable increasing to such an extent as to almost exterminate it. It is frequently reappearing in excessive numbers in one and another district of our country, and in addition to wheat, injures also barley and rye.

There are two generations of this insect annually. The eggs resemble minute reddish grains, and are laid in the creases of the upper surface of the leaf, when the wheat is but a few inches high, mostly in the month of September. These hatch in about a week, and the worm crawls down the sheaf of the leaf to its base, just below the surface of the ground, where it remains, subsisting upon the juices of the plant, without wounding it, but causing it to turn yellow and die. It is a small white maggot, and attains its growth in about six weeks. It then changes to a flax seed like body, within which the worm becomes a pupa the following spring, and from this the fly is evolved in ten or twelve days. The fly closely resembles a musquitoe in its appearance, but is a third smaller, and has no bill for sucking blood; it is black, the joints of its body being slightly marked with reddish. It appears early in May, lays its eggs for another generation and soon perishes. The worms from these eggs nestle at the lower joints of the stalks, weakening them and causing them to bend and fall down from the weight of the head, so that towards harvest, an infested field looks as though cattle had passed through it.

Wheat can scarcely be grown except upon a fertile soil in those districts where this insect is abundant. The sowing should be deferred until about the last of September, the season then being past when the fly usually deposits its eggs. If at any time in autumn the eggs of the insect are observed to be profusely deposited upon the leaves, the crop should be speedily grazed down by sheep and other stock, or if this cannot be done, a heavy roller should be passed over it, that as many of the eggs as possible may be crushed or dislodged thereby. One or the other of the same measures should also be resorted to in the spring, if the same contingency occurs; or if the worms are at a later date discovered to be numerous at the first and second joints of the young stalks, the experiment may be tried of mowing as close down as possible, the most infested portion of the field. Where the soil is of but medium fertility, a resort to some of the hardier varieties of wheat, which are known to be in a measure fly proof, may be advisable.

Fitch's Point, Salem, N. Y., Nov., 1846.

Note.—Since our preceding essay, upon the *Cecidomyia tritici* was published, having had an opportunity of perusing the original articles of Mr. Kirby upon that species, we find that he both figures and describes the joints of its antennæ as "medio constrictio." It is singular that this most important distinctive mark has been so misstated in the descriptions of that species which have been republished upon this side of the Atlantic, and also in Turton's edition of the *System of Nature*. From the remarks introductory to our "Description" some might perhaps infer that this error arose with the founder of the species. We hasten, therefore, to obviate any such impression.

INSTINCT AND REASON.

BY ALONSO CALKINS, M. D.

Could there be suddenly unfolded to the eye in one grand panoramic array and in regular gradation the myriad configurations of animated being, from the simple radiated asterias up to the most complex of the vertebrate genera, the zoologist would ask, are these forms the products of superaddition, or of independent evolution; are they incrementary developements only, or specific and intransitive individualities?

Now the mind takes cognizance of but two classes of ideas, its own cogitative perceptions, and the conceptions of material organizations in relation with those perceptions. "Nihil est in intellectu quod non prius fuerit in sensu." Thought never cuts loose and strays away from sense. Satyrs and dryads, centaurs and mermaids, inconcinnate and grotesque as they may appear to the view of the naturalist, are but fanciful reconstructions of sensible ideas. The primary idea is the "*cogito*," the consciousness of thought; the consecutive or inferable one is the "*ergo sum*," the presumption of a personality of existence, and of the substantive essence of material things. Intellection then, whether under its most coarctative restrictions, or in its most expansive amplitudes, can be regarded as none other than a homogeneous entity. To this principle we apply the name *soul*, the concrete, of which *mind* is the *alter et idem*, the abstract exponent.

What is instinct, what is reason as contradistinguished from instinct, and whether the latter is the sequential and progressionary expansion of the first, or an original and fundamental element, are among the "vexed questions" that have again and again tasked the acumen of metaphysicians.

These inquiries, recondite as they are in their nature and intricate in their bearings, have furthermore had to contend with apprehensions from without, "lions in the way," mistaken views of the moral proclivities towards which such speculations are supposed to tend. As a make-weight against the apparent duality of constitution as characteristic of quadrupeds, a tripartite combination has been devised for man, by the intervention of a *tertium quid*, a something to which the term *spirit* is appropriated. The distinction is a distinction without a difference.

I shall define the terms instinct and reason, (for the lexicography of science is yet to be written,) in accordance with recognized usage, and apply the same, less out of respect to the accident of birth-place, than in reference to their inherent relations.

Reason, the abstract expression of the art of ratiocination, is the process of educing a resultant idea from the catenation of two or more corelated simple ideas, and in adaptation to variable conditions. Judgment is reason in its elementary form. The operation involves sensation, abstraction, memory, and comparison.

Instinct is native reason in embryo, mature at birth, but circumscribed within specific ranges. "Instinct (Broussais,) arises always from sensations which solicit the human being to execute involuntarily and often unconsciously certain acts necessary to its welfare." Thus instinct is seen to be antecedent to experience, a blind automatic impulsion after the means, while the end is unforeseen; reason regards the end through experience of the means. Instinct like the æsthetic faculties, is perfect in its nascent state and unsusceptible of cultivation; reason like the locomotive machinery, works at first with a fitfulness of irregularity, for which time and exercise provide corrections. Instinct is the axiomatic and postulative; reason the problematical and deductive. Instinct "*spiritus intus*, the Divinity that shapes the ends"—speaks with the authority of infallible premonition; reason falls back upon its own constitutional sagacity, and modifies its action in accommodation to contingent conditions. The one moves along a uniform line; the other is ever diverging into devious lines. They are also measurably in inverse ratio, and in antagonism to each other, the former losing in predominance as the latter expands. For instances in illustration let us look to the habits and the habitudes of various animals.

As exemplifications of pure instinct may be adduced, the selection by the goat of the mountain Kalmia, what the sheep shuns as a poison, the cat retracing its weary home after having been transported in a blind sack, the caterpillar turning again to the body of the tree from which it has been shaken, the web weaving of the spider, the nidification of birds, the cocoonery fabrics of the silk worm, as facile and complete in the first effort as in the last, the bee ranging in a right line for its forest hive, the nightingale whose virgin warble falls in tones rich and mellow on the ear, as itself "melts away into air and liquid light." The ram receives his adversary upon his horns, the horse throws up his heels, the elephant flourishes his tusks, the tiger shows his claws and teeth. With the bland zephyrs of spring return the migratory robin and the blue bird to revive their amorous dalliance, now the crawfish seeks his wonted haunts, the ant hoards its stores against a winter's day, and the moth deposits its eggs for the future caterpillar.

Next for specimens of mixed instinct; instinct, that is, modified and improved by experience and instruction; here shadowed forth in but faint adumbrations, there illuminated with clearer glimmerings. Birds accustomed to build in accessible places, when disturbed, will seek out other and remoter ones. The ostrich in intertropical latitudes, incubates only by night. Birds in regions infested with monkeys attach their nests to pendant boughs. The dog guides a blind man with as much circumspection as would a boy. In scrutinizing a crowd moreover to hunt out a thief, he evinces a very considerable complexity of reasoning. The musquash when his conical domicil gets ice-bound, bores a breathing hole through. The birds as well as the running animals of the Falkland Islands that huddled around Bougainville's crew, soon learned to keep at a more prudent distance. The partridge is busy with ingenious artifices to decoy the fowler by feints till her young have got concealed, when she too suddenly disappears. The humming-bird too large for the corolla it lights upon, will pierce the flower from the exterior.

The existence of the reasoning faculty is eminently verified among the more intelligent of the mammalia. A fox in the Duke of Beaufort's grounds, being hard pushed by the hounds, rushed into a shiny pool and buried himself up to the neck, sustaining his head above water by a bough between his teeth. A respectable gentleman, a hunter in his day, related to me the following adventure. He had forced a fox upon a headland at the bend of a river, and so cut off his communications for retreat, when Reynard all of a sudden fell prostrate upon the ground as one dead, his eyes being shut, his limbs relaxed and his breathing arrested, and so suffered himself to be shouldered and carried home. Conceiving however a decided aversion against being skinned, he watched his chance as soon as his captor with half-averted eye had laid him down, and began to open his eyes cautiously, and raise his head, preparatory to making his tracks for the woods, when a ball laid him flat effectually. Could Falstaff have played the death-scene better? A dog, an acquaintance of mine, used to be shut in the rear yard, but being partial to the society of the kitchen, he would contrive to get back again thus. Waiting a space to lull suspicion, he would advance quietly to the door, and elevating his paw to the height of a man's elbow, gave a rap in exact counterfeit of the person preceding him, which if detained he would renew at intervals, so that I was taken in by him (or rather he was taken in by me,) more times than one. A signal case in point is given by a British officer in the east, the author of *Twelve Years' Military Adventures.* As a battering train on its way to the siege of Seringapatam was passing along the quicksand bed of a river, a man fell forward from the tumbrel of one of the guns, so that he must have been crushed but for the elephant behind, who instantly and of himself lifted the wheel with his trunk, and kept it suspended till the man was cleared.

Brute reason may ever predominate over instinct, as in the dog told of by Sergeant Wildie. This dog being addicted to prowlings after sleep, was afterwards tied up by night, but he would contrive to slip his collar and renew his depredations, taking the precaution however to return ere day break and readjust things as before.

Allied to both instinct and reason is an intermediate class of impulses, the appetites and the passions, or in phrenological phraseology the affective faculties and the sentiments. While instinct looks to the means, and reason to the end through the means, these when uninfluenced by the supervisory control of reason, regard the end directly, and irrespectively of the means. Anger is evinced in the horse, as he turns upon his master for cheating him with bridle in hand and an empty corn basket. For the lordly port of the turkey, ostentatious strut of the peacock, the swagger of the bull at the driving from the field his competitors. The elephant if sometimes implicable in his resentment of vexatious deceptions, is also warm in his attachments, and compassionate towards misfortune. Serpents even if possessed of but a fabulous power of charming, may themselves be charmed, and the cobra di capello is instructed by the Indian juggler to dance (in snake-fashion though it be,) to the rude din of his tambourine. The elephant will grieve for the loss of a favourite mohout, refusing the caresses of a stranger, perhaps, and so the canary bird sometimes pines to death after the separation of its mate, and a similar susceptibility attaches to the orang outang. A story is told by Virey of a dog, upon the Seine, that persisted in keeping upon the ice where his master had been drowned, till the ice melted away and left him to drown. Similar is the narration about a favorite named Dash, the companion of ——, a famous English gamekeeper.

Such are the correspondencies, such the convergences between man and the more intelligent of the quadrupeds. Are the lines of demarcation indefinite and conventional, or original and intranscendentible? On this question analogies have been evoked out of botany, chemistry, geology, and entomology, and with some plausibility on either side. Phrenology too has been summoned to interpose a decision. The fundamental principle of this theory, that the brain is multipartite in function, is a position in physiology long since recognized. While the organic excitabilities reside in the ganglionic chain, and the instinctive in the spinal cord with perhaps the cerebellum, the ratiocinative powers seem to appertain exclusively to the brain. Beyond that much, phrenology has hardly succeeded in making in advance by one decisive step.

Thus man in his retrogradative assimilations approximates to the quadrumana and the quadrupeds generally; is he distinguished above such *in re*, radically, specifically, or only *in modo*, that is, in degree?

Darwin and Lamarck speculated in this wise. The archetype of the animal creation was an oyster, which during the revolution of some plus or minus chiliads of years, proceeded onward through the pachydermatous, and other vertebrate metamorphoses, till it finally attained to the dignity of the troglodyte, the *homo caudatus* or *long tail*. This luculent idea Monboddo advances to its culminating point, by transforming the long tail through the help of caudal attrition into the *homo curtatus* or *bob tail*. Seriously, when a hypothesis neither hung upon one solitary fact, nor countenanced by the resemblance even of an obscure and forced verisimilitude, but distinguished solely for its crude and chimerical fantasies, is gravely set forth as the nucleus of a theory, the dreamer of such vagaries should have his *requiescat* written on a tumulus of sand.

The author of the *Vestiges* enters the arena—"caput altum in proelia tollit"—with the well-burnished panoply of geological armor. Here again is the doctrine of gradationary evolutions from an archeaus or primæval germ, in alleged correspondence with the laws of the material universe. The conclusion, abhorent as it is to faith, is none the less incongruous with analogy. Has this theorist adduced a single test, instance, palpable, unequivocal and pertinent? "Do men gather grapes of thorns?" Does the oak produce other than an acorn, does the acorn ever evolve itself into aught else but an oak? Individual forms may attain to greater vigor and symmetry, the coloring and shading may appear more picturesque, the physiognomical lineaments may approximate to their beau ideal, but the number, the configuration, and the conformation of parts is constant under all specific mutations. The argument, elaborate and specious, and imposing though it be, is besides opposed in its very front by the crucial physiological fact, that the hybrid products resulting from contubernation between allied species, have no perpetuity exceeding their individual existence. A more plausible supposition because more conformable to observation is the suggestion, that the germs of all forms preexisted by coetaneous creation, each awaiting a conjunction of conditions propitious to its proper excitation.

OPERATION OF NITROGEN ON PLANTS AND ANIMALS.

BY JOSEPH E. MUSE.

This subject is one of deep interest to science and agriculture. The suggestions of Dr. Mitchell, published in your last volume, founded in unequivocal truths, have been falsely ascribed to spurious claimants, and I had not, heretofore, been positive of the rightful owner.

The expansive, philosophic views taken by the Doctor, in the letter alluded to, really excite surprise, when we consider the period—fifty years ago—at which they were communicated; his physiological speculations and deductions, in relation to animal and vegetable life and death, under the influence of his septic (azotic) principle, justify the elevated position which he maintained through life.

Universities and their learned professors may teach the exclusive vegetable origin of malaria, pestilential disease, or atmospheric infection, by whatsoever names they may be called; yet I feel fortified by the Doctor's able and scientific communication, in the sentiments I have always held, "that decaying *animal* bodies contain, in a more exalted degree, than *vegetables*, the elements of that fatal virus—atmospheric poison—and consequently, that they are more productive of it.

Ordinary reflection and observation would seem to establish the truth of the proposition; the instinctive faculty revolts peculiarly from the penetrating fetidness of the putrid *animal* effluvium—so much more than that of the *vegetable*, as to characterize, unseen, the nature of the emanation. This *conservative* or *instinctive* faculty, has been conferred upon the whole animal world, to discriminate, for *self-preservation*, that which may be deleterious, from that which may be innocent.

It is known that each class of organic bodies contains the same ultimate principles; though septon (azote or nitrogen,) is much more abundant in the animal than in the vegetable, still I hold it as a necessary inference, that the presence of septon (nitrogen,) is the basis of the peculiar animal emanation, which all will acknowledge to exist, and which is so instinctively shunned; and we are thus forcibly led to the conclusion, that this septous (nitrogenous,) gas, is the basis of the pestilential atmospheric infection.

Some vegetables approximating the animal constitution, as "wheat," for instance, have often been charged, and perhaps correctly, as the source of malaria. But wheat contains gluten, one of the nitrogenized compounds, necessary to animal nutrition; and may, with many others, be capable of the same products.

An objection may be offered to our doctrine, that nitrogen without color or smell, or any deleterious effects, evinced from its copious abundance about four-fifths of the common atmospheric air, we are constantly respiring in safety; but every chemist is acquainted with the fact, that the action of a compound, its properties, and relations, are not necessarily, those of either, or all of the simples which compose it; many inert, inodorous, and innocent substances become active, odorous, and poisonous, when combined, and vice versa; acquiring by their union, properties essentially different from the individual components. Nitrogen, the substance in question, stands conspicuously in this category; from its union with oxygen, in various proportions and conditions, result compounds, well known to be totally dissimilar in their external qualities, and in their chemical relations. From the one proposition, a product, odorless, colorless, and innocent, as the air we breathe; from another, red, and smoking vapors, fatal as the exhalations of the deadly upas; indeed, instances to this point, are too numerous, and too notorious, to be quoted: and thus, nitrogen may, and from the facts in the case, does undergo a modification, though mysterious, yet fatal to the health and life of man; indeed the mind, untrammeled by the pride and prejudice of previous opinion, will, I think, acknowledge the reasonable conclusion, (though much mystery may still embarrass the subject, in the *modus operandi*,) that septous (nitrogenous,) vapors, constitute the basis of atmospheric infection. The enquiry is an important one, as the doctrine of the exclusive vegetable origin may and does lead to negligence of the animal nuisance.

In regard to its relations to agriculture, the communication of the Dr. manifests a research and attainment of physical science, far ahead of the times in which he wrote; it is true he used terms, septon, and septic acid, perhaps not now admissable, but they conveyed clearly his comprehensive views upon an intricate subject, and he directed the true course for way-worn travelers, in a region of much obscurity; and for which others have unfairly borne the palm.

The principle, which he prescribed as a guide to the cultivator of the soil, " that manures should contain what the plant is known shall, upon analysis possess," is now well established, was, I think, chiefly his own: his designation of septon (nitrogen,) as an essential principle in manures, " for the filling of the ear of wheat," and the cerealia in general, if not original, was forcibly illustrated and impressed by him, and he adds what a subsequent experience has taught, " that without it the straw may be large and heavy, but the grain will be scanty and light, yet in this ground, he continues " turnips and others, that do not require septon, (nitrogen,) may thrive exceedingly."

His introduction and connexion, as an auxiliary of practical agriculture from vital principles of hygeine, in the use and application of manures, and the forcible manner with which he impresses it, offer to the farmer a strong inducement to do his duty, by removing the dead carcasses, and other such nuisances, from the vicinity of his dwelling to his fields, for the two-fold purpose of preserving his health, and contributing to his wealth and comfort.

The deductions, which the author has drawn in this part of his subject, from his facts, in themselves remarkable, in those facts of comparative obscurity, of the chemical and physiological balance of nature, in the animal and vegetable creation; and now, so well established, and recently so well illustrated by Dumas and Boussingault, bespeak a philosophic acumen of no ordinary grade; the one, the vegetable, a simple laboratory of nature, deriving the elements for its operation, from the air and the earth, replete with poisons to the animal class, purifying, digesting, and adapting them for transformation, into the more complex nature, and fastidious taste of the latter, which decomposes, appropriates, and again vitiates them, to be again elaborated and refitted for his future uses. How clearly and substantially has Dr. Mitchell, half a century ago, discerned this obscure and salutary bond of physical science, when he says, "noxious effluvia are repressed, and their virulence counteracted by the *mediation* of *plants;*" and he adds, " the instrumentality of these two classes, (of organic beings,) seem to be intended to keep the great balance of nature *in equipoise*, and prevent either being overloaded with materials destructive to animal life."

ON THE GRASSES.

BY S. B. BUCKLEY.

We are aware that much has been written in this country on the grasses, and that already two essays on them have been published, one by Prof. Dewey, in the first volume of the *New Genesee Farmer*, and the other by the late Judge Buel, in the third volume of the *Cultivator*. The want of correct figures of the different species treated of in those communications, lessen very much their value. For example, suppose a farmer finds a grass growing, the name of which he desires to know, it is very doubtful if he can determine it from either of those essays, although it may be there mentioned and recommended. To remedy this difficulty, and enable the farmer to become acquainted with the names of some of the most common and useful grasses, by giving correct drawings in flower and fruit, of at least one species of most of the genera growing in the United States, will be the aim of this and the succeeding papers we hope to publish in this Journal.

Grass, in botany, is defined to have a hollow cylindrical stem, closed at the nodes and joints. Flowers in spikelets, consisting of chaff-like leaves, of which the exterior are called glumes, and the two which immediately enclose the flower are called paleæ. Stamens generally three, and seed single. Therefore, wheat, barley, rye, oats, indian corn, rice, and sugar cane, are true grasses, and clover, and other similar plants are not, though frequently called by that name. We shall use the term grass, as it is generally understood by farmers. Of the true grasses there are about one hundred and twenty species growing in the state of New York, according to Torrey the state botanist; in Massachusetts one hundred and twenty-one species are enumerated by Hitchcock; the catalogue of plants growing in the vicinity of New Haven, Connecticut, has seventy-six species; Drake's catalogue of Vermont plants has seventy-seven; a catalogue of plants recently published at Providence, Rhode Island, of the plants growing in that vicinity, contains forty-seven species; we have eighty (according to Sartwell) species growing in the vicinity of Seneca and Crooked Lakes in western New York; Darlington's catalogue of Chester county, Pennsylvania, has ninety-six species; Aiken's catalogue of plants growing in the vicinity of Baltimore, Maryland, contains seventy-five species; a synopsis of the flora of the western states by Riddell, has one hundred and twenty-seven species; Short's catalogue of Kentucky plants has one hundred; a catalogue of plants growing in the vicinity of Quincy, middle Florida, recently published by Chapman, has ninety-four species; Beck's

Botany of the northern states has one hundred and eighty-two species; Elliott's Botany of South Carolina and Georgia has one hundred and sixty-two, and according to Torrey in the year 1831 there were known in North America three hundred and twenty-nine species. The system of Rœmer and Schultes published many years since, contains eighteen hundred species, of which there are growing seven hundred and ninety-nine species in the torrid zone, and eleven hundred and forty-six in the temperate zone. The *Cyperacæ* and *Juncæ*, or the sedge grass and rush like tribes are not enumerated among the foregoing, yet they are generally considered as grasses. There are about one hundred species growing in western New York, yet how few of them receive any attention from the farmer. Our farmers evidently do not cultivate a sufficient variety of grasses, rarely sowing any thing except timothy (Phleum pratense,) and clover. In England where agriculture is carried to great perfection, and from whence many of our improved breeds of cattle and horses have been imported, great attention is paid to the different varieties of grass. In laying down fields for pasture, they generally select such as ripen their seeds in succession. The *Complete Grazier*, a work published in London, gives directions for seeding down meadows and pastures, with the quantity of seed and kind proper for each variety of soil. This work gives the following recipe for an acre of low land, "meadow fox tail two pecks, meadow fescue two pecks, rough stalked poa two pecks, ray grass one peck, vernal grass one quart, white clover two quarts, marl grass two quarts." To continue our extracts from the same work, "in the laying down of land for the purpose of forming a good meadow, greatly superior to the generality of pastures, the late Mr. Curtis recommends the following grasses and two species of clover, to be mixed in the following proportions: meadow fescue grass one pint, meadow fox tail grass one pint, rough stalked meadow grass half pint, smooth stalked meadow grass half pint, crested dog's tail half pint, of sweet scented spring grass half pint, of white or dutch clover half pint, of common or red clover half pint. These are to be mixed together and about three bushels sown on an acre." The superiority of the English stock must be owing to the manner in which they are kept, and that is on a variety of food both summer and winter. It cannot be owing to climate since we have a more genial sky than they. If our farmers will devote more attention to the cultivation of the different grasses for their stock, and see that they have enough food varied as to kind, and then select the best to breed from, there will soon be little necessity for importations. Horses, cattle, and sheep, delight in a variety of food, and so well aware of this are the farmers in many parts of Enrope, that in fattening stock for the market, different kinds of food are given each successive day, practicing a regular rotation. Every farmer who has sown much clover and timothy, (Phleum pratense,) must have observed in pasturing land thus seeded, that the sides of the fences and spots occupied by other grass, (no matter what kind,) are always grazed closer than the rest of the field. We have often noticed it whether the land was pastured by cattle, horses or sheep, and this shows plainly that they crave a variety. Sheep desire a greater variety of food than any other domestic animal. To prove this, the experiment of Linneus has often been cited. He found that horses ate two hundred and sixty-two species of plants, and refused two hundred and twelve of those which he presented. Cattle ate two hundred and seventy-six species, refusing two hundred and eighteen. Sheep partook of three hundred and eighty-seven species, refusing to eat only one hundred and forty-one.

Some grasses afford early pasturage, while others continue good until they are covered with snow in the winter, being little affected by frost in the fall. By paying particular attention to the cultivation of these varieties, the time of foddering may be lessened from two weeks to a month during the year. This is true with regard to those who depend much on the clover for pasture. We would earnestly recommend to our brother farmers, the cultivation of at least five or six species of grass, and it may be that they have suitable species growing in a wild state on their own farms; if so, they can easily select a few seeds of each kind, and sow them separately, and thus in a short time they can raise seed in sufficient quantity to seed down entire fields, and experiment on each kind separately, or mix them for pasturage.

The experiments of Mr. Sinclair, gardener at Woburn, the residence of the Duke of Bedford, called the "Woburn experiments" which were instituted to determine the relative value of the different grasses in a dry state, are quoted and much reliance placed upon them, in nearly every treatise upon the grasses.

"This method was to boil in water equal weights of each species of hay, till every thing soluble was taken up, and to evaporate the solution to dryness. The weights of the dry matter thus obtained, he considered to represent the nutritive values of the grasses from which the several samples of hay were made." But according to Johnston, from whose chemistry the above extract is taken, "the results of Mr. Sinclair's experiments have lost much of their value since it has been satisfactorily ascertained,

1st. That the proportion of soluble matter yielded by any species of grass, when made into hay varies not only with the age of the grass when cut, but with the soil, the climate, the season, the rapidity of growth, the variety of seed sown, and with many other circumstances which are not susceptible of constant variation.

2d. That animals have the power of digesting a greater or less proportion of that part of their food which is insoluble in water. Even the woody fibre of the hay is not entirely useless as an article of nourishment; experiment having shown that manure often contains less of this insoluble matter than was present in the food consumed. (*Sprengel.*)

3d. That some of the substances which are of the greatest importance in the nutrition of animals, such as vegetable fibrin, albumen, casein, and legumin, are either wholly insoluble in water or are more or less perfectly coagulated, and rendered insoluble by boiling with water. Mr. Sinclair must have therefore left behind among the insoluble parts of his hay the great proportion of these important substances. Hence the nature and weight of the dry extracts he obtained, could not fairly represent either the kind or quantity of the nutritive matters which the hay was likely to yield, when introduced into the stomach of the animal."

For the above reasons given by Johnston, he did not consider it necessary to dwell upon the results of the experiments of Sinclair, and we are of the same opinion. The reader will find a detailed account of these experiments in the third volume of the *Cultivator*, and in the *American Farmers' Encyclopedia.*

A good method of determining the relative value of the different grasses, would be to take an equal number of animals of the same age and as nearly as possible of the same condition, weigh them, then let them be kept a certain period on an equal quantity (determined by weight,) of any two grasses, either in a green or dried state—the two grasses to be grown on land of the same quality and manner of cultivation. At the end of the period, weigh the animals again, and this will show nearly the relative value of the two grasses on that particular soil, and for those animals. A similar experiment might be tried upon pasture—all that would be necessary would be to see that the grass of the different pastures was of equal condition as to ripeness and abundance, with a soil of the same quality.

We cannot confidently recommend many European grasses for cultivation, since few of them have received a fair trial in this country, but there are many native grasses well adapted to our climate and soil, indigenous in every portion of the United States. Nature has spread the different species with a lavish hand both at the south and north. A reference to the botanical works cited before will show, that there is no lack of species in any one region, and surely among so many there must be some well worthy of cultivation. Time will determine. Our task will be to try and make them better known.

Phleum pratense, (timothy, herds grass of New England and cats-tail grass of England,) in the northern and middle states is cultivated more than any other grass. It is so well known that we shall not describe it. (See plate 1, fig. 1.) It received its name of timothy from Timothy Hanson, who is said to have introduced it into Maryland. Another account says that he took it from New York to Carolina, and Loudon in his *Encyclopedia of Plants*, an English work, states that, "it received its name from Timothy Hanson, who brought it from New York and Carolina about 1780." It does not succeed well in the southern states, not well enduring their long and often dry summers. We allude to the states south of Virginia and Tennessee, excepting the mountainous portion of North Carolina, Georgia and Alabama.

During our rambles at the south to collect plants, we were often informed by planters, that they had attempted its cultivation and always failed. One stated that he had sowed it on new bottom land on which many of the largest trees had been left in order to protect it from the sun, but it was of no avail, the grass dwindled and died during the months of August and September. Several of these planters had emigrated from Virginia where they had been used to its cultivation.

Timothy is a native of Europe, whence it has been introduced into this country. It belongs to a small genus of plants of which there are but five or six additional species, nearly all indigenous to Europe. One other species, the Phleum alpinum, has been found in Arctic America.

Timothy is often sown with clover, with which it makes an excellent hay; however, a great objection to this practice is that it does not arrive to maturity as soon as clover, and unlike most grasses it contains the most nutriment when the seed is nearly ripe, consequently it should not be cut until its juices are sufficiently thick to gum a scythe. According to the experiments of Sinclair, the ripe crop exceeds in value the flowering as fourteen to five, or in other words the ripe crop possesses more than twice the nutriment; but from our experience we doubt there being so great a difference. The aftermath is light, affording but little fall pasturage, but when not mowed there are few grasses that excel it for summer pasturage—we mean summer in the strictest sense of the term, since it should not be turned into until the month of June in the climate of western New York, and here the reader will see the advantage of having other grasses for early pasturage. An eminent grazier in one of the southern tier of counties in this state, (N. Y.,) who owns from two thousand to three thousand acres of land pursues this course. He always keeps between one thousand and two thousand sheep, and generally pastures through the summer about five hundred head of cattle; in addition to his other pastures, he keeps large fields of fifty or more acres seeded down with timothy. In the spring he buys cattle in Ohio or Pennsylvania and drives them to his farm, where they are turned into pasture when the timothy begins to head out, and not removed until fall, when in a good condition for the butcher, they are driven to New York or Philadelphia. He says he has often had men apply to him to mow his timothy pastures on shares, but no, he will not suffer any thing in the shape of hay to be removed from them. This may appear to militate against the doctrine that cattle do best on a variety; but no, these cattle are brought from different sections where they have been used to living on various kinds of food, they get little if any green food in the spring until they are turned into the timothy, which has attained sufficient age and strength to not scour the cattle, and hence they rejoice in an abundance of that which is a variety to them, and at the end of two or three months are fit for the market. Timothy is a great exhauster of the soil, especially when repeated crops of hay are gathered; this is said to be one reason why it is so little cultivated in England, the English farmers preferring to cultivate many other grasses. There is no doubt but that sooner or later this or any other grass will exhaust a soil when taken from it, unless a suitable return is made to that soil.

The soil most congenial to timothy seems to be a low moist black vegetable mould, though it thrives remarkably well on dry rich uplands, often affording in such situations in western New York two or more tons of hay per acre. Many farmers think it best to sow timothy seed with wheat in the fall or rather immediately after the wheat, before the ground receives its last harrowing, but most farmers in this section sow in the spring; if on wheat or rye it should be sown during a light snow in March or about the last of that month, or first of April, in the morning after a frost of the preceding night, which places the ground in a honeycomb state. It is often sowed with oats or barley. We would recommend from a peck to twelve quarts of seed to the acre, though some only sow from four to six quarts. In western New York it ripens its seeds from the first to the fifteenth of August, and will often yield from ten to fifteen bushels of seed per acre, the price of which varies from one dollar to one dollar and fifty cents per bushel. The manner of saving the seed practised here is to draw the ripe grass into the barn and thrash it out with a flail, as the hay is wanted for fodder during the winter; but here there is not more than sufficient for home use saved. We may add that most of our farmers prefer timothy hay for their horses.

Alopecurus pratensis, meadow fox tail grass. (See plate 1, fig. 2.) This grass ranks among the best in England, but has received little attention in the United States, small patches of it being occasionally found in New England, the Middle States, Ohio, and Maryland. It is a native of Britain, and is also indigenous to nearly every country of Europe. For permanent meadows or pasturage this grass may prove valuable in many sections of this country, but it is unsuited to a system of alternate husbandry, as under the best management it does not attain full perfection so as to afford its maximum yield of hay or pasturage under four years from the seed. It abounds in most English meadows and pastures. It succeeds best in a moist clayey loam, and in such situations is said by Loudon to afford more bulk of hay and pasture than any other grass. It flowers twice in a season, and hence yields two crops during the year, the last crop affording the greatest yield. Sheep are very fond of it, and mixed with white clover an acre is said to afford abundant pasturage for ten ewes with their lambs. We believe this grass has never received a fair trial in this country, but it might prove a valuable addition to our dairy and sheep growing districts. Seven other species are enumerated as growing in Great Britain, all of which are valued for hay and pasturage excepting one, the Alopecurus agrestis. We think the fox tail grass would grow well in the southern states, because it is a native of the warm climate of Italy, in Europe. Should it receive trial at the south, particular attention should be given to have it on the most suitable soil, which has already been named.

There is another species of fox tail grass, (Alopecurus geniculatus,) which is a native of this country, being quite common in many portions of both the northern and southern states. Elliott says it is common in the rice fields of South Carolina and Georgia. We have occasionally found it growing on the bottoms or low lands of the Alabama river. It is peculiar to a low moist soil, rarely if ever being found in dry situations. It is also a native of England, and with the other species of the genus, excepting the agrestis, is valued for both hay and pasturage. (Loudon.) It is rerennial, and hence may prove worthy of cultivation in the southern states. It grows from twelve to eighteen inches high, is bent at the joints, and has a head resembling timothy, but smaller, by which it can easily be recognized. There is an excellent figure of it in the second volume of *Elliott's Botany* of South Carolina and Georgia. In western New York it ripened the past summer about the middle of June, yet our season was nearly two weeks earlier than usual. In the northern states, horses, cattle and sheep, do not eat this grass with as good relish as many others; hence it is unworthy the attention of the northern farmer, nor can we confidently recommend it to the southern planter. It may be that a southern climate and soil render it more palateable. Both this and the preceding species are said to afford the most nutriment when nearly ripe.

Dactylis Glomerata, (*orchard grass*,) *Cocksfort Grass of the English* (fig. 3, p. 1). This grass is a native of Europe, and has become naturalized to a considerable extent. As a meadow grass it is better than timothy, to sow with clover, since it arrives to maturity at the same time with clover, and also should be cut for hay when in blossom. An objection urged against this grass is, that it grows in tufts or bunches; however this is partly because the seed is not sown thick enough. This objection is of no force when it is sown with other grasses, which is the most preferable manner of its cultivation. It is not as valuable for hay as pasturage, there being few grasses that are of more rapid growth or abundant yield. Its leaves have been known to grow an inch in one single night.

To obtain the full benefit of this grass, it should be kept grazed pretty close. Sheep prefer it to almost every other grass, and it seems to be peculiarly adapted to them, as it flourishes well on dry uplands and withstands well the drouths of summer. It is well fitted for both early and late pasture. Sinclair, for an acre of winter pasture in England, recommends the following, with the proportion of seed which should be sown of each.

Dactylis glomerata, (Orchard grass,)	4	pecks.
Festuca pratensis, (Meadow fescue,)	3	"
Timothy, (Phleum pratense,)	$\frac{3}{4}$	"
Agrostis stolonifera, (Fiorin,)	1	"
Holcus avenaceus, (Tall oat like soft grass.) . . .	2	"
Lolium perenne, (Perennial rye grass,)	3	"
Poterium sanguisorba, (Burnet,)	2	"
Trifolium pratense, (Red clover,)	6	lbs.
" repens, (White ")	8	"

This shows the high value placed upon the orchard grass for pasture, in England; it also shows the English love of variety, and that they sow more seed to the acre than is generally practised in this country. In the *Genesee Farmer*, vol. v., p. 245, we find the following statement of the profits of a crop of orchard grass, on about an acre and a quarter of land, containing sixty-five young apple trees which were just beginning to bear; the price current is given at which the respective articles were sold:

17 bushels seed at $2 per bushel, ...	$34 00
2 tons of hay, first crop, at $10 per ton, ...	20 00
$1\frac{1}{2}$ " " second " " "	15 00
Amount.	$69 00

Estimated expense of gathering above crops.

Cutting and shocking seed, one hand half a day, .	$0 50
Threshing " " one day, . .	1 00
Cutting stubble of " " " . . .	1 00

Making the same into hay, and overhauling, ...	1 50
Cutting, making, and hauling hay of second crop, .	2 00
Interest on value of land, ...	4 87½
	$10 87½

leaving a nett profit from an acre and a quarter, of $58.12½.

To save the seed the tops should be cut off by a careful cradler, tied in small bundles, and put in shocks, and after standing in the field eight or ten days until it is dried, it should be hauled into the barn and threshed out with a flail immediately. If there be a large quantity of seed, it should then be spread on the barn floor to prevent its burning in the heap, and destroying the vitality of the seed. When placed in the mow before threshing, it is liable to heat, and render the seed worthless. After a little practice it is said that the cradler can catch with his left hand the portions cut by the scythe, and place them as he advances, after which double swaths should be sown of the under grass at suitable intervals, or the whole field may be mown, upon which the seed sheaves may be shocked. The seed is very light, weighing fifteen or sixteen pounds to the bushel. If sown with clover, one bushel to eight or ten quarts of clover seed, is the proper quantity to sow upon an acre. When sown alone, two bushels are required. For pasture we think this grass decidedly superior to timothy, but when a regular system of rotation of crops is practised, and the ground is plowed every three or four years it may not be as profitable, but the orchard grass should occupy a large portion of all permanent pastures. We are pretty confident that it would succeed well at the south; it is well calculated to withstand a drouth, flourishes well on dry upland or in shaded situations. Elliott says it has become naturalized on James Island, near Charleston, South Carolina, where it attains the height of from two to three feet. In this vicinity the past summer we noticed some stalks of it at least five feet high.

This is the only species known to botanists in this country; in England there are four other species. The genus is diffused over middle and southern Europe, northern Africa and Asia.

Poa pratensis, (plate 1, fig. 4..) Spear grass, meadow grass, Kentucky blue grass. This grass is a native of Europe, but it has become extensively naturalized in the United States, being common in large portions of the northern and western states, extending through the states on the Atlantic coast as far south as the neighborhood of Charleston, South Carolina, where Elliott remarks that it grows to the height of eighteen inches, and in continuation he says it is "a fine winter grass, remarkable for its deep green color and soft succulent leaves. As it bears the summer heats in close, rich soils, it wants only size to render it a valuable acquisition to the farmer." It is a perennial, and as the southern states are naturally deficient in good perennial pasture grasses, it certainly is highly deserving the attention of the southern planter. Nor is there the least doubt but that its successful cultivation there would save the inhabitants much corn fodder, which is the chief food for both their cattle and horses among the planters of the cotton growing region. This grass with the preceding, and perhaps one or two others (which will be mentioned in due time,) would afford abundant pasturage during their mild winters.

In the northern and western states it excels most grasses for its abundant and nourishing pasturage, which has the merit of being both early and late. Even now, in December, in western New York, from our window we can see good pasture composed chiefly of this grass. With us it has become completely naturalized, and it seems unnecessary to sow its seed, which from its early time of ripening in both our pastures and meadows, is often scattered upon the ground. It should be cut for hay when in flower, as when ripe the stalk becomes dry, and contains little nutriment. It flowers about the same period as clover, and hence with orchard grass and clover it would make excellent hay. Sending up but one flower stalk during the year, its aftermath consists of numerous long deep green leaves which sometimes attain the length of two feet. It flourishes best on calcareous soils, and here, western New York, grows both in open woods as well as pastures, flowering from the middle of June to the first of July. As it varies in appearance from the nature of the soil, some botanists have made an additional species, by the name of viridis, which is now generally considered to be a mere variety. Our specimens from Kentucky, and various parts of the United States, differ little from the plant as found here. The following mode of its cultivation in Kentucky, is condensed from the *Franklin Farmer*. "Some sow in September, others in February or March, that the tender roots may not be winter killed. It is sown either on woodland or open ground. If sown on woodland, the leaves, brush, and trash might be burnt or raked off. In woodlands the grass must not be grazed, or at all events till after the seeds have matured.

In open land some mix timothy and clover with blue grass, when half a bushel of the latter seed to the acre is sufficient. The advantage of this is that it secures at once a pasture which will bear considerable grazing the first year. The blue grass in a few years takes entire possession of the field. It is often sown in March upon wheat, rye, and oats. The grass or open ground is more abundant, sweet, and nutritious, than on woodland, and consequently will maintain more stock, perhaps nearly twice as much." We may add that this is true with all cultivated grasses. The "Blue Grass" of New York is Poa compressa. In our plate of the grasses, magnified views of both flower and fruit are given.

LONG ISLAND FARMING, AND THE EXPENSE OF RECLAIMING MARSHLANDS.

BY THOMAS P. YOUNGS.

I have forwarded you one box containing specimens of the soil from my farm. Some ears of corn and ore which I hope you have received, and are according to your wishes; each package is labelled, and is as follows:

One from a field that has been under cultivation for a great number of years, and for the last twenty or thirty years, as follows: first plowing sward that has been in grass for five or six years; and planting corn in hills, five or six grains in each, and some four feet apart, manuring at the rate of twenty to twenty-five wagon loads stable manure per acre, or twenty-five to thirty loads street dirt from the city of New York; sometimes spreading on after plowing and manuring in hills also, and sometimes without putting any in the hills; product forty to fifty bushels per acre. The next season we plowed the corn stubble and some oats, two bushels per acre, without manure; product forty to sixty bushels per acre. Fall of the same year we again plow the oat stubble twice, and sow wheat, one and a half bushels to the acre, manuring with stable manure, twenty-five wagon loads per acre, sowing three to six quarts Timothy seed per acre, after the first harrowing, which is covered by the second harrowing, which is done immediately after the first. In the spring, say March, we sow six pounds Clover seed per acre; the product of wheat twenty to twenty-five bushels per acre; the next two or three years we keep for hay mowing, two tons per acre; it is then pastured for one or two years or occasionally mowed another year, and then pastured as found desirable, plowing again for corn after having been in grass from five to six years. When the same rotation of crop commences, this I consider a good rotation for crops of our tillable land, and is probably the best considering its nature and the means we enjoy for obtaining manure.

Four specimens from swamp or now meadow-land, marked as we describe them, say high bog and low bog, of which the greater part consists, say three-quarters blue clay near the upland, sand clay adjoining the upland, (small proportion,) of this description I have in all about thirty acres which I have reclaimed from a useless piece of swamp, covered with bogs, alders, briars, grape, &c., &c., almost an impassible thicket, and mud, and mire. I commenced six years since, by ditching round the whole piece, three cross ditches to carry off all the water, and about three to four feet deep, and all left open; and have been cleaned out every summer. Last year I made under-drains of about one-third, using large stones for sides, say six inches high, and covered them with flat stones procured at Kinderhook, putting in plenty of small stones to keep the sand from washing in and stopping the water, and then covering the whole with the dirt taken from the ditch, being sufficiently deep to be out of the way of the plow. I next commenced clearing, by stubbing off the bogs, and burning the surface over every spring; heaping the bogs and roots, and burning on the field. I then commenced plowing, and the first day broke all my farm plows amongst the bog roots; and after plowing the furrows, which it took six men to do, some holding the furrow, which as soon as we let go our hold would turn right back in its old place, and was so tough that had we tied a rope at one end we could no doubt have dragged it ten miles without its breaking, or losing perceptibly any of the soil, so completely was it matted with roots. You may well suppose we were discouraged, and some of the men vented their curses upon the swamp. Not being in much better humor myself, I directed the broken tools and maimed teams to be taken home. Not liking the idea of giving up so favorite a project that all my friends had considered a wonderful undertaking, and would never be done, I set to searching the books for information how to go to work, which resulted in beautiful descriptions of the great productiveness of such land after being cleared; but not one word how it was to be done, save ditching. I slept but little that night, and said no more about the swamp for two months. But I had a plow made larger and stronger, and got my men in good humor, and we went at it again with a pair of oxen and a pair of steady farm horses on the lead, two men to drive, one to hold the plow, one bearing on the beam to keep it in, and three trying to keep the furrow from turning back; but it was of no use, it would turn back, and I then had it cut off in pieces, and hauled entirely out of the way, that the next should leave the first furrow to fall flat. This did better, and we got on very well, plowing about one acre per day, occasionally stopping to clear the last furrow.

I left this to remain during the winter, and in the spring found the frost had pulverized the furrow, so that a good iron-tooth harrow applied at three or four days apart finally got the ground in good order and we sowed oats late in the season, which grew finely but were lighter than our upland oats, producing about the same. After the oats, plowed the stubble and sowed wheat, ten to fifteen wagon loads stable manure with all the bog ashes, and six quarts of timothy seed per acre; wheat grew finely and stood the wintering well and promised to be the best piece of wheat in the county, but the grass seeds came on too rapidly for the wheat and resulted in a poor crop, very much shrunk and not over twelve to fifteen bushels per acre. Since then I have mowed it three years, producing about three tons good timothy hay per acre; and pastured it one year, and has produced double what our upland does and where double the quantity of manure has been used. The swamp grass having made its appearance, I shall plow it up for corn this season and oats next season, and plow the oat stubble in Sept. and sow timothy seed; clover does not answer, it grows well but the winter throws it out and kills it. The next attempt at another piece we plowed five acres in Sept. and left during winter the same as the other, and during the summer occasionally harrowing without putting in any crop; in the fall we plowed again, and sowed ten quarts of timothy seed per acre alone, which turned out well. I had twenty bushels timothy seed, and the bottom being green made good hay, of which I had ten tons, which sold after cutting at $7 per ton in the field; the seed sold for $4 per bushel—cradled the top and mowed the bottom. This piece promises much better this the second season than the last.

Another piece of about six acres, where the bushes were thick and large bogs, the whole had to be stubbed over; after heaping and burning, had it well harrowed and sowed timothy seed, ten quarts per acre, and six of clover seed, which has been in pasture for four years, and affords double what any of my upland does. This piece would not bear the cattle; that is, in many places it mired. It has now become firm, and can be tilled with little more expense than upland. I have planted corn on a small part, which has done well; also buckwheat, but this falls, the ground being too strong for it. Such as we have turned up a second time soon becomes perfectly pulverized and is very light and easily attended. I estimate the cost of tilling, ditching, &c., $30 per acre. The sample of yellow clay came from the bottom of a ditch adjoining the upland, and when first taken out smells like the bottom of a cow-yard. I spread some on the wheat, which was perceptible in that crop and also in the grass-crops, and I should like to have your opinion of its properties, and of the one sent; it came from near the surface and extends over several acres, and I do not know the depth, and also such of the others as you think desirable to analyze.

THE MAPLE FAMILY.

Who does not love the Maples. Who does not regard them with favor. If they are not known in song, they are still thought of for their substantial good in the fire-side comforts they bring, for their ample shades and symmetrical forms, for their straight limbs, and fair proportions. In the fields they spread their arms wide, and give clean shelter to the herds which feed there; in the forest they rise majestically, and stand strong and upright, and rank with the tallest trees. Their gray ridgy trunks lend age to the wood, while they lighten up the sombre scene. They see ten generations of men laid in their graves ere their strength begins to wane.

They form an harmonious family, whose likenesses are easily caught by the practiced eye, but they do not all seek the same kind of life. Some like the wet and marshy spots, some the dry hill side, but far below the mountain top. Others love the northern air, and others still the shady glen and rocky mountain pass. It is thus that each seeks light or shade, the plains or hills, the wet or dry, and yet each kind is maple-like. Some too are small, others large, but the kind is not lost whether great or small. The first among the kinds is the sugar maple, (acer saccharinum.) No tree is better known, and it is the type of the family. It has a wide range, being found growing in the latitude of 44, 1500 feet above the level of the sea, and yet in some places, spring frosts kill the tree in the state of New York. It is found in groves, where, with the Beech, they tenant together the whole field, they are associates in possession. New York New England and the middle states, are the most famous for their Sugar Maples. The whole region, except some of the highest in New York, is quite favorable to the growth of this tree. It here attains the height of 80 feet, and sometimes a diameter of four feet. Its bark is smooth when young, but becomes rough and ridgy with age. Its branches in the fields are numerous and widely spread; while in the forest, where light and air comes in from above, it rises high, and seems ambitious to overtop its neighbors. It is here too that in spring it gives its juice for sugar in its greatest abundance. It may be expected that an ordinary tree will yield from fifty to eighty gallons; four gallons of sap will make a pound of sugar. When the sap is concentrated by evaporation in perfectly clean vessels, and kept from the dirt and dust, it crystalizes in yellowish brown crystals, which are sharp and well defined. It only requires care to make a white sugar, which shall rival in color and taste the sugar of the cane. There is no mystery in the manufacture of pure sugar from the maple; it only requires the leaves and dirt, and the cautious management of the fire over which it is evaporated. When a fine forest of maples can be found the most economical mode which can be followed in making sugar, will be to evaporate the sap in large pans set in a water bath, in which the temperature will never rise over 212° of Fah.

The silver leaved or white maple is not an uncommon occupant of the New England forests. It resembles the sugar maple, but its wood is whiter and softer, and its leaves beneath posses a very fine silvery hue. It is the Acer dasycarpum of scientific botanists. We have a figure of its leaves and branches. Its trunk is among the largest of the maples. It grows about sixty feet in height in favored places. It commonly however is about fifty feet high. Its wood, which is white and soft, is easily wrought, and as it is light and strong it is highly esteemed for ox-yokes. So also it makes a pure white floor, and is much used for chairs; and indeed where lightness and strength are required, it forms a suitable material for furniture.

None of the maples can be employed for fence posts, as it is much subject to the dry rot when it is placed in a moist atmosphere, and undergoes a premature decay when resting upon the ground.

The swamp or Red Maple (Acer rubrum,) starts first into life with the returning spring. Its crimson blossoms, seated upon branches tipped with the same bright color, are seen with pleasure. Its leaves in autumn too, while they are the first to remind us that the summer is past, lend their bright hues to enliven and cheer the coming fall. They light up the forest covered slopes with yellows and reds, which amid the greens create a colored landscape which all love and admire. The wood of this kind of maple is also much esteemed, especially that fine variety known as the curled maple. It grows in swamps and in the northern forests of New York, and upon the flats of the Racket and Degrasse rivers it is the most common tree.

The Striped Maple (Acer Pennsylvanica,) is only a middling tree, but it is among the finest of our shade trees; and it is strange that it is so rarely seen planted by our village walks and streets. Its beautiful form, its large green leaf, and its handsome striped trunk, ought ere this, to have made it the favorite shade tree of New York and New England. It grows twenty feet high, and its trunk rarely exceeds eight inches in diameter. Its bark is smooth, and striped lengthwise with green and black. Its flowers are large and yellowish green, they appear after the tree is fully leaved. In the spring its bark peels off after it it is loosened by a few slight blows, and the wood is white and soft but not so strong as the sugar maple. It gives a sweet sap, but less in quantity than the foregoing species. It extends far north, and is there known as the Moose-wood, as the Moose feeds upon its branches and bark which it strips off with its teeth. Many trees are met with in the Adirondack woods, which have been broken and peeled by this animal. It is for this reason that it has received its name, Moose by the Indian, which in their language signifies woodeater.

The Mountain Maple (Acer montanum) is the smallest of the family of maples. As its name implies, it is a mountain species, and loves those places which are shaded and and damp, where the mountain rill dashes over the rocks and sends up its spray; there its branches bend down to the water's edge and choke up the fisherman's path, and hedge in the stream, as it seeks its way to the plains below.

These are all American species of the maple family; of themselves for ornamental shade trees, they are by no means of an inferior kind. The Acer dasycarpum is a fine tree for its shade, and especially the silvery hue of its under side, which the breeze constantly lifts, and which too creates a beautiful shifting scene by its changing greens, and its lights below. The Striped Maple is esteemed in gardenesque landscapes by the English. It likes the dry hill side, but still may be grown in any place when planted with care. The Maples have none of those properties which make shrubs or trees suitable for hedges — their determination upwards is too strong and their branches too sparse to form a close fence. But then they fill their own spheres of usefulness in the vegetable kingdom, and increase the comforts of life in many ways which may have escaped our notice.

Pl. 2. ACER *dasycarpum.* Fig. A, cluster of fertile flowers, natural size. Fig. 1, perfect flower. Fig. 2, magnified. Fig. 3, the same laid open. Fig. 4, ovary and styles. Fig. 5, sterile flower. Fig. 6, abortive ovary. B, branch with fruit.

ANALYSIS OF SOILS.

We received sometime since, a small box of geological specimens from our friend and correspondent, Col. Wailes of Washington, Mississippi. The box contained four or five specimens of marl and soil, concerning which, it was said that several friends would be pleased if an analysis could be made; and inasmuch as we are disposed to please our friends, we took them in hand and have completed the analysis, by the aid of Mr. Ball and Mr. Salisbury, who are rendering us assistance in the laboratory at the present time.

No. 1. Surface soil (Prairie) Hinds Co., Ms. Color, black—friable. Analysis:

Water,	10.40
Organic matter,	12.20

Silex,	55.00
Carbonate of lime,	6.80
Peroxide of iron and alumina,	14.52
Magnesia,	57
Potash,	1.34
Phosphates,	trace

Marl No. 4, 100 grains.

Dried, lost	3.92
Ignited,	4.04

Insoluble silica,	17.44
Peroxide of iron and alumina,	7.10
Carbonate of lime,	70.44
Potash,	3.64
Soda,	36
Magnesia,	64
Solluble silex,	trace
	99.62

This will be found without doubt a valuable fertilizer—it contains almost half the amount of potash which the green sands of New Jersey do, that are so remarkable for giving fertility to the exhausted soil of that State.

Another specimen of marl, from Hinds Co., Ms. gave the following result:—

Vegetable matter,	68
Silex,	12.20
Peroxide of iron and alumina,	3.40
Carbonate of lime,	82.62
Magnesia,	1.20
	100.10

Analysis of No. 5—color, greenish, compact. It contained water 3.20 per cent, and of organic matter, 3.60.

Analysis of 50 grains of the dry ignited powder.

Silicates,	27.00
Carbonate of lime,	7.30
Peroxide of iron and alumina,	13.03
Magnesia,	2.75
	50.08

This marl was examined for potash, but without success.

The following remarks were made of the soils in the letter accompanying the specimens. No. 1 is the black surface earth of the prairie. No. 4 below No. 1. It is a fine grain and chalky marl, with a few obscure fossil, which appear to belong to fresh water. Without doubt it is a valuable fertilizer. No. 4.—Indurated marl or white lime, and belongs to the preceding. It is quite compact and yellowish. It is rich in potash for a fresh water deposit.

No. 5.—Black tenacious or plaster marl. This also will form a valuable fertilizer, though it is less rich in lime and entirely destitute of potash. Accompanying the above specimens was one labelled, "Part of a trunk of a tree converted into coal, found embedded in lime rock." This is an interesting specimen, but is really petroleum.

It would appear from the above and from the examinations we have made, that the South is really rich in fertilizers, and that there is no necessity for her lands to become poor and barren.

MINERAL FOOD OF PLANTS IN THE SOIL.

After all the differences of opinion which have arisen among the men of science, in reference to what is the most important element in the various kinds of manure, the question must be settled by acknowledging on all sides, that no one in particular will answer the demands of growing plants. There may be an absence of any one, and the plant or its produce will be imperfect. The compensating power of Nature may restore the absence of one by another of a corresponding class of substances, as the want of our alkali in the soil in which a vegetable grows is often supplied by another, that is taken up and incorporated in the plant, but either the one or its substitute must be present. From these theories of certain substances being the controlling ones in manures, have arisen many fallacious practices, even in the days of improved modern farming.

Such was the old doctrine, that growing plants required only water to nourish them, and to which the experiment of Van Helmont was allowed for a long time to give countenance. He planted a *willow tree* in a quantity of earth of ascertained weight, in which it grew for five years, being watered with rain water only. At the end of that period, the willow had become a tree weighing one hundred and fifty pounds, whilst the earth had but slightly diminished in weight. The experiment, however, does not appear to have been conducted with much accuracy, in excluding foreign substances from the water. Besides, the amount of mineral substances in the willow is very small, and might very readily be overlooked in weighing a quantity of earth sufficient to support a tree of one hundred and fifty pounds. But Duhamel's experiment with the *horse-chestnut* and *oak*, watered with *distilled* water only, the former for three, and the latter for eight years, give a different complexion to the matter, for they were barely kept alive, growing but very little. It was evident therefore that they did not derive much sustenance from the water.

Of a similar kind was Jethro Hull's theory, that if the soil were finely divided, plants would thrive in it without manure. In the same class of theories, may be ranked that which makes the atmosphere the great storehouse of vegetable food, and which would make it unnecessary to apply any manure to the soil; a theory utterly inconsistent with all experience, and along side of it we must place the doctrine of soaking seeds in saline solutions, to impregnate them with a sufficient quantity to sustain a growth of increased vigor, and an increased production of fruit.

All these theories, and the multitude of others which would make it unnecessary to manure the ground, must rest side by side. They will not be confirmed by practice. Plants must be fed. They must have all the elements necessary to make them perfect. Water alone is not sufficient—any single salt, or mixture of salts, will not be the thing unless it contain all the plant requires, and in such a form that the plant can obtain it. The earth was made for them to grow in, and was formed and mixed by the Creator in the wisest and best manner possible. If He has left us any thing to *add*, then let us find it out. He certainly did not leave us to discover that plants will grow in the air, or in the water better than in their natural soil.

From the known constitution of plants, we should have no hesitation in infering that they require food. Experience teaches us that it is the case. Unmanured soil will not produce good crops. A succession of crops taken off the same land, impoverishes it, unless some of the loss is restored. If weight is restored, equal to what is taken off, in the ordinary form of manures, that is, in the form of *dung*, vegetable or animal matter; we still find, in the process of time, a deterioration in the capabilities of the soil, manifested in its diminished and constantly diminishing productions. To this cause is owing the "wearing out," as it is called, of old cultivated lands, even under what may be considered a liberal system of husbandry. These facts teach us that something is required for the sustenance of the plants we wish to grow. What is this?

The substances entering into the constitution of vegetables, have, as it appears to us without much reason, been divided into two classes, according to their origin, or perhaps rather in accordance with an opinion no longer held by any, that only four, of all the elements found in plants, belonged essentially, the others being present only by accident. These four were called organic —the rest inorganic. From the circumstance that upon the death of plants and animals, their decaying bodies mingle with, and form a part of the soil; it also has been divided in the same way, and the portion derived from decaying organized matter has been termed in like manner organic, while the original mineral portion has been called inorganic. Probably no soil has been found which does not contain, in some degree, organic matter. If no plant has ever grown upon it, yet the insects or worms which people air and earth and die on every inch of surface, or the animals which have perished throughout all time, have mingled a portion of their dust with the soil, and thus have served to prepare the ground for the purposes of agriculture. This forms in all good soils but a small proportion.

The mineral portion of the soil constitutes its chief bulk and serves various purposes to the vegetable kingdom. Its use as food to growing plants is the one to which we would call attention now. It was stated above that even under the application of ordinary manures, soil would deteriorate. But if at the same time certain mineral substances are applied, they have a marked effect, in many cases. It is undoubtedly true that the action of these is not altogether as nutriment, and they have therefore been often regarded as only stimulants, or a sort of condiment required by the plant to aid its digestion. At the same time it is equally true that they do form an essential article of *food*. Their constancy in all plants warrants this belief, as well as the effect they have when applied. It therefore becomes a question of considerable importance whether they may not be applied with great benefit, and whether they ought not to be very extensively applied to soils in all the long tilled sections of the country. These soils generally contain a considerable portion of organic matter, and yet are not so productive as they were. Would not the use of mineral manures do much towards restoring their fertility? Analysis may detect their presence in the soil already, but they may not be in the state which renders them available to plants, and as they exist the process may be very slow which prepares them to become soluble, and thus capable of being absorbed.

Experience teaches the use of many. The different forms of lime are those most commonly used, and the benefit resulting from them is universally known. In some parts of the country wood-ashes is an indispensable manure. It is probable, that on very old farms their value would be abundantly shown by a fair trial, and where peat abounds it will often be found best to burn it and apply the ashes to the soil than to use it in any other way. In the vicinity of villages and cities where large quantities of anthracite coal are consumed every winter, great use may be made of the ashes thus produced, which are usually, entirely wasted. On clay soils this kind of ashes may be found highly useful in ameliorating the mechanical condition of the soil, besides adding important chemical properties.

The presence of these mineral elements is important not only to the amount, but also to the quality of the crop. Grain grown upon a soil abounding in them in a condition to be rapidly assimilated will be of much better quality than that grown upon a soil deficient in them. Some are disposed to attribute the diseases to which many vegetables are subject to defective properties of the soil in which they are grown. Though there are very few facts of a character to throw light upon this subject, yet it is, to say the least, possible, and the restoration of the deficiency by the use of mineral manures, may be also the restoration of health and vigor to the plants. This subject is worthy of more attention than has been bestowed upon it.

The growth of plants upon any soil adds every year more or less to the organic matter of that soil. The leaves and the stalks of these plants die and rot upon the ground and are gradually incorporated with it. The roots that die annually in the soil add also to the store of organic matter. The different forms of animal life inhabiting the earth and its surface—also the worms that crawl through the ground serve to increase the amount of this portion of the soil, so that there is no part of the surface of the earth, and especially that which is cultivated, in which organic matters are not constantly accumulating. These sources of organic matter are also in a degree sources of inorganic elements in a form to be easily used by growing plants. But this portion is so small as to be hardly worthy of computation, applied in this way. It is probably never more than 10 to 12 per cent. of the whole amount added, and is quite as small, compared with the amount taken away.

It is easy to see and understand the causes which are continually operating to impoverish the soil. Reason teaches us, when we know the constitution of plants, what experience teaches us without this knowledge. Reason ought also to teach us the remedy. There are many farmers at the present day, in this country, who act upon the general principle of feeding plants to a great extent. But they are still behind the teachings of true science in the manner of giving that food to their crops. The analysis of soils from land long tilled always shows a deterioration in some of the inorganic elements. In almost all cases the soil contains a very considerable portion of organic matter. The true principle of farming is to make the soil produce what is most profitable to the tiller. He should therefore understand what is required in order to effect this. And it is undoubtedly true that as a general rule, the soil is more deficient in inorganic than in organic elements, and the restoration of them would be the restoration of increased fertility.

NOTES ON NATURAL HISTORY, ETC.,

BY JAMES EIGHTS.

De la Beche remarks that "it not unfrequently happens that in clays, containing disseminated carbonate of lime, there are nodules more calcareous than the other parts, and which we readily perceive are not bodies rounded previous to deposition, although at a distance they have that appearance;" and in a note Prof. Hitchcock adds, "these concretions generally go by the name of claystones, and are regarded as the result of running water; though not unfrequently they have been considered as the work of man. Indeed I have never seen any thing in the mineral kingdom that had so artificial an aspect."—*Geological Researches.*

These argillo-calcareous concretions are exceedingly common in the lacustine marly-clay in the vicinity of Albany. They are strictly confined to the upper part, or that part which is most commonly made use of for the manufacturing of brick. The manner in which they have been found, is distinctly perceptible every where among the various and extensive diggings, which have thrown them open to the light of day. The strata among which they are usually found is in a horizontal position, not unfrequently separated by thin seams of a remarkably fine sand; the delicate fibres of the roots of the different trees of the forest, that at one time completely covered the surface of the soil, have, in innumerable places, penetrated to a very considerable distance beneath; it was along these roots that the moisture from the surface, highly charged with carbonic acid, has readily found its way, collecting the lime and other necessary materials as it descended, until its arrival at one of these seams; here a deposition commenced, and the particles gradually arranged themselves in a concretionary form, around a nucleus of ligneous fibre. Whenever these concretions have been examined in a perfect state, the nucleus, or remnants of it, has invariably been found, exhibiting no other change in its appearance than that of a brownish stain given to it by the oxide of iron. Sometimes two or more of them are united together; at others, where the deposition seems to have been far more copious, the liquid mass appears to have spread out to some considerable extent, giving origin to those stony plates of the same nature, which are always to be found associated with them. It is, also, not an unusual circumstance for many of them to be marked with circular depressions, where, after a short exposure to the atmospheric influences, they readily disunite, the central portion falls out, carrying with it the woody nucleus, which it contains, and leaves the concretions in that very regular ringlike form that they so commonly assume.

In some instances, while undergoing the necessary process of induration, the particles appear to have shrunk from the centre towards the circumference, causing those radiating fissures which afterwards become filled by segregation, with calcareous spar. In this case these nodules become perfect septaria

SPECIFIC CHARACTER.

To us it appears a wise arrangement, a beautiful as well as useful provision that each species is stamped with characters, which clearly separate it from all other species—that species are individualized both by corporeal marks and by intellectual and instinctive powers. The intention or purpose which is fulfilled by this arrangement, we do not design to speak of at this time; it is the fact which we wish to bring up and which interests most. But do not many labor under a fallacy in this matter, when for instance they remind us that gradations exist every where in nature, that things are linked together, and so linked that no breaks appear in the chains, or would not, provided we could gather up the dust of the lost races. Where are those gradations seen, and what is the idea which is held out so prominently in the phrases, gradation of being—beings linked together, etc.? Is it probable that in the gradations which are so prominently set forth, there is anything like a coalescence of species? In this idea some confusion has arisen in consequence of misunderstanding the nature of the changes which have occurred in some species especially those which constitute varieties. Those varieties if carefully observed are specific and never generic. Take the apple, which runs into innumerable kinds; but who has ever seen a variety which was becoming a pear or quince; or a pear, a quince or an apple, although they grow upon the trunks of each other respectively. Still there is not the least advance of an apple to a quince, or of a quince to an apple, and yet each in their own sphere branch out and form hundreds of kinds, without obscuring in the least their parentage, or the specific points which make an apple or quince what they were originally stamped with. There is no upward or downward movement in all this. Though some are better than others, still there is a difference in quality only, but this capability is clearly a specific point itself, just as much as fixedness is a character in other species. Who does not recognize an aptitude in the elephant to learn, and who does not see that the

the rhinoceros or hippopotamus on the contrary have none of the aptitude of the elephant. The positive character of the first is as important specifically as the negative of the latter. If it is supposed that by gradation species run into each in their varieties, the view is erroneous. If it is meant that there is a system, that species occupy a position which is positively assigned them in that system that there are grades of being, some high, some low, it is undoubtedly true.

The position which a species holds is positive and arbitrary; they occupy a shelf or platform which is fixed, and this neither inclines downward nor upward, its position is parallel, and all species are placed in the same relations. The shelf is nearer some than it is to others. The resemblances are less remote, and the affinities approximate some and separate others. This arangement gives us families and groups. But still not only the species, but the groups are kept apart, and we may take them singly or collectively, and we shall never be able to discover a coalescence of species.

While then the species are kept strictly apart, each upon its own platform, the advance towards a higher organization is by species, yet it is not by the advance of the individuals of a species. Species in their individual capacity do not advance towards a higher or lower species, but advanced species are created. The spaces which intervene between the platforms which constitute the station they occupy is greater in some cases than others. This is all.

Another important view which may be taken of species is, the mode in which they sometimes break up into groups. This is well illustrated in the dog. The groups or varieties constitute many well-marked families which are capable of maintaining their identities, as if they were real species, and yet the specific marks of the dog remain unadulterated in each. The groups which are formed by the breaking up of this species represent in miniature the entire class to which they belong, without a coalescence of any one group with either of the species in which there is a relationship. While then a species in some instances possesses a constitutional ability to change, it is evident those changes never destroy specific marks, and the change itself is governed by a law which, while it marks groups with characters analagous to the specific, still, not one group, or individual of a group is merged in any of the near or remote species. The author of the Vestiges of Creation has attempted to build up a system, the foundation of which is laid upon the constitutional ability in some species to change, or produce deviations within a certain range from the parent type. A hasty and superficial view may favor his system. When however these deviations are carefully observed, it appears without a foundation—it has all been built upon defective observations and unphilosophical views.

Another fact which seems to be established in respect to varieties is, that the true and real variety subsists by itself, and it cannot be maintained in an intermediate state for a great length of time. The variety may die out and leave a blank, just as a species dies out. Some varieties of the dog have already nearly, and have perhaps entirely disappeared. One variety of the human race is verging to an extermination. This is owing to the narrow range of the constitutional susceptibilities. They are unfitted, or less fitted for that wide civilization which characterizes the European. Their civilization must be different in kind. In attempting to force upon them European civilization suddenly, too much violence is done to the associations which surround them, in which they have grown up. The specific character of the red men of the forest, those which place him in the species, man, are as strong and pure as in the European or Caucassian.

We remark again, that specific character is never destroyed by external influences. In those instances where a species is changeable and readily breaks up into groups whose characteristics are transmitted from parents to offspring, the specific character is never uprooted; in fact, these peculiar changes must be regarded as a part of the specific character. It is true, that those characteristics are not readily expressed or measured; and hence are loosely estimated; or, indeed are noticed only as accidents which have happened, but which are not determined by law. Lastly, it is not difficult to see, that the loss or extermination of a species, may take place without violence; indeed, in the whole range of geological dynamics, we have no evidence that an entire race, or a species, has been destroyed by a sudden catastrophe. Individuals perish, but the race lives. Catastrophes are local, never general; hence the species survive. The power, then, which exterminates a species, operates gradually; the final result is brought about slowly; it is a wasting process which only shows itself in the movement of cycles, not one which prostrates a race in a day.

Indelible Ink.—Add lampblack and indigo to a solution of the gluten of wheat in acetic acid. It is of a beautiful black and cannot be removed by water, chlorine, or dilute acids.

Another process is to free the gluten of wheat from its starch and dissolve it in acetic acid. The solution is then mixed with sufficient rain water to bring it to the strength of common vinegar, and 10grs. of the best lampblack, or 2grs. of indigo water added to each 4oz. of the liquid, &c., with oil of cloves. It is not used for marking linen, as it will not bear mechanical force.

NEW PUBLICATIONS.

GEOLOGY OF VERMONT.

Second Annual Report of the Geology of Vermont, 1846, *by C. B. Adams, State Geologist, Prof. of Chemistry, &c.:* pp. 267.

The report is made up first of an introduction in which the public is presented with a history of the survey, from October 1845, to October 1846. The work is divided into five parts. The first part is taken up with elementary geology; it occupies one hundred and six pages. The second part is quite brief, and is merely a statement respecting the most important localities of minerals in the state. In the third part the Professor gives an essay upon clay concretions or clay stones, in which the law and power of concretion is stated. Part four is occupied with scientific geology; the subjects which have received the attention of the geologists of Vermont are drift, its distribution, drift moraines, furrows, streams of stones, fracture of slate hills, age of drift, its theories, etc. The subject is concluded by a description of the older pleistocene deposit and its fossils. It is regarded as a marine formation, and its origin and climate of this period is well described in this place. The fifth part contains the economical geology and mineralogy. The Agricultural Geology is given by Mr. Hall. The soils of Vermont have received attention but the subject is still in progress.

Under economical geology mining receives its share of attention. The ores of iron are the brown iron, magnetic and specular ores. Chromic iron is also reckoned as one of the important mineral products of Vermont. Ochres and manganese have long been known as ores associated with the brown ore. Marble, serpentine, soapstone, roofing slate, limestone, materials for roads, etc. In the appendix the labors of the lamented Olmsted are given. Mr. Olmsted had only commenced his labors and it appears had made some progress in the analysis of the limestone and iron ores, and we regret that they were terminated by death. The report is also favored with a letter from the Rev. President Hitchcock, of Amherst College. Mr. Thompson, of Burlington, has reported progress. His well known accuracy and industry gives sure promise of valuable results from his connection with the survey. Mr. Thompson has given the heights of the following mountains, as ascertained by his recent observations.

		Above L. Champlain.
Mansfield Mountain, (chin,)		4258
	Nose,	3954
	S. Peak,	3792
Camel's Hump,		3994
Sugar Loaf,		913
Snake Hill,		822
Cobble Hill,		737
Underhill Flat,		575

It is stated that by leveling, Camel's Hump was found to be 3984 thus making only nine feet difference between the barometrical measurement and leveling.

The report we have observed for sale in Mr. Little's bookstore. It is an interesting volume, and contains a large amount of elementary and scientific geology, together with many of the leading facts in respect to the geology of Vermont. It is expected the work will be completed in the course of 1847.

A Flora of the State of New York, comprising full descriptions of all the indiginious and naturalized plants hitherto discovered in the State: with remarks on their economical and medicinal properties, by John Torrey, M. D., F. R. S., vol. 1. Albany, Carroll & Cook, Printers to the Assembly, 1846: pp. 484, 4to.

The public have been recently favored by the distribution of the first volume of the New York Flora, which has been in a course of preparation for several years under the authority of the State. The present volume constitutes a part only of the work. The second part or volume, though completed and bound, is retained in the office of the Secretary of State. The Flora is a model publication ; and may be regarded as a complete and perfect work of its kind. It embraces full descriptions of all the indigenous and introduced plants which have hitherto been found growing wild in the State. Dr. Torrey has arranged the descriptions of the plants according to the natural orders; an arrangement which may disappoint a few of the older botanists, or those who have not kept up with the progress of the science. The Linnean classification, which appears to be so plain to beginners, is considered by the author of the Flora to have fulfilled its mission; and under the present state of our knowledge of the character and structure of plants to be no longer important to those who are pursuing the study of plants.

Indeed the opinion here expressed seems to be supported by the most enlightened view we can take of the utility of the study of botany and natural history generally. Some, and even many, have supposed that when a system is struck out which provides the means for determining the names of species and genera, that then all the wants of the student would be supplied. They found their views, or notions, however, too narrow a basis, viz: that names contain the essence of knowledge, and that when the name of a thingis determined, that is sufficient. Names stand with such persons in the place of ideas or knowledge.

In the study of natural history the great object is, or should be, to comprehend the plan or system upon which beings are organized—to see the links which bind the several parts together and which make one great whole—to perceive relations and ends, antecedents and consequents—or to put in movement that train of thought by which may be evolved the connecting links which bind together the high and the low, the finite and the infinite. The discovery of analogies and affinities, indicated by a resemblance near or remote, form one of the immediate objects of this study. The study of structure instead of names, constitutes one of the principal objects in natural history. This is the road by which the attainment of the great end is to be secured. It is not the aim of the Flora to teach structural botany; but the arrangement being founded on structure, the study of the work must be through the channels of structural botany. Views here expressed, however, are not intended to controvert the notion that names are not things or that the name is unimportant.

But to return to the consideration of the work itself. It appears from the preface to the Flora, that New York contains about 1450 species of flowering plants. Of woody plants 250 are employed in the arts or used as fuel. There are 150 plants which possess medicinal properties. The introduced plants which have become naturalized and grow wherever they please, amount to 150. Some of these are really the farmer's pests. They came from Europe, mostly, and are there too known as great vagabonds, which have stole into the crops and have found means to come over the Atlantic in bags and barrels of choice grain in which they have secreted themselves. Several of the naturalized plants are of the greatest consequence to us, witness the grasses, the herds grass, red top, etc., which by their superior vital powers take deep root in our soil and freqnently force out the useless kinds, whose places they take and maintain, provided they are duly nourished and cared for. Dr. Torrey's work furnishes clear and detailed descriptions by means of which species may be identified; and the view which it is stated was taken at the commencement of the work, was to secure this end.

The popular descriptions of plants and those details of history and of narrative which constitute a larger part of the literature of botany has been entirely omitted. This is an interesting part of the subject, but it seems that the work would have become too voluminous if this interesting part had been superadded to the more technical details which have been furnished.

In conclusion, then, we will not complain of the natural system. Neither will we complain of the rigid technicality the exact terminology in which the book is dressed; or of the dry and naked descriptions of sepals, carpels, involucres, corymbs, acheniums, ovaries, cotyledons, pericarps, mericarps, mesocarps, etc., by which we are brought to the object sought, the indentification of a species, and by which too the exact indentification only of species and genera can be secured.

AN EASY METHOD OF PREPARING BETULINE.

Place a roll of white birch bark upon a plate of iron, whose temperature is sufficiently hot to char white paper, and it will be covered in a short time with a white frosting, which under the microscope will be seen to consist of beautiful and splendid crystals of Betuline. If the bark remains an hour or two, the crystals will continue to sublime, when they will form delicate tufts, finely radiating or forming clusters of crystals, some of which will be half an inch in length. The substance is, as stated by Lowry its discoverer, insoluble in water, but soluble in alcohol, ether and oil. The odor emited by burning bark resembles that of benzoic acid. A yellow volatile oil sublimes, also, and a few drops appear among the crystals. The Betuline exists ready formed upon the bark in the form of a white powder, which on being heated to about 280 or 300 degrees sublimes, and on cooling is precipitated upon the bark in a position farther removed from the hot plate. It is neither acid nor alkaline, so far as we have observed, and is not soluble in boiling solutions of the carbonated alkalies.

How to Keep Smoked Hams.—The best method for keeping hams is, after they are smoked, to put them back into the pickle and the smoky taste is preserved as perfectly as when put in ashes or kept in a dry place.

Quinine in the Urine and Blood.—Quinine may be detected in the blood and urine of patients who have taken it for some time. It gives a bitter taste to the serum of the blood.

TINNING AND ZINCING BRASS OR COPPER BY THE MOIST WAY.—Prepare a boiling solution of stannate of potash, mix with tin turnings, immerse the copper or brass, and it is tinned in a few seconds.

Zinc is also effectually laid upon brass or copper by making a chloride of zinc in which zinc turnings are put. The brass or copper is immersed and a coating obtained.

FORCE OF WAVES.—The force of waves is determined by a marine dynamometer, which consists of a powerful steel spring enclosed in a cylinder. The wave is received upon a flat circular plate firmly fixed to the spring. The observations have been made at the Skerrymore rocks in the Atlantic ocean. By these observations it is proved that the mean force of the waves for summer is equal to 611lbs. per square foot: for winter 2086lbs. The greatest power yet witnessed was a pressure equal to 6083lbs. to a square foot, a result which succeeded a gale on the 29th of March, 1845.

TO MAKE RED INK.—Take 2oz. of the best of Brazil wood, ½oz. of alum and half an ounce of crystals of tartar and boil with 16oz. of rain water down to half its bulk, add half an ounce of gum Arabic, after it is strained. To this add also one half ounce of cochineal, made into a tincture with one and a half ounces of alcohol.

MEDICINAL SUBSTANCE IN THE BARK OF THE ROOT OF THE APPLE TREE AND WILD CHERRY TREE.—The substance is called Phloridine, and acts upon the system in a manner resembling quinine. It is said that its efficacy is so decided, that we cannot hesitate to class it with the most powerful febrifuges, and that it has an advantage over quinine, that it never induces pain in the stomach. It is prepared by boiling the root bark in a quantity of water sufficient to cover it, for half an hour. This is poured off and a fresh portion added; the two fluids are mixed together and at the end of six hours the phloridine has separated in the form of a deep red velvety looking matter.

METHOD OF COVERING BRASS OR COPPER WITH PLATINA.—One part of solid chloride of platina is dissolved in 200 parts of water, and to this solution is added 8 parts of common salt, or what is better, one part of platino-chloride of ammonia, and 8 parts of hydro-chlorate of ammonia are placed in a flat porcelain vessel and from 32 to 40 parts of water poured over it, the whole heated to boiling, and the vessel of copper or brass, perfectly bright, is placed therein. This will be covered in a few seconds with a brilliant coat of platina.

AMERICAN JOURNAL

OF

AGRICULTURE AND SCIENCE.

This work will be issued hereafter monthly, at two dollars per annum payable in advance. It will form two volumes at the close of the year of three hundred pages each, and will be illustrated by plates and wood engravings.

The object of this Journal is to disseminate useful knowledge relating to Science, the Arts, and Agriculture, and to promote sound views in education. It is in fine designed for a farmers' magazine, and no efforts will be wanting to make it a welcome visiter in his family.

Communications may be addressed as usual to the conductors at Albany or when more convenient, to the publishers, Huntington & Savage, at 216 Pearl st., New York.

E. EMMONS,
A. OSBORN.

Albany, January, 1847.

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THE LIMESTONES, AND LIME.

The subject divides itself into the following parts: 1. The distribution of the limestones in the geological formations. 2. The composition of the limestones. 3. Their origin. 4. The theory of the action of lime as a fertilizer. 5. The uses of lime in the arts.

I. Distribution of Limestone.

Limestone, as is well known, occurs as a rock which, when pure, contains lime 56.15, and carbonic acid 43.7. Its specific gravity is 2.74. The rock is distributed through many of the geological formations in the United States; but, as in the case of the sandstones, slates, etc., it cannot be considered as peculiar to any given system of rocks. We speak now of limestone as a mineral simply. When, however, we come to take a special view of it, we must regard every formation which contains a limestone as belonging to it exclusively. Geologically, it has an age and position, and this particular limestone is unknown elsewhere. The same bed of limestone may be widely separated from another bed, and yet can be proved to belong to the same period. Geology then aids the farmer in his search for limestone; and though we can not lay it down as an established law, that the same formation every where will contain its limestone, yet there is so much constancy in its presence in certain formations, that its absence may be considered an exception to a rule, and hence it is a real advantage to know where and in what formations it has been found. It is needless to enter here upon the consideration of the fact, that limestones are unequally developed in the same formation, at distant points. We are not to wonder that it is so; but rather wonder that there is so much constancy in the presence of this rock over such vast areas, and that eras should occur at all, during which the sediments consisted mainly of calcareous matter.

At the first view of the fact, the discovery at two distant points of a limestone in the same formation, would be regarded as an accident. We should not expect that in the workings of inorganic nature, that the steady recurrence of one kind of mineral matter would be likely to happen. But we find that the same hand which has sown broadcast seed for the mountain, the valley and the marsh, has also made the limestones to grow in their eras and seasons.

We shall describe the limestones as they are distributed in the formations, beginning with the oldest or lowest, and thence we shall proceed and speak of them in the ascending order.

Limestone of the Primary System.—Few rocks possess a greater interest than this, when associated with granites. Hence it is in this particular association that we find a clue to an explanation of several important facts; besides it overthrows an old dogma that granite is the oldest and lowest rock upon the globe. This is not, however, the place to speak of this matter; it will receive attention under the general head, the origin of limestone. Primary limestone is white, granular, and quite coarse-grained, and is rarely pure or free from foreign minerals. It contains mica, hornblende, pyroxene quartz, serpentine, and graphite. The rarer minerals are chrondrodite, spinelle and sapphire. But the most injurious one is silex, which is frequently disseminated in fine or coarse particles, or seggregated in masses, in which it is common to find imperfectly developed hornblende or pyroxene. The presence of one of these minerals of course injures limestone for all the purposes to which it is applicable, but usually in the large beds comparatively pure masses occur, which may be selected from the impure.

Localities.—It is impossible, or rather it will be inexpedient, to give all the localities of this rock which have fallen under our own observation, or under the observation of others. The following, however, are some of the most important in the state of New York, namely, Hammond, Rossie, Gouverneur, and Antwerp, which taken together constitute a region over which limestone is widely spread, though not in continuous beds. It here contains very frequently phosphate of lime in small and large six-sided prisms, crystals of feldspar, pyroxene, and zircon, which latter mineral seems to replace the sapphire of Orange county; mica, and graphite, and quartz, are perhaps the most common minerals. Graphite is usually in disseminated folia, but rarely in veins.

There is another limestone district in Edwards and vicinity, in St. Lawrence county. Specular iron ore and carbonate of iron is often associated with these beds. Theresa and its vicinity also is another district where primary limestone is common, particularly in the direction of Muscolunge lake, and upon its shores, where fluor spar, carbonate strontian, was formerly quite abundant. It is here that a rock is quite common which might be called a *calcareous granite.* In the interior of the great primary region, few beds of limestone are known. Near Long Lake, about four miles south of its head, primary limestone was discovered; and also near Newcomb, in Essex county, some inferior beds have also been discovered. One of the most interesting localities however, and which clearly exhibits the relation of this rock to the primary rocks associated with it, is at Long Pond in Essex county. In Warren county a limestone district exists in the west part of Warrensburgh, and in the adjacent towns of Athol and Johnsburgh. It is here associated with serpentine and some poor pyroxene. The beds however are sufficiently pure for lime.

The last limestone district in the northern primary of New York is in Moriah. The principal beds terminate on the shore of Lake Champlain at Port Henry, where, as will be seen, the rock is a pure carbonate of lime.

Leaving the northern primary rocks and passing south to the Highlands of the Hudson, we find several beds or veins of limestone, some of which have a fine red color, and contain scapolite and hornblende. These beds may be regarded as continuous, or rather as forming an interrupted belt, which extends through Orange county into New Jersey, passing on its route through Amity, where spinelle, serpentine, pyroxene, scapolite and sapphire are the most common and remarkable minerals. This belt of limestone is often sufficiently pure for lime.

It appears from the foregoing hasty sketch of the localities of the limestones, that the primary rocks are almost constantly associated with them; and as we have passed over many localities without even a passing notice, it seems to be well established that primary rocks are as rich in limestones as any of the later sedimentary formations.

We shall now turn our attention to the primary of Massachusetts and Vermont; and we may at once say, that large areas of the gneiss and mica slate districts are quite deficient in limestone. Beds and veins of limestone pass through the western part of Middlefield, near the rail road, which extend, with some interruption, north and south through Hampden and Berkshire counties. They are intermixed with serpentine, and belongs to the magnesian variety.

Beds and veins of limestone closely resembling these western ones occur in the east part of the state, in Bolton and Chelmsford. These are coarse, crystalline, and contain scapolite, and rarely blue and beautiful spinelle.

New Hampshire and Maine are supplied with lime in many instances from the primary rocks. In the former state the limestone seems to be interlaminated with mica slate. Lyme, Haverhill and Lisbon each contain inexhaustible beds of limestone, and it is an interesting fact, that they lie in one range, running a little east of north. Mica and quartz are the only two minerals which vitiate the rock, and diminish its value for quick-lime.

In Maine, the occurrence of limestone in the primary rocks is well established. The beds hold the same relation to the rocks, as in Massachusetts and New Hampshire, and which have already been noticed in the Green Mountain range. Dr. Jackson, in his geology of Maine, remarks, that many valuable beds of limestone occur in the interior of Maine, particularly in York and Oxford counties, where it alternates with gneiss and mica slate, in beds varying from a few inches to several feet in thickness. They generally rest upon the flanks of granite mountains, though they also occur on the hills and table lands.

These limestones are considered as of the very best quality, since they are free generally, from imbedded minerals and magnesia. When the limestone contains earthy impurities, they may be riddled out, after being partially slacked with a little water. The impurities are well adapted to agricultural purposes, while the pure lime may be employed for mortar. Limestone of the primary system occurs in the following towns in Maine:—Newfield, Norway, Paris, Buckfield, Winthrop, Hallowell, Whitefield, Brunswick, Phipsburgh, Rumford Falls, Skowhegan Falls, Poland, Carthage and Bingham.

The primary limestones, if they exist, are not well described south of New Jersey. They are well known in this state. The beds are a continuation of those of Orange county, and contain the same minerals. Serpentine also accompanies the formation penetrating the limestone in disseminated masses, and occuring also with it as associated beds.

It is a curious fact that serpentine in Massachusetts, forms by itself extensive beds, independent of limestone, as in Middlefield and Chester, while in the primary system of New York, especially of the northern district, they invariably occur together, frequently penetrate each other or lie side by side. Whenever the serpentine is associated with the limestone, the latter contains magnesia independent of the masses of serpentine which may be contained in it.

II. Composition of Limestones.

We shall now proceed to state the composition of the limestones of the primary system. Our principal object in entering somewhat minutely into details in this part of the essay is to inform our readers what limestones contain magnesia, and what are adapted to agricultural purposes.

It has been taught that those limestones which are situated near the primary rocks, are more likely to contain magnesia than others; and if our recollection of former doctrines does not fail us, we were taught to believe that magnesia was imparted to the limestones, at a period subsequent to their consolidation; and hence it was believed that magnesian limestones, especially those called dolomites, were altered rocks, and had undergone a process which was termed *dolomitization;* which consisted in the reception of this earth from some preëxisting magnesian rock, through the agency of heat. This doctrine, however, seems to be too far fetched, especially when it is quite agreeable to all the facts which are known of the origin of sedimentary rocks, to consider the materials as existing together at the time the sediment is forming, or at the time the deposition is in progress.

Many of the beds of limestone in the primary rocks are free from magnesia, and we believe that observation will supply us with indications respecting its presence, though probably nothing short of analysis will be perfectly satisfactory. Agreeably to our own observations, as it respects the presence of this earth in the primary limestones, when we have found serpentine associated with the beds, or disseminated in a part of the bed, we have always found magnesia present. On the contrary, in those which are unconnected with serpentine we have not found magnesia.

It is quite important to have some simple test for the presence of this earth, which is easily applied; inasmuch as magnesia is injurious when applied to lands in a caustic state, and as it absorbs water and carbonic acid more slowly than pure lime, it is more likely to be applied too soon; and it would result in the injury of a crop the first year, after which it is probable that it would act beneficially, for we believe that magnesia is as important to some crops as lime. Magnesian limestones indeed may always be regarded as important substrata for soils, and we always find those soils peculiarly adapted to Indian corn and the cereals.

But we find that we have digressed, and must return to the consideration of the composition of the primary limestones, those which are associated with gneiss, hornblende, mica slate, and granite.

1. *Limestones of New York*—which are usually found in connection with granite.

Natural Bridge, Jefferson county; color white, coarsely crystalline. It contains graphite, scapolite, pyroxene and quartz.

Analysis.

Carbonate of lime, - - -	98.24
Carbonate of magnesia, - -	0
Alumina and per oxide of iron, -	.88
Insoluble matter, - - - -	.88
	100.

A limestone mixed with serpentine, from which the calcareous spar was separated and tested was found to be highly magnesian. This limestone was taken from the vicinity of Oxbow, in the town of Antwerp, Jefferson county. It contained also Rensselaerite, a mineral which has some resemblance to soapstone, though it is considerably harder. The Oxbow variegated or serpentine limestone contained

Insoluble matter, - - -	1.16
Alumina and peroxide of iron, - -	3.
Carbonate of lime and magnesia, -	95.84
	100.

Limestone of Port Henry, Essex county: color white, crystalline, with yellow particles, which resemble chrondrodite, and others which are sulphuret of iron. Large masses of calcareous spar are imbedded in the rock at some distance south of the landing, which is a pure carbonate of lime. In the vicinity of the bed at Port Henry, serpentine marble is common, but seems to be disconnected with the white rock near the iron works.

Analysis.

Insoluble matter, - - - -	.40
Carbonate of lime, - - -	98.40
Carbonate of magnesia, - -	0
Peroxide of iron and alumina, -	1.20
	100.

The iron is set down as an oxide, although it is probable it is in the state of a carbonate.

Limestone of Putnam county.

Analysis.

Insoluble matter, - - -	1.00
Peroxide of iron and alumina, - -	4.20
Carbonate of lime, - - -	94.80
Carbonate of magnesia, - - -	trace
	100.

It will be observed that the primary limestones are frequently destitute of magnesia, or contain it in very small proportions. They however contain other impurities, such as quartz and other minerals, which injure them for economical purposes, and it is not uncommon to find at least from 50 to 75 per cent of foreign matter in some parts of the beds in Northern New York; but these inferior beds occur usually in patches, and it is rarely the case that good limestone may not be found somewhere upon all the beds or ranges.

2. *Limestones of Massachusetts.*—The following analyses of the primary limestones were made by President Hitchcock,* for the Agricultural Survey of Massachusetts. These limestones are associated with gneiss and mica slate, and are often considered as interlaminated beds. In the western part of the state, the rock is not uncommon, and undoubtedly extends north and south along or near to the ridge of the Green mountains. These beds should be distinguished from those belonging to the Taconic system, which appear along the western flank of the same range.

Limestones of Becket, Berkshire county, Mass.

Analysis.

Carbonate of lime, - - -	58.31
Carbonate of magnesia, - - -	28.61
Peroxide of iron, - - -	1.24
Alumina and silica, - - -	11.84
	100.

Specific gravity, 2.84. Per cent of quicklime, 32.65.

Limestone of Middlefield, Hampshire county, Coles brook; color white, crystalline.

Analysis.

Carbonate of lime, - - -	56.25
Carbonate of magnesia, - - -	31.56
Peroxide of iron, - - -	1.12
Silica and alumina, - - -	11.07
	100.

Specific gravity, 2.78. Per cent of lime, 31.50.

Limestone of Blandford, Hampden county; color white.

Analysis.

Carbonate of lime, - - -	51.66
Carbonate of magnesia, - - -	39.48
Peroxide of iron, - - -	0.91
Silica and alumina, - - -	7.95
	100.

Specific gravity, 2.77. Per cent of caustic lime, 28.93.

Micaceous limestone of Ashfield, Hampden county, two specimens.

* Hitchcock's Report, pp. 80, quarto edition.

Analysis.

	1st specimen.	2d specimen.
Carbonate of lime, -	46.85	43.13
Carbonate of magnesia,	1.50	2.70
Peroxide of iron, - -	1.55	2.70
Silica and alumina, -	50.	48.67
	100.	98.
Caustic lime, - -	26.24	25.37

Limestone of Worthington; color white, crystalline.

Analysis.

Carbonate of lime, - - -	99.85
Carbonate of magnesia.	0
Oxide of iron, - - - -	.15
	100.

Peroxide of lime, 55.92.

The east part of Massachusetts contains also a few beds of primary limestone, whose composition is as follows; color white, and crystalline.

Analysis.

	Bolton.	Chelmsford.
Carbonate of lime, -	61.80	56.52
Carbonate of magnesia,	27.	39.38
Peroxide of iron, -	0	.90
Silica of alumina, - -	3.20	3.20
	91.	100.
Per cent of lime, -	34.61	31.65
Specific gravity, - - - -		2.85

3. *Limestones of New Hampshire.*—Dr. Jackson has given the composition of several important beds in New Hampshire, of which we deem the following the most interesting. Haverhill; color white, crystalline and free visibly from foreign matter.

Analysis.

Carbonate of lime, - - -	99.3
Mica and quartz, - - -	0.5
Carbonate of magnesia, - -	0.2
	100.

It contains 55.729 per cent of caustic lime. This is regarded as a limestone of the first quality. The following from the same town is inferior to the preceding; color white with a bluish streaks, granular or crystalline.

Analysis.

Carbonate of lime, - - -	90.66
Mica and silex, - - -	3.80
Carbonate of iron and manganese, -	5.54
	100.

Per cent of lime, 51.03.

Limestone of Lisbon. It is found in the south west extremity of Mink pond. Color white with gray stripes, and mixed with mica and quartz.

Analysis.

Carbonate of lime, - - -	90.8
Mica and quartz, - - -	8.2
Carbonate of iron and manganese, -	1.0
	100.

A limestone from a quarry in the same neighborhood yielded,

Carbonate of lime, - - -	81.6
Mica and quartz, - - -	15.6
Carbonate of iron and manganese, -	2.8
	100.

Per cent of caustic lime, 45.59.

This lime is in good repute in the neighborhood, and is used profitably in agriculture.

Limestone of Lyme. Color grayish white, crystalline.

Analysis.

Carbonate of lime, - - -	71.70
Silex, - - - - -	25.70
Carbonate of iron and manganese,	2.60
" of magnesia,	traces
	100.

Per cent of caustic lime, 40.35.

Limestone of Amherst yielded,

Carbonate of lime, - - -	75.2
Iron and alumina, - - -	2.4

Silica, - - - - -	21.0
	98.6

Per cent of lime, 42.32.

Limestone of Franconia.

Carbonate of lime, - - -	78.00
Silex and mica, - - -	20.00
Carbonate of iron, - - -	2.00
	100.

It contains 43.9 per cent of caustic lime. It is used as a flux for smelting the iron ores of Franconia, and it is probably well adapted for this use. The silex it contains becomes, as far as it goes, an important addition to it for fluxing. It is also employed in agriculture.

It appears from the foregoing analysis, that magnesia is rarely if ever present in these limestones. They are associated with the mica slate and hornblende rocks. It is not usual to discover any traces of stratification in them. Magnesia, which is more commonly present in limestone than is suspected, seems to be a rare element here.

4. *Primary limestone of Maine.*—Limestone of Androscoggin, at Rumford Falls. Color white or gray, granular, containing actynolite, and pagasite. It is included between layers of slate, and is much disturbed and contorted by a vein of granite.

Analysis.

Carbonate of lime, - - -	78.0
Oxide of iron, - - - -	1.2
Insoluble matter, - - -	20.8
	100.

This, Dr. Jackson remarks, burns fine in part, slackes quickly and makes a strong white mortar of a good quality. Phosphate of lime, pyroxine and hornblende are also found in this rock, and it is principally from their presence that I infer that the limestone whose analysis is given above belongs to the primary system.

The limestones of Maine, which are generally known as those of Thomaston belong to the Taconic system. Others belong to the new red sandstone.

We have been particular in noticing the limestone beds of the primary for the purpose of calling the attention of those who may be interested in the subject to the fact, that those rocks are by no means deficient in this important member, and may be sought for with a prospect of success in all parts of our country which are underlaid with granite, gneiss, mica slate, and hornblende rocks. This view of the matter, however, is contrary to the doctrine which is usually taught, and which has led most inquirers into the belief that the primary masses are destitute of lime. One additional remark we wish to make is, that before they are used for agricultural purposes, the presence or absence of magnesia ought to be determined.

III. Origin of Limestone.

Remarkable as it may now seem to us, the idea has been advanced by distinguished geologists, that limestone was an animal secretion, not perhaps intending to carry the idea so far as to consider it as an actual creation by animals, but as a new formation by a combination of preëxisting elements. The opinion seems to have been founded on the conclusion, that limestone is extremely scarce in the primary rocks, and that it increases in the later formations in the direct proportion in which animal beings themselves increased; for instance, limestone is very common in all the later rocks, the lias and cretaceous systems, and the tertiary, large and thick beds often occurring in almost every country, which are made up of calcareous matter, of which a large proportion consists of shells, the coverings of animals, which are composed of carbonate of lime principally. But the conclusions of the geologists are erroneous, as will be observed from the foregoing statements; for, if they are true, there is no deficiency of limestone in the earliest formationsof the globe.

Leaving out of view then the notion that lime or limestone has not an animal origin, we are thrown back at once upon the more rational idea, that it originated, like all other earths and rocks, by the same power and force, and at the same time; or in other words, that it is coeval with granite, gneiss, and other rocks which are called primary. With them it was created, and it appears every where by their side, lying either in parallel position, or traversing them as veins. It lies also in many places beneath granitic beds, and under circumstances which show clearly that in those instances its age is equally great; or according to the rules of interpretation which are acknowledged as authoritative, it existed prior to those beds. In respect, however, to the prior existence of primary rocks, especially the unstratified ones, we have no means of determining the ages of individual masses; for even in the case of superposition, it may be inferred that it is accidental; that if we could penetrate deeply into the bowels of the earth, we might find the superior mass the inferior one. All we can say is, that the last change which these rocks have undergone has placed the granite in a position superior to the limestone.

The facts which are established in regard to the age of the rocks composing the earth's nucleus, and which were in the main consolidated before the creation of animals, go to prove that they were formed at the same period, but that in after times they have been subjected to certain changes which, in one case, has placed a given mass in a position superior to the others, and other instances still, the latter have been placed in a position superior to the former.

Lime seems to be one of the essential constituents of animals and vegetables; it enters into them as a part of their frame work, and without doubt the provision of this material was prospective. In the earliest sedimentary rocks, it is derived immediately by abrasion of the primary rocks preëxisting. When water contains carbonic acid in solution, it is capable of dissolving carbonate of lime. Muriate of lime is very soluble, and sulphate of lime more soluble than the carbonate. In consequence then of the solubility of the calcareous compounds, lime has existed in all waters; largely in some, but in others only in small quantities; hence, it has been brought within the reach of all organized beings, being found not only in the seas and larger fresh water lakes, but also in most soils, from which it is taken by the roots of plants.

We do not pretend to account for the origin of lime, or rather the original creation of limestone. We merely speak of its derivation, it coexists with the earliest rocks, and has been subjected to the same agencies; the great mass in the interior is brought to the surface and ground down like other rocks, and hence it appears as common as sand and clay, in all the formations which are really sediments. Lime, too, exists largely in rocks which are not in the common acceptation of the word calcareous. Though it cannot be considered a constituent of gneiss and granite, yet it is a constituent of feldspar which enters largely into the composition of those rocks. So it is found in mica; and when we examine the sediments which appear to consist mainly of alumina and silex or sand, still lime is found even there—and if we analyze any of the rocks in the Taconic and Silurian systems, few are found which are destitute of it. It forms 10 per cent very frequently in rocks which are never regarded as calcareous. The universal distribution of lime and limestone, then is an important feature in our system of rocks and serves a purpose which in the constitution of things is of the greatest moment to animals and vegetables.

Limestones of the Taconic System.—In the ascending order the Taconic succeeds the primary system; it contains two distinct ranges of limestone, one of which is often magnesian. The strike of the system is north a few degrees east, which brings the limestone ranges on the western side of the primary system in New York and Vermont, or that part which is widely known as the Green Mountains, in the northern extremity of the United States, which being traced southwardly merges itself in the great Appalachian chain. The magnesian limestone is near the primary, and is generally known as the Stockbridge limestone. The sparry limestone, in which we have not detected magnesia, except in inconsiderable quantities, ranges on the west side of the Stockbridge limestone and occupies a parallel position to it, and may be distinguished by its numerous short sparry interrupted veins of a more crystalline structure than the body of the rock. It is frequently slaty and imperfectly accretionary, while the Stockbridge in its purest and most perfect form is a crystalline sacharoidal rock, which is susceptible of a fine polish, and constitutes one of our finest marbles; some beds, for a limited extent, having been found nearly equal to the Italian statuary marble. The composition of the Stockbridge limestone is not uniform; that is, omitting to notice some minor differences which concern merely the quantity of alumina and iron; it is found to differ still more in the quantity of magnesia which it contains. Even many beds which have passed for dolomite, have proved, on analysis, to be a pure carbonate of lime. Still it is so common for the friable limestones to contain magnesia, that we are rather disappointed if we fail in detecting it in them.

The limestones of this system are usually distinctly stratified; beds, however, of a limited extent appear destitute of the lines of stratification. So it often happens in well known sedimentary rocks, which when homogeneous, seem to consist of thick masses formed of materials uniformly distributed through them, and destitute of those peculiar lines which denote stratification. The color of these limestones are white, gray, mottled or clouded. The clouded portions are mixtures of carbonate of lime and fine particles of the adjacent slate rocks, and is never due to the oxide of iron or manganese, and hence those clouded varieties retain unchanged the colors which they exhibit at the time they are removed from their beds. We leave out of view here, the stains which appear in some of the finest varieties which are produced by sulphuret of iron, and which totally destroy their beauty and usefulness. The limestones of this system are found in New York, Connecticut, Rhode Island, Massachusetts, Vermont, and Maine; and we have before us analyses, from many localities from each of these States. The formation or system extends also through the Southern States, but we have no good analyses of them in their prolongation south.

Taconic Limestones of New York.—Sing Sing marble.

Analysis.

Carbonate of lime, - - -	53.34
" magnesia, - -	45.89
Silica and alumina, - - -	0.87
Oxide of iron, - - - -	trace
	100.10

Per centage of caustic lime, 30.04.
do do pure magnesia, 22.23.

This rock is regarded as a dolomite; it does not resist the action of the atmosphere of this climate very well, and for heavy structures it is not the best material which can be employed.

Limestones of Dover and Dutchess county. Color, white, bluish white, fine granular.

Analysis.

Carbonate of lime, - - -	60.50
" magnesia, - -	39.50
	100.

Per cent of pure lime, 34.14.
do. magnesia, 19.12.

Sparry limestone of Hoosick Falls. Color; bluish white; and it is usually traversed by short white crystalline veins. It is west of the Stockbridge limestone, and is not magnesian properly speaking.

Analysis.

Insoluble matter, silica, &c., -	7.40
Alumina and peroxide of iron, -	1.60
Carbonate of lime, - - -	91.00

2. *Taconic Limestones in Massachusetts.* The beds are prolonged from New York, the Westchester limestones being identical with those of Stockbridge and Adams. The range is still prolonged into Vermont.

Stockbridge limestone of Great Barrington. Color, white, and clouded, forming a clouded marble.

Analysis.

Carbonate of lime, - - -	60.30
" magnesia, - -	38.09
Peroxide of iron, - - -	0.65
Silica and alumina, - - -	0.96

Specific gravity 2.84. Per cent of lime 33.77.

Limestones of Sheffield. From this quarry the stone for the Girard College was taken.

Analysis.

Carbonate of lime, - - -	97.80
Silica and alumina, - - -	2.20
Carbonate magnesia, . - -	0.00
	100.

Specific gravity 2.75. Per cent of pure lime, 54.77.

Lanesborough gray limestones or gray marble.

Analysis.

Carbonate of lime, - - -	93.60
" magnesia, - -	5.50
Peroxide of iron, - - -	0.60
Silica and alumina, - - -	0.30
	100.

Specific gravity 2.76. Per cent of pure lime 52.42.

Egremont; color white, crystalline.

Analysis.

Carbonate of lime, - - -	92.80
Carbonate of magnesia, - - -	1.20
Silica and alumina, - - -	6.
	100.

Specific gravity, 2.60. Per cent of lime, 51.97.

Williamstown limestone, at the foot of Saddle mountain.

Analysis.

Carbonate of lime, - - -	55.79
Carbonate of magnesia, - - -	42.96
Peroxide of iron, - - -	.47
Silica and alumina, - - -	.78
	100.

Specific gravity, 2.79. Per cent of lime, 31.14.

Limestone of North Adams; color white and coarsely crystalline.

Analysis.

Carbonate of lime, - - -	99.60
Carbonate of magnesia, - -	0
Silica and alumina, - - -	.40
	100.

Specific gravity, 2.47. Per cent of pure lime, 55.78.

The last specimen is evidently one of the purest limestones which is ever met with, containing only a trace of foreign matter. It will be observed that magnesia, though frequently present, is not in a fixed proportion, and that it is always less than one-half the rock, or less than the carbonate of lime.

Many other beds are well known, and equally important with those whose composition we have given; but these appear to be sufficient to answer our purpose.

Taconic Limestones of Vermont.

3. The Rutland quarries, of which Prof. Adams notices two varieties, a greenish and white variety.*

Analysis.

	Greenish variety.	White variety.
Carbonate of lime, -	85.45	97.93
Alumina and iron, -		.59
Silica and mica, - -	14.45	1.68
	100.	100.

Brandon statuary marble; color, pure white, granular, and included in the magnesian state.

Analysis.

Carbonate of lime, - - -	99.51
" magnesia, - -	trace.
Silica and insoluble matter, -	.29
Water bloss, - - - -	.20
	100.

Prof. Adams remarks, that of the former it was confidently expected that they would be found to contain magnesia. The latter is a marble of spotless beauty.

* Prof. Adams' Report for 1846.

Taconic Limestones of Maine—Analysis by Jackson.

Limestone of Clinton; color, gray, pyritous; the Caustic lime brown.

Analysis.

Insoluble slate, - - - -	17.2
Peroxide of iron, - - -	6.
Carbonate of lime, - - -	76.8
	100.

The limestone is enclosed in strata of slate, whose strike is N. 48° E.; dip S. E. 76°.

Limestone of Foxcroft; color light blue, sparry and pyritous, and embraced in Taconic slate.

Analysis.

Carbonate of lime, - - -	35.6
Insoluble matter, - - - -	62.
Oxide of iron, - - - -	2.4
	100.

Per cent of lime, 19.9. This limestone is too poor for caustic lime, but will answer as a flux for smelting iron ore.

Guilford limestone; color dark blue.

Analysis.

Carbonate of lime, - - -	84.8
Insoluble matter, - - - -	13.8
Oxide of iron, - - - -	1.4
	100.

Per cent of lime, 47.6. Lime from this locality is esteemed, and bears a full red heat, and makes white lime.

Thomaston limestone, Beechwood quarry; color white and gray, and sometimes these are arranged in stripes.

Analysis.

Carbonate of lime, - - -	55.6
Insoluble matter, - - - -	2.8
Carbonate of magnesia, - -	39.4
	9.78

Per cent of lime, 31.2. Makes good mortar.

The Thomaston limestone is equivalent to the Stockbridge limestone, in Berkshire, Mass., and interstratified with the slate, which is equivalent to the magnesian slate.

Winslow limestone; color blue, mixed with slate.

Analysis.

Carbonate of lime, - - -	77.8
Insoluble, - - - - -	20.6
Oxide of iron, - - - -	1.6
	100.

Per cent of lime, 43.7. The quality of the lime is good. It is interstratified with slate, which is equivalent, we believe, to the Taconic slate of New York.

5. *Composition of the Taconic Limestones of Rhode Island—by Jackson.*

Limestone of Smithfield, Rhode Island.

	Harris Quarry.	Dexter Quarry.
Carbonate of lime, -	92.4	94.8
Carbonate of magnesia,	1.2	0
Insoluble matter, -	6.	1.6
	99.6	96.4
	Lime, 52 per cent.	53.4 per cent.
		Sp. gravity, 2.96.

	Arnold Quarry.	Angell Quarry.
Carbonate of lime,	50.6	97.6
Carbonate of magnesia,	44.4	0
Insoluble matter,	3.8	1.0
	98.8	98.6
	Pure lime, 28.5	Lime, 54.9

It will be observed that the presence of magnesia is by no means uniformly present in the Taconic limestones, or that where it is present the amount is at all uniform; the same fact will be noticed also in the primary limestones, and while its presence is indicated by the existence of serpentine in the rock, still it is by no means certain that it is in considerable quantities.

The analysis of the Vermont limestones shew also, that while magnesia is often present in the white and clouded marbles, yet it is proved by analysis that it is often absent too in the granular varieties, which pass under the name of dolomites. They resemble the Berkshire marbles, several analyses of which have been already given.

(To be continued.)

PROGRESSIVE CHANGES OF MATTER.—NO. II.

BY A. OSBORN.

Winds and Rain.

Winds are caused by an uneven temperature of the atmosphere at the earth's surface. The rays of the sun falling upon this surface, cause the inequality; the colder portion of the air being heavier than that which is more rarified by warmth, rushes in to occupy its place, thereby producing a current. Every day's experience teaches us that local heat, when coming in contact with the air, produces a current in this fluid. A heated stove and the fire-place of our dwellings are suitable places to observe these facts. A fire placed in a stove causes a current of air to rush in, which in common speech is called a draft, and some may have an idea that the fire or heat within *draws* in the air from without, whereas, in fact, the colder air without rushes in to occupy its place. This fact is owing to the inequality of atmospheric density, produced by heat and cold. The same fact becomes apparent in cold winter weather when our dwellings are surrounded by a freezing atmosphere, and within the comforts of warmth prevail. The exterior air is sighing at every crevice for admittance; but when the summer returns and the temperature of the atmosphere, both within and without are equal, no complaint is heard, no ingress sought. Bring two fluids in contact where the degrees of density in each make a still greater contrast, to wit: air and water. The latter fluid, when standing in a tube, if an orifice be made at the base, rushes into the air with a velocity in proportion to the height of its column. In this case we do not embrace the idea that the air *draws* the water out of the tube. A cork placed in water will rise to the surface; the same fact appears in relation to an air bubble in which cases we see an illustration of the *forcing* propensity of a denser fluid, rather than a *drawing* propensity in a less dense to produce a current. The motion in the atmosphere known as winds or currents, is caused by that subtle, ever active and universal law, gravitation. It is the great pressure of the atmosphere that forces a cold jet of air into a warmer medium, and when this cold air is forced into a heated stove, it becomes almost instantaneously rarified and forced on by a rear column; hence, a current of air, or *draft* in common speech. Having glanced briefly at the cause producing a disturbance, in the atmosphere we are next to cast about for proofs illustrative of the principle.

It is known to every one, that when the sun's rays fall upon a surface at right angles, the greater heat is produced at that point. For this reason the south side of hills have a warmer temperature, in a clear day, than a level surface. This fact is tested in the experience of animal and vegetable existences. The heat of the noon-day sun also proves this fact; hence a variation in the inclination of surface will cause also a variation of warmth produced in those places. We are now to consider the uneven surface of the earth, in which we behold hill and dale, the river valley with its varied sides of slope and gorge—the upland range and the mountainous country, each presenting some surface form peculiar to itself. There is another condition of surface which will vary the amount of warmth produced by the sun's rays. We have spread out before us the forest and cultivated field, the water surface—snows lingering upon the hills or in the shade of the wilderness. Again we behold the shadow of clouds, the passage of storms, and the alternation of a wet and dry surface: add to these the succession of day and night, in which these warming rays fall upon a given surface at unequal angles during every hour in the day. Again, we have a more magnificent order of causes, giving us a still greater variation of temperature in the same localities. The sun, as he comes peering over these northern climes, dispenses to us the summer's heat, and receding to the southern extreme of his pathway leaves us to the rigors of the polar blast: hence from this movement of the sun, the general heat is daily increased in one zone, while in an equal ratio it is diminished in another. In a nicely balanced scale beam, how interesting it is, to see it rocked by the weight of the minutest hair. But in the subject before us, the balance beam rests its central point upon the most subtle of all fluids, the atmosphere;—then how inconceivable slight may be the weight to set it in motion. Under the above law and the varied and magnificent causes existing at all times in some form or other, in relation to the production of atmospheric currents, what are the effects we calculate will follow. A perpetual circulation of currents in the great body of the atmosphere. The air, unless confined, never appears at rest—we have the soft breath of the morning, the noon-tide breeze, and the sweeping tornado, all perhaps during the same day. Atmospheric currents are most commonly indicated by the motion of clouds and vapors, by the waving of trees and fields of grain, by the smoke of fires and by various other phenomena. We have local winds, such as arise around mountains or some prominent head land, or such as trail over the plain without following any settled direction.

There is another order of winds, generally named from the four cardinal points of the compass; these may be termed periodic winds. These winds however, are frequently guided by mountainous ranges. The southerly wind at Albany, becomes an easterly wind as it passes up the valley or the Mohawk. A north wind is seldom experienced at Herkimer, while at Albany it is common. The prevailing periodic wind in this latitude, is the north-westerly, and this we should expect to be so from the fact that the greater amount of heat is dispensed along the line of the equation. In the movement of all these winds, there appears to be a general uniformity, varying perhaps more in intensity than otherwise. There is a class of winds which appear to be more continuous than the preceding; such as the trade winds and the monsoons. There is another phenomenon in the theory of winds, interesting to those who may contemplate it. There are at times various currents of air existing, the one above the other, at the same time. Three or four strata of clouds are not unfrequently seen moving the one over the other, and in as many directions, and so continuing for a day and perhaps days. It may not appear mysterious that these various currents should exist for so long a period, when a cold and a warm current coming in juxta-position, have so strong a propensity to mingle and the barrier intervening so feeble. It is said that there is a great atmospheric current constantly passing over from the equator to the poles. This perhaps would follow from the fact that the tendency of surface winds is toward the equator.

Evaporation, Clouds and Rain.

That water disappears on being evaporated is familiar to all, but that it maintains an elementary existence in this condition may not be so well considered. The last visible traces of evaporating water is seen in the form of steam and spray, but it soon disappears in the surrounding air. Whether it in its evanescent state combines chemically or mechanically with the atmosphere, is not fully determined,—the matter seems to be somewhat in dispute. A simple experiment of steam will favor the idea that it is mechanically combined. Attach a tube to the spout of an ordinary tea-kettle, containing boiling water, and keep the exterior surface cool by snow or cold water, and instead of a jet of steam escaping there will be a trickling of water. Let a plate be held over a steam rising from boiling water, and drops will collect on the underside. The process of distilling is but the evaporating and condensing water, and is a method resorted to for the purpose of freeing it from its impurities. There are two agents in nature that appear to be active in hastening the process of evaporation, the warmth of the sun's rays and a brisk wind. Manufacturers of cloths have profited by an observance of the latter fact. They construct a fan-wheel which is moved with great velocity; the warp on being sized becomes wet, they pass it over this wheel while in motion, and it is dried by this current of air. Our experience has taught us that the wet surface of the ground after a shower, is soon dried by a brisk wind. Water that is neither exposed to the sun's ray nor to the winds, wastes away, but slowly however. We may, perhaps, account for this difference upon mathematical principles. Suppose a surface of water to be a foot square, and to be in the bottom of a tube exposed to the air, but not to the wind or sun; and a like surface passed over by a wind, it is evident that the latter is exposed to a greater surface of a decomposing air in a given time; or in another form of expression, as soon as the particles of water mingle with the air, they are swept away with the current: whereas in the tube they would be sometime in ascending into a free air. There is another process by which the evaporation of water is greatly facilitated. The dashing of sea waves against the rocks, the cascades and cataracts of rivers and the falling of rain drops through the atmosphere. The water in these forms being subjected to such rapid movements that it becomes pulverized, and so rapidly are its elementary particles separated in a given time and space, that it rises in form of fogs and spray. In these dashings of the water a greater surface is exposed, and persons in some countries have profited by an observance of this fact in the manufacture of salt, by permitting salt water to pass down numerous small sticks or wickers, by which the water readily escapes, leaving the salt adhering to the faggots. Why may we not embrace the same views by way of comparison relative to a mechanical suspension in an atmospheric fluid, as in a watery liquid. A rock is heavier than water of equal bulk, and readily sinks in it. But when it is finely pulverized, the mass is held in suspension, provided there be a current of water. This is owing to the greatly increased surface or exposure of the parts to the water. That the aggregate surface of these particles is infinitely greater than that of the original mass, will become apparent by a moment's reflection: suppose the rock to be two feet in diameter, then by taking off one inch of its surface you make two new surfaces, thereby increasing the surface of the entire mass nearly two fold; but when you come to grind the entire mass to powder, you then increase the aggregate surface beyond computation. Salt is heavier than water and readily sinks in it, but water being its solvent the particles are soon held in suspension; and when the water becomes pulverized, the particles being lighter than the particles of salt, the former are carried away by the atmosphere, leaving the latter to re-combine into their original form. Fill a vat with a compound of bullets and corks, and pass a current of water over it, and by agitating the mass, you would perhaps have an analogous illustration of the manner in which the air separates water from salt. But whether our views are correct or not, one thing is certain, that immense quantities of water in an invisible state are daily passing into the air, and in due time returned again to the earth.

Clouds are formed of the watery element contained in the atmosphere when passing into a cold temperature. When steam passes off from boiling water, if rising into a cold atmosphere at the surface of the water it makes a great display of white cloudy vapor. In the summer season this fact is scarcely perceptible. In hot weather a rail road steam engine passes over the plain without being observed, in severe cold winter weather, a trail of white clouds comet like, marks its course for a great distance. It is evident therefore, that clouds are formed in a colder medium than that of the surface of the earth, over which they move. The hurried vapors of the atmosphere seem to pass through two degrees of condensation before rain drops are formed. When clouds are formed the atmosphere may not be sufficiently saturated with water to produce rain ; they continue sometimes for weeks, and are then dispersed without affording showers. But as the evaporation of water at the surface of the earth is constantly taking place, it follows that condensation will also take place at some period, or else all the water in the seas would be carried into the sky. It is a fact, well known, that a warm volume of air becomes contracted on being cooled, and writers on the natural sciences have compared, not inaptly, a body of air saturated with water, to an ordinary sponge saturated with that element ; the only difference is perhaps, that the water in the sponge retains its original identity, in the air it is vaporous. In sultry weather in the summer season, is the most suitable time to contemplate the formation of clouds and rain. Evaporation at that period is rapid, and the extremes of temperature often occur.

When the upper atmosphere becomes surcharged with an ascending watery element, condensation is first discovered by the formation of a cloud. This cloud casts at once a shade, the influence of which is felt even at the earth's surface ; an influence also may be felt in the vicinity of the cloud from the same cause. The cold increases, and the cloud accumulates, the centre of which becomes so cold and dense, that the particles of water, are brought into such proximity as to unite in drops and fall. The cloud still increases and draws into its dark freezing bosom the elements of an abundant shower. Whole regions of atmosphere being so suddenly contracted by cold, that fierce winds arise, and a general commotion of the elements ensues. The cloud is wheeled about or floated along by some prevailing wind condensing and scattering the buried vapors that fall within its march. In the phenomena of a storm, we see the same forces that contributed so essentially to its formation, contributing also as essentially to its destruction. The shade, the cold, and the winds all combined to exhaust the atmosphere of its watery element to a degree far below what it was capable of bearing in a clear sun. The cloud for want of a saturated atmosphere to keep up the rain, becomes the mere skeleton of a storm, and is scattered by the winds. We may perhaps account satisfactorily for the intervals of rain and fair weather. Did condensation always take place at a certain point of saturation, and never exhaust the atmosphere below that, the sky would be perpetually overcast with clouds, and a constant drizzling of rain upon the earth would follow. When we contemplated the varied and wonderful movements among the elements caused by the process of evaporation and condensation of water, we cannot fail to behold another of nature's balance beams so nicely adjusted that it is susceptible of motion by the slightest touch. Can man conceive of any motion of matter so minute, so silent and so effective, as the vanishing of water? Can any wonder be more imposing than to behold the majestic storm gathered out of a clear transparent atmosphere? So it is the ascent and descent of water, is but the vascillation between these two opposing influences. To the student of Natuie, what lesson can he learn more interesting than the laws by the force of which storms arise, move and are destroyed. And to contemplate the extraordinary changes, matter undergoes when coming within the influence of these laws. Who could calculate on looking through a fluid, so thin and clear as to see without a dimmed medium, the motions of the planetary orbs, that it contained all the elements that would bring forth perhaps in a few hours, the majestic cloud, the portending storm and the drenching rain, and out of this commotion of the elements would issue forth the fearful flashes of electricity followed by the terrific peals of a riven atmosphere.

In early childhood we may have formed an idea that the clouds always existed somewhere, that when they passed over the hills and disappeared, they wandered about until they were moved back again by a veering wind. In the same category of thought, we may have seen in the clouds by fancy's vision, monster animals, such as whales, and bears, and the grosser order of quadrupeds. Ships and castles, and hoary headed giants were not wanting to fill up the back ground. With some peradventure the charms of contemplating the clouds, and the storm may have ceased, and the recollections of the past may revive in their minds, nothing but the fancied images of early youth. To an eye that has been accustomed to look upon things in their true light, and consider them in their proper characters, even to such a vision, what colors can be more beautiful and varied than those seen at the rising and setting sun. While men have been allured away by the attractions of facinating colors and imitative forms spread on canvass by human hands, they have lost the pleasure of contemplating brighter colors and a purer drapery, that adorn the heavens. But here is design, say they ; so there is design stamped upon the very image of the clouds. Even in the minutest and almost invisible particles forming a cloud, is beheld a mechanical structure adapted to its supervision in the atmosphere, and the cloud itself is but a congeries of floating vessel in mid air, drawn out in fantastic forms by the winds. There is then a design in the formation of a cloud, adapting it to the element in which it moves, and in which it performs such wonderful labors.

It is also interesting to contemplate the connexion one system has with another system. The whole phenomena in relation to the rise of winds, the evaporation of water, and its condensation into clouds and rain is a system of changes in the elements in harmony with the existence of man. They produce results with other elements well calculated to develope and foster the growth of his organic system, to enlarge the compass of his knowledge and to increase the amount of his happiness. Notwithstanding there is at times a conflict among the elements, he is accommodated with light and shade ; a transparent medium in which to direct the labors of his hands, or mark the pathway for his footsteps—he has a pure healthy air constantly moving around him, clear and healthy water ever abounding, "and seed time and harvest while the earth remaineth,"

While his wants are supplied, for the pleasures of vision he has all the variety and change of form he can desire, and all the grandeur his capacity can bear in the workings of this system, and even from the imperfect knowledge he has of his own organization and the connection of his body with his mind he exclaims, "I am fearfully and wonderfully made." We can realize in a measure the connection and dependence running through all matter and systems of motion, however small or however remote ; and no influence, and no condition of matter forming this connection can be dispensed with, and still maintain a harmony in the works of nature. The rays of the sun have both light and heat, they have an influence among the elements of our globe. Now deprive these rays of the warmth they impart to this sphere, all can tell the consequences that would follow. Arctic winds would sweep over temperate zones—the cold at the equator would be more intense than that at the poles ; there would be no wind nor cloud ; no river nor cataract ; all living things would stand benumbed with adamantine stiffness. A frozen atmosphere would wind its fleecy sheet over the face of nature with the stillness of death. And the sun's rays, in the view of surrounding orbs, would, with funeral pomp, remove the chaotic envelope from the pale visage of a lifeless world !

With a moment's reflection we can realise the indispensable need we have of the sun's warmth, and the appaling consequences that would follow on its withdrawal. And although the fountain from which light and warmth emanate, may, at its borders, have an intensity of heat and glare beyond all human conception, yet its rays traversing the voids of space so many millions of miles, become so softened as to invigorate and cherish every animal and vegetable existence however delicate, or however minute. And yet with all their softness of warmth and mellowness of light, these very rays are the agent, that nerve nature's laws and diffuse life and vigor among all the elements of our globe.

There is another characteristic feature stamped upon these systems—the stability of the laws by which they are kept in motion. The schoolmen amid the versatility of human laws and human learning and from an observance of the tendency of all matter to change, have fallen back on their self-evident truths in order to give stability to the mind. Hence they will tell you that "all right angles are equal to each other," and that two parallel straight lines can never cross each other how far soever extended. These rigid truths are sometimes employed in removing the metaphysical rubbish with which the mind at times becomes lumbered. The laws also by which matter is moved, directed and combined, are as abiding as matter itself, they become the constituents of matter in the designs of Infinite Wisdom. Then how interesting are these immutable laws which move with as much precision and certainty, those systems whose frame-work is lighter than air, and whose motion is quicker than thought, as they do those great systems which are the pillars of the Universe!

Incident to these systems is the *progressive changes of matter* in which are developed new organizations and new combinations on which is stamped DESIGN. This order of things is the very perfection of design. The laws of matter therefore seem to act as with an intuitive consciousness, and as with an unwavering fidelity in carrying out the eternal purposes of an Almighty Architect.

THE FARMER'S CALLING.

An address delivered by the Hon. Levi H. Alden, before the Green County Agricultural Society, at their Annual Fair, held at Greenville, Oct. 2, 1846, and published at the request of the Society, contains many valuable ideas expressed in a plain, straight forward, and unpretending style. We extract the following remarks on the farmer's calling.

"One thing I think is very certain, that the public are beginning to set a higher estimate on the farmer's calling than formerly; and this is encouraging for the welfare of the country. In the commotions which I have read of in history, I never find that the owners and tillers of the soil have risen up and overthrown

Law and Order, and turned society upside down. I have read of their rising against oppression. It was the farmers who achieved our independence. It was a farmer who lead them on to victory. When the great majority of the people have a right in the soil, and work with their own hands, then you may be sure Law and Order will prevail. Now, the more respectable you make a profession, the more will be willing to enter it. Hence, as I said, the fact that the calling of the farmer stands higher in public opinion is encouraging, for more will be farmers; and the more farmers, the better for the cause of good government.

Why, I can remember the time when it was (in some places at least) hardly considered respectable to be a farmer, especially if one worked enough to brown and harden his hands. The time was (and not a very great while ago) when our village girls thought more of a man with white hands who stood behind a broad board and measured off tape and ribbons, (and gave short measure too) though he owed for the cloth on his back and the making of it up; I say the time was, when they thought a great deal more of such a man than of the young sunburnt, hard-handed, honest-hearted farmer who paid his debts and had something laid up against a rainy day. But such ideas are a good deal changed. Our young men have found that getting along without work is harder than getting along with work; and besides, a good many men of first rate talents and learning have put their hands to the plow and looked straight forward and held on; so that now very few are ashamed of the profession of the farmer."

We commend the following remarks of the Judge to those who sigh for the *ease* of a farmer's life.

"When a profession comes to be popular, many will go into it —many will go into it who understand very little about it. This will be casethe with farming; such men must expect to make mistakes, and fail. It is very difficult for a man to succeed in any thing, unless he knows something about it. If a man is going to succeed in farming, I mean real farming; for when a rich man sees fit to buy land and lay out money upon it without expectation of profit, I do not call that farming, at any rate, it is not farming for the people. I say if a man is going to succeed in farming, there are three things which he must do; there are other things that are important, but these three are indispensable— first, he must work himself, second, he must work hard, and third he must keep at it.

There are but very few farms in this region which will keep a man long unless he works with his own hands; and there are but few men who will keep a farm long unless they work with their own hands. If a man has a fortune that has fell to him, or that he has made in trading, he may own a farm and lay out his money upon it ; but that is not the kind of farming that we have to do with. We are speaking of the farming by which a man is to get his living and make provision for his family. The farmer of this sort must work himself, and not to do enough for exercise, and then to read the newspapers and talk politics the rest of the day—this will not do. Such a man will find every day that he needs less and less exercise and more talk,until by-and-bye his farm calls out for another owner. But he must keep at it, for he will always find enough to do. The true farmer's work is never done. He may clear up the woods, and kill out the noxious weeds, and fence his land well, (a work that many of us have not come up to yet,) still his work is not done. If he is an observing man he will always find something to be done by way of improvement ; and if he has the right spirit, it will be no hardship. A man to whom labor is not a pleasure had better not take to farming."

The following are the author's views of science in connection with agriculture.

"There is a great deal said in our day about scientific farming ; and a great deal is expected from it. Far be it from me to say a word against it—the more science the better, if it is only sound. But almost always, there are a great many things said of every thing when it first comes up, which do not turn out to be true. So with this matter : there is, no doubt, a great deal in science that may be useful to the farmer. But science alone will not do it all ; and every thing that is called "science" is not to the point in farming. The man who has spent his life in the study of science, can give information and hints which the practical farmer can apply ; but he cannot do away with the necessity for experience. Hence I never went into the idea of an Agricultral College, where men are to be turned out farmers as spools are turned out from the turning lathe. My idea is that every farmer must have a home school to teach farming, and he must be master of it, and his boys and hired help must be the scholars. He must read and observe, and guide himself by his reading and his experience united. I believe every farmer should have a good education, and for this purpose the standard should be raised higher in our common schools ; and they should study things having a bearing on their business ; but practical farming is to be learned by working in earnest. I know it may be said that I am not exactly the man to give an opinion on the subject of education ; but let it be remembered that there are two classes of men who have a right to speak on the subject of education—those who have a good education, and those who have felt the want of it. It does appear to me that people are disposed to look in the wrong direction for the improvement of education, as regards the farming interest ; that is, so far as they expect it from the State founding great agricultural schools. The right place to look is to themselves. The State may offer some encouragement, but after all the work must be done by the farmers themselves. The State will never mow our meadows, or cradle our hills ; if they should undertake it, the work would be badly done. The State has done well in encouraging agricultural societies, and so have individuals, and none better than our liberal and public spirited chairman ; but he knows the great work must be done by the farmers themselves ; he knows that nothing but himself could have made him what he is, or what he may yet be ; he is the last man to teach the farmers to depend on anything but themselves. What is essential to advancing the farming interest, is, that every man to till his own farm in a first rate manner, and give his children a first rate education, an education which includes giving them good understanding of matters and things, and good habits of industry. When each individual of the community does well, the whole will do well of course."

The following hint, in regard to neatness about the farm-house is worthy of attention.

" Besides setting out fine fruit trees, would it not be well to pay a little more attention to preserving neatness and order on the grounds about our dwelling. It is said a man is disposed to behave better when he is well dressed ; on the same principle will he not be disposed to behave better when his house and grounds are well dressed? If it has no direct bearing on his purse, it has on his feelings and character. And this is a matter we all know of the first importance. No class have a deeper interest in the moral character of the community than the agricultural class. No class have so deep an interest in having the rising generation trained aright—having them trained to respect the right of property. The lawyer can keep his bonds and mortgages and money (if he has any) in his iron safe ; the merchant can easily keep his eye on his goods, but a large part of the farmer's property must be more or less exposed, and his security must be in the moral sense of the community. Farmers therefore, of all others, have an interest in promoting the cause of temperance, of good education and of religion ; for there are very few who will deny the truth of the remark made by the father of his country, in his farewell address, that " religion is the only sure basis of morality.

MR. DUROPUS AND FAMILY.

One Friday evening, as Mr. Duropus came in from the field, he found his house in especial fine order, and all the labors with which he was wont to close the day, anticipated. This was certainly a very pleasant fact, and not a very unusual one in the history of his experience. It was commonly followed by a demand on the part of Mrs. Duropus, upon a leathern purse which lay in a small chest, under the bed, in which (the purse, not the bed,) was deposited gold, silver, and bank-notes, received in exchange for beef, pork, hay, oats, potatoes, apples, and other commodities produced by the farm of sixty acres, owned and cultivated by Mr. Duropus.

When the supper table was removed, and the girls had gone over to the next neighbor's, and Mrs. Duropus had lighted her candle and threaded her needle, (which last feat was not performed till after divers nippings of the thread with her eye teeth, and many fears that Mr. Duropus would repeat a remark, not at all pleasant, "you had better take your spectacles,") and had commenced repairing a rent in her husband's coat. When all these important things had taken place, Mrs. Duropus began to expatiate on the prosperity and fine appearance of their neighbors, the Dashiels. "Only to think," said she, looking up from her work by way of emphasis, "how well they have got along in the world. Two or three years ago, when they came into the village, they had nothing at all, and now there is not a family in the place that dress better; I don't know of a single family that has got along as well as they have."

"Mr. Hardy's family have got along better, to my notion," said Mr. Duropus.

"According to your notion; but your notions are different from those of most persons."

"When Hardy bought that run-down farm, four years ago, he paid two hundred dollars down, and gave a mortgage for eight hundred. Since then he has managed to pay one hundred and twenty-five dollars a year, besides the interest, and to make the farm worth double what it was when he took it. He will soon be out of debt, if he lives, and be the owner of a fine farm."

"How has he done it? He hasn't allowed his family the comforts of life."

"I think you hardly do right to say that. The house is about the neatest one I have been in, and the children look as plump as partridges."

"I presume they have enough to eat. As to the house, I suppose you have never been in any room but the kitchen. Their parlor has nothing in it but the bare floor and walls, a table and a few old chairs."

"I can't say how that may be, I was in the room they live in, and, if any thing, it was more comfortable than this one."

"There is no need of our living in this room," Mrs. Duropus was tempted to say, but remembering the object in view, she suppressed the remark. The good lady, together with her three daughters, had simultaneously conceived the idea that it was ungenteel to live in the kitchen. Hence, when in company, they spoke of it as a dim and shadowy land, into which they rarely made excursions. They were too well acquainted with Mr. Duropus's notions, to make any attempt to dislodge him from the time honored corner, or to make their own residence in the 'front room,' other than theoretical.

"I presume," continued Mr. Duropus, after a brief interval of silence, "that Mr. Hardy feels that he can't afford to furnish a room which is so little used as a parlor is, while he is in debt, and has so many improvements to make on the farm."

"That is always the way with you men. There are so many improvements to be made on the farm, that the house can never be made decent inside. Every old barn and rail fence and ditch must be fixed first."

It was plain that Mrs. Duropus was losing sight of the object for which the house was put in extra order, and losing something of the pleasantness of her voice, she perceived it, and made an effort to repair the error; but her feelings were too much interested in the topic we have mentioned, to leave it without a few more remarks. She moreover hoped she might give them a bearing which might tell on her as yet secret purpose.

"If he has some excuse for not furnishing the house, he has no excuse for letting his girls go dressed as they do."

"I don't know much about such things, but they always look very nice at home and abroad."

"It behooves those who have only one or two frocks, to keep them clean."

"I should think it would be harder work to do so, and therefore they deserve the more credit for it."

"I don't think their father deserves much credit for laying out so much on his farm, and making his daughters do with only a dress or two."

"I don't know how many they have, I'm sure: they always appear well dressed at meeting."

"They have worn the same dresses at meeting and everywhere else they have been, for a year, and will do so, I suppose, a year longer."

"It may be, and if they are kept nice, I don't see why they shouldn't."

"I don't suppose *you* do, but other folks do; I reckon you would like to have the girls wear the same dresses, sabbath after sabbath, for a year."

"I should stand a better chance to know them when I meet them, than I do now. The other day as I was going to neighbor Hardy's, I passed a smart looking young woman with a good many ribbons flying. I thought she noticed me as I passed, though I didn't know her.

"Where has Phebe-Maria been?" said one of the girls.

"She hasn't been any where to-day, as far as I know," said I.

"You must have met her, for she just went by here."

"I remember I passed a young woman, but I didn't mind who it was," said I.

"I think it is pretty well," said Mrs. Hardy, "if a father don't know his own daughter." They had quite a laugh about it.

"I suppose you joined in with them," said Mrs. Duropus.

"I rather think I did laugh some."

"I do wish you wouldn't run down your own children, or what is just as bad, let other folks do it. The Hardys need not say anything. I don't think that one of them has had a new thing for six months past."

"I don't believe they have," said Mr. Duropus with a quiet smile, "you would certainly have known it, if they had; but do you think they are less respected on that account?"

"If parents wish to have their children be any body, they must have them do as other folks do."

"I rather guess, mother, that neighbor Hardy's girls will make out as well as any of the girls in the place after all."

"They may, according to your ideas of making out well. They may marry men like their father, whose hearts are set on improving their farms, instead of making their families comfortable."

Mr. D. made no reply to this remark. A cloud passed over his good-humored countenance. What were his thoughts as he sat gazing at the place, where, in winter, the fire was wont to glow? Was it strange that the phrase, 'they may marry men like their father' struck him unpleasantly? Would it be a calamity to them if his own daughters should marry men like their father? Did their mother regret that she was wedded to one whose notions differed so much from the new ones she had adopted? He had toiled under the scorching summer sun, and amid the storms of winter to gain the means of rendering his family comfortable. Was this unappreciated? True, Hardy was the man spoken of, but his own views and practice had not differed materially from those of his neighbor. But thoughts like these were soon dismissed. 'She has been,' thought he, 'a faithful and loving wife; when we began the world with nothing, she did her full share of the labor; true, now, some of the notions which are filling everybody's heads, in these days, have got into hers; but she will get over them, when she comes to think more about them.' He felt pained at the thoughts which he had indulged. By way of atoning for the same, he determined to grant the favor, whatever it might be, which he saw his wife was preparing to ask at the commencement of their conversation. He rubbed his face, and changed his position, and talked on various topics so cheerfully and pleasantly, that Mrs. Duropus was emboldened to prefer her request.

Mr. Mason, a merchant in the village, had just returned from the city with a fresh supply of goods. In the fullness of his benevolence, he had informed Mrs. D. that he had procured certain dress patterns, with especial reference to the adornment of her daughters, and that in expectation that she would purchase the same, they should be withheld from the public eye till noon the next day. Mrs. D. was authorised, by her relenting husband, to make the purchase on the following morning.

CHAPTER II.

Let us now look in at Mr. Hardy's, it was about ten o'clock in the morning; Mrs. Hardy and her two daughters, Mary and Jane, were busily employed in the labors appropriate to their calling. Occasionally the sweet voices of the girls might be heard in song, and then in an affectionate dispute with their mother relative to the division of labor. A knock was heard at the front door. Instead of fleeing in various directions, and slipping on dresses, whose rebellious folds clearly indicate the suddenness of their appropriation, Jane continued at her work and Mary went to the door. She found there Miss Phebe Maria Duropus, and a young gentleman, (the brother of the minister) who was spending his vacation in the village.

"Good morning," said Mary, with a slight want of composure, at the sight of the stranger, "walk in."

"We were making a few morning calls," said Miss Phebe, after she had introduced Mr. Foster, "but perhaps you are engaged." This was spoken while she was still standing before the door.

"We are not more engaged than usual; we are always happy to see our friends; come in," said Mary.

They entered, and Miss Phebe seated herself on the edge of a chair; whether through fear of soiling her new dress, or because she thought it more genteel, is not known.

"You are very industrious," said Miss Phebe Maria, "I wish I were so."

"We are obliged to be; so we don't deserve any credit for it."

Jane came in without waiting to be inquired for; and after a very few moments spent in labored conversation, and after amusing herself by tapping on the bare floor with her sun-screen, and then becoming very ostentatiously conscious of the impropriety of the act, Miss Phebe Maria rose, saying that they must not hinder their friends from their work, bade them good morning Mr. Foster bade them good morning with rather more politeness and respect, than was quite agreeable to Phebe Maria.

"Phebe seems to be very friendly, all at once," said Jane with a smile, after they had resumed their operations in the kitchen.

"There wasn't too much friendship in her call to-day," said Mary, slightly vexed.

"Don't be harsh in your judgment, dear," said Mrs. Hardy.

"It isn't a judgment but a fact. She brought him here to let him see that our house was not as well furnished as hers."

"She took unnecessary trouble then," said Jane, "she might have told him about it."

"I suppose she thought that seeing is believing," said Mary. "If he is a sensible man, I don't think she has gained much by bringing him here."

"Let us talk about something else, dears," said Mrs. Hardy, and the suggestion was cheerfully adopted.

Not long after this call, Mr. Foster presented himself at the door, unattended by Phebe Maria. "Are the young ladies at home?" said he to Mrs. H., who came to the door.

"Yes, sir, walk in. They are at home, and will be ready to see you in a few minutes. They are now helping their father milk the cows, or rather he is helping them. Mr. Hardy has so much to do, that when we can get the cows home soon enough, we try to have them milked before he comes; that is, the girls do, for they won't let me go out of the house."

"You havn't them under very good government then," said Mr. Foster, smiling.

"It isn't the fashion now, you know. The fashion now is, for the young folks to rule and the old ones to obey. However, I can't complain of my girls, they try to do everything they can for their parents; only they won't let me do as much as I wish to sometimes. I don't like to see them do it all."

The girls had now finished straining the milk, and as the labors of the day were over, some slight changes were made in their dress, and they came in and passed the evening with Mr. Foster. He had no such horror of uncarpeted floors, or of industrious girls as to prevent his staying till the village bell "toll'd the hour for retiring."

It appeared that one of Mr. Foster's uncles, with whom he spent a part of his time, was well acquainted with Mr. Hardy, and highly appreciated his character. He had requested his nephew to make his acquaintance, during his stay in the village. Perhaps he thought he was fulfilling that request by becoming acquainted with the daughters, for the nine o'clock bell rung before he inquired for the father, and then he had gone to bed. So it was plain that it would be necessary for him to call again. He did so, and the necessity for repetition seemed to be increased, insomuch that Miss Phebe Maria, on one occasion, said that if any one wished to find Mr. Foster, they must look for him in Mr. Hardy's kitchen.

CHAPTER III.

"Mr. Duropus, our girls must have more things. It don't signify ; they can't be any body unless they do."

"What is wanting now ?" said Mr. Duropus, who looked thinner and older than when we saw him last.

"We must have an ingrain carpet, and some mahogany chairs, and a looking-glass: every body has them now. Even Mr. Hardy has got his girls a carpet."

"He can afford to do so, but I cant."

"What is the reason ? Your farm is as large again as his."

"And my debts are as large again, and more too, for I don't know as he owes a cent in the world. When he owed eight hundred dollars, I didn't owe much if anything ; and now he is free from debt, and I have just as much as I can do to pay the interest, and I shan't be able to do that long at the rate we are going on."

"I don't see how that can be. We have not bought anything for the girls but what was necessary. They have only had what other folks have.

"I don't know how that may be, they have had more than I can afford. I ought to have refused and put my foot down at the first of it, and got only what I could afford to get."

Mrs. D. was silent. She was not given to profound reflection, and hence had never thought what effect her demands on her husband's purse might have in the end. She was sorry if he was embarrassed ; and yet she could not believe it. The girls had had next to nothing. Old fashioned folks were prone to exaggerate, where new things were concerned. He could surely afford the carpet and chairs. She would do without something herself. The girls would be married soon, that is, if they had suitable things to attract husbands with. With such thoughts did she fortify herself in the resolution, to persevere in her application; and who ever heard of a persevering wife who was denied.

The money was raised by a mortgage on his stock, and the carpet, chairs, and *glass* were purchased. Mr. Duropus excused himself for yielding, by saying to himself, "I shall have no peace till I do."

About two years after the above mentioned purchase, Mr. Hardy came one day to the field in which Mr. Duropus was hard at work. "Good morning, neighbor," said he, "I have noticed for some time that you havn't looked well. You work too hard, you can't stand it."

"That isn't it, I'm in debt, and expect to have all my stock sold before long."

"I concluded you must be in debt some—and—I—was rather surprised at it too."

"That is, you thought I had too much sense to give way to the foolish ways that are ruining half the farmers in the country."

"Yes, that is about it, seeing you have said it yourself."

"Well, you see, I got into it by little and little, and once in, it is hard swimming against the tide. I shall never get out of it. I shall see the last of my farm if I live many years longer."

"You must get out of it; your duty to your family requires it."

"They have got the upper hand now, if you could persuade them to make a change, I might save myself."

"You certainly can persuade them if you tell them just how you are situated."

"I have told them many a time, and there is a crying spell and a reform for a day or two, and then the old story over again."

Mr. Hardy felt too deep an interest in the welfare of his neighbor, to leave matters in their present state. He inquired into the amount of his debt, and proposed several ways by which he might extricate himself.

"What good would it do? I should get right in again?"

"Not if you will just make up your mind to buy nothing except what you can afford to buy. I have five hundred dollars that I had thought of giving to my son-in-law, Foster, to get him a library, but he can do without for a while. I will give you that for the wood-lot and pasture adjoining, and pay off the mortgage bonds; and then you will have more than sixty acres and free from debt, and if you can't keep out then, why I don't know what can be done for you."

"There can't be anything done for me, unless I do for myself. I'll take up with your offer, and will follow your advice to the letter, come what may. Let us go and draw writings. I want a good night's sleep, a thing that I havn't had for months, and shan't have till I am out of debt."

WORN OUT LANDS OF VIRGINIA AND NORTH CAROLINA.

The high price of lands in the State of New-York, together with a disinclination to encounter the privations and sickness incident to a life in the newly settled regions of the west, have induced the farmer of small means to turn his attention to the old states of Virginia and North Carolina, where lands are offered at a price not much exceeding that asked by the government.

The only objection to these lands is the idea that they have been exhausted of their fertility—in farmer phrase, worn out. To a certain extent this is the fact; but that these lands, under the system of tillage practised by Northern farmers, will not immediately yield a profitable return for their cost, is a mistake which a knowledge of their former mode of culture will correct.

Traveling lately in one of the most populous counties of North Carolina, the writer had occasion to call upon a planter who owned and tilled some two thousand acres of land, which by long cultivation had in his estimation become nearly worthless, and was offered for sale for three dollars per acre. A different system of tillage, including sub-soil plowing, rotation of crops, and the use of clover, was suggested as the means of restoring the soil to its original fertility. The proprietor replied that although it was a prevalent opinion that deep plowing *killed the land*, yet he had so far departed from the custom of his neighbors as to sub-soil a small portion of one of his fields, on which a crop of corn was then growing, to which the writer's attention was directed, and which showed a markea superiority over the other portions of the field.

Upon an enquiry as to the kind of plow used, depth of furrow, &c., it was discovered that the sub-soiling was done with a short, wide, clumsy implement, generally used for breaking up bush-pastures, called a *bull tongue*, and that the whole depth of both furrows was *four inches*. This was the planter's idea of sub-soiling; and yet the additional depth of one or two inches had brought to the surface fresh portions of earth, the mineral and saline ingredients of which, by the action of light heat and atmospheric agencies, had been rendered soluble, and given up the growing crop. Thus demonstrating that by deep plowing and the application of those principles which make up the science of agriculture, the lands which are now deemed worthless, may be rendered as productive as when first subjected to the plow.

HARROWGATE SPRINGS OF MASSENA, St. LAWRENCE COUNTY.

We gave in the last number of the Journal for 1846, the analysis of a new mineral spring at Saratoga. A spring whose water bottles remarkably well, and which is so perfectly free of iron that it may be drank by all classes of patients. It supplies a desideratum at Saratoga, inasmuch as it contains a large amount of iodine without the iron which most of the springs contain.

We now give below the analysis of the Harrowgate or Sulphur Springs of Massena, St. Lawrence Co. They are remarkable waters, and have been eminently servicable in cutaneous diseases and in rheumatism.

Their temperatures are 52° which is called the warm spring, and 46° which is called the cold spring.

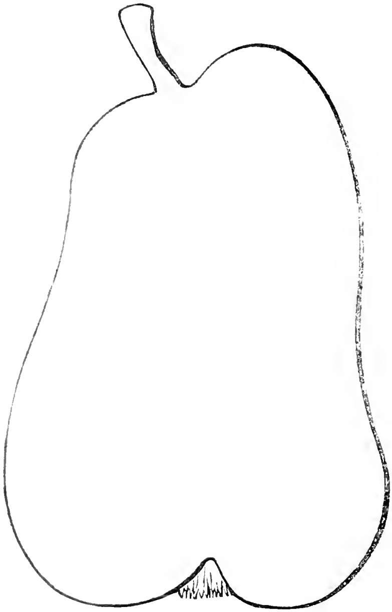
Analysis.

	Warm Spring.	Cold Spring.
Chloride of sodium,	6.988	6.205
" magnesia,	0.644	0.846
" calcium,	1.026	0.466
Carbonate of lime,	2.794	1.960
Carbonate of lime,	1.630	1.100
Hydro-sulphuret of sodium, magnesium and organic matter,	00.000	1.870
Solid matter in one pint,	13.082	12.544

The water of the warm spring, at the time of analysis, had lost its gaseous contents, as it did not blacken silver; the other retained a portion: both contained organic matter which seemed to be combined in some way with the sulphuretted hydrogen. Without doubt, the gas is produced by the decomposition of the sulphates by the organic matter. Those springs issue from the calciferous sandstone, and are situated upon the north branch of the Racket river, about 3 miles above its junction with the St. Lawrence, and just above the Long Sault. There are three springs within 30 feet of each other, and they possess nearly the same properties. The quantity of sulphuretted hydrogen is considerable. We cannot but regard these springs as medicinally important, and as forming an important addition to our curative means in certain classes of chronic ailments. We hope our exchange papers will give publicity to this notice.

SALISBURY'S SEEDLING PEAR.

BY J. H. SALISBURY.



This large and characteristic seedling originated in the county of Cortland, from seed sown about the year 1818 by Nathan Salisbury. The tree is now about 28 years of age. Trunk below the limbs not far from 14 inches in diameter. Height from 25 to 30 feet. Branches come out within 6 feet of the ground. Lower limbs are nearly horizontal. Spread of the top from 14 to 16 feet in diameter. Limbs shorten and assume a more vertical position as you ascend, giving the top a fine, regular, conical shape. Young shoots vertical. Color yellowish olive. Buds acute. Leaves broad and rather large. Tree very thrifty, hardy, and produces regular and abundant crops. Scarcely ever suffers from blight Fruit large. Shape sub-cylindrical, as seen in the cut. Stem from half an inch to an inch in length. Stout and set in a shallow depression. Calyx close and rather deep set. Skin thin and tender. Color, when ripe, greenish yellow, slightly marked with small spots of russet. Flesh white. Very melting and juicy, with a rich, perfuming and delicious flavor. Contains a large per centage of sacharine matter. Ripens about the middle of September, and keeps till the last of November. The productiveness, hardiness, and thriftiness of the tree, fit it for almost any situation, while the large and uniform size of fruit, together with its excellent qualities place it, it is believed by those who have had an opportunity to test it as a baking, preserving and table pear, among the finest of its season.

PUBLICATIONS.

Farmers' & Mechanics' Journal, published by W. H. Starr, New York, appears in a new dress, and is one of our best exchange papers.

It would seem that a new impulse has been given the American world, if the multitude of Journals indicate at all the movements of mind. Very many of our journals have a wide circulation, and in their spheres are gradually enlarging the field of knowledge, and extending wider and wider the discoveries and improvements in all the branches of human pursuits. Let the efforts continue, let every journal send out its light, and soon the combined rays and beams which issue from so many centres will make our land bright and light with knowledge. We feel happy and cheerful in the prospect, though our own efforts may be lost in the general blaze.

Eureka, or the Journal of the National Association of Inventors, published in New York, No. 5 Wall-st. Devoted to the discoveries of Science and invention in the Arts. W. H. Starr, Publisher; J. L. Kingsley, J. P. Pirsson, jr., Editors.

This journal must be an invaluable work for all persons who feel an interest in the progress of Science and the Arts. It is a record of the inventions of the day, and exhibits the power and workings of mind upon matter.

THICK SOWING *vs.* THIN SOWING.

Thick sowing consumes more seed. Thin sowing less. Thick sowing gives a great number of single stalks. Thin sowing gives a multitute of stalks from a single seed. Thick sowing gives a perfect stalk and head. Thin sowing the number is increased at the expense of perfection, for there are too many mouths feeding in a small space at one point.

There are many men who take all opportunities to proclaim their excellence. They really have no faith themselves in their own works, and hence feel that the faith of others must be quite feeble unless they greatly magnify their own doings.

CORRESPONDENCE.

GEOLOGY.

The following extract from a letter which we have just received from the Rev. Prof. Sedgewick, of Cambridge, we consider sufficiently interesting, at least to a part of our readers, for insertion in the Journal. It relates, it is true, to the geology of a distant country, but still contains important facts which bear upon American geology. After expressing in a general way a strong desire to visit this country, Prof. Sedgewick introduces his subject by remarking, that "In one important respect I am certain that I agree with you. We have an enormous thickness of fossiliferous slates, &c., below any rocks to which the name Silurian system can be given with any geographical propriety; for they exist in Cambria, but are not found in Siluria.

The change introduced by Sir R. I. Murchison about three years since, without my concurrence, was this; he sponged out his base line and removed it to the west side of Wales, and then he split his Silurian system into two systems—making his lower system to comprehend the so called Cambrian rocks. This change not merely introduced a geographical inaccuracy of correlation, but went on a mistaken hypothesis, viz: that the fossil band in north Wales was the equivalent of the Caradoc sandstone and Llandielo flag stone repeated again and again, by undulations. I have sifted this to the bottom and am certain that the hypothesis is not true to nature.

My scheme of arrangement for the lower stratified rocks of this Island, (and let each country be worked out on its own evidence, before we begin to institute close comparisons) is as follows:

Class 1. Hypogene.
Class 2. Palæozoic.

Palæozoic {
1. Cambrian.
2. Silurian.
3. Devonian.
4. Carboniferous.

Between each of those four systems I interpolate an intermediate, or transition group. Thus the Cambrian system ends in the ascending order with a Cambro-silurian group.

Speaking again of the Cambrian system, Prof. Sedgewick remarks that it is of enormous thickness, perhaps not less than

25,000 or 30,000 feet thick. It is naturally divided at least into four groups, as follows:

1. *Lower Protozoic group.* Lower part without fossils; upper part contain lingula antiqua in abundance and fucoids, trilobites, etc.

2. *Orthidian group.* Numerous shells of the genus Orthis, trilobites four to six species, corals, encrinites. The species ascend to the base of the upper Silurian rocks of Murchison.

3. Enormous development of trappean rocks; stratified masses sometimes containing organic remains (the scr aalstein of German Geologists,) enormous beds of roofing slate, &c. &c. The shells abound here and there, and suddenly disappear on the line of strike, at least for miles, and again reappear.

4. Slates with occasional bands of contemporaneous porphyry, &c.,—generally more or less calcareous—three or four regular bands of limestone (Bala limestone) thickness of these very great.

In addition to the species of No. 2, many new species enter—some (such as arsterias and ophiura) are peculiar to this group.

4. *Cambro-Silurian Group.* Llandielo, Caradoc: see Silurian system for fossils.

Here we have many fossils of the groups two and three, but we have several which are *peculiar*, and among them are abundant such as pentamerus, lævis and oblongus, also many fossils of the Wenlock shale which are not found in the lower groups. Again; the mineral character is peculiar—we have many beds of sandstone, sometimes coarse and passing into a conglomerate.

In this scheme the classification and nomenclature are both natural, I mean so far as regards this island, but by no means apply to your country. Let each country (as I said before) be worked out in its own evidence.

The Llandielo and Caradoc are one formation, not two formations. They replace one another, but the Llandieilo is merely a local development of a singular calcareous flag, and is comparatively of little value in general classification.

It is not difficult to recognize in this scheme, of the distinguished Professor of Cambridge, the groups or systems of the rocks in this country.

1. Thus the first group embraces at least a part of the Taconic system, which seems to be more perfectly developed in this country than in England and Wales, and which has not suffered by disturbance as there; in consequence of which, the base lines of the two systems are apparently obliterated there, while here they are preserved; being indicated along the Hudson river, and Lake Champlain by a band of limestone which is known as the calciferous sandstone, and which rests upon the Taconic slate along this range of country.

2. We recognize also one of our great divisions of the New York system, the Champlain division, after which we pass into the Ontario division, in which we find that remarkable fossil the pentamerus oblongus.

We doubt not the general correctness of the general divisions of what we should here call the lower part of the New York system, inasmuch as these divisions are recognized in the main by the geologists of both countries. We may therefore have confidence in geological conclusions, when they so far agree, especially as they have already been worked out in detail by independent observers.—Ed.

AGRICULTURAL COLLEGE.

At the late annual meeting of the State Agricultural Society, the following resolutions were offered by Gen. Veile, recommending the establishment of an Agricultural College through the aid of the funds of the State. The following is a copy of the resolutions ; they express the object and design of the mover.

Resolved, That in the opinion of this Society, the profession of practical agriculture cannot fail to be vastly improved by a genial diffusion of scientific knowledge applicable thereto.

Resolved, That by uniting scientific knowledge with practical skill, the profession of agriculture will obtain the elevated station that belongs to it, and we regard it as a sure method of improving the moral condition of the people.

Resolved, That this Society respectfully recommend to the consideration of the Legislature, now in session, the propriety of adopting measures calculated to promote this object, by making reasonable appropriations for the establishment of agricultural schools or colleges connected with experimental farms.

Gen. Veile sustained the resolutions on the ground that agriculture is the great source of wealth, and that by agriculture the great mass of men live. He remarked that strange as it may appear, all our great schools have been created and endowed for the direct purpose of educating in the general sciences, and what is exceedingly important to bear in mind is, that those endowed institutions have a tendency to lead young men from industrious pursuits than to them; to professions which are always so full that they are really bubbling or boiling over rather than to those which lead to a life of industry and frugality. Distinctions are sought in the professions which often result in pauperism: to the want of institutions of the kind which the resolutions contemplate, is to be attributed the ruin of hundreds of the young men of our city. Mr. Allen of Erie, and Mr. Chandler of New York, also sustained the resolutions upon the same grounds. Mr. Senator Clark, though a friend to the measures proposed, considered that in the present condition of the State it was inexpedient to press the Legislature on the subject of pecuniary aid—this view was also taken by Mr. Wadsworth. Mr. Mack advocated the resolutions and spoke of the flourishing agricultural schools in Europe, and especially those of Scotland and Ireland. Several other gentlemen participated in the discussion not dissenting from the spirit of the resolutions, but questioning the expediency of passing the resolutions formaly at the present time ; especially when the Society would be obliged to ask the Legislature to continue its aid to the State and County Societies.

The resolutions were finally passed in a modified form, by which it was designed to express the hopes and wishes of the Society ultimately ; rather than with the expectation of effecting immediately the establishment of an institution which they contemplated.

STRICTURES ON THE VIEWS OF DR. SELLER

In regard to the Exhaustion of the Organic Matter of the Soil in the Nutrition of Plants.

On the 13th of February, 1845, Dr. Seller examined the views of Liebig in an essay read before the Botanical Society of Edinburgh,in which he sustains the now Baron's opinions on the nature of the food of plants. The following condensed extracts from this essay will give the reader an idea of the character of the doctrines of this distinguished chemist as stated by Dr. Seller:

"It is represented," says Dr. Seller, "that the food of plants must be derived from the inorganic kingdom, if we would avoid certain disastrous consequences which would follow, provided their food was derived from the organic kingdom." Thus, Dr. S. calculates the annual conversion of the carbon of organic matter into inorganic carbonic acid at not less than 600,000,000 tons; and infers, on the most favorable aspect of the amount of soil over the earth's surface,that such an annual loss could not be withstood beyond 6000 years ; and, on a less exaggerated assumption of its amount probably very near the truth, that the waste would absorb the whole of the existing organic matter of the soil in about 740 years. Dr. S. contends that the truth of these conclusions remains unaltered, even if it be conceded that much of the carbon of plants is drawn, not from the organic matter of the soil, but from the inorganic carbonic acid of the atmosphere, unless some other source of hydrogen and oxygen be at the same time admitted.

He therefore regards Liebig's views of the inorganic nature of the food of plants as supported, not merely by many special facts

—for example, by the increase of the organic matter of the soil often observed during the growth of plants—but also by the general view of the earth's surface just taken, because there is nothing in its aspect to warrant the idea that its means of maintaining the organic kingdom are declining with the rapidity indicated in the statement just made.

But we may well enquire, admitting the fact that the food of plants is organic, are the views really sustained by Dr. Seller's reasoning; or, is it possible, under present arrangements, to exhaust the organic matter—for the living to consume all the dead organic matter. The following considerations have a bearing upon the question:

1. Plants have a limited duration, and although they consume food which enters into their bodies and is withdrawn from the soil, still, in the course of a few years, or centuries at most, it must and will be restored again, and will pass through those changes which are necessary to fit it to become again the food of succeeding generations.

Organic matter, if resolved into inorganic carbonic acid, ascends into the atmosphere, but returns to the soil again; for in the nature of its constitution it must be dissolved in the vapor of the atmosphere; and when this takes place, it ceases to obey the law of the diffusion of gasses and descends to the earth. No accumulation of this gas can ever occur so long as the earth is supplied with water wherewith to form vapor, and here we infer, too, that it never did accumulate in the atmosphere. However, this may be, the compensating processes which are provided in all structures must not be lost sight of in the physical arrangements of the globe—regeneration necessarily follows decay: and provision was made in the original construction of things to furnish a supply for the wants of life. Matter is never at rest; and when once it is liberated from its connections with a given body, it soon begins to be fitted for some other. Nature is balanced by compensations, and the processes which, on a superficial view, seem as if they would exhaust a necessary supply of any material or any force, are found to have been provided for in the operation of the very machinery which seemed at first view to consume its own material or its force by its own workings. The wheels of nature as they move along may seem to exhaust all the force and material in their progress, yet a return for all this expenditure is secured by the workings of the apparatus and by the ministration of the materials employed.

But to recur once more to the accumulation of carbonic acid in the atmosphere. It is a favorite doctrine with many, that this substance must have been much more abundant in certain geological periods than it is at present. The ground of this opinion is based on the fact that accumulations of carbonaceous matter either took place by some peculiar existing arrangements, or else had always existed in the atmosphere; but the assumption is by no means justified when we consider the movements of the organic and inorganic worlds. At one time a peculiar vegetation prevails, but it is really of that kind and character which adapts it to the formation of coal. It may be true or it may not, that the aggregate amount is greater at this period than at a former or subsequent one; the only fact proved by observation is, that the vegetation was peculiar; and may have been luxuriant or not; but not that more plants lived at the time. It is not even necessary to say that it was more luxuriant; for time is all that is wanted to supply the amount of matter required to form coal beds, when the proper kind of vegetation exists. It does not appear that trees grew to a greater size than now—tree-ferns were common, and they were of a large growth; but what then, they were not luxuriant species which had, or which have since existed; they were *sui generis*, and size was one of their characteristics. But in this respect they were no greater than many vegetables which live now. In fact the trunks and branches and roots of trees were not greater than the present average of our own forests.

But then, as we have before remarked, the relation of carbonic acid to water is such that it is impossible it should have accumulated in the atmosphere beyond a certain limit, and that limit must have been at about the same standard as the present. We cannot but regard all the speculations respecting the state of the atmosphere as unfounded, and unsupported by a single fact, when we consider the nature of carbonic acid itself, and its ready solubility in vapor, and the peculiar character of the vegetation of the period when a greater amount of carbon became fossilized than at any other period. This arose not from quantity but kind, and the peculiar habits of the then existing vegetations.

Again, we cannot sustain the assumption that the great abundance of carbonic acid had an existence coeval with vegetable life; for prior to the existence of the coal period we find no facts which indicated a greater amount than the present, or any other geological era; hence we are obliged to consider the vegetation of the coal period as an incident in the multitude of geological changes, as peculiar in kind and constitution, not in quantity.

We will hazard another opinion. It is maintained on all hands that the temperature of the coal period was higher than the present, or in other words that it was the temperature of a tropical region. Now, may not the very fact of the formation of coal be taken as an argument adverse to the common opinions of geologists? If the climate had been tropical, would not the heat have dissipated the carbonaceous matter? In the dense vegetation of the tropics, where do we find accumulations of carbonaceous matter; where except in the temperate zones is this process going on? In reasoning then, from the present to the past, we find nothing which goes to sustain the assumption that the climate of the coal era was a tropical one.

VALUE OF NON-CONDUCTORS OF HEAT.

Non-conductors of heat seem to perform two functions. 1st, to prevent the escape of heat from a body, and 2d, to prevent the access of heat to a body; for example, wrap a cake of ice in tow or cotton, and its temperature is not diminished nor increased. Its own heat is preserved by the covering, and the outward heat of the atmosphere cannot gain access to the body. The principle is an important one, and its application and use is often witnessed in the common operations of nature. In fact this principle is among the most common in the world. The warmth of the earth is maintained by the non-conduction of air and snow, the warmth of lakes and rivers by the non-conduction of ice.

Men avail themselves of the principle in preserving ice for summer, in preventing the freezing of bodies by surrounding them with porous bodies which are always non-conductors, and we have no doubt but that the principle may be more frequently applied than it is. In certain situations for example, where vegetation comes forward so early as to endanger it by subsequent frosts, this principle may be applied successfully. The object will be to retain the temperature of winter about the roots and trunks of trees, till the danger of frosts has passed. This may be effected by keeping the earth frozen about their roots by surrounding the trunk and covering around it by hay, straw, or horse manure intermixed with its litter. When a covering of this kind is applied during the continuance of snow, it will not melt as the outward heat cannot penetrate through the non-conductors with which they are surrounded, and it will not be melted and removed until the heat of the earth has considerably accumulated, when it can gain access to the snow and ice laterally by conduction. But the earth conducts heat slowly, and hence the dissipation of the snow will not take place for a long time.

Practically, then, gardeners as well as farmers, may secure important ends by availing themselves of the non-conductibilty of matter, taking any or all light and porous materials to preserve one uniform temperature. The use of these materials about fruit trees to keep vegetation back is only one among many. Of these materials, horse manure will be the best, as it is not only effectual in guarding against the access of heat, but is useful in promoting vegetation when the proper time has arrived.

AGRICULTURAL ADDRESS.

An Address delivered before the Onondaga Co. Agricultural Society at their annual Fair, October 2d, 1846, *by S. B. Woolworth, A. M., Principal of the Cortland Academy.*

It is not to lavish panegyric on Mr. Woolworth's address that we take this opportunity to notice it. We cannot, however, say less than this, that we have been instructed in perusing it, and we have no doubt the sound and practical views which it contains, will be highly appreciated by the enlightened body before whom it was delivered.

We shall enrich the columns of our next number by a few extracts from its pages. We regret that it was not received in time for insertion in the present number.

Manna.—This substance is obtained from the mountains above Iropœa, from a small leaved oak. It exudes from incisions made in the stocks of the older trees and caught in cups made of the leaves of maple.

The Fat of Milk.—It is maintained that butter exists in milk ready formed in globules, enveloped in a white translucent pelicle. In churning this globule is broken and the butter escapes. The broken pelicles afterwards float about and gives consistence to the buttermilk.

Exchange Journal.—The Journal of Agriculture and the Transactions of the Highland and Agricultural Society of Scotland, just received.

Acknowledgements.—We are indebted to our distinguished senator, the Hon. John A. Dix, for Congressional Documents. To our friend E. G. Squier for the first annual report of the Ohio State Board of Agriculture.

AMERICAN JOURNAL

OF

AGRICULTURE AND SCIENCE.

This work will be issued hereafter monthly, at two dollars per annum payable in advance. It will form two volumes at the close of the year of three hundred pages each, and will be illustrated by plates and wood engravings.

The object of this Journal is to disseminate useful knowledge relating to Science, the Arts, and Agriculture, and to promote sound views in education. It is in fine designed for a farmers' magazine, and no efforts will be wanting to make it a welcome visiter in his family.

Communications may be addressed as usual to the conductors at Albany or when more convenient, to the publishers, Huntington & Savage, at 216 Pearl st., New York.

E. EMMONS,
A. OSBORN.

Albany, January, 1847.

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No. XI. MARCH, 1847.

THE LIMESTONES, AND LIME.

Continued from page 82.

The limestones of the New-York system belong mostly to its inferior part. If we take our departure in the series from the Potsdam sandstone, and extend our examination to the top of the Catskill mountains, the limestones of the most important varieties and kinds will fall in the lower division of the series; the upper being almost destitute in New-York and Pennsylvania, not only of deposits of limestone, but of calcareous matter. The first appearance of this rock is the calciferous sandstone, a rock which was denominated by the late Prof. Eaton, *Calciferous Sandrock.* The predominant color of the rock is gray; but it appears of various shades of light and dark gray, and light and dark drabs. In the main, it is an impure limestone, and is rarely sufficiently free from silex to admit of its manufacture into good lime. In addition however to silex, it contains magnesia in a large proportion: alumina and iron are also constantly present. It therefore usually makes very good hydraulic lime, and has been so employed with success. It contains encrinal beds, which appear to be nearly a pure limestone; at any rate, they are quite free from silex. The same remark may be made of the oolitic beds. Some parts of the rock contain chert, which is arranged in parallel bands. These beds are the poorest part of the rock for economical purposes.

Geologically the calciferous sandstone succeeds the Potsdam sandstone, from which it departs first by a small sprinkling of calcareous matter, which, on increasing, soon becomes apparently a tolerably pure limestone. Its sandy character, however, is often disclosed by the presence of fine particles of sand, which invest the weathered surface. The nature of these particles may be proved by rubbing them between two plates of glass, which will be found to be scratched by the operation.

The rock is often an excellent building stone, and has been employed largely in the construction of canal locks and other structures which require a durable material. A gray variety, which is quite uniformly crystalline, resembles granite at a distance. The cathedral of Montreal is constructed of this rock.

Distribution of the Rock in New-York.—The calciferous sandstone is but imperfectly developed in the valley of the Hudson. It appears occasionally as a fossiliferous band, resting upon the Taconic slate. It may or may not have formed a continuous bed. It appears upon the knobs or highest of the hills, as at Greenbush and Troy. It is quite common to meet with it when it has assumed the form and condition of a breccia. Undoubtedly some of these beds are merely accretionary; others, however, are real conglomerates, inasmuch as the pebbles are distinctly rounded and frequently weather out, and leave a smooth round cavity in the mass.

This rock is prolonged from the Hudson into the Champlain valley, and increases in thickness, and is visibly more continuous here than in the Hudson valley. This rock, however, is mainly important in New-York, in the immediate region of the northern highlands, which it surrounds as a band, and an outcropping rock above the Potsdam sandstone; and it dips quite regularly from this great primary mass.

The most remarkable localities are in the Mohawk valley, where it forms quite a conspicuous rock at the Noses and Little-Falls. The most perfect exhibition of this rock, however, is at Chazy, where it is highly fossiliferous. It is here that it forms such a contrast with the limestones of the Taconic system; and it is here that we have an instructive series of fossils belonging to the earliest of the brachiopods and crustaceans, which orders have survived all the geological changes, and have come down to us as it were in their earliest forms. We have said *survived,* because it is the common expression or phrase. It carries, however, an erroneous view, and needs correction. The survivors of these orders are no more the lineal descendants of these ancient families, than are the present quadrupeds. The true representation lies in the fact that these orders have been continued by *creation,* and not by *generation;* and hence they cannot be said to have survived the changes which have taken place since the deposition of this rock, inasmuch too as it cannot be shown that they have been exposed or subjected to those changes in that mode and manner which would tend to exterminate them. The scheme of creation being determined upon by the Creator, which in itself was adapted to the chemical and physical conditions of the globe, has been continued and acted upon during the immense lapse of time which has intervened between the era of protozoic life and the present.

In this scheme the outward forms of the created have appeared under every aspect in which it was possible, without departing from the general form of the original type. In these forms we find the species of the different eras: forms which, while they characterize the periods, still are not necessary to animal existence, or necessary to fit them for the chemical or physical conditions of the earth; but rather appear for the purpose of displaying the power and resources of an all-powerful Creator—his ability to form and fashion an infinite variety of apparatus, by which pleasure and happiness could be received by sentient beings. It is true the form and apparatus of all beings is fitted to the present condition of things; nevertheless, not one form of this apparatus was in itself essential and necessary to the sustenance and support of its animal existence. It is a form not chosen for the sake of the creature, if we may so say, but for the sake of the Creator, whose end in creation was to glorify himself. This view of the subject is not invalidated, when it is said, that when the shape and form of an organ was determined upon, that this form and shape must control the whole of the remaining structure. The only necessary thing connected with the construction of individuals, is harmony; which is always manifest when the whole being of the creature is understood.

We had no thought of a digression of this kind, at first; but we justify ourselves in it, from the consideration that in the calciferous sandstone we have an exhibition of protozoic *life*, or a large portion of a scheme of organization which was afterward to appear, and which was to be repeated with modi .cations in many successive eras.

Calciferous Sandstone in Vermont.—From Whitehall to the provincial line, this rock continues with but few interruptions. The top of the mountain at Whitehall is crowned with the calciferous sandstone, where it is about 200 feet thick. It supplies a few layers, which make a tolerably good lime. It is however generally too sandy for this purpose. It is along this range, upon the east shore of lake Champlain, that the relations of this rock are worthy of the particular attention of the geologist.

The calciferous sandstone does not exist in Massachusetts, New Hampshire, or Connecticut. The possibility of its existence in or near the Notch in the White mountains, we shall not deny. Prof. Rodgers has described a fossiliferous mass there, which may belong to the Champlain division, though it is considered by that gentleman as a fragment of the Ontario division.

We know of no localities in Maine, of this rock. In Pennsylvania and many of the Southern states it is well developed. It is not however noticed as a distinct rock, but is merged in the other limestones—the birdseye and Trenton limestones. This consolidation of the lower limestones is not objectionable in a general system.

Composition of the Calciferous Sandstone of New-York.

Analysis.

Insoluble matter (silica), - - - -	6.20
Alumina and per oxide of iron, - -	4.50
Carbonate of lime, - - -	58.86
Carbonate of magnesia, - -	27.20
Water, - - - - - -	3.04
	99.50

This rock invariably furnishes a large amount of magnesia; and when the silicious matter is not in excess, it may be used as a hydraulic lime. The specimen, the analysis of which is given, was from Galway, Saratoga county. Its color is gray. Those layers which form the best cement, weather to a light or yellowish drab.

The best localities known of this variety of limestone, are in the neighborhood of Plattsburgh. A belt of the rock extends into Canada; and in many places the purer beds are highly charged with interesting fossils. In the valleys of the Mohawk and Black river, localities of a pure limestone abound. The rock skirts the St. Lawrence river from Ogdensburgh to Canada; and in places it is the lowest rock of the New-York system, and rests immediately upon the primary, or upon the Taconic slates. Interesting relations sometimes appear, especially when this rock is found in the vicinity of the primary limestone. In these places we find sufficient cause for rejecting the opinion of some geologists, that the primary is only an altered limestone of the New-York system. Both rocks, however, sometimes exist in a short distance of each other; one associated with granite, the other reposing upon the Potsdam sandstone.

Composition of the Chazy Limestone of New-York.

Analysis.

Insoluble matter, - - - - -	27.62
Alumina and per oxide of iron, - -	18.03
Carbonate of lime, - - -	49.00
Carbonate of magnesia, - - -	3.00
Water, - - - - - -	1.74
	99.39

This limestone is usually too impure to be used for agricultural purposes. The specimen, however, exhibits an extreme of impurity—some layers furnishing quite a pure limestone. Indeed, in the midst of these lower limestones, some rocks are found which make the best of quicklime in the state. In Chazy, for example, the birdseye limestone is mostly free from magnesia, and is regarded as one of the best rocks for lime; and is extensively used in the glass works at Redford, in Clinton county.

Composition of the Trenton Limestone in New-York—Slaty variety from Plattsburgh.

Analysis.

Insoluble matter, - - - - -	15.60
Alumnia and per oxide of iron, - -	4.18
Carbonate of lime, - - - -	52.76
Carbonate of magnesia, - - -	24.87
Water, - - - - - -	1.19
	99.60

This specimen is also below the average of the rock for purity. It is however a magnesian limestone. If used with the necessary caution, it is well adapted to agricultural purposes.

*Composition of the Calciferous Sandstone of Vermont**—From Milton.

Analysis.

Carbonate of lime, - - - -	84.45
Carbonate of magnesia, - - -	12.14
Alumina and iron, - - - -	1.01
Insoluble matter, - - - - -	1.50
Water and loss, - - - - -	.90
	100.00

Olmsted.

Composition of the Calciferous Sandstones and Lower Limestones in Pennsylvania.

These rocks are designated in the Pennsylvania and Virginia reports, as formation II.

Limestone near Easton. Keller & Able's quarries.

Analysis.

Carbonate of lime, -	51.02	55.00
Carbonate of magnesia,	43.28	31.40
Alumina and oxide of iron,	0.50	2.30
Insoluble matter, - -	4.80	10.80
Water and loss, - -	0.40	0.50
	100.00	100.00

Rodgers.

* Second Annual Report of the Geology of Vermont.

Limestone from Louisville, Kentucky.

Analysis.

Carbonate of lime,	55.03
Carbonate of magnesia,	24.16
Alumina and oxide of iron,	2.60
Insoluble matter,	15.30
Water,	1.20
Loss,	2.71
	101.00

It is supposed by Messrs. Rodgers, that the property of hardening under water depends on the presence of magnesia. It has not been shown, however, that the dolomites, or white granular marbles, possess this property. The same view, however, of the subject was previously maintained by M. Vicat of France. We have already stated that magnesian limestones are favorable rocks for agricultural purposes; and that it is only when caustic by burning, that they become injurious, and then only before they have lost their caustic state. These limestones, however, are unsuitable for fluxes in reducing iron ores, as will be found by trial.

The lower limestones of the New-York system, the composition of which we have just given, terminate with the Trenton, after which a wide interval occurs before we reach another calcareous rock. The first in the ascending order is the Niagara limestone, if we except a few calcareous bands immediately below, one of which contains the Pentamerus oblongus, and which is characteristic of the Caradoc sandstone of Murchison's Silurian System. It is a dark colored limestone, often emitting a bituminous odor, when struck or heated. It is comparatively a thin rock in New-York, but increases in thickness in its Western prolongation, and becomes in the Western states an important rock. It is the upper member of the Ontario division.

Analysis.

Insoluble matter,	0.08
Alumina and oxide of iron,	4.24
Carbonate of lime.	93.50
Carbonate of magnesia,	0.20
Water,	2.09
	101.11

The specimen examined was from Lockport, and its purity is above the average of the rock.

This rock is continuous from a few miles southwest of Utica to Niagara Falls. It is absent in the New-York series in the valley of the Hudson—the Helderbergh division resting upon the shales and sandstones of Lorrain. Its position is well defined westward and beyond Utica. It is the geodiferous rock of Eaton.

Composition of the Helderbergh Limestones.

The calcareous matter appears first in a series of shales which lie at the base of the Helderbergh range. They effervesce strongly with acids; but are too impure for any of the purposes for which limestones are employed. Magnesia soon appears in these beds, and finally forms a constituent part of the rock.

The Manlius water-limes, as they have been called, were first employed for cement. The best beds are only about six or eight feet thick in Western New-York. In the valley of the Rondout the Pentamerus limestone is the one which is so extensively used for hydraulic lime.

*Analysis of the Hydraulic Limestone of the Rondout—by Jackson.**

Water,	1.181
Silicic acid,	10.087
Carbonic acid,	41.200
Sulphuric acid,	0.606
Lime,	25.087
Alumina,	3.395
Per oxide of iron,	3.274
Magnesia,	12-800
Oxide of manganese,	0.606
Potash,	0.700
Soda,	2.182
	101.158

Limestone of Pennsylvania belonging to the same group as the preceding. It is a rock eight miles east of Pine-Grove, Schuylkill county. Color dull lead blue; texture somewhat coarse and subcrystalline, sparry.†

Analysis.

Carbonate of lime,	49.90
Carbonate of magnesia.	7.10
Alumina and oxide of iron,	6.30
Insoluble matter,	36.30
Water,	0.40

The limestones of this formation are not always magnesian, as

* Jackson's analysis of the Ulster cement stone, in the Proceedings of the American Geologists and Naturalists.

† Rodgers' Pennsylvania Report, p. 169.

appears from the following analysis of limestone, from the same formation:

	1.	2.
Carbonate of lime, -	81.95	98.30
Carbonate of magnesia, -	none	trace
Alumina and oxide of iron,	3.10	none
Insoluble matter, - -	14.60	1.30
Water, - - - -	0.50	0.40
	100.15	

The first rock is six miles above the Delaware Water-Gap. Its color is gray, and both sparry and crystalline. The second is at Loyalsock, near Williamsport. It is used as a flux at the Astonville furnace, Lycoming county. Color blueish black; compact, fracture conchoidal; fossiliferous.

The best limestone in New-York, which has a wide distribution, and is generally known, is the Onondaga limestone. It is the upper member of the Helderbergh division, and extends from the Hudson river to Lake Erie. It is usually divided into two parts; the lower, which is gray and crystalline, is the Onondaga limestone proper; the upper is dark colored, more compact, and contains a large amount of chert or hornstone. It is not entirely free from magnesia. It is burnt for lime, and supplies the Albany market.

Analysis of the lower part.

Insoluble matter, - - - - -	3.74
Alumina and iron, - - - -	0.18
Carbonate of lime, - - -	89.90
Carbonate of magnesia, - - -	4.00
Phosphate of lime, - - -	0.93
Water, - - - - - - -	2.02
	99.87

In Pennsylvania the corresponding rock gave Rodgers, in his analysis:—

Carbonate of lime, - - -	83.30
Carbonate of magnesia, - - -	7.22
Alumina and oxide of iron, - -	traces
Insoluble matter, - - - -	9.98
Water, - - - - - -	0.50
	100.00

The rock occurs at Stroudsburgh. Color dull slate blue; fine grained; subcrystalline.

The only limestone which remains to be noticed, is the Tully limestone; a rock which succeeds the Hamilton group, in the middle and western counties of New-York. As a general mass, it is unimportant; as a local deposit, it becomes important in consequence of the scarcity of calcareous matter in the region where it occurs. We believe it is confined to the state of New-York.

Analysis.

Insoluble matter, - - - - -	27.01
Alumina and iron, - - - - -	10.34
Carbonate of lime, - - -	54.10
Carbonate of magnesia, - - -	0.34
Phosphate of lime, - - -	0.88
Potash, - - - - - - -	1.80
Soda, - - - - - - -	traces
Water, - - - - - - -	4.93
	99.60

The Tully limestone is an important variety, for the lime which it may furnish for agricultural purposes. It is dark colored, compact, or only sub-crystalline.

In the geological series, superior to the New-York system, important beds of limestones occur, which it is proper to notice in this place. Thus, in Formation XIII., of Rodgers' Pennsylvania Report, we find the following analyses:—

	First.	Second.
Carbonate of lime, -	96.10	96.90
Carbonate of magnesia, -	none	none
Alumina and oxide of iron,	1.30	0.50
Insoluble matter, - -	2.30	2.90
Water, - - - - -	0.30	0.30
	100.00	

The first limestone occurs in Butler county, Pa. Color light gray; compact or close grained; fracture smooth and slightly conchoidal; fossiliferous—containing stems of encrinites.

The second occurs in Clarion county. Its characters and appearance are much the same as the preceding.

We give two additional analyses of limestones from the same formation, but from different parts of Pennsylvania.

	First.	Second.
Carbonate of lime, -	84.00	94.00
Carbonate of magnesia, -	none	none
Alumina and per oxide of iron,	1.00	1.30
Insoluble matter, - -	12.80	4.30
Water, - - -	0.45	0.40
Loss, - - - -	1.50	0.00
	100.00	100.00

The first occurs at Rockland furnace, Venango county. Color grayish drab; compact, and fine grained.

The second occurs at Sugar creek, Armstrong county. Color blueish gray; mostly compact.

In Virginia, many beds of limestone appear, which belong to the lower part of the New-York system, which have been employed as cement.

The two following analyses are abstracted from the Report of Wm. B. Rodgers:—

	First.	Second.
Carbonate of lime,	55.80	53.23
Carbonate of magnesia,	39.20	41.00
Alumina and oxide of iron,	1.50	0.80
Silica and insoluble matter,	2.50	2.80
Water,	0.40	0.40
Loss,	0.60	1.17
	100.00	100.00

The first occurs at or near Sheppardstown, on the Potomac, Va. The second at the Natural Bridge, and Cedar creek. Both are said to make a good hydraulic cement.

Dr. Jackson, in his Maine Report, gives the analysis of an hydraulic limestone, which is found at Machias, upon Starboard's creek, which we subjoin:—

Carbonate of lime,	59.5
Carbonate of iron,	6.0
Silica,	14.0
Alumina,	15.0
Oxide of manganese,	4.0
Water,	1.5
	100.00

The geological position of this limestone is doubtful. We have supposed that it might be referred to the New Red Sandstone period. We notice this hydraulic limestone, for the purpose of showing that magnesia is not essential to give lime the property of hardening under water. This indeed had been shown by Jackson's analysis of Parker's celebrated cement, which we here subjoin; and with which we shall close this part of the subject relating to the composition of limestones in the United States.

Analysis of Parker's Cement.

Lime,	33.00
Alumina, oxide of iron and manganese,	39.00
Silica,	10.00
Water,	1.00
Carbonic acid,	17.00
	100.00

Uses of Lime.

It is by no means an easy matter to determine the uses of lime in vegetation; and we shall take the precaution to inform our readers that we are not prepared to say much upon the subject. The opinion of chemists and agriculturists differ greatly upon the theory of the action of this substance, while at the same time they agree in the opinion that it is useful.

Mr. Towers, who has lately written upon lime, in the Farmers' Magazine, has summed up its action under the following heads:—

1. When air slacked, and in a fine powder, if applied to lands, it kills slugs. 2. It neutralizes acids, and especially unites with humic acid. 3. Liberates potash and soda in soils and rocks. 4. Does not render vegetable and animal matters soluble.

According to Fownes, lime acts merely as an antidote to redundant humous matter, and fixes acids, and makes an innocuous humate. One remark we believe we may safely make, in regard to the above summary, is, that the uses here ascribed to lime are mostly incidental, and do not come up to the solution of the problem. The whole summary is based upon an assumption that lime, in the vegetable economy, is of little or no consequence. It kills slugs—it neutralizes acids—renders humous matter innocuous—liberates the alkalies, &c.; and hence we say that the view is wholly defective; for they only imply that its use is something, *ab extra*, and has nothing to do with the economy of vegetation—with the internal arrangement of organized beings, and fulfils no end, so far as their structure and functions are concerned. Such we regard, therefore, as wholly defective, and as falling far short of explaining those purposes for which lime and its compounds have been created.

Lime, without doubt, exerts an influence, which is modified according to circumstances; and this influence is especially modified by the presence or absence of vegetable matter. In itself and alone, or while in the form of a carbonate, as it exists in rocks and marls, or as a mild hydrous carbonate, in the form of an air slacked lime, it may not be adapted to the economy of vegetables or animals. It may be absorbed, however, in the form and state of a super-carbonate, because in this state it is soluble; still, even then we believe it requires a different combination, in order to fulfil the functions required of it in the vegetable kingdom.

One of the great obstacles which seem to have prevented most writers from seeing the uses of lime to plants, is the insolubility of some of its compounds, especially when they are prepared in the laboratory of the chemists. Coupling this fact with another, viz., that the food of vegetables must be dissolved, and that they cannot receive solid matter into their structures, it is by no means strange that the comparatively insoluble nature of some of the calcareous compounds should lead many to infer that so far as their use in the vegetable economy is concerned, they are of little value; and that their use can be dispensed with. Even admitting that they are important and necessary, it will be seen that, in the view of many, their importance is confined to the guarding of outposts, and that they are not designed to act within and help build up the citadel.

If insolubility of the calcareous compounds must be received as a bar to the performance of other functions than those which have been ennumerated by Towers and Fownes, then certainly, the same objection must be made to silex; for, of all substances, this is the most insoluble of the materials; and yet it is largely absorbed by plants, especially by the cereals, and the monocotyledonous plants generally.

But it is a fortunate thing that the laboratory of nature is quite different in its arrangements, and that its powers are quite superior to the laboratories even of a Berzelius or a Liebig. Now, in the earth, or the laboratory first referred to, the chemical changes go on in continuous circles. As an illustration of our meaning, the waters beneath flow upward in invisible vapors, until the air above approaches to a saturation, when the currents are reversed by the descent of showers of visible rain, which saturate in their turn the earth; or the springs and rills flow outward to the sea in ceaseless streams, while the supply of the internal fountain is kept full by vapors from the broad ocean flowing upward first, and then downward to the earth, and sinking into its depths profound.

These movements of mist and rain serve an important purpose: they continually bring the active elements required in the vegetable economy into a nascent state; a state in which nutrient matter is made ready and prepared for the vegetable's use. This state is a transient one, and is in one sense incomplete; or it is that state in which the elements are in the act of combining; or we may better say, in a state in which they are disposed to combine. Oxygen and hydrogen confined in a tube, will never unite and form water. If, however, by any chemical action they are simultaneously liberated from their combinations, they at once unite and form water. So it is not improbable that most of the combinations of inorganic matter with the organic, take place in that state which is called by chemists, the *nascent state*, and that in this state the same elements will be received into the vegetable organs, which, when they have passed it, cannot or will not be taken up.

But to come more directly to the uses of lime; and upon this point, we suppose that the simplicity of our views may be a bar to their adoption; for we regard the use and value of lime in agriculture to consist mainly in this—that it is an element which in itself is essential in the vegetable economy; or that it is important, for the simple reason that vegetables are so constituted that they require it. It is a part and parcel of the elements which go to make up the frame-work of the vegetable. This view of the subject rests on facts. If we find, for instance, that lime enters largely into the structure of all plants, then indeed do we prove our position to be the true one. As an illustration of this position, we may refer to the composition of bone. Lime, as is well known, forms a large proportion of this tissue; and hence it is inferred, and it is fair to infer it too, that lime is an essential element to bone, because it forms in it so large a proportion.

The same is true of vegetables. It forms a large proportion of the ash of plants, the hard parts of the vegetables; and so by the same process of reasoning, we have no doubt that the use of lime is, to form an essential element in its tissues. In this, then, mainly consists the use of lime in agriculture; and this is by no means an incidental use, such, for example, as the destruction of slugs. It is of no use to say that the compounds of lime are insoluble; for we find it actually in the ash of vegetables. It is there, and forms, in many instances, the largest proportion of the inorganic matters.

To show our readers the fact as it is, we subjoin three analyses of the ash of different plants, which have but recently been completed in our laboratory:—

	Bean leaf.
Carbonate of lime, - - - -	49.182
Potash, - - - - - - -	9.877
Magnesia, - - - - - -	7.716
Phosphates, - - - - - -	14.557
Silica, - - - - - -	12.276
	93.608

	Hickory bark. *Carya alba.*	Iron-wood bark. *Ostrya virginica.*
Potash, - - - -	2.340	0.696
Soda, - - - - -	0.125	0.023
Chlorine, - - - -	0.145	0.040
Sulphuric acid, - -	1.925	0.086
Phosphates lime, mag., iron,	5.000	5.100
Carbonic acid, - -	33.995	33.853
Lime, - - - -	51.105	57.932
Magnesia, - - -	0.820	1.200
Insoluble silica, - -	4.550	0.250
Soluble silica, - -	0.250	
Organic matter, -	not determined	0.276
	100.255	
Matter insol. in Ho. in chlorides,		0.800
		100.256

The analysis of the ash of the bean leaf is incomplete; but it still serves the purpose for which we have introduced its composition. It shows the quantity of lime which enters into the composition of its inorganic parts.

With such facts before us, it seems plain that it is quite unnecessary to attempt to construct a labored theory of the use of lime in agriculture. We find it plainly set forth in the fact that it is a necessary and essential part of the vegetable tissue. And though we may not now know the precise combination which it forms, still we have some reason for supposing that it is in combination with crenic and apocrenic acids, or in combination with an organic acid. And though it may appear in the laboratory, that some of these combinations are far from being as soluble as we should expect; still, it must be remembered that vegetables which have life in themselves, possess a power over those combinations which chemists do not possess; and that we have no right to infer that because we are unable to effect a ready solution of a substance, that hence vegetables cannot take it up and convert it to their use.

We might proceed farther, and show that lime, in order to exhibit clear and perceptible effects in vegetation, the soil must be furnished with organic matter; or, in other words, that its effects and influences upon vegetation will be modified by the condition of the soil. But as we propose to resume the subject on another occasion, we shall let it drop for the present.

PROGRESSIVE CHANGES OF MATTER.—NO. III.

BY A. OSBORN.

I stated in a previous number that there were two dissimilar physical forces that always had a tendency to disturb the repose of matter. Heat exerts an expanding force and when deep seated and wide spread beneath the ocean's floor, raises up the superincumbent mass from the bosom of the waters, thereby forming a continent. The principal change matter undergoes in this process is elevation, and a general disturbance of its interior arrangements. The other force is gravitation, having a direct control over elevated water which, when rained upon the earth, flows toward the ocean, moving along in its progress the ponderable matter coming within its influence. The changes that have thus taken place among the surface materials of the North American Continent from the era of its emergence until the present time, constitute its geological history which I now propose to examine. To assume however, that all these changes have left even any traces of their former existence, would be the extreme of presumption ; for the elements of matter have been embodied, broken up and scattered, and again formed into other bodies with new combinations through so long a vista of departed time, that even some of their most conspicuous formations have, like the rain-storms, by whose agency they were produced, lost their original identity. And to pretend to give even a general history of all the prominent formations that now exist in connection with previously existing bodies, would be alike presumptuous. All that I venture now to do will be to contemplate the former existence of things and "restore in imagination" the original surface condition of this continent, and the varied phases it presented during the wearing down of this surface until we behold the present condition of things ; and even confined within these bounds of historical labor, as my own observations have been limited to certain localities, no pretence will be made to account for the geological phenomena in other places, except in so far as their history may be involved in a plausible interpretation of nature's laws.

The North American Continent on its emergence from the ocean was a great and extensive pile of sea-deposit, embracing nearly two zones, its surface ribbed and domed shaped, by the protrusion of igneous rocks, and so immense had been the accumulations of these rocks, at the period of which I am now speaking, that their towering heights ranged among the clouds ! By an upheaval, this secondary formation became disorganized and shattered, and by its own weight was crushed and pulverized. Add to these considerations that at that time no mantling forest bound the surface of the land with its net-work of roots, nor were there walled channels nor deep valleys to restrain the abrasions of torrents.

In this condition of things we can readily imagine the rapid and magnificent changes the river floods produced among these mountain masses. Truly this was an age of floods and land-slides. That such was the condition of things at that remote age, I will now proceed to offer some proofs.

The northeastern part of the State of New York embraces the district of country denominated by the geologist of the second district, Prof. Emmons, the great primary nucleus, and contains an area by an approximate calculation, of 6 or 8000 square miles. Around this nucleus, except a portion of the southern side, the sedimentary rocks exist.

I have drawn a profile view of these latter rocks by a line stretching south, from the south west corner of this nucleus through the county of Herkimer to the Otsego county line, having a length of sixty miles or thereabouts. This line traverses two valleys, the valley of the West Canada creek and that of the Mohawk river. The water-shed line at the top of the banks of these rivers is from 3 to 5 miles from the streams, and their elevation from 800 to 1000 feet above the lower valley. These banks or inclinations of surface have given rise to many rapid tributary streams which have in many places and to a certain extent left bare an out-crop of the secondary rocks.

I have given the above view of the aqueous rocks, not for the purpose of describing their minerological character, but for the purpose of showing their mechanical arrangement, and their present position.

The question now arises, did these rocks, of which we see the out-crops, once extend over the primary rocks. If such were the fact, then on the emergence of this country from the sea, this formation became an over-lying mass. That such was the once condition of things, I am fully of the opinion. The present appearance of these out-crops shows that they were not formed with their present abrupt precipices.

I will now proceed to bring forward some proofs that tend to show that these secondary rocks once extended over the primary nucleus. The conglomerate rock is about mid way in the series, and is the characteristic group in the secondary formations, and boulders and field stones of this rock can be readily identified wherever they exist. Parts of this rock in the form of field stones, are plentifully strewed in a southerly direction from the out-crop, and over the Onondaga limestone at an elevation at least, of 300 feet above the part of the parent rock now left. For an explanation of this geological phenomena we will quote from the report of the geologist of the third district, Mr. Vanuxem. "In order to account satisfactorily for all the loose materials which are scattered over the surface south of the Helderberg range, nothing more is required than an extension north of its rocks, which must have existed so as to bring those of a lower level by the dip or inclination which the rocks have with the geological level which contains their products."

There is another fact corroborative of the above views which we presume did not fall under the notice of the geologist, or he would have mentioned it. About 6 miles north of the conglomerate out-crop in the valley of the Mohawk there is a boulder of this group weighing at least a ton, and in the valley of the West Canada creek, a distance of at least 10 miles, fragments of the same rock are seen. It will be observed that the conglomerate rests immediately upon the slate rock, which is at least a thousand feet in thickness at these places, so that these field stones, when connected with the original mass, must have existed in that elevated position above their present place of repose; and as the rocks beneath them were carried away by active currents, they could not have made a perpendicular descent, they must have been brought down on an inclination from a far northerly locality.

We have selected the conglomerate because it is so readily recognized, but as we become familiar with the other groups, both above and below it, we can see the same phenomena in respect to their fragmentary parts scattered over the surface. The birdseye and Trenton limestones, for instance, in many places skirt the valley of the West Canada creek, and yet field stones are so numerous from these groups, over on the side of the Mohawk valley to the south, that they are gathered up and burned into lime. The hill intervening must be at least 600 feet above them.

Another fact will also be noticed bearing upon the subject. The nearer these rocks approach the primary, the more their beds are inclined.

But why should we detail this class of proofs when others are more available, and we think more conclusive. From whence came these massive piles of broken rocks now in the form of rounded field stones, the numerous beds of gravel, sand and clay, and sometimes all these or parts of them jumbled together? The loose materials forming the immediate surface, are but parts of the same rocks upon which they are now over-spread, and had principally a northern origin. Now where did they exist when in the form of rocks. Certainly not immediately above nor below their present place of rest, nor could they have existed in southern localities. The legitimate conclusion to be drawn from the fact, is that these aqueous rocks, parts of which we see out-cropping, once had a northern extension, covering the regions of the northern part of the State of New York.

The next question arises, what was the probable depth of the secondary formation, and particularly that of which we are speaking? And of this fact we have not the means of making even a probable estimate. The out-crops of the rocks extending to the line of Otsego, have been estimated to be more than 5000 feet in thickness. The geologist of Pennsylvania, Prof. H. D. Rodgers, has laid down on his map of these rocks, (and of which these in New York are but an extension) as being more than 30,000 feet in thickness, 6 miles at least. Prof. Emmons, speaking of one of the lower groups, the Taconic slates, and of that which lies between Lansingburgh and Bennington, says: "I have often ex-"amined it two miles, perpendicular to its strike, and found no "indications of its repetitions." All the facts therefore that can be brought to bear upon the subject only prove that the secondary deposit was enormous. This primary nucleus is now from 3 to 5000 feet above tide level, and the boulders and field stones, the beds of gravel and sands in addition to the parts which have been carried into the sea, and which once constituted an integral part thereof only tended to increase its hight. Upon this rested the aqueous rocks.

We are next to consider the condition of this over-lying mass on its being uplifted from the sea. The primary rocks we should infer, from their appearance in many places, were forced up by a protrusion, the indications of which are now seen in perpendicular cliffs, and in pyramidal mountains. In many places there are dome-shaped crests and undulating ridges among these igneous rocks, evidently proving that there was to a certain extent,a commingling of the primary and secondary rocks. In this view of the subject we can easily imagine how readily currents of water would change the position of matter when flowing over it.

In a previous number we gave our views in relation to the formation of river currents, and the ever active laws by which they were perpetuated; and they were the agents, we now affirm, that were employed to reduce and demolish the towering masses of our new formed continent, and to give to its present surface its peculiar configuration.

To maintain the above hypothesis many things are to be viewed in a different light than that in which we now behold them. Do we look upon the present rivers as the agents by which the wonders of antiquity were achieved? We might as well look upon the now living Egyptians as having constructed the pyramids. We have at times been asked, did the West Canada creek ever roll its periodic flood over that high range of land, intervening it it and the Mohawk, and by which the majestic boulder was rolled from its original bed, and left on these upland ranges! We answer that when these boulders made their transit, the West Canada creek had no existence. So too it has been said, that the river St. Lawrence once swept its mighty waters through the great valley, which its in part occupied by the Mohawk and the Hudson. But when these valleys were formed, rivers swept through them that have long since been identified with the things that have been. What is a river, more than the waters of a rain cloud, flowing into a channel and working its way toward the sea, and these currents prevail on the surface of the land, let that surface be ever so much elevated. Therefore when we aver that river currents produced the great changes in moving those stupendous blocks and those immense masses from one place and position to another, we are to consider the present rivers as having taken no part.

We are next to consider the number and magnitude of rivers in ancient times in geological history, and what was the probable quantity of water that fell from the clouds in that age. Our rivers are now constantly rolling their vast volumes into the ocean. But what is the time employed by the clouds in scattering it upon the surface? Suppose it to be 6 hours in every tenth day, and that time however, is not consumed in the process. Then the amount of water falling upon an inclined plane that would hurry it immediately to the ocean would form a volume tenfold larger. The one would be characterized as a constant river, the other as a flood. Hence this age of our continent was distinguished as an age of floods.

We are next to inquire, what was the first great change matter assumed in being moved sea-ward. Conceding that the land was upraised by an internal heat it would not long remain the smoking ruins of the sea's dominion before this heat would escape into the atmosphere. Then upon its extreme altitude in these northern regions, a perpetual congelation prevailed in all probability, while upon the Atlantic coast every shower brought down in flood form this loose deposit to the ocean's level. Upon the borders of the sea the frosts of winter imposed a less restraint than it did in more northern latitudes, hence this northern continent presented its first great change by a southern exposure. The agents were more constantly active, and also increased in volume as they flowed toward the sea. The inclination of the primary rocks may have also tended in a measure to give the same inclination to the over-lying sedimentary rocks. In this order of change the rivers flowing into the Atlantic, extended their channels farther north than they do at present, and not improbably north of those that at present flow into the St. Lawrence river. In this way we may account for the phenomena of drift of northern origin being found so far south.

It would be extremely difficult to form an idea, or have just conceptions of the scenes that daily occured in that age of the world, and in that order of progress. There was no human eye there to behold them, as no human being could then have existed in these regions. What was considered *terre firma* to day would be to-morrow on its way to the ocean. Floods were identified with rain storms, and one wide deluge of periodic torrents prevailed over the face of the land. In this age of the world, and before the excavation of river valleys, the ponderous boulder was swept from its native bed and left in distant fields, where, during all time it remains an imperishable monument to speak forth in its own transport, the magnificent scenes that once prevailed over these regions. In vain we may look for a just comparison between the floods of geological antiquity and those of the present day, although we may have the same amount of water flowing from inland toward the sea, as did at that remote age. The body on which such wonders were displayed has lost its form, the beds of gravel, the fragments of rocks rounded and smoothed as we see them, the finer materials of clay and sand abounding everywhere, and looked upon as enormous, are but the mere remnants of the original pile, they are but a thin covering to the rocks beneath them.

In assuming that the surface matter of this land once existed as we have above dscribed it, we have found ample means to carry the mind forward to such a conclusion. We have only presupposed an extension of the secondary rocks to their proper length and breadth, nor have we set down their thickness beyond its true limits. When we have found recorded that the remaining parts of these formations, in one place is more than six miles in depth and in another more than 5000 feet, and still in another but a part of one of the lower groups more than two miles, we have only to considered them in connection with the geological history of the country previous to their removal into the ocean. And although by the upheave their horizontal position may have been disturbed, and in many places they may have been titled over, yet the great mass was there in a commingled body, with its fields ranging higher than any mountain now existing on our globe. In Europe these secondary formations are said to be still more massive.

If such was the vastness of the pile, we have not then over-estimated in the tide of imagination, the magnitude of any result we have ascribed to the rain-floods that commenced with the dawn of this new continent. Could such an enormous mass, saturated and semi-fluid as it was, pass off without bearing along every object that became embosomed in its moving masses. What deep gorges must have been furrowed out in the slate formations ;

perhaps thousands of feet in depth, and what astounding crashes followed by the undermining of its banks that were still over-hung with other groups. The return of spring still gave greater facilities for floods and land slides, when ice-bound rivers were broken up and lake barriers gave way.

We have given above our views in relation to the former condition of matter, both as it regards its high and massive position, and its subsequent removal. In so doing we do not conceive that we have adopted a new mode of contemplating past realities. The antiquarian naturalist, when he finds the bones of a monster animal, whose race has long since become extinct, restores them to their appropriate places ; then the frame-work of the animal stands before him as it originally existed. He then restores in his imagination, the covering of this skeleton with sinews and muscles, and in so doing he forms an idea of the propensities and habits, the capacities and movements of the living creature. So it is with the oriental traveller, who traverses the sites of ancient cities ; and while he traces the base-walls of a dilapidated edifice and sees its ruins scattered around him, he contemplates its prostrate columns, the relics of its dismembered entablature, he then restores in his mind and not unfrequently in the history of his travels, this architectural monument in all its due proportions, and throws around it an air of its original beauty and grandeur.

As further evidence that the earth had an exterior covering which has been carried away by rain-floods ; we will mention that from the rounded and smothed field stones,so plentifully strewed over the surface, it is apparent that they must have been moved and jumbled onwards through a long series of rubbings against each other over an highly inclined surface. They were then properly named drift, for the reason that they were driven along by the force of the floods. While matter was in this condition, every shower tore away some bank, and formed new ones in other places. One important fact should be well considered as bearing upon the discussion, the universal tendency a stream of water has to change its bed and line of flow, while bearing along coarse material like gravel and field stones, when not restrained by rocky banks. We have at times an illustration of this principle on a small scale, in tributary streams that bear down drift material from the mountain side into the river valley, not unfrequently to the great detriment of cultivated fields.

We have spoken of an era before the excavation of river valleys, and let us suppose for a moment that the regions, extending northerly from the Atlantic ocean to the line which divides the waters that flow into it from those that flow into Artic seas, to be one vast field of drift, we can see at once that no part of this field could escape the deluge of waters that were periodically rained upon it; that such was the fact, the drift of a high northern origin is the proof.

To most readers it may be unnecessary to mention, that the field stones of which we have spoken, and which so often are observed, are but fragments of rocks that were once masses and stratified ledges, and that by being broken and shattered by subteranean disturbances, were once a mass of blocks similar to quarry stone, and that subsequently, they were driven along by water currents, and being rubbed and jamed against each other, were rounded and smothed; when therefore, we find the part of the origninal rock left, it is called the parent rock; a rock in place. In this way we can determine the general course of ancient rivers.

The manner in which drift materials was generally desposited, is more conclusive evidence of an inclined surface over which it was moved than any that we have heretofore brought forward. This fact established, then every rain would of itself produce a flood; and drift banks formed by this flood left their materials jumbled together in all possible admixtures and internal arrangements as we now see them. Another fact in relation to currents should be observed; the tendency they have when wearing away drift material to form falls or steps in their channels, a fact ever to be noticed whether the stream be large or small, and as these chasms become filled up in the advance of the drift, they were but the repository of fine, as well as coarse material.

We have frequently observed in gravel banks through which excavations have been made, both by running water and the labors of man, a stratum of sand beginning and terminating within the distance of a few rods, and no place to exceed a foot in thickness, above and below which, were layers or beds of gravel with large field stones, and sometimes in the same bank strata of the finest clay. It is evident from this fact that the character of the current and the position of the material underwent a striking change when the bank was formed. It certainly could not have been a deep, strong uniform current that deposited matter in this form.

We will now proceed to notice some of the last and striking evidences these great ancient rivers have left of their labors. By turning to the figure we have given, it will be observed that the part of the Onondaga limestone that remains, has a southern inclination. The average distance from its out-crop to the Marcellus shales and the Hamilton group, in the towns of Warren and Columbia, is from 5 to 6 miles. A range of hills composed of the latter groups in place, skirt its southern border. On this area large oblong piles of drift remain. These ridges are composed of coarse and fine drift, generally of a bluish cast, and in many places indurated to the almost hardness of rock. Field stones of primary rocks are numerous on this locality, some of which will weigh at least a ton. Some of the primary boulders weighing many tons, are seen a little farther east. By ascending some of the hills on the southern border of this field, it is no difficult matter to trace some of the last great sweeps of the northern waters that prevailed here, and passed through the valleys which contain Schuyler's and Otsego lakes. Farther east in the vicinity of Springfield, the evidences of river channels are still more striking, having as well defined banks of limestone, and side shutes as though the water was now flowing through them. This section of the country has remained undisturbed since the falling waters have been diverted into other channels.

The great mountain ranges of primary rock appear to have directed, to a certain extent, the formation of ancient river courses as well as those of recent origin. The long chain of mountains stretching from the southern to the northern States, and the mountains of New England, hold a conspicuous place in the geographical history of the country. For our own State we have the history of the State of New York, by James Macauley Esq., and also the Natural History of the State under a survey directed by public authority, in which the mountains are minutely and accurately described.

At one time it appears that the northern waters flowed over the aforementioned nucleus, as is indicated by the chain of lakes there existing, and taking from thence a southerly direction scattering their drift and boulders more plentifully than elsewhere along the line marked by the figure. The Hassenclever hills intervening the West Canada creek and the Mohawk river is loaded with them. Some of these boulders are truly magnificent ; they will weigh at least a huudred tons, and generally rest upon the extreme surface. At this place they are perhaps more than forty miles from the parent rock. It may be asked, if these ponderous rocks were moved onward amidst the rush of avalanches and land-slides, why do they have this solitary position. We do not believe that the place where we now see them was their first place of rest. Suppose that the aqueous rocks once extended north so far as to flank the primary region, (and upon this hypothesis the previous argument is based,) then the grey band in the Clinton group which now forms the terrace bank on the south side of the Mohawk, and the Onandaga limestone still farther south, would give great facilities for the transport of drift. We have only to imagine a river flowing from this great nucleus over these groups and depositing and lodging these masses on the way. As long as the slate rocks beneath these groups remained undisturbed they constituted a large field for depositing boulders. At a subsequent period, when the valleys of the two rivers were excavated in the slates beneath them, they rolled down to a lower position, and resisted the waters that bore away the smaller drift connected with them. As the waters were constantly falling, in the wearing away of the rocks, these boulders could, by no possibility, be covered over with drift. Hence their appearance of being dropped upon the surface. On the south side of the Mohawk and where the ancient river beds and banks have remained undisturbed since the deposit of drift and boulders, we have seen them making their appearance in beds of gravel and field stones, when a new face has been given to the bank. If these groups did not extend north, and did they not once constitute the great field for the flow of rivers, how shall we account for such immense quantities of the primary rocks in the form of sand and drift, transported south of the two great intervening valleys ? and how shall we account also for an indiscriminate commingling of the drift and clays of the aqueous rocks with those from that remote distance. We have seen in the vicinity of Schuyler's lake, piles made up of primary and secondary drift with limestones imbedded in them, as unworn as you would see them fresh in the quarry. During the time when the Onandaga limestones formed the surface rock, we have no doubt the groves and scratches were made on the surface of the parts that now remain.

We have given our views of the changes of matter as it regards place and combination. When we come to treat upon the excavation of river valleys, we shall be enabled to call the attention to changes that become apparent from a mere inspection. We have differed in opinion from many others in the foregoing remarks, we may also differ in continuation of the subject. In so doing we may have entertained erroneous views upon the subject; if so, they are not of a dangerous character, as those who comprehend our ideas, will more fully comprehend the things about which we have written, should their attention be turned in that direction, and then they can judge for themselves. We have, however, given our opinion in candor, and after a mature deliberation, and our chief object has been to call the attention of the "tillers of the ground," to a subject that daily falls under their observation.

Our next subject will be the excavation of river valleys, the formation of hills, and the deposit of the surface soil.

According to Herschell, the rays of light of the remotest nebulæ, must have been about two millions of years on their way to the earth.

DUTY OF EDUCATED MEN.

BY AGRICOLA.

In the present advancing age of improvement, and especially in the art and science of Farming, it cannot be denied that men of education, and high literary and scientific attainments are under a paramount obligation to throw in the aid of their wisdom and skill to aid the onward march. All men have a duty to perform in this respect, inasmuch as they all depend upon the arts for those things, which, from being originally luxuries, have now become the necessaries of life. But the business of agriculture has especial claims upon the man of science and education. It is now rapidly rising, and striving to take its proper place in the world as the foundation and chief of all arts. For ages regarded as little better than bondmen or serfs, the tillers of the soil, who fed and clothed the whole human race, have been kept down and compelled to take an inferior place in society. This can be so no longer. The chains are broken, and the dignity of the calling is fully appreciated and acknowledged. Much however yet remains to be done for this class of men, and we wish at this time to call the attention of two of the learned professions in particular, to the obligations they lie under, and the immense facilities they enjoy of doing more than any other men, for the true advancement of the farmer. We refer to clergymen and physicians.

There is no corner nor hamlet in the more densely settled portions of this broad land, where both these professions are not represented. Men cannot get along without a doctor, and in a Christian land without a minister. So we find them throughout the country. They are supported by the farmers, and if they make money, they get it from the farmers. They may think they make a full return in the cure of the bodies and souls of those among whom they live, but this is not true. They owe, as men living among men, those obligations which spring up in society, and especially to aid all around them in making progress in every thing which is for their profit or advantage. No man fills up his measure of duty till he has done all this.

We said these professions have peculiar facilities for advancing the interests of the farmer. This is seen as follows.

From their education they stand, ordinarily, somewhat above all among whom they live. They are, and should be expected to know more, and of that kind of knowledge which is of use in directing onwards the arts of life. Of such kind is the knowledge of the sciences. This forms a prominent part of the education of the minister and physician. The latter is not fully prepared for the practice of his profession if he have not a considerable acquaintance with the principles of philosophy and chemistry. They are regarded on all hands as necessary, and are therefore made to hold a prominent place in all systems of education. And most justly is this the case. For they are the foundation of all practical arts.

Much has been said and written of late years on the subject of educating the farmer, or at least the sons of farmers in all those sciences necessary to make this art take its highest place in the business of life—that is, in geology, chemistry, natural philosophy, botany, philosophy &c. All this is as impossible as the attempt of the frog in the fable, to puff himself up to the size of an ox. The fallacy of the attempt does not require argument nor example to demonstrate it. Yet some men blind themselves to the fact, and hug the project yet.

It is impossible, because three-fourths of our population are to become tillers of the soil, and we cannot hope to procure schools, nor teachers to educate them. It is looking too far down the future, to anticipate any such Eutopian success in the present state of things.

It is impossible, because there are few farmers who can afford to give their sons this education.

We repeat that all hopes of success in such a project are utterly fallacious. More than this, such an education is *unnecessary* to the farmer. We do not expect any physician to be so far an adept in practical chemistry, as to manufacture his own medicines, though his business consists in the applications of these medicines. Carrying out such a principle a man would require to be skilled in chemistry to be a tanner, or a dyer, or a painter, or in fact to engage in any art, and then the great mass of society would be educated to this extent. There is no branch of art, at the present day which is not dependant to a greater or less degree upon the science of chemistry for its perfection, and yet the folly of making any practical artizan a chemist, will be evident to every one. Some directing mind, thoroughly taught in the science, is capable of directing the operations of thousands in this day, when the application of the principles which men have discovered, can by the art of printing be made intelligible to the whole reading community, although entirely ignorant of the principles themselves; so in any grade and sort of art, the operatives learn only how to apply the principles of science while they know nothing of the science as such.

Such is now, and ever must be, the case with the mass of farmers. They are practical chemists by occupation, though they never heard the name of chemistry. They apply its principles in all their operations, and they need only to be shown how to apply any others, to put them immediately into practice. They are capable, under proper direction, of preparing manures in the very most approved manner, though they may be ignorant of the reason why it is necessary to protect it against the loss of ammonia &c., or may not know that such a gas is produced during the fermentation of dung. They may apply lime and gypsum to the soil with as good effect as if they knew all the secrects of their mysterious working in the soil and the economy of the growing plant. There is no process in connection with their business, which they cannot perform, if once they are told how, as well as or better than the man of science, although they never stop to ask the "*why.*"

The knowledge and the practicing upon it need not be joined in the same individual. Indeed, in this case, the division of labor will tell with as great effect as in our large manufactories. The man of science must investigate the principles and the manner in which they are to be reduced to practice. The practical farmer is the one who will carry them out. And he will never be backward in doing his part of the duty provided you can show him, to his conviction, that it will be for his profit.

We will now return to our subject, from which the foregoing can hardly be considered a digression.

The physician and the minister do not strictly belong to either of the classes we have been considering. They may be regarded as a sort of middle men between the two. From their education they are capable of tracing out the bearings of science upon the business of the farmer, and being, from their position in society, possessed of a large influence over all around them, they may point out to farmers those modes by which they will be benefitted, and warn them against error. To neither of these men will it ever be much trouble, nor a loss of time, to inform themselves on subjects connected with farming, and by lectures during the winter evenings, they may spread a vast amount of very useful knowledge through their whole neighborhood.

"Knowledge is power," and the difference paid to the superior wisdom of the so called, "learned professions," opens a large sphere of power to them,and which they may use to the great benefit of their race. It is too generally the case that they devote very little of their time and care to any thing beyond the regular routine of their professions, whereas, should they devote a portion of their leisure in promoting intellectual improvement and advancement in all the occupations of life, they might do an incalculable amount of good. They might easily and with a powerful iufluence be engaged every day in gradually breaking down those prejudices which are among our farming population, the greatest hindrances' to improvement. They might rapidly introduce the practice of reading agricultural papers, and books, things which unfortunately a vast number of our farmers are afraid of, and therefore need stimulating and leading in order to overcome their prejudice.

Professional men in the country, generally cultivate a small portion of land for themselves. Now by putting in practice on their little places the improved processes with which they become acquainted, they will perform an experiment, which, in its success, will induce many in the vicinity to do the same.

But it is not necessary to point out to such men the modes in which they may do good. To a willing mind the way will always be open and plain. It was our object in what we have written to call the attention of these two classes of men, who stand in two of the noblest and most useful callings of life, to a sphere of usefulness, too long overlooked. They owe it to the community in which they live—to the men who support them—to the young who are growing up about them, and to the world at large. Their influence and their efforts properly directed will do far more for the improvement of farming than all the *scientific* lore than can be crammed into the minds of the farmers.

NICHOLAS BRADFORD,

THE MAN WHO EXPECTED TO GO TO THE LEGISLATURE.

" What makes that corn look so yellow and spindling ?" said Mr. Lovell to his neighbor Jackson.

" The owner expects to go to the legislature next winter," said Mr. Jackson.

" I don't know what that has to do with the corn looking so yellow. Mr. James took the premium for the best field of corn the same year he went to the assembly."

Mr. Jackson was a man who was averse to saying anything against his neighbors ; so he did not enlighten Mr. Lovell as to the connection between poor corn, and an expected seat in the legislature.

" Let us go across the fields ; we shall save half a mile or so by that means."

The two neighbors were on their way to the house of a lone widow, whose little cornfield required some attention which she was not able to bestow. They began to act on the labor-saving suggestions above recorded. The first thing to be done was to get over the fence which separated the cornfield from the highway. It was a high rail fence, and the top rail was supported by crossed stakes. Mr. Jackson was a little more active than his companion. He placed himself astride the top rail before Lovell had begun to climb. The pressure of Mr. Jackson's weight upon the rail caused the bottom of the stakes to fly up. There was then nothing to prevent the rail and its rider from obeying the law of gravity. This they speedily did—the rail in its descent communicating something of its rotaiy motion to Mr. Jackson. He gathered himself up and wiped his face, and was busy for a moment in removing something which had taken that opportunity to get into his eyes. As he looked up, he saw Mr. Bradford sitting in his sulky. He happened to be driving by, and drew up as he saw Mr. Jackson's somerset.

"I hope you haven't hurt yourself," said he.

Mr. Jackson was somewhat vexed and made no reply.

"Stakes are apt to get thown out by the frost," said Mr. Lovell, feeling that the silence was rather awkward.

"Yes," replied Mr. Bradford. "It is well to go round in the spring and tighten them, but I had so much to do this spring that I neglected it. I must try to do it yet, good day to you," and he drove on.

By this time Mr. Jackson had replaced the rail, and laid some large stones at the bottom of the stakes, that no one else might be caught 'in the same trap,' as he said, and was prepared to move on. He was just vexed enough to talk freely about Mr. Bradford's corn and conduct.

"It is a shame to see such corn on such land," said he.

"The land appears to be good," said Mr. Lovell.

"The soil, if anything, is better than that," pointing to the field which they were approaching, in which the corn was, (to use an agricultural hyperbole,) "as black as your hat."

"I don't see what the difference is owing to. This hasn't been very well 'tended to be sure."

"In the first place the ground wasn't ploughed: see there, not more than half the surface was broken up at all. It is now getting to be as hard as a rock; nothing can grow in such a case. He hired Stillwell to plough it by the acre, while he was managing matters for the town meeting. Stillwell slighted it, but Bradford did not dare to say anything because he wanted his vote. Then he hired a couple of voters to plant it while he was gone to a county convention; and you see how they planted it, so crooked that it is impossible to put the plough through it more than one way."

"It looks as if it had been hoed by voters," said Lovell.

"It was hoed by a couple of young chaps, who will be old enough to be voters at the next election; so he must be easy with them."

By this time they had reached the fence which separated Mr.

Bradford's field from Mr. Barnwell's. The fence resembled the one above noticed.

"Take care that you don't get another fall," said Lovell, as he saw Jackson spring on the fence.

"No danger here, this is Barnwell's fence, and his stakes are always firm set."

It happened that Mr. Barnwell and his son Henry were in the cornfield with their hoes. They were finishing the two last rows as Jackson and Lovell came upon them. Henry was a member of college, but it was vacation, and he was now putting it in strong by the side of his father, who felt none the older in consequence.

"You have a fine piece of corn here," said Jackson.

"Yes," replied Barnwell, "it is coming on pretty well. It hardly needed the hoe, but Henry was a mind to scratch it over again."

"Your scratchings are always pretty thorough ones; does Henry improve any in hoeing by going to college?"

"Well, I don't know. He is pretty much the same."

"Well, I shall be glad if he don't get spoiled going to college. May be he wont. I saw your classmate Fairfield, as I was coming out of the lane."

"Where was he going?" said Henry, quickly, and the blush that suffused his countenance would seem to indicate that the question was improper or unnecessary. Unnecessary it may have been, since the lane led only to Mr. Jackson's house. There was certainly a very high degree of probability that the person walking in said lane towards the house was going to it. Mr. Jackson noticed the embarrassment attending the question and replied.

"I can't say for certain where he was going. I think it likely he was going to my house. He was pretty well starched, and hardly seemed to know me; so I didn't think it worth while to tell him that the women were not at home." Jackson perceived that his reply had restored Henry's circulation to its usual state. He disturbed it again however by adding, "Milly says she likes that book, and wants the other volume."

"I'll bring it up to her," said Henry. "Will *they* be at home this evening?"

"Yes," replied Mr. Jackson, without noticing the unusual use of the pronoun they. Perhaps he thought it was in accordance with college rules to use it when reference is made to a young, rosy cheeked, black-eyed, enthusiastic girl of seventeen.

"We were going to give widow Jones a lift at hoeing; as you have your hand in, you may as well come along."

"I will," said Henry, "that is, I will be there soon after you get there—in time to overtake you if the rows are long enough."

"I shouldn't wonder" said Jackson, as soon as they had passed on out of hearing, "if that young man should get into the legislature and into congress too. He is taking the right course for it. He was always fond of his books, and when he is in college I'm told he studies with the best of them, and when he comes home, he puts right in and helps the old man, whatever he is doing. If he were to set up for the assembly next fall, he would run better than Bradford, who spends half his time in fishing for votes."

How far this opinion of Jackson in regard to Henry was worthy of universal adoption, we will not stop to consider ; but content ourselves with remarking that it is quite probable that this opinion was modified by the partiality of Henry for that black-eyed girl of seventeen, to whom allusion has been made.

The two neighbors had reached the widow's cornfield where they were soon joined by Henry, and their joint labors were continued till sunset. A close observer might have noticed that young Barnwell looked at the sun pretty often as it neared the horizon, still he showed no signs of going over till the patch was hoed out."

"Come," said Jackson to him, "go home with me."

"I think I shall come and bring that book this evening."

"Never mind the book, you can bring that some other time. I told Milly that it was likely as not that you would come home to supper with me."

This Mr. Jackson supposed would be conclusive, but he was in error. Henry's wardrobe had materially improved since his connexion with college, and if there was any occasion in which it was put in especial requisition, it was when about to visit Miss Amelia Jackson.

"You will be round in time for supper then ?"

"I guess so."

"Henry hastened home, and after a copious use of cold water, began to make such a disposition of his dress as he deemed advisable. Several collars proved quite refractory, and his success in folding a new necker chief was by no means gratifying. He was ready at last, and with the book in his hand, was on his rapid way to the end of the lane. It was quite dark before he reached it. A white figure that he saw in the door way, assumed very distinct and perfect proportions, notwithstanding the darkness. The table was spread, and they were soon seated at it, and Milly undertook to "pour out,"—with the difficulties of which act she was evidently unacquainted, since with the best possible intentions, she twice failed to mix the ingredients in Henry's cup according to his directions. After the "things" were "taken away," a feat that was performed by Milly without any blushing, in a remarkably dexterous and graceful manner (at least so thought Henry,) conversation became animated, though perhaps Mr. Jackson was disposed to appropriate more than Henry would have meted out to him. He, (Henry) however, gave no sign that such was his opinion. He wisely listened and talked to the father, concluding that in accordance with a praiseworthy custom, he would betake himself to bed at an early hour and leave to his daughter the task of entertaining the visitor. At what hour Henry returned to his father's that night is uncertain. Certain it is that he was never out of his room at college at so late an hour.

CHAPTER II.

Mr. Bradford, was for many years one of the most industrious farmers in the place. Few men raised better crops, few better cattle, or kept his fences and buildings in better repair. Few men minded their own business better, and were more generally respected. Things were thus going on well with him, till in an evil hour he was nominated for supervisor by one party, and no opposition was made to the nomination by the other.

That to him very unexpected event, happened on this wise. The patriotic leaders of the dominant party could not agree among themselves as to who should serve the people in the offices of the current year. They therefore were obliged to select a man who had no claims. The opposite party thought it useless to make any opposition. So he was elected by almost a unanimous vote. Many honest men who were not in the habit of going to elections, turned out to vote for a man who had never sought office, and whose good care of his farm gave a pledge of good care of the town. He made a good supervisor, but he got, as his neighbor Jackson said, a "taste for office," which grew upon him to the damage of his farm, comfort and character. We have already seen something of its influence on his farming. Let us now take a glance at some other of his "fair business transactions."

"Good evening, Mr. Roy," said Mr. Bradford, to a man with a damaged countenance, and dilapidated wardrobe, as he entered the house just before sunset one evening, "how do you do ?" Mr. Bradford rose with evident reluctance and gave the unit of sovreignty of his hand.

"I'm pretty well, how do you do ?"

"Very well ; how are the children ?"

"They ain't to home."

Mr. Roy's children were a little eccentric in their habits. They were not particularly given to staying at home. They were sometimes found in other people's barns, hen-roosts, &c., at night. Several of them had taken lodgings for a time in a public building at the county seat. It was natural for the father of the town, and the expectant legislator, should feel solicitious about such children, and make them the subject of defininte inquiries. That inquiry elicited no definite information.

"We are beginning to get ready for election in our part of the town," said Mr. Roy, seating himself with great deliberation, and with somewhat of dignity as he supposed. "We mean to put it through right there. We feel as though we must have more farmers in the legislature. These lawyers are a ruining the country, and that is the whole of it."

Mr. Bradford was not disposed to dispute so reasonable and agreeable a proposition, and was quite thankful to be permitted to hope that that was the whole of it. But he was mistaken. The most important part of it was to come. Listen.

"Mr. Bradford, I am in rather a strait just now for a couple of bushels of corn. Mr. Wiles (the expected opposing candidate for the legislature,) has corn to sell, but he is not the one for a poor man to deal with, so I come to you as the poor man's friend. I will certainly pay you before election, if I don't in a week or two."

"Well, I suppose you must have it," said the man of the people. He rose and went to the corn house, and went through the very unnecessary formality of measuring the grain. It was carried away by the sovereign, and in due time consumed. Mr. Bradford knew that the only pay he could possibly expect was the vote of the said sovereign, which *might* be had, provided the opposing candidate did not furnish too copious a supply of strong drink. This was one specimen of the business transactions of the people's candidate for legislative honors.

Now take an example somewhat different.

"How do you do Mr. Bradford," said a rather smart semi-gentlemanly looking man. There was considerable importance in his bearing, and quite an odor of politics about him. He had once been deputy sheriff, and hence claimed a right to be on terms of equality with all office seekers and office holders. After some introductory remarks, which had no relation to the subject, he remarked. "They say Mr. Wiles means to run for the legislature next fall." Mr. Bradford wished that a seat might be gained by running, since in that case his chance in the contest with Mr. Wiles would be good. Mr. Wiles being a very corpulent, wheesy, rubicund man, besides usually carrying too much weight of brandy and water to run with advantage. Mr. Bradford did not give expression to that wish, but contented himself with remarking, "I havn't heard much about it."

"I don't think he can fetch it. He is not popular enough. He don't take pains to please people. He is not willing to help a neighbor in time of trouble. Finch had a cow taken, and was about to be sold by the execution. He tried to get Wiles to go security for him, but he wouldn't. Finch managed to get the money, (I helped him to part of it,) but I don't think he will vote for Wiles."

In brief, the object of the ex-deputy sheriff was to get Mr. Bradford's endorsement to his note of hand for one hundred dollars—the said deputy having a desire to illustrate the excellency of the credit system as facilitated by banks. He was successful, and at the end of four months, Mr. Bradford was called upon to make payment, and did so by effecting the sale of a favorite horse.

In the mean time the election had taken place, and Mr. Bradford obtained leave to stay at home during the winter—a striking example of the ingratitude of republics towards those who desire to serve them. He now had leisure to examine into the state of his farm, reckon up his bad debts, and to devise ways and means to meet his pecuniary engagements. He found that his political career had been so expensive, that it was necessary to sell at least a part of his farm. He finally concluded to sell the whole and remove to the West, firmly resolving however, to accept of no office save that of path-master. His political experience was of vast service to him, and we have recorded it for the benefit of others.

The farm was purchased by Mr. Barnwell senior, and as soon as Henry had graduated it was made over to him in company with the black-eyed girl above mentioned. Some wondered that old Mr. Barnwell should have sent his son to college to make a farmer of him at last ; and others thought that *Milly* was too lady like to be a good farmer's wife, but I never heard as that opinion gained general currency. All acknowedged that college had not spoiled Henry for work, and that somehow he got larger crops than any of his neighbors.

It was not long before he was solicited to be a candidate for office, but he strenuously protested that he could not attend to his farm and the State at the same time. " When my farm" said he " is clear from all incumbrance, and has received the necessary improvements, and my affairs are in such a state that I can leave them for a time, then if the people really need my services, they shall be given." Was he an unwise man ?

A cubic inch of the Tripoli or rotton stone of Bilin, contains 40,000 millions of the siliceous coverings of the Galionellæ—a microscopic animal.

It is supposed that the bright star in Lyra, has a diameter equal to 1,800,000,000, and hence, would nearly fill the orbit of Uranus.

AGRICULTURAL CHEMISTRY.

The Three Kingdoms of Nature adapted to each other—Liebig's doctrine of Vegetable nutrition considered—Facts against it—Improvement of soils—Rules—Scientific Agriculture—Necessity of an extensive Atmosphere.

1. The adaptation of the animal, vegetable, and mineral kingdoms to each other, is one of the most beautiful instances of *designing* mind and *controlling* power. In the mineral kingdom are treasured up the elements which enter into the composition of vegetable matter. Besides the *carbon*, *oxygen*, *hydrogen*, and *nitrogen*, the four great constituents of vegetables, the earth contains the other varying elements, as *potash* or *soda*, *lime* and *magnesia*, *common salt* and *iron*, and *silica*, *phosphoric acid*, &c., called inorganic substances. Besides giving the adequate support of plants, the roots spread themselves into the midst of the great storehouse of these latter substances. Constituted as the vegetable kingdom is, the roots become the only possible way of bringing these substances into the vegetable structure. When the necessary quantity of these substances, or of any one of them, is wanting in the soil, vegetation suffers; and the *art* of agriculture consists in supplying the deficiency, as the *science* reveals what element is wanting.

2. The vegetable kingdom is the great source of nutriment to the animal. It elaborates the albumen, fibrin, and caseine, which are the substances essential to the maintenance of animal life; while both animal and vegetable matter yield, in their decay, to the mineral kingdom, the elements for the repetition and continuance of this process.

3. By respiration, animals take up the oxygen of the atmosphere, and return it united with carbon, in the form of carbonic acid. By means of combustion, fermentation, and the like, the quantity of carbonic acid in the atmosphere is greatly increased. But this acid is the support of plants; for it is taken up by the leaves and bark, and roots; and its carbon goes to form the various vegetable substances, while its oxygen is discharged for the special use of the animal kingdom. Thus the atmosphere is made pure, for the support of animal life, and the vegetable receives one of the essential parts in its composition. The adaptation to each other is thus splendidly shown in these two kingdoms. The atmosphere is deteriorated by various chemical and chemico-animal processes, and is purified again, and constantly, by chemico-vegetable operations.

4. Another substance, *ammonia*, is considered essential to the

support of plants. As it is composed of hydrogen and nitrogen, the latter enters into combination with hydrogen, oxygen and carbon, in the vegetable, to form the *nitrogenous* substances, as they are called, of vegetables, in distinction from those which contain no nitrogen, and which constitute far the greater part of vegetables. These nitrogenous portions, however, are of the highest consequence to the animal kingdom, as, being dissolved in the blood, they are used to form a large portion of the animal structure, as the *fibrine* for the muscles, the *albumen* for the nerves, &c. The ammonia is formed from natural decompositions of various vegetable and animal matter; and being naturally in the gaseous state, rises into the atmosphere, unites with the vapor and carbonic acid there existing, and falls in rain and snow to the earth, to be taken up by the roots of plants, or is absorbed directly by the foliage and stems of plants, for their aliment and nutrition. It is for the reason just given, that the late snows of spring have long been called *the poor man's manure and blessing* from the skies. Thus again, the adaptation of the three natural kingdoms to each other, cannot fail to lead the contemplative mind from this fact to the boundless wisdom which has contrived and directs the whole.

5. It is the doctrine of Liebig, that *plants derive all their carbon and nitrogen* from the carbonic acid and ammonia of the atmosphere. This broad assertion is denied by Johnston, in his *Agricultural Chemistry*, and is doubted by many intelligent chemists. If the doctrine is true, manures are of no importance in yielding these two most important elements, carbon and nitrogen, to the vegetable kingdom, as these come from the atmosphere; while water, containing oxygen and hydrogen, may be taken up from the atmosphere by the leaves, or from the earth by the roots. That a great portion of the water passes in the latter method into plants, is obvious from well known facts.

6. The objection to Liebig's doctrine, as rendering manures unimportant, is made in a note to the work of Liebig.* The reply of Mr. Ruffin, there noticed, is considered wholly unsatisfactory, as the note thus concludes: "Thus, though a *large proportion* of nutritive principles may be furnished by the atmosphere and water, still the benefit will be limited by and in proportion to the fertility of the soil; and this fertility, in force of growth, must be in proportion to the additions made to the soil by man." If these two elements, however, are not included in the additions made, there are strong reasons for the opinion that their absence would materially diminish the growth.

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* See *Organic Chemistry, in its Applications to Agriculture and Physiology:* Cambridge, 1841; p. 24–5.

7. Before offering these reasons, let the arguments be considered which seem to support the doctrine of Liebig.

8. *The growth of a forest, and the amount of carbon produced.* Admitting that this carbon is derived from the atmosphere, has any proof been offered that the growth of that forest would not have been greatly augmented, if the whole earth under it had been manured to the perfection attained on the fields of many agriculturists?

9. *The removal of nitrogenous products, as wheat, corn, beans,* &c. Admitting that the carbon and nitrogen are derived from the atmosphere, has experiment ever proved, that a soil containing all the other inorganic elements of the support of plants will produce in equal quantity with that which, besides the same inorganic elements, is abundantly dressed with vegetable and animal manures? Besides, how do *night soil*, *guano*, &c., produce these wonderful results, if manures have no importance in supplying carbon and nitrogen to plants?

10. *Increase of products by some inorganic substance*, as *ashes*, without other manures. In such a case, has it been known that the soil was destitute of vegetable and animal matter? If not, then *ashes* may have been the material to increase the power of the plants to take up more vegetable matter from the earth, as well as more nutriment from the atmosphere. If the soil was destitute of vegetable matter, where is the proof that the addition of vegetable and animal manures with the ashes, would not have produced a still greater increase? Until the contrary shall be proved by experiment, the adduced fact cannot be conclusive proof. The same may be remarked of the use of other inorganic substances in other similar circumstances. This is corroborated by the acknowledged but imperfect growth of vegetables in earth destitute of vegetable or animal matter.

11. It should have been remarked, that the doctrine of Liebig is often supposed to imply that the carbon and nitrogen are taken up only by the leaves of plants, being derived directly from the atmosphere. But, he intended to include also that introduced by the roots, which had been carried to the earth in rain and snow. For he declares afterwards, that "the roots and other parts of it (a plant), which possess the same power, absorb constantly water and carbonic acid."* The same is to be admitted in respect to ammonia, as it must in the same ways find a passage into the plant. And this is the more necessary to be admitted, as, according to Prof. Horsford, Dr. Krocker has ascertained that a large amount of ammonia exists in all the common soils. This varies in different soils, from 3373 to 9751 pounds of ammonia in an

* Again he says, "The carbonic acid, which has been absorbed by the leaves and by the roots, together with water," &c.; p. 33.

acre of earth or soil one foot deep. If this has not come from the atmosphere in rain and snow, the earth itself must be considered no small reservoir of ammonia. Indeed, before Prof. Horsford had found ammonia in the ice of the *glaciers*, it was made certain that ammonia descends by rain and snow, and hail, to the earth.

12. Giving this extension to the doctrine of Liebig, there are adequate reasons for doubting its truth, and for modifying and qualifying its language.

13. The quantity of carbonic acid is about one-thousandth of the weight of the atmosphere. This is adequate, no doubt, to supply all the demands of the vegetable world. It is continually taken up by vegetables, or carried to the earth by the falling vapor, and thus placed in a situation to be used by them. It is produced by the respiration of animals, by combustion of all vegetable and animal matter, and by those chemical processes which reduce organized matter to its elements. Vast quantities must be produced in the last method. It is the natural result of the putrefactive process in vegetable matter. This is the very condition of many manures of both vegetable and animal origin. Is it conceivable, then, that this process shall go on in the decay of vegetables, and not hold true in relation to manures? Shall carbonic acid result from the natural changes of organic matter, except in the case of manures? This must surpass belief. But, if this process takes place, manures must be converted, to a great extent, into carbonic acid, which is formed in the very position to be taken up by the roots, if the soil has the proper character, and thus augment the amount of vegetable products.

14. Similar must be the conclusion in respect to ammonia as the food of plants, admitting the adequate amount of this substance to have been at first created and thrown into the atmosphere to supply the wants of the vegetable kingdom, it would long since have been exhausted, without a continual reproduction. But, in the decomposition of animal and vegetable matter by natural processes, it is continually reproduced. Ammonia, absorbed by vegetables, is decomposed into hydrogen and nitrogen; and these elements go to form the different vegetable products. These pass in part to constitute animal matter, and in part fall to the earth to undergo the process of decay. In the decomposition of the matter of urine, night soil, and some other manures, the production of ammonia is palpable.

15. Now, unless animal matter is the entire reproductive source of ammonia, which is not universally admitted, there must be a resort for a further supply of this substance, to the decomposition of vegetable matter.

16. Then, vegetables contain the two elements which compose it, and their union into ammonia is possible and probable. There

have been experiments, too, which indicate such a composition. Connected too as decaying vegetables are with the nitrogen of the atmosphere, and tending to unite as nascent gas is with that already existing, here may be another means of the production of ammonia. But, aside from this source, where is the proof found, that in the decay of vegetable matter, its nitrogen escapes as a gas into the atmosphere?

17. If ammonia is thus formed by a natural process, does that process fail when the matter is used as a manure? But, if ammonia, or even nitrogen, is evolved by manures, they become the food of plants, by being formed in the very place to be taken up by their roots and conveyed throughout their structure.

18. It is almost *necessary*, indeed, that the *nitrogenized* vegetable substances, composed of the same elements and placed in the same circumstances for decomposition as the animal, should be changed to the same simple or compound bodies. Thus, the decay of those substances which contain no nitrogen, would yield carbonic acid, and those which do contain it, would form ammonia.

19. On this view of the subject, the adaptation of the kingdoms of nature to each other, is only more admirable. And, if animal matter is decided to be the only reproductive source of ammonia, this adaptation rises in splendor and beneficence. But, in either case, the use of manures is obvious, as they afford one considerable means of nutrition to plants.

20. In the fall of leaves and the decay of vegetable matter in a forest, we find the natural process by which plants receive through their roots one portion of their food, being the process of nature to convey manure, and thus nutriment, to her own productions.

21. Liebig asserts, p. 90, that ammonia is "a product of the decay and putrefaction of preceding generations of animals and vegetables." Why should this product fail, when manures are the subject?

In addition to these reasons, consider facts.

22. If the manure is left uncovered on the surface of the earth, the farmer derives little benefit from it to his crop.

23. To make a crop of clover valuable to his cultivated grain, the clover is plowed in, and thus covered by the earth.

24. When, in the same soil, the manure in one place is scattered on the surface, in another buried in the earth, and in another placed so that the corn shall send its roots into it, the difference in the product is too palpable to doubt that the last is not the most beneficial. The reason is, that the plants have access to another source of food than that of the atmosphere.

25. The greater benefit derived from the use of animal manure,

as that from the hog-pen, &c., is because it yields more ammonia directly to the plant: also, of guano, night soil, &c., near the roots of plants.

26. The striking advantage of *muck*, when the roots of plants have access to it.

27. The well known fact of the rapid growth of the grape, when the roots penetrate to the *reservoir of night soil.*

28. The imitation of nature in the general use of manures.

29. The preparation of composts, so conducted that the vegetable nutriment may be retained in it, and the roots of plants have direct access to that compost.

30. The improved mode of retaining the ammonia of fermenting animal and vegetable matter, by ground gypsum, and of mixing earth, gypsum, &c., with the droppings of cattle and horses, because earths and porous substances absorb the ammonia, and then burying this prepared manure so as to be accessible to the roots of plants.

31. To point the attention to no more facts—these are utterly unaccountable, if manures are not actually one source, and no inconsiderable source, of carbonic acid and ammonia for direct support and nutriment of plants. And Liebig states, p. 90, "that the proportion of azotized matters in plants is augmented by giving them a larger supply of ammonia conveyed in the form of animal manure." Here is a virtual admission of the facts already stated, and of the reason for the facts.

32. If *manures* are merely the *ashes of animal and vegetable matter*, then the supply of ashes is all the dressing actually necessary in agriculture—*the ashes of the plants to be cultivated!*

33. That *prairies* are covered with dense vegetation, while they receive from year to year only the ashes which the fires leave upon them, cannot be a satisfactory argument, until the soil is proved to be destitute of animal and vegetable matter, and that neither animal nor vegetable manures increase the productiveness of the soil already possessing the necessary inorganic substances.

34. That feeding in a poor soil a plant with the ashes of its kind, should be followed with increased productiveness, is to be expected as a natural result; but let it be proved by experiment, that in a soil possessing all the inorganic elements, the addition of vegetable and animal manure, and especially of the compost duly prepared, or the improved mixture from the stable, does not augment the growth. Let the plant be dressed with the proper ashes in one case, with and without the ashes and with the improved mixture in the other, and the *experimentum crucis*, the adequate test, will have been applied.

35. Liebig asks why the "absorption of carbon from the atmosphere is doubted by all botanists and vegetable physiologists;

and that by the greater number, the purification of the air by them is wholly denied?" The reply is, that at the time he wrote, and long before, the purification of the atmosphere through the absorption of the carbonic acid by vegetables, was a common doctrine in our country. The same is now true, while his doctrine, in its extreme application, is doubted. Adequate reasons for the doubt in this case, it is hoped, have been advanced. The language of the doctrine must be changed, and its universality be given up.

36. From the adaptation of the kingdoms of nature to each other, *result all the valuable directions* for the improvement of soils, and the increase of agricultural products.

37. The soil must possess all the inorganic substances, which are essential to the perfect growth of all the parts of vegetables. If any one is wanting, it must be supplied, whether it is gypsum, potash or soda, lime or magnesia, bone ashes for phosphate of lime, and the like.

38. The soil must be put into a state to make these substances easily accessible by the roots of plants. This will require due attention to the mechanical operations of husbandry, and such a mixture of different soils and earths as are suited to the objects of cultivation.

39. The employment of manures for the double purpose of adding to the soil the essential inorganic substances, and of increasing the accessible amount of carbonic acid and ammonia. The preparation of manures, and the application of them to the roots of plants, need only to be mentioned. The agriculturist here finds additional reasons for the application of the various manures to soils.

40. Hence it is obvious, that *scientific* husbandry is the investigation of the mutual adaptations of the three kingdoms of nature to each other, and the appliance to agriculture of the fixed principles thus obtained. *Practical* farming, as it is sometimes called, derives all its importance from following the deductions already obtained in this precise way. No other farming but that founded on the adaptations fixed in nature by its great author, can be successful, and repay the laborer for his efforts. Some of these are easily discovered, and have ever been used. Others are not so accessible, and require other sources of knowledge for their discovery. Chemistry has in this way become the handmaid of agriculture; and has already unfolded new and most important principles in the employment of *this first and chief of arts.* In this acceptation of the term, *Book-farming* is the only true and rational farming—the only successful and profitable farming—the only safe guide to the agriculturist. All its principles harmonize with the adaptations of the kingdoms of nature to each other.

41. Finally. The necessity for so extensive an atmosphere as surrounds the earth, is obvious. It must be so constituted that the relative proportions of its oxygen, nitrogen, vapor of water, carbonic acid, and ammonia, shall be so nearly preserved as is suited to the conditions of the vegetable and animal kingdoms. Too great an excess of carbonic acid and ammonia, would endanger the race of animals, as would also a great excess or deficiency of oxygen. But in some times and places, a vastly greater amount of carbonic acid is poured into the atmosphere, and the oxygen is made to disappear to the same extent. Animal life would in such places be exposed to destruction, from the abstracting of oxygen and the abounding of carbonic acid. With all the facility with which the gases diffuse themselves among each other, were the atmosphere of very limited extent, danger and death would be at hand. But with the great extent of the atmosphere, and the diffusiveness of gases and vapors, there is no such possibility. Now the adaptation of the three kingdoms to each other, prevents this result. The heated and cooled air, the moist and the dry, the land and the sea air, the tropical and the polar air, abounding in oxygen or carbonic acid and ammonia, or the contrary, the air at the surface of the earth and high in the atmosphere, aided by the water which absorbs the carbonic acid and ammonia, and brings them to the earth, are all so mingled and diffused in their due proportions, that the animal and vegetable worlds are secure and flourishing, and "nature is dressed in smiles." The adaptation is beautfiul, admirable, wonderful. *In wisdom hast THOU made them all.*

THE DIFFUSION OF AGRICULTURAL KNOWLEDGE IN MISCELLANEOUS JOURNALS.

It is with pleasure that we see some of our exchange papers that are not professedly devoted to the interest of farming, publishing in their columns scientific essays upon that subject. The *Philadelphia Saturday Courier* has published a series of these articles both useful and interesting to the lover of agricultural knowledge. The writers appear to aim at elementary truths in treating of those productions that are brought forth and fostered by the aid of human labor. Such articles cannot be too highly prized in this age of the world when reading is so universal among civilized nations. At no period in the history of man has there been so vast an amount of publications issued from the press as at the present time. Every book establishment in the land is filled with them, every mail is burthened with their weight and bulk, and yet the press is still incessant in rolling out its floods of reading. How few however are devoted to the interests of agriculture, embracing as it does in its elementary principles, a large field of knowledge, and in its practical labors an occupation so well adapted to the happiness of man. Leaving out of the discussion for a moment the science of farming as embracing the composition of soils and the constituents of plants, and animals, and confining the inquiry to that knowledge among farmers, which should call forth a sound and discriminating judgment as to what grain he should sow upon a certain field ; the quantity and kind of stock he should keep on his farm ; what kind of produce he should raise for his most convenient market, and many other calculations in which his interests are so directly involved : we say that the farmer is far behind the mechanic and the artist. Among the latter branches that have been matured by mental labor we will mention that of steam as applied to mechanical purposes, and we are not competent to enumerate the sleepless hours of night, or the more wakeful mode of severe and constant thinking that has been devoted to the improvement of the steam engine ; there have been many painful instances in which individuals have suffered great losses by their unwearied efforts and profuse expenditures in striving to find out the best mode of applying this power to machinery.

By these applications and expenditures great improvements have been made in that branch of mechanical labor, and mankind have been greatly benefitted by its successes. There have been also great improvements made in other branches of the mechanic arts, and agricultural implements have also been wonderfully improved in these latter times. The subject of manure has of late been much discussed and thoroughly investigated, yet we conceive that one branch of agricultural knowledge has not been so thoroughly pursued as those of less importance, and that is the manner in which the farmer should apply his labors. To obtain the greatest profit from a given amount of labor should be one of his chief studies. It is not characteristic of farmers to set down and calculate and systamatize a course of farming for a series of years to come. Among the more prominent facts to be considered in maturing his plans, are the quantity of land to be tilled, its condition, his means for improving it, the amount of family labor, and its proximity to market. Now, where is there a farmer that devotes as many thoughtful hours and subjects his mind to such severe labor in maturing his plans embracing the above facts, as he who strives to improve a piece of machinery.

Perhaps the extreme apathy of the husbandman to discharge this duty, in which his interest is so directly involved, arises in view of the cheapness of land, and the quantity that remains unoccupied in this country ; and the great and varied abundance of produce that is yearly given as the reward of his labors. A reflection absorbs the mind of the farmer when contemplating the growth of animals and vegetables on his own domain, that they appear to exert the extremest effort to reward the labors of his hand. The animal grazes the live-long day on the barren heath, and foregoes that rest enjoyed by those in a more luxuriant pasture. The plant also struggles for life on a barren soil, and seems to economize every means, though feeble, to mature its seed ; what faithful laborers to contribute to his comfort and prosperity.

Again, passing on beyond the limits of a well matured and a judicious system in husbandry, a farmer can enlarge the bounds of his knowledge by an acquaintance with the constituents of his soil, as well as those of the plants and animals which are the objects of his care. In this department of knowledge he learns many facts, both interesting and profitable. If he is entertained and instructed in beholding a perfectly organized body with all the necessary and adequate functions for its development, then he has it in these existences. In this field, though large, there is no waste or barren heath ; every part, with all its diversity, instructs and pleases. It is the great field of mental labor, and the powers of the mind become strong and stable in cultivating its wide domain. It is the appropriate duty of man to cultivate this science—these organizations are developed by his labors, they are constantly under his observation.

The agriculturist should also be industrious and vigilant in learning the principles and forms of the government of his country and its institutions, for on him its burdens fall ; as in its representative form he has the power to correct its abuses, even now in prophetic vision when party strife verges towards its maximum intensity, all eyes are turned to an intelligent yeomanry to hold up the pillars of the government, to maintain the integrity of its laws and to restore the fountains of justice to their wonted purity. Under this impression learned statesmen and philanthropists have not withheld their strenuous efforts to devise and adopt the most efficient measures to educate the rising yeomanry of the land. Some have manifested this zeal ; hence, the common-school system has been shadowed forth as the great thing desired to accomplish that object, and in their zeal they have betrayed, to a certain extent, a coldness toward the higher institutions of learning. Now that we may not be misapprehended in our views of these institutions, we state explicitly, that, in our opinion, they should be sustained by the aid of government,so long as they are conducted in reference to the object for which they were established ; and it is to be regretted that they are not provided with observatories, having a more extensive and perfect apparatus. Although the more abstruse and profound sciences have been generally, fathomed to greater depths by individual enterprize, yet these institutions are the medium through which they are disseminated. These sciences, in many respects, are of the utmost importance to mankind ; even the science of astromony, having its ranges so remote from the field of human action, in its application to the navigation of the seas, has a direct, indispensable bearing upon the commerce and prosperity of our country. Every man who "tills the ground" is benefitted by the perfection of this science : and every prosperous and patriotic farmer should feel proud of the high and noble literary institutions of his country. Nor would we detract in the least from the merits and usefulness of the common schools of the land, it is in these assemblages that individuals learn the rudiments of that knowledge which qualifies them to transact the ordinary business of life. It is in these schools that they acquire a knowledge of letters which enables them to conduct their international commerce in a legible form. It is here they take their incipient steps in the progress toward higher attainments of learning. So important is the knowledge acquired even within these limits, that it is a duty fraught with the most sacred injunctions, devolving upon parents and teachers to give the children of the land every proper facility to advance their knowledge in the rudiments of learning, to spread before them every inducement to engage in the enterprize, and faithfully and impressively to warn them against the delays in acquiring the literary qualifications so useful to them in manhood. In casting a glance however, over the great drama of life, there is a great ardor of human learning other than that acquired in collegiate halls, in academic shades, or in the cheerful circles of the school house ; the knowledge that man acquires after he arrives at the age of maturity, as he launches forth into the bosom of society, depending as he does upon his own resources to bear him onward in a successful career of action. Here is a field of contemplation, to interest the youth and the sage. How often has it happened that intellects that shone with such brightness in the halls of learning, have in after life, been dimmed by the brighter glow of intellects that once flickered in obscurity, and their marches traced along the shades of poverty far into manhood. Hence the importance of pursuing the paths of knowledge, after both mind and body receive the impress of maturity.

A well educated mind in early life, that fails to receive an after culture, is not inaptly compared to a garden that has received the best labors of its culturist's care ; admired for the efficiency of its enclosures, for the well arrangement of it walks, for its ornamental trees, and for the beauty and fragrance of its flora. By neglect, its walls become dilapidated, its trees assume a dwarfish form, and its flowers amidst offensive weeds exhibit but a sickly bloom. How many that go forth with collegiate honors and mingle in the affairs of men, fail to enlarge their minds by reading and reflection beyond the daily incidents of life. Some may in after life avoid laborious habits, others may cherish evil propensities. Hence arises an unjust prejudice against these higher institutions of learning. But while we look upon the sad features of this picture, justice demands that we turn and look upon its opposite, in which we see the powers of human thought multiplied and enlarged, the mind disciplined and prepared for the acquisition of a more useful and extended knowledge in after life.

We therefore make a distinction between the knowledge acquired in youth at literary institutions, and that which is obtained in manhood, the former preparing the way for the latter. We abhor those schemes that have for their object a common standard in learning for all our fellow citizens. A common level may be pleasing to some, but a sad misfortune to the many. The same rule is applied to the mechanic, and to the varied labor of man must be applied to the republic of letters. All have their own sphere of action, all have their peculiar train of duties. It is not possible for all laboring men to become adepts in the varied mechanic arts, and it would be unwise in them to make the attempt. So in the walks of knowledge, all men cannot be adepts in the varied sciences. All may however attain to a certain degree of perfection in knowledge in his own sphere of action ; and it is when this rule is applied that we have an intelligent community. It is not possible for the great mass of young men that are approaching the stage of human action to receive even an academic education ; the number of these institutions is too limited to accommodate the throngs that move in the circles of society.

Then what must be done to equalize mankind, we know of no better scheme than that which requires a man to become great in his sphere of labor, and in the popular knowledge of the day. Reading and reflection are indispensable for the acquirement of knowledge ; when we bring the agriculturist within this scheme and require him to learn the science peculiar to his calling, we throw around him every inducement to become the scholar of varied learning in physical science. The mere knowledge of plowing and sowing and gathering is far short of what the farmer should attain to. His legitimate studies are the construction of the earth's surface, the great field of his labor ; the laws that govern the moving elements around him, the constituents of the soil he cultivates, and the structure of plants and animals in reference to the food that is required to bring them to mau rity. When he has learned these sciences, even to an ordinary comprehension he has attained to a rank among men, at once conspicuous and influential. Of all classes of men the agriculturist has the most time to read and reflect ; we speak of those that pursue some calling after arriving at the age of manhood. What has the plowman to do after commencing his day's labor by striking out a land, when his team, in the language of the poet, voluntarily

> " Pursues with care the nice design
> Nor ever deviates from the line,"

but to contemplate the elements around him. How much time a company of field laborers have to discuss the varied topics connected with agricultural science during the toils of the day. They can do so with the same ease that counsellors discuss the principles of law in courts of justice. The farmer can devote the long winter evening to reading, and in the summer, many hours intervene the time of labor and repose. It has been asked, of what is the use of subjecting the mind to so severe a discipline and of adopting so rigid an economy of time? The same use that you would plant the seed of a fruit tree ; on its germination and during the first year of its growth, no benefit can be derived from it. In this process there is the *prospect* of the future although at times it is stricken with frosts and bent down with the weight of driven snows. So it is with the mind that sets out in early life in pursuit of knowledge, it has its growth and it must arrive at a certain age of maturity before the pleasure of its fruits can be enjoyed.

In view of the preceding remarks, all that is wanting on the part of the husbandman is, a *taste* for reading and reflection, and acquiring knowledge. We consider it exceedingly fortunate in a young man commencing life, though with limited means, and with an imperfect education, to possess moral propensities, industrious habits, and a *taste* for reading. Such an one will always find time to gratify his taste and improve his mind, a good foundation is laid thereby for his future prosperity and distinction among men. We therefore turn to the point at which we started, by repeating the gratification we feel in seeing the publication of agricultural essays in the popular journals of the day. In this kind of reading the mind is not only entertained, but the area of thought is enlarged and the beauties of the intellect are exhibited in a justly proportioned frame-work of knowledge. A. O.

PLOWING AND HOEING.

Though plowing and hoeing are the most common and simple operations in husbandry, still it is not certain that all the reasons for performing them are understood.

That the turf must be broken, and the grass side reversed, that the seed to be sown may have a naked surface which the young plant may exclusively occupy, is sufficiently clear at first sight. It is evident too that the subsequent growth of weeds should be repressed, and that the entire surface of the land devoted to a particular crop, should for the time being be its sole occupant. It is unnecessary to dwell upon these points for the purpose of making them plainer to farmers; although, if we might be permitted to judge from appearances only, it would appear that even the points noted above were not very well established.

In this brief article, we shall say nothing of the manner and mode of performing these important operations in husbandry; or the best form of the instruments designed for them; of the depth of furrow, or the width of the furrow slice; for in each particular, each will be modified by circumstances, and by the crop itself. Climate, too, will especially govern the depth to which the plow may profitably run, when time is taken into consideration; for there is little doubt that shallow plowing is better adapted to a warm climate than to a cold one.

But we proceed to speak of the objects which are gained by plowing. The objects of plowing and hoeing, then, belong to two classes—*mechanical* and *chemical*.

The first we shall not dwell upon, inasmuch as they are well understood. The breaking of the sod; the pulverization of the soil; the frequent renewal of a new surface to the atmosphere, are acknowledged to be the necessary means by which a crop acquires vigor and strength, and reaches an early maturity. But then again, although these mechanical operations are important, simply as mechanical, still they are necessary, that the chemical changes may take place. The chemical changes concern three agents—*heat*, *air* and *water*.

First, *Heat*. When a surface which is covered with a sod, or grass, is turned over, and the earthy side is brought uppermost, heat is rapidly absorbed, and the temperature of the whole is more elevated than it was in its original condition. This prepares the soil for the early germination of seed, and gives it a speedy growth at the beginning.

Second, *Air*. The looseness of the soil, which is effected by stirring or plowing, enables it to take up a greater amount of air than in its original condition. Upon this depends some of the most important changes which take place in the soil, and which are themselves subservient to the growth of the crop. To understand what these changes are, it becomes necessary to speak of some of the elements of the soil; for the simple presence of more air in the interstices of the soil is not in itself sufficient. We do not know that the spogioles of the roots can take in air or oxygen, or even carbonic acid, so long as they remain gaseous, or rather, uncombined with other bodies. We believe, at any rate, that these gaseous bodies, before they are received into the tissue of the plant, must be dissolved in water, or enter into combination with the elements of the soil.

The element which performs an important, not to say the most important function, is iron. It exists in two forms, a protoxide and peroxide: and it is probable that all soils contain it in both states, at the same time. Now the important fact which comes out of these two states, is this, viz., that plants possess the power of taking away from the peroxide an atom of its oxygen, when it will be reduced to the state of a protoxide; or if living plants have not this power, organic matter in the soil has. So that the iron, in its state of peroxide, is continually being reduced to its first state of oxidation; by which change it is furnishing oxygen either to the growing plant, or else furnishes it to the dead inorganic matter; by which it becomes an organic acid, and capable of combining with the alkalies and alkaline earths. These are then prepared to be received into the tissues of the living plant, by which it is nourished and matured. But the protoxide of iron does not long remain in this state. It soon takes again from the atmosphere another portion or atom of oxygen, and, as it would seem, only to be robbed again by the organic matter of the soil. Now, plowing and hoeing aid these changes: for free exposure to the atmosphere facilitates the oxidation of the iron; and to improved plants it becomes a necessary part of their cultivation; if we would forward their growth, we must facilitate also the round of these chemical actions.

But again, iron does not act upon the air alone; it decomposes water also. It robs water of its oxygen, as well as the atmosphere. This chemical change, in fact, is more important than the other; for, involved in this decomposition, is the formation of one of the most important bodies to vegetation. We allude to ammonia.

When water is decomposed by the protoxide of iron in the soil, hydrogen, one of the elements of water, is liberated. Now hydrogen, the instant its liberation is effected, by no means makes its escape a solitary and unattended body, into the atmosphere; but, instead of this, it seizes upon the nitrogen of the air in the soil, and forms ammonia. This in its turn is, or may be fixed by the salts in the soil, or will, under ordinary circumstances, be retained for the benefit of the growing crop, even if it is only dissolved in the water of the soil.

But another important object in plowing and hoeing, is to bring a fresh and new surface of moist soil to the atmosphere. For every time this is done, the new surface absorbs a fresh portion of ammonia from the atmosphere. Leaving out of view, then, the pulverization of soil, and the destruction of weeds, we see that another object is gained by a frequent stirring of the soil. Plants are thereby furnished with a greater amount of ammonia, from which the nitrogenous compounds in the crop itself are increased.

We may sum up in a very few words, the most important objects of plowing and hoeing.

1. The new exposed surface brought up by the plow or hoe, absorbs caloric in a greater proportion than when the same surface is covered with growing vegetables. In the spring the soil is warmed then, by means of the plow.

2. Plowing and hoeing aids and facilitates the absorption of oxigen from the atmosphere. The protoxide of iron in the soil, becomes a peroxide.

3. The peroxide of iron, when freshly formed, is readily decomposed by the organic matter in the soil. In other words, by this means the organic matter is burnt; by which it becomes an oxidized body, and capable of entering into combination with inorganic elements.

4. Water is decomposed also by the peroxide, by which means hydrogen is liberated; and which being in a nascent state, is disposed to enter into combination with nitrogen. This gives the soil ammonia, and of course indicates the method by which nitrogenous compounds are generated in the living vegetable.

5. Every fresh moist surface absorbs of itself the floating free ammonia of the atmosphere, so that a double source of this important element is provided for in the chemistry of nature.

Remarks. If the foregoing are not the only ends which are accomplished by plowing and sowing, it is plain that these must be among the most important.

We see from the foregoing view of the subject, that the analysis of soils is an important object, were it for the single purpose of determining the amount of iron in the soil, and the states in which it exists. And we see too that those writers upon agriculture, the editors of our journals, have only a faint view of the chemistry of nature, when they have undertaken to cry down chemical investigations of the soil.

Correct and productive, or profitable husbandry, must rest upon a knowledge of the physical and chemical laws of nature. A manufacturer might just as well think of extracting profits from the old mode of spinning wool and cotton, as the husbandman to obtain the largest profits from a farm by dint of labor alone, unassisted by the lights of modern science and modern improvements in the implements of husbandry.

HOW TO MAKE OLD LANDS NEW.

To bring about the reformation about to be described, it is necessary to recur to the condition of our lands when first cleared of forests, and sown for the first time to wheat, or planted with Indian corn.

The clearing of land, as is well known, in New-York and the Middle states, consists of chopping down the forest trees, and then cutting them into logs, and piling them, with their limbs, into large heaps, and burning the whole to ashes. The ashes are usually saved in part; but no inconsiderable part remain upon the ground. There remains also a large quantity of half burnt leaves, twigs, &c., which being intermixed with the ashes, constitutes a very valuable fertilizer.

Now it is impossible to imitate to the letter, by any artificial means we possess, the condition of the new lands of this country; yet, it is not impossible, in many instances, to make an approach to it, by which a decided addition to the fertility is added, and which will be retained for several years. For this purpose, raise from the pit a large quantity of peat; and when sufficiently dry to burn, partially consume it with a slow and smothered fire. There will be formed peat ashes and peat coal intermixed; both of which perform their own functions in the soil, and to the crop on which they are to be applied.

They are to be spread freely upon the land. It may be applied at the rate of 150 to 200 bushels to the acre. In the partially burnt peat, will be found potash and soda, chlorine, silica, both soluble and insoluble, lime, magnesia, alumina, sulphate of lime, and phosphate of lime, and coal in a fine state of division. We give the alumina on the authority of chemists; but the real ash of the peat probably contains phosphates of iron, lime and magnesia, and no alumina.

The office of the coal or charred peat is, to absorb and fix ammonia.

It may be observed, that however much farmers have differed in their views as it regards the effect of peat in its natural state, they can scarcely differ as it regards the power of this compound as a fertilizer, and at the same time see that it is essentially the material which is left upon the surface of newly cleared lands.

Of course the plan can be adopted only by those who have peat lands. But these peat lands are often situated at a point in the farm so distant from the barn, that it is impracticable to use barnyard manure. Where circumstances are favorable, then, this mode for restoring fertility to partially worn-out lands, will, we think, be regarded an important, as well as feasible measure.

IS IT PROBABLE THAT LIME EVER ACTS AS A POISON TO VEGETABLES?

The opinion has been expressed by one of our most distinguished pomologists, that lime sometimes acts as a poison. We refer to the opinion of David Thomas, on the action of a supposed calcareous soil upon the Kalmia latifolia, and which was communicated to the public by J. J. Thomas, in one of the early numbers the Horticulturist. The opinion was based partly upon observation and partly upon experiment. This beautiful shrub was observed in its highest excellence on the low range of mountains traversing the northern skirts of Pennsylvania. This soil, from its position, and its distance from any known deposit of limestone, was supposed to be destitute of lime. This led to the experiment of selecting a quantity of earth from the wooded ravines, which are underlaid by the shales of the Hamilton group, and which was supposed also to be equally destitute of lime with the soil of the Pennsylvania hills, which produces the plant in its highest state of perfection.

Now, it is not for the purpose of finding fault with opinions, but for the purpose of getting at their probable truth, that we call up this subject once more; for it has already been referred to in this journal.

The question, as it seems to us, can be settled by analyses of the soil and of the plant itself. Notwithstanding that David Thomas's experiment succeeded perfectly, by cultivating the Kalmia in his artificial soil, which was supposed to be destitute of lime; yet if that is proved by analysis to contain lime and especially if the Kalmia itself is found to contain a large proportion of lime, then the inference will be just that lime is not a poison to it; and that it is true that we shall not fail in cultivating this beautiful and ornamental shrub, in consequence of our soil containing lime.

Now, in regard to the fact that this artificial soil contained lime, we have shown before, by a thorough analysis. This we need not repeat here. Only we will say, that it contained a full average amount of lime which is found in the soils of Cayuga county.

Then again, we have analized the ash of the bark of the plant, and found it to contain the following earths and alkalies:—

Silex, - - - - -	16.88
Phosphate of iron, magnesia and lime,	22.22
Carbonate of lime, - - -	44.00
Magnesia, - - - - - -	13.55
Potash, - - - - -	2.50
	99.27

The lime, it will be observed, in this analysis, forms nearly one-half of the whole ash; hence we consider it safe to affirm that lime in this instance is not a poison to the plant. This analysis we deem correct in the main; but as we had only five grains of ash to work upon, we may find some slight errors to be corrected. But that those errors, if any, will affect the doctrine we have attempted to establish in this article, we do not expect nor believe.

The subject and the inquiry is an important one; and hence ought to be pursued until agriculturists can feel that they have a sure basis of practice, in the use of lime and calcareous manures. If they feel uncertain as it regards the use of lime; if they feel that their plants are in danger of being poisoned by its use—certainly it will be a long time before lime will be employed to that extent in husbandry which we think it ought.

Besides, if the charge of poisoning is untrue, it ought to be freed from the charge. If not true, an indictment ought not to stand on the books of the agriculturists, without good and sufficient reason.

WHY ARE ASHES MORE VALUABLE AS FERTILIZERS THAN LIME OR GYPSUM?

Our neighbors of Long Island have become famous for their trade in ashes. They send their boats the entire length of the Mohawk valley, and they would push their enterprize as far as the Black river valley, if the Black River valley canal was completed; and they could well afford to transport not merely the live ash, but the refuse ash which has been exhausted of its potash. They have been in the habit of buying the refuse of the asheries of Albany and Troy, and paying as much for it as the soap-maker paid originally for the live ash. In looking about for a fertilizer, the Long Islanders have found by experience that they form the best which they can employ. The question we have propounded demands an answer; we therefore proceed to state, that ashes owe their value to their composition. Our reader will perhaps say that he knew this before. Very well. We say again, and more to the point, that ashes, spent and unspent, owe their principal value to the potash in the first instance, and to the phosphates, and to lime and magnesia, in the second. We design to speak mainly of spent ashes; though we believe farmers had much better keep all their ashes for their corn and wheat lands, rather than sell them for one shilling per bushel.

Spent ashes, then, we repeat, are valuable for the phosphates they contain, together with the lime and magnesia, which are in a state of great subdivision. Besides the foregoing elements, silex, both soluble and insoluble, is present. The amount of the former will vary in the quantity, by the intensity of heat to which the vegetable may have been subjected; and both will vary according to the plant from which they may have been obtained. Thus, the yellow pine which grows on the sandy lands west of Albany, contains in its ash of the bark, nearly one-half of its weight of silica.

When the value of ashes is sought for, it may with propriety be said, that they rank next to bone dust. Containing as they do, phosphate of magnesia and iron, together with a large percentage of lime. The ash of forest, as well as fruit trees, is as various as their own products; scarcely two agreeing either in the amount of ash they yield, or in the elements which compose it.

We have already a large amount of important information respecting the ash of plants, which we shall soon lay before our readers.

METEOROLOGICAL OBSERVATIONS.

BY A. HOPKINS.

Dr. Emmons:—You will find below, a statement of the amount of rain which has fallen here during the past year. The apparatus for measuring it is the same as was described in my last year's report. I then gave the proportionate amount for the several months, and the amount in *inches* for the year. I now give the proportional amount, as before, in the first column, and the number of inches for each month, in the column adjoining.

	Proportionate amount.	Inches.
January, - - -	58	2.295
February, - - - - -	30	1.188
March, - - - - -	47	1.771
April, - - - -	30	1.219
May, - - - - -	86	3.404
June, - - - -	48	1.891
July, - - - -	119	4.692
August, - - - -	51	2.044
September, - - -	32	1.260
October, - - - -	58	2.283
November, - - -	132	5.200
December, - - - - -	62	2.444
Amount, - - - - -		29.693683

The decimals for the months are not carried out at length, but the whole amount is given at the foot. It will be seen that the season has been dry, compared with last year. The amount of rain is less by about eight inches. It will be seen that February, March, April, and June, were all dry months. May about an average. So that, although July was rather a wet month, yet the moisture was mostly absorbed by the surface, and did little towards raising the springs. Towards the close of summer, wells began to fail; and before the end of September, this was true with us, to an extent almost unexampled. Probably the effect was due, in part at least, to the small amount of moisture which fell, in the late winter, and early spring months. Though counting from the 20th of August to the 20th of September, the amount of rain was only 0.669, including one or two weeks of excessively hot weather in September. The great scarcity of water, this season, has led our citizens to enquire for a permanent supply from the hills; of which, as you are aware, we have many of no mean altitude around us.

Having been appointed, among others, to examine several springs, I took the opportunity to ascertain the temperature of them. As facts of this kind have some meteorological interest, I will give the temperature of a few of our largest springs, as then ascertained—September 21st.

	Temperature.
A large spring at the base of Saddle Mountain,	47°
Do. of another, " " "	45
Another on Stone Hill, - - - - -	48
Of my well, - - - - - - -	48.5

You are aware that several springs in this valley are *thermal.* I shall endeavor this season to excite a little zeal among the members of my class, on the subject of experimenting upon these points. And unless something unfavorable to the Taconic system should appear, shall ask the privilege of incorporating any facts we may arrive at, in my next annual report upon the amount of rain.

Williams College, Feb. 22, 1847.

The distribution of the fossil plants in the different rocks, according to M. Göppert, is as follows:—

Palæozoic,	52
Carboniferous,	819
Permian,	58
Triassic,	86
Oolitic,	234
Wealden,	16
Cretaceous,	62
Tertiary,	454
Unknown,	11
Total,	1,792

FRUITS, INSECTS &c.

BY N. S. DAVIS.

Agreeably to your suggestion I give you the following account of the fruit crop in Binghamton and its vicinity. Apples, pears, cherries, plums and grapes constitue the principal variety of fruit cultivated in this section of country. A few peaches, however, are successfully cultivated on the hills and colder locations around us ; if planted in the warm gravelly soil in the valley of the rivers, they bud and blossom so early that the fruit and the tree also is very generally cut off by frosts ; but all the other kinds of fruit named, when well cultivated, attain a high degree of perfection.

For three years previous to the one just past, the apple trees in all the section around our village have been rendered entirely barren by late frosts. Last fall however, the apple orchards were heavily loaded with fruit, of fair size, and where pains had been taken in its cultivation, of excellent flavor ; but great and almost universal neglect, or want of proper care and cultivation in regard to the apple orchards prevails among us, and much injury is also done to our best varieties of the apple, by the apple worm. The depredations of this insect and worm have been increasing for several years.

Indeed, so prevalent has it become that scarcely a bushel of apples has come under my observation during the past year, that I could not select out many that had been penetrated by the worm, and I know of many good trees whose fruit has been entirely spoiled by it. Comparatively few pear trees are cultivated in this vicinity, but those few were the past autumn well loaded with a good quality of fruit. The plum and cherry trees have flourished with us until the last four or five years, and in some localities or neighborhoods they flourish well yet, and have yielded an abundance of good fruit during the past season ; but in very many localities both these trees have been attacked by the Rynchinus nenuphar or plum weevil, and not a few of both varieties have been entirely destroyed, being converted into rough, spongy black, insightly stumps ; many more are fast assuming the same aspect. Indeed so prevalent has this destructive insect become with us, that in our village and vicinity almost every plum and cherry was attacked last spring by it, and the crop entirely destroyed. My own plum and cherry trees looked very prosperous early in the spring, they blossomed well, and set very full of plums and cherries ; but they had scarcely attained the size of pepper corns, before every plum and cherry showed the smicircular cut of this insect, and not a single one of either attained maturity. They were not content, however, with the fruit, but they fiercely attacked the tender twigs of the trees also ; for myself, I carefully picked up the destroyed fruit, and the affected branches, and burned them in hopes of lessening the influence of this depredator another year. And if all my neighbors had done the same thing, I have no doubt but we should soon rid ourselves of this truly annoying insect ; but here is the trouble, the great majority will neither learn the habits of this fruit destroyer, nor take any steps to protect themselves from its ravages. I have frequently called the attention of our community to the subject through the local press, and I have urged our County Agricultural Society to appoint a committee to investigate and report on it together with all other insects and worms injurious to vegetation, but thus far my urging has been in vain. It does seem to me, that if all our agricultural societies, instead of spending all their energy and means on an annual fair, and cattle shows, would appoint committees to investigate, not only the subject of insects and worms, but noxious weeds, wet lands, the proper principles of draining, the varieties of fruit, grain, &c., best adapted to their particular localities ; the kind of manure and mode of cultivation adapted to the same ; and the best means of improving stock and preserving the health of the same, it would not only advance the interests of agriculture an hundred fold faster, but would render such societies more than an hundred fold more interesting. I know the common objection is, that there are not men enough belonging to the county societies, who are by education &c., capable of acting on such committees ; but if this is so, it is not because there are not men enough in every *county* capable of serving on such committees ; it is rather because the men best qualified taking but little interest in a mere cattle show, have hitherto stood aloof from active participation in such societies ; only let the cause here proposed be entered upon, and there would be no difficulty in enlisting every intelligent member of the legal, clerical and medical, as well as agricultural professions. The members of the medical profession especially, from the very nature of their education, are peculiarly qualified to aid the agriculturist in many departments of his calling. And our agricultural societies only have to open the way, to ensure their hearty coöperation ; but neither ministers nor doctors often have fine horses, fat cattle, or big squashes to exhibit, and hence they will never take great interest in a mere agricultural exhibition. I am by no means arguing against such annual exhibitions, but what I would urge, is, that while " they do the one, they would *not* leave the others *undone.*" Will not the whole agricultural press speak out on this subject, that another year may not pass away without more improvement ?

Binghamton, 1847.

N. B. I have omitted the name of the apple worm, because I cannot recall it to mind this moment.

INFLUENCE OF FOOD ON COWS FOR THE PRODUCTION OF MILK.

BY C. N. BEMENT.

Farmers in general are not fond of trying experiments, and are more attached to their old customs than persons of other professions; this may arise frcm the value of their labor, which they cannot spare from other avocations to make experiments, and from fear of being laughed at by their neighbors should they be unsuccessful. The best way, therefore, to introduce any thing new is to give facts from occular demonstration.

Being rather fond of making experiments myself, I had an opportunity of gratifying my propensity, while I resided on my farm at Three Hills. The results of some of the experiments made, I have freely communicated. I have given some experiments in regard to making butter in cold weather, by the scalding process; I have also endeavored to ascertain the difference in the quality of milk from different cows; the quantity of milk it takes to make a pound of butter, &c., &c.

To make cows give an abundance of milk, and of a good quality, they must, at all times, have plenty of good nourishing food. It was my desire to ascertain the *kind of food* best calculated to produce the richest and greatest quantity of milk. Grass is generally supposed to be the best food yet known for this purpose, and that kind of grass which springs up spontaneously on rich upland or hilly soils is considered best of all. It is also generally believed, and confidently asserted, that old pastures alone can ever be made to produce rich butter. This, however, I know from my own experience to be a popular error, as I have had as rich and high flavored butter made from the milk of cows fed on meadows, or aftermarth, as it is called by some, as those fed upon very rich old pastures.

It is well known to the most superficial observer, that in order to obtain milk from a cow, something must be given her to manufacture it from. For proof of this I will only refer to those persons who keep one or two cows. Such persons generally *slop* their cows—that is, they feed them on slops or swill of the house, with a small quantity of bran, ship stuffs or Indian meal mixed with it. Cows thus fed, in addition to hay or grass, generally produce more milk than when fed on grass alone; evidently showing the necessity, if not economy, of liberally feeding cows while in milk. From my own observation, I am induced to believe that the *kind* of food has probably more influence upon the quantity of the milk than any other circumstance. It is well known to most dairy farmers, that the wild onion, the cabbage or turnip, when eaten by the cow, imparts to the milk and butter an unpleasant and disagreeable taste. It has been observed too, that when fed upon one pasture a cow will yield more cheese—upon another, more butter. Hence the difference in the quantity of butter made in different parts of the country. Orange county butter has long enjoyed a high reputation; but the best flavored butter I have ever tasted came from the hills of Vermont.

The experiment I am about to communicate, will show the influence of food on the quantity of milk produced from a given number of cows, in the months of June, July, August, and a part of September, in all fourteen weeks. It is not, of course, very definite, still it shows the quantity of milk produced was graduated by the quantity of food consumed. Probably the temperature of the weather may have had some influence.

The following table shows the results as far as it goes:—

Influence of food on the quantity of milk obtained from a given number of cows, per week, for fourteen weeks.

From		*lbs. of Milk*	*State of the pasture.*
June 1st	to 7th	937½	Grass rather poor,
8th	" 14th	1036	" better—fresh pasture,
15th	" 21st	980	Pasture good—one cow sick,
22d	" 28th	836	Grass short,
29th	" 5th	724	" short and poor,
July 6th	" 12th	803	Pasture some better,
13th	" 19th	679	Grass very poor,
20th	" 26th	514	" still diminishing,
27th	" 2d	488	" still poorer,
Aug. 3d	" 9th	479	Feed very scant,
10th	" 16th	450	" very poor indeed,
17th	" 23d	966	Fresh pasture—aftermarth,
24th	" 30th	846	Grass diminishing,
Sept. 31st	" 6th	868	" improved by rains.

In order to have made the foregoing complete it would have been necessary to have churned the cream and noted the amount of butter obtained from the milk of each week. It was my intention to have continued the experiments in the stable, but something occurred at the time, which at present I do not recollect, that prevented, and it was dropped.

The influence of breed upon the quantity and quality of milk is well illustrated by the result of a series of trials made at Bradley Hall, Derbyshire, England. During the height of the season, and when fed upon the same pasture, cows of four different breeds, gave per cow:—

Breed	*Milk*	*Butter*	*or 1 lb. of butter yielded by 12 qts. milk,*
Holderness	29 qts.	38½ oz.	12 qts. milk,
Alderny	19 "	25 "	12 " "
Devon	17 "	28 "	9¾ " "
Ayrshire	20 "	34 "	9½ " "

It would appear from the foregoing trial that the Ayrshire cow gave the richest milk, and a larger quantity of both milk and butter than the Alderney or Devon, but the Holderness breed surpassed them all. It gave ¼ lb. more butter than the Ayrshire, and nearly one half more milk. It would appear therefore that the Holderness breed would be admirably adapted to the purposes of the city dairyman, whose profit arises from the sale of milk only.

The old Yorkshire stock, a cross between the improved short horn and the Holderness, is preferred by the London cow keepers, as giving the *greatest quantity of milk*, though poor in quality.

In spring the milk is more abundant; in autumn, other things being equal, it yields less cheese, but a larger return of butter. Where cattle are fed upon grass only, this observed difference may be derived from a natural difference in the quality of the herbage upon which the cow is fed.

If the cow is milked only once a day it will yield a seventh part more butter than an equal quantity of that which is obtained by two milkings in the day.

THE EXPERIMENTAL HUSBANDMAN.

BY C. N. BEMENT.

Although agriculture is not allowed to be the most necessary of all arts, it is nevertheless a subject worthy the attention of the greatest and wisest men. When the Almighty chastised the first man for his offence in eating the forbidden fruit, he yet preserved so much tenderness for him, that he made his labor necessary to him, and his practice of agriculture a resource against his misery. 'Tis too much luxury and pride which has rendered agriculture a despicable calling ; and has made some sort of men suppose it a trade only worthy such of the sons of Adam as were good for nothing else, and whose poverty could only make them undergo the hardships of it.

But this was not the idea which the true Roman spirit had of Agriculture ; their warriors, on their return from battle, from subduing nations, were impatient to cultivate their lands, and thought it no disgrace to follow the plow, and at the same time prepared to serve the wants of the state, and attend the councils, or put themselves at the head of armies. The natural historian tells us, that in those days the earth bore testimony, by the richness of its productions, how much it rejoiced in the honor of being cultivated by hero laborers and dug up by a spade crowned with laurels.

But I do not propose this as an example for every one to follow. The manners of men are too much changed, and our senses too refined, to receive the austerity so much esteemed by the first Romans ; I only wish that the world may conclude with me, that the study of Agriculture is not unworthy the greatest men, leaving the most laborious part of that to professed farmers and laborers ; for may not the learned at least contribute to their work, in reflecting for them upon the uniformity of Nature in the production of its works, and in assisting those workmen towards perfecting an art, which is yet so little understood ; yes, certainly; and such as can furnish just remarks, and such observations as are useful to the public are praiseworthy.

Farmers being only guided by experience, and seldom led to reflect upon the principles of their art; the knowledge they have is for the most part historical, and is wide from the course of what they see; they sow grain in the earth, and when it is reaped and carried away they know the ground must rest, or be amended by some sort of manure. The seed grows, if the soil is good; but how does it grow, and in what degree, or by what means, is this vegetation produced? This would be too much to ask of them, and the very question would be lost. They plant a tree, as their fathers did before them; but might it not grow better, if they were to follow some other method. Would not Nature work with more facility in her operations, if by studying her laws we were to take necessary preparations to ease her in her works? But their studies are not of that extent. They act agreeable to the practice they have seen, and the old beaten path they have been bred up in, stands them in lieu of reason.

On the other hand philosophers often want the experience of the farmer; many of them form systems in the air, upon which they build abundance of specious reasonings, but have nothing solid in them, because they are not founded upon the true basis of natural knowledge, which is experience; it is therefore no wonder if many of those speculative system makers fall into mistakes. We may compare them to enchanted castles founded upon magic, which have nothing real in them, and vanish in smoke, in the very instant when we should admire their beauties.

But when we find a wise and laborious man, who joins reason with experience, we cannot fail of some happy production from him, both useful and in the road of truth, sooner than enjoy even one of these agreeables, from one who has but one of these excellencies.

To cure one of chewing Tobacco, it would only seem necessary for him to look a moment at the exspirted juice upon a clean bed of snow.

NEW-YORK STATE AGRICULTURAL SOCIETY.

MEETING EXECUTIVE COMMITTEE, FEB., 18, 1847.

Present—Geo. Vail, President; Wm. Buel, C. N. Bement, Vice-Presidents; A. Stevens, T. J. Marvin, J. T. Blanchard, Ex. Committee; B. P. Johnson, Secretary; Luther Tucker.

Proceedings of the board of agriculture of the State of Ohio, were received from Mr. BATEHAM, editor of the Ohio Cultivator, and the thanks of the Society were voted him. Letters were received from Z. B. Wakeman, Herkimer; H. S. Randall, Vice-President; W. Winthrop, Esq., U. S. Consul, Malta; Lewis F. Allen, Esq., on the subject of fruit, and the location of the Fair, and from Hon. E. Burke, com'r of patents, proposing an exchange of documents and publications with the Society; from A. L. Fish, Herkimer county, on the subject of cheese dairies, accompanied with a proposal to make experiments with a dairy of 50 cows, the ensuing season. The Secretary was directed to accept the proposal made by Mr. Fisk.

Col. J. M. Sherwood, ex-president, presented to the Society a draft of the buildings and show grounds at Auburn, neatly framed, and the thanks of the Society were voted him.

A premium of $15 was awarded to Charles Lee of Penn Yan, for his crop of spring wheat, raised in 1845, being the best crop raised that year—a mistake having occurred in the examination of his papers when presented.

T. J. Marvin, Esq., presented a bond, as required at the last meeting of the committee, in relation to the erections, &c., at Saratoga, for the Show and Fair, which was accepted.

The committee on the premium list, presented their report, which was accepted, and the list, after examination and amendment, was adopted, except as to fruits, which was refered to Messrs. Johnson, Stevens and Bement, to perfect, after receiving statements from Mr. L. F. Allen, to whom the subject was refered at the annual meeting. The secretary was directed to have the list published.

Messrs. Tucker, Johnson and Geddes, were appointed a committee to prepare statements in relation to the manner of conducting experiments in the fattening of different animals upon Indian corn, for the purpose of ascertaining its value for that purpose—and to report at the meeting of the committee in March.

The President, Mr. Bement and Mr. Johnson, were appointed a committee to prepare premiums for animals from other states and countries, to be added to the premium list.

Report of Mr. Bement on D. B. Stockholm, Esq., communications on "chemical guano," presented and adopted at the last meeting—that the committee have carefully examined the same, and from the statements made and certified by B. Gifford, it appears to be a valuable discovery. The results of the experiments made the last year, are truly wonderful, and if on further trial it should prove equally satisfactory, Mr. Stockholm deserves great credit for the discovery, provided he makes the discovery known to the public, and will stand in the enviable position of being a great benefactor to his country, as causing "two blades of grass to grow where but one grew before."

As Mr. Stockholm has not divulged the method or materials with which his "chemical guano" is composed, the committee cannot form an opinion of its relative value; and as he intends to prepare enough for testing its qualities the coming season, the committee would recommend a further trial, before an opinion of its merits or demerits can be passed upon by the Society.

B. P. JOHNSON, *Secretary.*

PUBLICATIONS.

THE AMERICAN POULTERER'S COMPANION.

This valuable work has passed through four editions, which must be regarded as substantial evidence of the usefulness of the work.

The fifth edition is much improved, both in additional matter, and in the style and execution of the work generally. It contains all that is necessary to be known in regard to the raising of poultry; and as this is a branch of business which is both profitable and interesting, we hope the work will fall into the hands of the younger members of the family throughout our land. It is well adapted to our school libraries, where we hope it may be placed, for the general benefit of the young.

PROGRESS OF NATIONS: By E. C. Seaman. Published by Baker and Scribner, 145 Nassau street, New-York; pp. 455.

We are indebted to our friend O. C. Gardiner, esq., for a copy of this valuable work. We can only remark at this time, that we see that the work is full of valuable and interesting facts, embracing mining, agriculture, manufactures, commerce, banking, revenue, etc. We shall at some future time notice this work in detail.

ERRATA—In the article on the "Operation of Nitrogen on Plants and Animals:—

On p. 33, 14th line from bottom. the word *proposition* should be *proportion*.

Page 34 2nd paragraph, "the plant *is known*" should read "the plant *to be grown*;" and in same line, "*is* now well established," read "*though* now."

Same page, 3rd paragraph, 2nd line, *from*, should be, *of some*.

Same page, 4th paragraph, 2nd line, *facts*, should be *days*.

AMERICAN JOURNAL

OF

AGRICULTURE AND SCIENCE.

This work will be issued hereafter monthly, at two dollars per annum payable in advance. It will form two volumes at the close of the year of three hundred pages each, and will be illustrated by plates and wood engravings.

The object of this Journal is to disseminate useful knowledge relating to Science, the Arts, and Agriculture, and to promote sound views in education. It is in fine designed for a farmers' magazine, and no efforts will be wanting to make it a welcome visiter in his family.

Communications may be addressed as usual to the conductors at Albany or when more convenient, to the publishers, Huntington & Savage, at 216 Pearl st., New York.

E. EMMONS,
A. OSBORN.

Albany, January, 1847.

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No. XII. APRIL, 1847.

DISTRIBUTION OF THE INORGANIC MATTER IN VEGETABLES.

BY E. EMMONS.

1. The distribution of the inorganic matter of plants, has hitherto received but little attention. M. A. Vogel has examined the ash of a few fruits; M. A. Leuchtweiss the ashes of the seeds of the cannabis sativa; Kleinschmidt the ash of the acorn; and M. Poleck the seeds of the pinus picea and sylvestris. The inorganic matter of a few only of the woody plants has received the attention of chemists at different times; and hence it must be acknowledged that the ash of the forest and fruit trees have been hitherto greatly neglected. And when it is considered that much light may be thrown upon their cultivation, by trustworthy analyses of their ashes, it is somewhat surprising that the subject has received so little attention by the active chemists of the present day.

The value of analyses of the ash of cultivated plants, is well set forth in a memoir on the ash of the oat, by Mr. Norton, which received the premium of the Highland Agricultural Society of Scotland, in 1846.

The same may be said of Mr. Horsford's analysis of the red clover, in Baron Liebig's laboratory at Giessen, about the same time.

The earliest recorded labors in this field of enquiry, are those of Saussure. He first established the importance of the inorganic constituents of vegetables; but in consequence of the defective method of quantative analysis pursued at the time his labors were in progress, he failed to recognize the most important elements contained in the ash. The merit, however, still remains with Saussure, of having in the first place proved the importance of the inorganic constituents of plants.

Berthier also made many analyses of the ash of the different kinds of wood; but his objects were not particularly designed for the improvement of agriculture. He however discovered an important fact, that the nature of the ash was changed by the composition of the soil in which the tree grew. But a still more important fact, and which agreed with the observation of Saussure, was, that the ash of different species of trees growing in the same soil, were different; and hence the doctrine may be said to have been established to a certain extent, that the roots of plants possess the power of selecting the inorganic matters stored up in their tissues. Other chemists, pursuing the same train of enquiry synthetically, have shown that certain elements in the soil are essential to the perfection of the seed; and that, for the full development and maturation of fruit, both organic matter and the phosphates must be present in the soil.

2. If there is one arrangement more beautiful than another, in the disribution of the inorganic matter of vegetables, it is that by which is secured the accumulation of all the elements which are necessary to the growth of a plant in its seed; for, regarding it, as we undoubtedly may, as analagous to the egg of animals, we find the substances which are necessary for the nutrition of the young plant stored up for sustenance, whenever germination takes place. Hence the young plant, for a time, or in the first stage of development, is placed in a position independent of the soil. In the seed then, especially, the inorganic matter is stored up in a condition to meet the immediate wants of the embryo plant, the stock of which in a perfect seed is sufficient to administer to its growth and its existence, until it can supply itself from the great storehouse, the earth.

3. Pursuing a little farther the history of the analsyses of the ash of vegetables, it will be seen, on consulting the work entitled Rural Economy, that Boussingault has been one of the most active in studying analytically the composition of the ash of vegetables. The special object of his enquiry was the determination of the amount of the inorganic matter removed in the crop. The problem itself is an important one, as by its determination the farmer could easily calculate how much of the valuable constituents were removed, and perhaps sold in his hay, oats and potatoes, all of which would be forever lost to his soil. He would be able to calculate how far this exhausting process might be carried, without much detriment to it; and when, in the ordinary process or course of cropping, he must cease to exhaust his land, and must begin to restore to it what had been removed.

4. Another important fact, which I may with propriety refer to in this place, is the absence of alumina in the ash of vegetables hitherto examined. This is the more remarkable, from the

circumstance that alumina is one of the most abundant elements in the soil; that silica, which seems quite as insoluble, under some circumstances, as alumina, is by no means rare in plants. The cause of the absence of alumina is considered by Will and Fresenius, to be wholly due to its insolubility in phosphoric and carbonic acids. It is well known that Saussure, in his earliest analyses was mistaken when he stated that the ashes of the bilberry, pine, and rose laurel, contained respectively 17.5, 14.8, and 28.8 per cent of alumina.

5. I might in this place propound the question, if alumina is of no use as a constituent of the inorganic matter of vegetables, what is the function which it exercises in the growth of vegetables? What function does it fulfil in the soil? Silex, lime, magnesia, oxides of iron and manganese, potash and soda, chlorine and iodine, all abound more or less in the ash of plants; while alumina, one of the most common of earths, is excluded from exercising an agency in building up their inorganic structure. The question I will not attempt to decide in this place; but I may suggest the most obvious answer to the enquiry, viz., that the function of alumina is wholly mechanical in the soil; that it serves simply to hold together the materials composing the mixture in which vegetables are to grow.

6. I have already stated that only a few analyses of the inorganic matter of forest and fruit trees have as yet been made. These however are interesting; and hence I propose in the first place to transcribe a few of them to the pages of the Journal.

The analyses are full, and trustworthy, and valuable; but I hope it may not be deemed presumptuous, if I remark in this place, that certain facts which I shall state in the proper place, diminish materially their value. These facts do not relate to the mode of analysis, or to the accuracy of the results obtained, but to the selection of the ash employed in the analysis. This remark, however, applies only to the ash of the woody part of vegetables, and not to the seeds.

Analysis of 100 grs. of the ash of the seeds of the *Pinus picea* and *sylvestris*, by M. Poleck.*

	P. picea.	*P. sylvestris.*
Potash, - - -	21.75	32.37
Soda, - - - - -	6.76	1.26
Lime, - - - -	1.54	1.86
Magnesia, - - -	16.79	15.09
Peroxide iron, - -	1.31	3.01
Phosphoric acid, - -	39.65	45.95

* Annalen der Chemie und Pharmacie, t. L., p. 414.

Chloride of sodium, -	0.57	
Silex, - - - - -	11.71	10.44
	100.07	89.98

Composition of the ash of the wood of the *Pinus sylvestris* and *Pinus larix:*

	P. sylvestris.	*P. larix.*
Potash, - - - -	2.29	10.87
Soda, - - - - -	13.09	5.55
Lime, - - - - -	26.09	19.31
Magnesia, - - -	16.24	7.49
Oxide of manganese, -	14.94	9.65
Silex, - - - - -	2.50	2.57
Phosphate of peroxide of iron,	4.29	4.41
Sulphuric acid, - -	1.60	1.22
Chlorine, - - - -	0.74	0.40
Carbonic acid, - - -	12.50	22.15
Carbon, - - - -	6.03	7.49
	100.31	91.10

Analysis of 100 grs. of the ash of the wood of the Apple-tree—by Will and Fressenius:

	Carb. acid included.	*Cab. acid deducted.*
Potash, - - - -	14.67	19.24
Soda, - - - - -	0.32	0.45
Lime, - - - - -	45.19	73.60
Magnesia, - - -	5.30	7.46
Peroxide of iron,		
Phos. of peroxide of iron, -	1.71	2.41
Phosphoric acid, - -	2.95	4.15
Chloride of sodium, - -	0.32	0.45
Chloride of potasium,		
Sulphuric acid, - -	0.65	0.93
Silica, - - - - -	0.93	1.31
Carbonic acid, - - -	24,10	
Charcoal and sand, -	2.03	
	97.26	100,00

Analysis of 100 grs. of the ash of the fruit of the Horse-chesnut—by De Saussure:

Carbonate of potash, - - -	51
Phosphate of potash, - - - -	28
Chloride of potassium and sulph. potash,	3
Earthy phosphates, - - - - -	12
Silica, - - - - - -	0.05

Metallic oxides, - - - - -	0.25
Loss, - - - - - - -	5.25
	100.00

The most important facts brought out in the foregoing analyses, are the great amount of phosphates, phosphoric acid and alkalies, in the seeds of plants; elements, which we have already remarked, as indispensable to it in its young state.

The same fact appears in Shepard's analysis of the ash of the cotton seed, already published in this Journal.

Analysis of the ash of the *Tobacco*—by Will and Fressenius:

	Powder of leaves.	*Powder of stalk.*
Potash, - - -	6.01	7.35
Soda, - - - - -		
Lime, - - - -	31.74	27.09
Magnesia, - - -	10.01	10.31
Chloride of sodium, -	2.06	4.38
Chloride of potassium, -	2.88	2.10
Phosphate of peroxide of iron,	4.32	5.19
Sulphate of lime, - -	3.94	6.46
Silica, - - - - -	4.03	5.72
Carbonic acid, - - -	17.08	17.30
Charcoal and sand, -	19.36	13.80
	100.65	99.74

It is necessary to make only one remark in this place, namely, that it is possible to ascertain by analysis, the entire amount of the inorganic constituents which any given cultivated crop takes from the soil annually, and which, under some circumstances, the different parts of the same plant which are left to decay upon the soil, will restore to it. By a careful analysis of the soil from which these fixed constituents are drawn, we may construct a scale, upon which may be recorded the losses to which the great storehouse, the soil, is subjected—the nature and kind of drains which flow from it; and hence, too, the nature and kind of supplies by which these drains must be met.

6. The foregoing remarks, together with the analyses, which are intended to illustrate them, and to show the importance of the investigations, contain, however, an imperfect and unsatisfactory view of the ash of vegetables. It is true, that they serve several important purposes, namely, the fact that the inorganic matter of trees and seeds differ with the species from which the ash is obtained; and furthermore, it does not appear that these differences are accidental: though it is still true that certain elements may be replaced by others, without apparent injury to the growth of the

plant, or without producing a visible deterioation—yet it is shown that in the case of tobacco, the substitution of lime for potash, injures greatly its commercial value.

It is unnecessary to dwell here upon the importance of this single discovery; for no one can fail to inquire, if the properties of one plant are injured by substitutes, may not many of our most important vegetables products be injured also; or may they not be greatly improved by supplying them with certain inorganic elements. An inquiry of this kind comes up at once, with respect to our most important esculents and cereals; and probably it will be found, that upon a supply of certain kinds of food, their most important properties depend.

7. I have already observed, though the remark may appear hazardous, that former analyses of the ash give us only imperfect views of the composition of the inorganic matters of an individual species. The observation is founded upon a fact, which appears to hold good in a majority of cases—namely, that the wood of different parts of the same organ contain not only an unequal quantity of ash, but an unequal distribution of the same elements. For example, the wood of the trunk of most forest and fruit trees contain a less percentage of ash in the inside than the outside wood; and especially does this fact hold good, if the bark is taken into consideration, which contains in some instances ten times as much ash as the wood of any part of an individual tree.

When I had ascertained the necessity of analysing the bark separately, not only on account of its composition, but also on account of its great amount of ash, it occurred to me that possibly a law may exist which controls the distribution of the ash in the plant. This law I supposed might be represented by two combined movements of the inorganic matter: one an outward movement from the centre to the outside, and another by an upward or an axial movement, by the same process, operating in that direction.

8. It may not be possible, however, to prove the first movement, inasmuch as the diminution of inorganic matter may be occasioned by its transference to the superior branches, in order to contribute to their growth, rather than to the growth of the last annual layers of wood, which constitute the outside of the tree. The fact, however, which it is designed to convey is, that in process of time, the inside or heart wood, loses a part of its inorganic matter; that it contains less than when the heart wood was itself the sap or outside wood.

I do not, at this stage of inquiry, assert that the ash of the inside wood is always less than the outside. It is in a great majority of instances. Still, a few woods have been met with, in which it was the reverse. But in these instances, there were circumstances which went to diminish the force of the objection to the general rule. They were either small trees, or were those of which I was unable to procure examples in a green state.

9. The law which is expressed by the axial movement of the inorganic matters, is by far the most important. It is by this law that an annual return is made to the soil of the most important matter, such as the phosphates and the alkalies. If these matters were allowed to be hoarded up in the trunk of the tree, it would destroy by its own consumption, that food which now serves to give it vigor for centuries. The leaf, and the nut or seed, which is charged with the alkalies and phosphates, falls beneath the spreading branches and in the immediate reach of the roots: they decay annually, and thus furnish a re-supply of these most important elements.

So the bark, which contains a great store of inorganic matter, in many instances falls off and rots, and yields up its storehouse of inorganic food to the still growing vegetable. These beautiful arrangements, which are designed to secure perpetuity to the pines and oaks, ought not to be overlooked or forgotten. The useless rind of the walnut or butternut, contains much potash; but it is speedily prepared by decay, to return and circulate through the vital organs. In this arrangement, we see too how solubility operates in the distribution of the inorganic matter. The most soluble, as the alkalies and chlorides, go to the organs which annually perish; or in other words, they are distributed to the periphery of the vegetable, and hence are enabled to circulate annually in the sap of the individual. Such appear to be some of the beautiful arrangements which are established in the distribution of the inorganic matter. First, there is an accumulation of the most important elements in the seed: this is effected by the axial movements of the sap or food, which has been referred to. And, second, a movement towards the periphery of the trunk, where the next most important actions are going on, and which continues to administer to the life of the individual. The formation of the annual layer may be regarded as the production of the individual referred to. Nature is sometimes lavish on herself, where a large amount of food is easily obtained, and the individual luxuriates without regard to the extension of the species. When, however, the existence of the individual is threatened, it puts forth efforts to renew the species, by restricting the growth of wood and leaves. She expends all her energies in the production of fruit.

10. Before I proceed to give the analyses which have been made in my laboratory, I will offer one remark on the condition of the inorganic matter of vegetables. It is impossible, it is true,

to obtain much light on this point, by an inspection of the growing, or from an inspection of a section, of the vegetable. Indeed, the thinnest slicings or cuttings do not permit us to observe the inorganic matter at all. When, however, a thin slice of wood is carefully burned, the ash which remains will often maintain its place. When this is the case, it will be observed that the particles of ash are arranged in a net-work, and actually form a frail skeleton in the wood. So it would appear from this observation, that the inorganic matter is actually organized, forming by itself a basis upon which the organic matter is built, or in which it is deposited. In other words, the inorganic matter of a vegetable is perfectly analagous to that of the animal. Bone is formed of a net-work or tissue of phosphate and carbonate of lime. It is precisely the same in the vegetable; a large proportion of the phosphate and organic salt of lime is disposed in a reticulated skeleton; only in the vegetable the amount of carbonaceous matter greatly exceeds in proportion that of the animal.

The analogy between the condition of the inorganic matter in the two kingdoms, does not fail here. In vegetables, the juices or sap carry the most soluble materials: some of these never become a part of the structure forming the skeleton of the plant. Chlorine, sulphuric acid, soda and potash, probably never enter into the structure here referred to, although they form an essential part of the seed. They are the more insoluble matters, as the phosphates of lime, and an organic salt of lime, which form the skeleton or frame-work just referred to.

The inorganic matter then exists in vegetables in two states: in one it is fixed, and forms a species of skeleton, upon and around which the organic matters are deposited; in the other it forms a part of the circulating current, which permeates the whole vegetable tissue. The latter, when a tree is felled, will be found in the interstices of the plant, and lodging at the point where it is carried by the circulating fluids, when they cease to flow.

11. The solid inorganic structure of animals, it is well known, are by no means fixed and permanent, but undergo a change by absorption and a deposition of new matter. In vegetables, however, it appears that though the old inorganic matter may be removed by absorption, still it is by no means as probable that it is ever renewed or replaced. This will appear from the observations which are to follow. Hence it appears that the vital energies or powers are spent in the renewal of the individual, and in the production of the species; while the old individuals forming the heart wood, are left to decay. This internal decay affects but slightly the vigor of the tree; though the observation requires modification, inasmuch as some trees, as the pines, rarely become hollow before their vitality is nearly extinguished.

12. The inquiries which I have recently instituted respecting the inorganic constituents of forest and fruit trees, have been directed to the determination of the following points:

1. The percentage of water which is lost by a temperature of 212° Fahr.
2. The percentage of ash in the different parts of the tree.
3. The actual percent of water in the wood.
4. The determination of the elements of the ash and its general distribution in the tree.

It will be observed that the field of labor which these investigations required, or will require, when extended, as it is proposed, to the most important forest and fruit trees in New-York, is immensely large; involving a multiplicity of details, and exceeding great care, in order that they should terminate in valuable results. In their execution, thus far, I have been assisted by Mr. J. Salisbury and E. Chandler Ball, esq.; both of whom have entered with great spirit and perseverance in the work. Indeed, without their labors, my own would present but a meagre result. Single handed investigations make slow accumulations, when confined to analytical details. The drying of the wood, and the proper preparation of the ash, and the determination of percentages, though among the least of the labors, yet consume considerable time.

13. *Preparation of the Ash.*

It is a matter of considerable importance to make and prepare the ash for analysis. The mode I adopted for determining the percentage of ash, was to burn the wood in a hot porcelain evaporating dish. By a simple arrangement, the wood is burned at a low temperature, and the fusion of the potash is thereby prevented, and but little coal is left unconsumed.

The ash which is designed for analysis, is prepared by burning in a clean furnace with an iron grate, which never acquires sufficient temperature to form an oxide of iron upon the bars. This mode, though it might be objected to, is still a safe one; and if the operation is properly conducted, the ash procured is in a state as free from foreign substances as possible.

14. *Mode of Analysis.*

The analysis of the ash has been conducted in the main in a mode which is usually followed, where the substance is soluble in hydrochloric acid. The ammonia precipitate, which contains the phosphates of iron, lime, magnesia, and alumina, if present, is ignited and weighed. Subsequently this is re-dissolved in hydrochloric acid, and filtered, if silica is present. Ammonia is again employed for precipitating the phosphates; acetic acid is then added in excess, which dissolves the phosphates of lime and magnesia, and leaves the phosphate of the peroxide of iron untouched. This is separated from the filtrate by prepared filters, dried, ignited and weighed. The lime is afterwards precipitated by oxalate of ammonia, and the magnesia by phosphate of soda and ammonia. The carbonates of lime and magnesia are obtained in the usual way, after the separation of the phosphates. The chlorine, sulphuric acid, potash and soda, are obtained by the ordinary well known methods.

15. Per cent of water, wood, ash, etc., referred to in section 12.

White Oak—(Quercus alba.)

	Heart wood.	Sap wood.
Per cent of water, - -	30.90	35.44
" dry wood, - -	69.10	64.46
" ash, - -	0.18	0.64
" organic matter,	68.92	63.92
Calculated dry, - -	0.261	0.991

	Bark of trunk.	Do. twigs.
Per cent of water, - -	27.71	40.30
" dry wood - -	72.29	59.70
" ash, - -	11.30	4.72
" organic matter	69.39	54.98
Calculated dry, - -	15.63	7.906

	Wood of the small limbs.
Per cent of water, - - -	35.00
" dry wood, - - -	65.00
" ash, - - - - -	0.55
" organic matter, - -	64.45
Calculated dry, - - - -	0.846

Black Walnut—(Juglans nigra.)

	Heart wood.	Sap wood.
Per cent of water, - -	45.05	38.90
" dry wood, - -	54.95	61.10
" ash, - -	0.36	0.54
" organic matter,	47.285	59.936
Calculated dry, - -	6.919	0.950

	Bark of trunk.	Do. twigs.
Per cent of water, - -	48.75	49.26
" dry wood, -	51.25	50.80
" ash, - -	3.99	3.715

	Wood of twigs.
Per cent of water, - - - - -	39.65
" dry wood, - - - -	60.35
" ash, - - - - -	1.20

Tap root of the young Black Walnut.

	Wood of root.	Bark do.
Per cent of water, - -	56.17	58.60
" dry wood, -	43.83	41.40
" ash, - -	.85	1.10

Iron Wood—(Ostrya Virginica.)

	Heart wood.	Sap wood.
Per cent of water, - -	36.96	36.00
" dry wood, -	63.04	65.00
" ash, - -	0.301	0.196
" organic matter,	62.739	64.805
Calculated dry, - -	0.475	0.300

	Wood of twigs.	Bark do.
Per cent of water, - -	21.45	23.83
" dry wood, -	78.55	76.17
" ash, - -	0.64	9.321
" organic matter,	77.91	69.07
Calculated dry, - -	0.815	9.321

The per cent of charcoal, = 16.21, for the wood of the trunk.

Seasoned wood of the Ostrya Virginica.

	Heart wood.	Sap wood.	Bark.
Per cent of water, -	14.80	19.06	14.30
" dry wood,	85.20	80.94	85.70
" ash, -	0.40	0.28	8.06
" organic matter,	84.80	80.66	77.64
Calculated dry, -	0.467	0.344	9.405

The iron wood is one of the instances in which I have found the per cent of ash of the heart wood to exceed that of the sap wood. The tree, however, from which the wood was taken for the experiment, is a young, vigorous tree, about eight inches in diameter. The seasoned wood from which the ash was procured in the last analysis, was a small tree, though about one hundred years old.

Horse Chestnut—(Aesculus hippocastanum.)

	Sap wood near the heart.	Do. near the bark.
Per cent of water, - -	50.	47.50
" dry wood, - -	50.	52.50
" ash, - -	.35	0.62

	Heart wood.
Per cent of water, - - -	58.05
" dry wood, - - -	41.95
" ash, - - - -	1.50

	Wood of limbs.	Bark do.
Per cent of water, - -	23.70	36.25
" dry wood, -	76.30	63.75
" ash, - -	1.15	3.50

	Outside bark of trunk.	Inside do.
Per cent of water, - -	17.35	44.35
" dry wood, -	83.65	55.65
" ash, - -	10.00	5.00

White Elm—(Ulmus americana.)

	Sap wood.	Heart wood.
Per cent of water, - -	34.65	49.50
" dry wood, -	65.35	50.50
" ash, - -	.80	.35

The wood of this Elm gave charcoal 15.84 per cent. Deducting .80 for inorganic matter, leaves 15.04 per cent of organic matter left, after ignition.

	Outside bark of trunk.	Inside do.
Per cent of water, - -	19.00	47.50
" dry wood, -	81.00	52.50
" ash, - -	8.25	7.25

	Bark of limbs.	Wood do.
Per cent of water, - -	42.60	36.50
" dry wood, -	57.40	63.50
" ash, - -	7.50	0.45

The outside bark of this Elm consists of alternate layers of common ligneous matter and cork, which, though thin, is quite elastic.

White Maple—(Acer dasycarpum.)

	Sap wood.	Heart wood.
Per cent of water, - -	35.50	37.50
" dry wood, -	74.50	62.50
" ash, - -	.25	.20

	Bark of trunk.	Do. limbs.
Per cent of water, - -	40.00	41.55
" dry matter, -	60.00	58.45
" ash, - -	3.25	2.75

	Wood of limbs.
Per cent of water, - - -	31.00
" dry wood, - - -	69.00
" ash, - - - -	.35

Yellow Pine.

	Sap wood.	Heart wood.
Per cent of water. - -	37.00	22.50
" dry wood, -	63.00	77.50
" ash, - -	.15	.15

	Wood of small limbs.
Per cent of water, - - -	47.00
" dry wood, - - -	53.00
" ash, - - . -	.25

	Bark of twigs.	Leaves.
Per cent of water, - -	40.32	54.55
" dry matter, -	50.68	45.45
" ash, - -	0.64	0.50

Red Cedar—(Juniperus Virginiana.)

	Sap wood.	Heart wood.
Per cent of water, - -	41.94	17.50
" dry wood, -	58.06	82.50
" ash, - -	.15	0.04
" organic matter, -	57.91	82.46

Chestnut—(Castanea vesca.)

	Wood of trunk.
Per cent of water, - - -	42.35
" dry wood, - - -	57.65
" ash, - - - -	0.48

The per cent of coal, ash, or absolutely dry matter, in the chestnut, = 9.75.

Broad-leafed Laurel—(Kalmia latifolia.)

	Wood of trunk.	Do. root.
Per cent of water, - -	30.30	36.30
" dry wood, -	70.00	63.70
" ash, - -	0.22	0.10

	Bark of trunk.	Leaves.
Per cent of water, - -	18.73	49.19
" dry wood, -	81.27	50.81
" ash, - -	0.70	1.46

The charcoal, or dry matter of the laurel wood, = 7.30.

Willow Tree—ten inches in diameter.

	Heart wood.	Sap wood.
Per cent of water, - -	37.45	59.55
" dry wood, -	62.55	40.65
" ash, - -	0.25	0.28

	Bark of trunk.
Per cent of water, - - -	41.10
" dry wood, - - -	58.90
" ash, - - - -	6.26

Grape Vine—(Vitis.)

	Wood.
Per cent of water, - - -	40.26
" dry wood, - - -	59.74
" ash, - - - -	0.98

Black Ash.

	Sap wood.	Bark.
Per cent of ash, - -	.34	8.19

This per centage was obtained from seasoned wood.

Common Butternut—(Juglans cinerea.) Branch, one inch in diameter.

	Wood.	Bark.
Per cent of water, - -	38.50	40.00
" dry wood, -	61.50	60.00
" ash, - -	0.37	2.80

Beech—(Fagus sylvestris.)

	Sap wood.	Heart wood.
Per cent of water, - -	40.45	
" dry wood, -	59.55	
" ash, - -	0.85	0.26

	Wood of twigs.	Bark do.
Per cent of water, - -	37.40	35.61
" dry wood, -	62,50	64.39
" ash, - -	0.47	5.53

Weight of charcoal, or absolutely dry organic matter, in 100 grains, 17.16. Deducting .85 for inorganic matter, and it leaves 16.94, from which all the volatile matter and water has been expelled by ignition.

Bass-wood—(Tilia americana.)

	Sap wood	Bark.
Per cent of water, - -	51.30	46.32
" dry wood, -	48.70	53.68
" ash, - -	0.28	3.57

Black Birch—(Betula excelsa.)

	Sap wood.	Heart wood.
Per cent of water, - -	38.90	34.61
" dry wood, -	61.10	65.39
" ash, - -	0.05	0.26

The per cent of coal, or absolutely dry organic matter, in 100 grs., 16.01. Deducting .05 for inorganic matter, leaves 15.96, from which all volatile matter has been expelled by ignition.

Juniper—(Seasoned stick, 32 years old.)

	Bark of trunk.
Per cent of water, - - - -	20.90
" dry matter, - - -	79.10
" ash, - - - -	8.42

White Pine—(Seasoned.)

	Bark of trunk.
Per cent of water,	6 10
" dry wood,	93.90
" ash,	.22

Hemlock—(Seasoned.)

	Wood.
Per cent of water,	18.00
" dry wood,	82.00
" ash,	.61

Red Cherry—(Seasoned.)

	Wood.
Per cent of water,	10.00
" dry wood,	90.00
" ash,	.17

Sweet Apple.

	Sap wood.	Heart wood.
Per cent of water,	39.10	33.35
" dry wood,	60.90	66.65
" ash,	0.35	.16

	Bark of trunk.
Per cent of water,	59.00
" dry matter,	41.00
" ash,	4.55

Sour Apple.

	Sap wood.	Heart wood.
Per cent of water,	39.13	46.30
" dry wood,	60.87	53.70
" ash,	0.25	0.20

	Bark of limbs.
Per cent of water,	45.10
" dry matter,	54.90
" ash,	3.33

The apple gives a heavy, compact coal. Organic matter, from which water and volatile matter has been expelled, 15.90 per cent.

Pear—(Green wood.)

	Sap wood.	Heart wood.
Per cent of water,	42.80	22.05
" dry wood,	57.20	77.95
" ash,	0.20	0.10

	Bark of trunk.
Per cent of water,	63.70
" dry matter,	30.30
" ash,	1.99

Root of the Pear.

		Wood.	Bark.
Per cent of	water,	22.33	53.80
"	dry wood,	79.67	46.20
"	ash,	0.40	3.26

The per cent of organic matter in the wood of the pear, = 9.79. The wood of the pear is white, soft and compact, and easily wrought, and may be used in the place of box, for wood engravings.

The Dog-wood (Cornus florida), which is also a compact wood, gives 11.16 per cent of coal.

The Hickory, when seasoned, gives the largest per cent of ash, of any wood experimented upon—amounting to 7.30, equal in amount to the bark of most trees.

Remarks on the foregoing tables.

1. The inorganic matter exists in the largest proportion in the bark of the trunk.

2. In the wood, it is usually larger in amount in the outside than inside wood.

3. The amount of ash in the small limbs usually exceeds that on the trunk.

4. The amount of ash in the bark of the limbs is less than in the bark of the trunk.

5. The amount of inorganic matter sometimes varies in the same species. Those trees which have grown slow, seem to have the largest amount of ash.

Results of the Analysis of the ash of several Forest and Fruit Trees, which have been obtained by methods described in the foregoing sections.

White Oak—(Quercus alba.)

Analysis of the ash obtained from the green wood.

	Sap wood.	Heart wood.
Potash,	13.41	9.68
Soda,	0.52	5.03
Sodium,	2.78	0.39
Chlorine,	4.24	0.47
Sulphuric acid,	0.12	0.26
Phos. perox. iron & phos. lime,	32.25	13.30
Carbonic acid,	8.95	19.29
Lime,	30.85	43.21
Magnesia,	0.36	0.25
Silica,	0.21	0.88
Soluble silica,	0.80	0.30
Organic matter,	5.70	7.10
	100.18	100.06

	Bark of trunk.	Do. twigs.
Potash,	0.25	1.27
Soda,	2.57	4.05
Sodium,	0.08	0.08
Chlorine,	0.12	0.13
Sulphuric acid,	0.03	trace
Phosphate peroxide of iron,	0.60	
Phosphate of lime,	10.10	14.15
Carbonic acid,	29.80	30.33
Lime,	54.89	47.72
Magnesia,	0.20	0.20
Silica,	0.25	0.65
Soluble silica,	0.25	0.65
Organic matter,	1.16	1.52
	100.05	100.00

	Wood of twigs.
Potash,	9.74
Soda,	6.89
Sodium,	0.16
Chlorine,	0.25
Sulphuric acid,	0.08
Phos. peroxide of iron and phos. lime,	23.60
Carbonic acid,	17.55
Lime,	34.10
Magnesia,	0.50
Silica,	0.55
Soluble silica,	0.60
Organic matter,	5.90
	99.99

The oak grew in the immediate neighborhod of Albany, upon a stiff clay, known as the Albany clay.

Ash of Elm—(Ulmus americana.)

	Sap wood.	Heart wood.
Potash,	15.85	8.640
Soda,	7.64	20.490
Chlorine,	0.74	0.090
Sulphuric acid,	0.12	0.140
Phosphate peroxide of iron,	1.82	1.050
Phosphate lime,	14.53	2.750
Carbonic acid,	29.51	28.225
Lime,	20.08	22,635
Magnesia,	4.72	10.080
Silica,	2.00	3.250
Soluble silica,	0.00	0.00
Organic matter,	1.45	1.800
	98.46	99.115

	Outside bark.	Inside bark.
Potash, - - - -	5.32	1.170
Soda, - - - - -	3.22	2.170
Chlorine, - - - -	1.21	0.050
Sulphuric acid, - -	0.10	0.040
Phosphate peroxide of iron,	4.00	
Phosphate of lime, -	19.55	3.775
Carbonic acid, - -	13.26	42.515
Lime, - - - - -	30.26	42.495
Magnesia, - - - -	4.84	8.160
Silica, - - - - -	12.15	1.250
Soluble silica, - -	1.60	
Organic matter, - -	4.12	0.400
	99.69	102.025

Ash of Elm, seasoned—(Ulmus racemosa.)

	Wood.	Bark.
Potash, - - - -	25.93	8.284
Soda, - - - - -	1.70	0.498
Chlorine, - - - -	0.30	0.560
Sutphuric acid, - -	2.57	4.485
Phosphate of lime and iron,	13.77	5.605
Carbonic acid, - -	17.70	19.568
Lime, - - - -	22.83	46.912
Magnesia, - - -	8.20	1.557
Silica, - - - -	3.57	11.214
Soluble silica, - - -	1.67	1.121
Organic matter, - -	undetermined.	
	98.24	99.807

Ash of the Hickory—(Carya alba.)

The wood had been seasoned during one summer and fall, and grew in the valley of the Mohawk.

	Outside sap wood.	Inside do.
Potash, - - -	7.472	20.185
Soda, - - - - -	0.084	0.085
Chlorine, - - - -	0.096	0.085
Sulphuric acid, - -	0.892	4.640
Phosphate of lime and iron,	14.440	11.450
Carbonic acid, - -	29.576	21.405
Lime, - - - -	38.264	27.695
Magnesia, - - -	6.200	8.600
Silica, - - - -	4.200	6.150
Soluble silica, - -	0.280	0.010
Organic matter, - -	undetermined	
	101.504	100.331

	Heart wood.
Potash,	12.210
Soda,	0.055
Chlorine,	0.065
Sulphuric acid,	5.260
Phosphate of lime and iron,	6.340
Carbonic acid,	33.630
Lime,	43.520
Magnesia,	4.000
Silica,	1.300
Soluble silica,	trace
Organic matter,	undeterm'd
	106.390

As this analysis appears to be far out of the way, I can only account for it on the supposition that a part of the lime and alkalies were in a caustic state. It was one of the earlier analyses, and made before it was suspected that the ash might be in this state.

	Bark.
Potash,	2.340
Soda,	0.125
Chlorine,	0.145
Sulphuric acid,	1.925
Phosphate of iron and lime,	5.000
Carbonic acid,	33.995
Lime,	51.105
Magnesia,	0.820
Silica,	4.550
Soluble silica,	0.250
Organic matter,	undeterm'd
	100.255

Ash of the Iron-wood—(Ostrya virginica.)

	Sap wood.	Heart wood.
Potash,	1.581	14.549
Soda,	0.025	0.086
Chlorine,	0.049	0.098
Sulphuric acid,	0.086	0.378
Phos. lime and peroxide iron,	5.650	23.100
Carbonic acid,	36.159	20.139
Lime,	48.791	27.461
Magnesia,	4.200	4.400
Silica,	0.200	0.400
Soluble silica,	0.000	0.000
Organic matter,	2.853	
	99.577	90.611

	Bark of trunk.
Potash,	0.696
Soda,	0.023
Chlorine,	0.040
Sulphuric acid,	0.086
Phosphate of lime and iron,	5.100
Carbonic acid,	33.853
Lime,	57.932
Magnesia,	1.200
Silica,	0.250
Organic matter,	0.276
	99.456

	Bark of twigs.	Wood do.
Potash,	2.780	20.76
Soda,	0.405	2.97
Chlorine,	0.150	0.25
Sulphuric acid,	0.520	0.64
Phosphate of lime,	10.550	35.40
Carbonic acid,	33.975	12.22
Lime,	48.225	20.98
Magnesia,	1.000	5.60
Silica,	2 300	0.40
Soluble silica,	undetermined	
Organic matter,	do.	
	99.905	99.21

Swamp Beech.

	Wood & bark.
Potash,	5.212
Soda,	0.088
Chlorine,	0.100
Sulphuric acid,	2.296
Phosphates,	15.190
Carbonic acid,	20.488
Lime,	26.512
Magnesia,	10.720
Silica,	8.520
Soluble silica,	18.440
Organic matter,	undeterm'd
	107.576

White Birch—(Betula populifera.)

	Inside bark.
Potash,	7.33
Soda,	0.41
Chlorine,	0.46

Sulphuric acid, - - - -	5.72
Phosphate of lime and iron, - -	20.60
Carbonic acid, - - - -	18.04
Lime, - - - - - - -	43.16
Magnesia, - - - - -	2.90
Silica, - - - - - -	0.50
Soluble silica, - - - -	1.30
Organic matter, - - - -	undeter'd
	100.42

	Wood.
Potash, - - - - -	7.33
Soda, - - - - - -	0.41
Chlorine, - - - - -	0.46
Sulphuric acid, - - -- -	10.480
Phosphate of lime and iron, -	17.300
Carbonic acid, - - - -	15.039
Lime, - - - - -	31.081
Magnesia, - - - - -	10.050
Silica, - - - - -	1.250
Soluble silica, - - - -	0.350
Organic matter, - - - -	undeter'd
	100.145

Ash of the Black Walnut—(Juglans.)

	Sap wood.
Potash and soda, - - - -	6.75
Phosphate of peroxide of iron and lime,	28.50
Carbonate of lime, - - -	50.00
Carbonate of magnesia, - - -	14.00
Silex, - - - - - -	0.80
Coal, - - - - - -	0.30
	100.35

This analysis is considered imperfect. The potash and soda were obtained from the ash procured from the seasoned wood—the remainder from green wood; but the ash operated upon amounted to only three grains.

	Wood of small limbs.	Bark do.
Potash, - - -	31.63	11.635
Soda, - - - -	0.17	1.205
Chlorine, - - -	6.20	0.075
Sulphuric acid, - -	0.21	0.255
Phos. of lime & peroxide iron,	46.30	13.950
Carbonic acid, - -	5.26	25.405

Lime,	6.83	40.502
Magnesia,	0.05	2.84
Silica,	0.40	1.450
Organic matter,	8.70	2.200
	99.75	99.517

	Principal mid-rib of pennate leaf.
Potash,	trace
Soda,	0.165
Chlorine,	0.188
Sulphuric acid,	0.950
Phosphate of lime and iron,	16.250
Carbonic acid,	30.743
Lime,	39.782
Magnesia,	trace
Silica,	7.375
Organic matter,	0.750
Matter insoluble in water in the chlorides,	2.850
	99·053

	Bark of trunk.
Potash,	2.34
Soda,	0.27
Chlorine,	0.30
Sulphuric acid,	0.42
Phosphate of peroxide of iron,	1.60
Phosphate of lime,	12.31
Carbonic acid,	32.63
Lime,	42.22
Magnesia,	3.24
Silica,	1.04
Soluble silica,	undeter'd
Organic matter,	3.00
	99.37

Ash of the Pear.

	Sap wood.	Heart wood.
Potash,	22.25	26.94
Soda,	1.84	
Chlorine,	0.31	0.21
Sulphuric acid,	0.50	0.45
Phosphate of lime,	27.22	20.40
Phos. of peroxide iron,	0.31	0.80
Carbonic acid,	27.69	25.48
Lime,	12.64	13.14

Magnesia,	3.00	2.93
Silex,	0.30	0.30
Coal,	0.17	1.00
Organic matter,	4.02	5.00
	100.25	96.65

	Bark of trunk.
Potash,	6.20
Soda,	
Chlorine,	1.70
Sulphuric acid,	1.80
Phosphate of lime,	6.50
Carbonic acid,	37.29
Lime,	30.36
Magnesia,	9.40
Silex,	0.40
Coal,	0.65
Organic matter,	4.20
	98.30

	Wood of root.	Bark do.
Potash,	22.26	3.92
Soda,	6.20	2.75
Chloride of sodium,	2.04	0.25
Sulphate of lime,	1.02	2.63
Phosphate of peroxide iron,	1.10	3.30
Phosphate of lime,	44.36	8.20
Phosphate of magnesia,	0.34	
Carbonic acid,	16.32	34.78
Lime,	1.84	40.09
Magnesia,	0.10	0.20
Silica,	1.50	4.50
Vegetable matter,	3.10	2.30
Soluble silica,		0.70
	100.18	103.62

The tree from which the ash was procured for analysis, grew in Richmond, in a deep soil, resting upon the Stockbridge limestone. Its fruit was miserable, being astringent and bitterish. The wood was in an incipient decay. The root was sound. It is worthy of notice, that the wood of the root contained a very large amount of phosphate of lime. It having been taken up in the winter, when the circulation had ceased, it is not improbable that this large amount of phosphate of lime may have been accumulated and held in store for the use of the plant, when a revival took place in the spring.

Ash of the Apple.

	Sap wood.	Heart wood.
Potash, - - - -	16.19	6.620
Soda, - - - - -	3.11	7.935
Chloride of sodium, -	0.42	0.210
Sulphate of lime, - -	0.05	0.526
Phosphate of peroxide iron	0.80	0.500
Phosphate of lime, - -	17.50	5.210
Phosphate of magnesia,	0.20	0.190
Carbonic acid, - -	29.10	36.275
Lime, - - - - -	18.63	37.019
Magnesia, - - -	8.40	6.900
Silica, - - - - -	0.85	0.400
Soluble silica, - -	0.80	0.300
Organic matter, - -	4.60	2.450
	100.65	98.535

	Bark of trunk.
Potash, - - - - - -	4.930
Soda, - - - - - - -	3.285
Chloride of sodium, - - -	0.540
Sulphate of lime, - - - -	0.637
Phosphate of peroxide iron, - -	0.375
Phosphate of lime, - - - -	2.425
Phosphate of magnesia, - -	
Carbonic acid, - - - -	44.830
Lime, - - - - - -	51.578
Magnesia, - - - - -	0.150
Silica, - - - - - -	0.200
Soluble silica, - - - -	0.400
Organic matter, - - - -	2.100
	109.450

Common Wild Grape Vine.

	Wood.	Bark.
Potash, - - - -	20.84	1.77
Soda, - - - - -	2.06	0.27
Chlorine, - - - -	0.02	0.40
Sulphuric acid, - - -	0.23	trace
Phosphate of lime, -	15.40	5 04
Phosphate of peroxide iron,	1.20	5.04
Carbonic acid, - -	34.83	32.22
Lime, - - - - -	17.33	39.32
Magnesia, - - - -	4.40	0.80
Silex, - - - - -	2.80	14.00
Soluble silica, - -		0.30
Coal and organic matter, -	2.20	1.70
	100.21	

The grape vine grew in the forest, upon the Albany clay. The vine, on being cut, there exudes from the cut ends a dense white mucilage or gum, which appears upon the end like small white worms escaping from the open pores.

Ash of a Fungus, (Boletus ignarius,) growing on an Apple-tree.

The inside of the fungus is soft and corky, the outside is hard and unyielding. The difference in texture led to a separation of the fungus into two parts.

	Outside.	Inside.
Potash,	21.25	15.36
Soda,	4.29	4.00
Chlorine,	1.58	0.80
Sodium,	1.04	0.52
Sulphuric acid,	2.58	2.30
Phosphate of peroxide iron, Phosphate of lime, Phosphate of magnesia,	12.20	18.11
Carbonic acid,	14.39	10.80
Lime,	20.31	2.13
Magnesia,	0.60	0.20
Silica,	3.30	8.30
Soluble silica,	0.20	0.70
Organic matter,	11.20	16.50
	92.94	90.45

The injury which fruit trees sustain by fungi and lichens growing upon them, is evident from their analyses. The nutriment is all derived from the bark and wood of the tree; and besides, these parasites produce and hasten the decay of the tree.

Ash of a Lichen, (Gyrophora vellea,) growing upon gneiss, at Little-Falls.

	Lichen.
Potash,	8.850
Soda,	2.588
Chlorine,	2.938
Sulphuric acid,	2.738
Phosphate of peroxide iron,	10.937
Phosphate of lime and magnesia,	10.188
Carbonic acid,	2.667
Lime,	2.926
Magnesia,	0.380
Silica,	44.000
Soluble silica,	1.000
Organic matter,	9.250
	98.094

It is not a little remarkable that plants which possess apparently so small a share of vitality, should be able to take from a rock its potash, lime, and phosphates. It will be observed, however, that they adhere with as much tenacity to the rock as a shrub to the earth, and that it is as easy to extract the one as the other from its bed. It would seem, from this single examination, that the presence of the element of rocks may be determined by an examination of the ash of the plant which grows upon it.

The results of the foregoing analyses may be studied in some of the most important facts which they contain.

The first fact which it seems proper to notice here, is the per centage of inorganic matter which is contained in the parts of the wood and bark. On this point I would speak with caution, particularly with regard to the difference of ash contained in equal quantities of sap and heart wood. It is, however, as it seems to me, too common an occurrence, to find the ash greater in the sap wood than in the heart wood, to be due to accident. But inasmuch as instances do occur, in which it is directly the reverse, it becomes necessary to wait the results of an additional number of analyses, before I should venture to say that the law referred to prevails. In the case of the iron-wood, this excess is due to the potash in the heart wood; and it will be seen that the oxygen of the bases is greatest in the outside wood.

Leaving for the present this question, I may state with entire confidence, that the bark of all kinds of trees is more largely supplied with inorganic matter than any other part of the tree. This position is sustained at least by all the foregoing analyses. The fact is this, to state it more particularly, that the old bark of the trunk is richer in inorganic matter than the newer bark of the branches. The element which predominates in the bark is lime. This substance is probably better adapted to protect the outside of the tree from injury than any other. It is a more perfect defence to the tender and growing wood immediately beneath. As in the animal tissues, outward defences are set up, so the vegetable is not left unguarded in any of the tissues which are liable to outward injuries.

But this is not all: a practical rule of great importance flows from the fact that lime predominates in the bark and other parts of plants. It is to supply lime freely to the tree. This rule may not be regarded as new; and yet its importance is placed in a clear light by the foregoing analyses. The farmer may no longer fear that he shall poison his trees by its use, since, under all circumstances, it is found so abundantly in its tissues, forming, as we have already stated, a substitute for an osseous or frame-work for the support of the organic matter. This frame-work is more useful to the young plant. It is here that lines of an organized salt of lime shoots out in threads, in the form of veins and nerves, which circulate freely on every side. When the organ has acquired consistence by an abundant secretion of organic matter, the frame-work of lime appears of less importance. In confirmation of its importance to trees and to most vegetables, is the experience of agriculturists generally; which, though they cannot always affirm that lime has been eminently serviceable, still very few can object to its use on the ground of its having been detrimental. The most which has been said against its use, is, that little or no effect was observed on the tree or crop to which it was applied. Whatever may be the views of agriculturists upon this subject, which their own experience has formed, it is still to be remembered that the effects of lime are modified by the condition of the soil, by the presence of organic matter, by that of alkalies, &c.

The phosphates seem to be sent to the periphery of the growing tree. It will be observed that in a majority of instances, the sap wood contains a larger amount than the inside wood. It also exists largely in the wood of the young branches. The bark, however, obtains only a small proportion of the phosphates. In one instance, that of the pear root, they are remarkably large, and unexpectedly so. It stands, as far as I know, an insulated fact.

It will strike every reflecting person who is acquainted with the effects of phosphoric acid on iron, that wood or coal, rich in this substance, when iron is raised to a white heat, both in the process of reduction, and that it would necessarily produce a quantity of phosphuret of iron. Perhaps in the ordinary coarse operations of the furnace or forge, it is a matter of little consequence. In the manufacture, however, of the finer instruments, and of springs, the quality of the article may be essentially injured by the presence of phosphoric acid in the coal.

In a practical point of view, in husbandry affairs, the use of the phosphates must not be forgotten. The application of bone earth has been restricted to the annual crops. But I have little doubt that the application of those substances, rich in phosphates, to the roots of trees, will be one of the most efficacious means of giving vigor to the tree, and excellence to the fruit. The phosphates, it will be observed, lie in the direct route of the sap from the root to the fruit. An accumulation in the bark would place it out of the reach of the fruit, inasmuch as the fruit is connected directly with the wood.

The phosphate most abundant in the ash of all trees, is phosphate of lime. Phosphate of peroxide of iron is usually, if not always, present, even when least suspected. This substance seems to accumulate in the red cherry, and to impart to the old wood its rich brown color. While it may be laid down then, with a good degree of certainty, that the phosphates are always important elements in the manures for trees, still, in these cases, as in the apple-tree and pear, where the proportion of ash is small and light, it is a natural inference that manures, rich also in organic matter, is the one best adapted to them. Experience also coincides with this view.

Phosphate of magnesia is not a common salt in the ash of vegetables, except in the cereals; and when present in the wood, its quantity is small. In many instances, where it was carefully sought for in the ash of the wood, none was found; in a few others it was present in a small quantity.

In green wood the water is distributed to the periphery. The sap or new wood, and the wood of the young limbs, contain usually a larger proportion of water than the inside wood. The bark of the young wood receives about the same quantity of sap as the wood. In the old bark of the trunk, it is reduced to a minimum quantity.

From the foregoing per centages of water contained in different kinds of wood, it will be easy to calculate how much water exists in a cord of green wood, the weight of which may be approximately set down as equal to two thousand pounds; and also how much water has to be evaporated in burning green instead of dry wood. The caloric thus expended is mostly lost, in the ordinary processes of heating rooms. The weight of water sometimes amounts to nearly one-half of the wood. Its carriage to market is a useless item of expense.

Another element, whose distribution is to the periphery of the plant, is potash. Instances, however, are not wanting, in which it seems to have accumulated in the inside wood. In the ostrya virginica, the wood of the small limbs contained twenty per cent of potash. The treee grows in the back yard of the old State House, where it receives the entire wash from the kitchen of a family living in the establishment. It is not impossible but that this accumulation of potash may be temporary; that if the wood should be examined about mid-summer, it would contain less potash than during the winter season. It is useless to form conjectures in questions of this kind, since they can be answered only by experiments; and still it is a rational conclusion, that the alkalies may vary in amount with the season at which the analysis may be made.

The most important direction, however, which the alkalies take, is towards the seed and its envelopes. The potash in the acorn amounts to sixty-four per cent; in the horse-chestnut, fifty-one. In the envelope of the fruit of the black-walnut, I found seventy-five per cent of the carbonate of potash, and about twenty-five to thirty per cent in the shuck. Now, where fruits are removed and consumed, it is easy to see that the soil will deteriorate, notwithstanding the roots continually extend themselves into new soil; for, in the course of a few years, all the important sustenance must be derived mainly from the outside roots, and the exhaustion of the central part of the area will be unavoidable. When, however, the fruit of trees, together with their leaves, are suffered to remain and decay upon the ground, there will be not only no exhaustion of the soil beneath the tree, but rather an accumulation of food. The alkalies and phosphates are brought up from the deep parts of the soil, and are mixed necessarily with the surface soil. In this single effect of a forest upon the distribution of the inorganic matter of the soil, the most important results may be said to flow. In a deep soil, a large amount of the most essential elements must accumulate near the surface; hence the forest prepares the soil for tillage, and the pursuits of civilized life are promoted by the organic laws which govern the vegetable kingdom.

It is stated by Liebig, that trees of the same species, although they may give different alkaline bases, still they will give an equal quantity of oxygen in their several alkaline bases.* The instances cited prove the position Liebig has taken; and yet the amount of oxygen required to saturate the bases of the alkalies belonging to the inside and outside wood, is quite different in almost every instance.

The distribution of oxygen, considered in the light presented by this distinguished chemist, will be found in excess in the envelopes of the wood, that is, in the bark. In the Ostrya virginica, the ash is greater in an equal weight of the inside green wood, than in that of the outside. This greater weight is due to the presence of potash; but in this instance the oxygen is greatest in the outside wood, and still greater in the bark.

It is well known that silica, in the monocotyledonous plants, is distributed through the outer layers of the envelope of the plant; something quite analagous occurs in the dicotyledonous plants. Thus there is 7.7 per cent of silica in the bark of the red cedar; 19 per cent in the bark of the yellow pine growing upon the sand plains near Albany; 6 per cent in the outer wood of the same tree; and 8 per cent in the outer wood of the white pine: and, according to Poleck, 11.7 per cent in the ash of the Pinus picea.

Some woods which are rich in lime, burn with great intensity, and emit much caloric. Hickory is an instance of the kind. Other substances, rich in potash, burn slowly, and with difficulty.

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* See Chemistry in its application to Agriculture and Physiology: The New World Edition, p. 16.

The elm is a poor kind of wood; and it is rich in potash. Whether cause and effect, as intimated, are well put together, cannot be regarded as settled. Hickory wood burns well, and is rich in lime: elm, and some other substances, are rich in potash, and burn badly.

Fungi injure trees, by absorbing the alkalies and phosphates. They draw off the supply of these important matters, which seem more especially designed for the perfection of fruit and seed. In addition to this, they destroy the tree, by favoring the extension of the decayed spot upon which they first fix themselves. Not a lichen or fungus, which grows upon the trunk or branches, feeds upon air. They all depend upon the juices of the plant; and hence divert from their channel many currents of food, designed for the growth of the plant, and the perfection of its fruit and seed.

CONTROVERSY RESPECTING THE HESSIAN FLY.

[We need not apologize to our readers for admitting the discussion relative to the Hessian fly. The question is one of great importance to the farmers of Western New-York and elsewhere. We hope and expect that, as it is in competent hands, it will be set at rest in the end, by their mutual observations. We expect Dr. Fitch will reply in the May number.—Ed.]

Having, through the kindness of a friend, received the second number of your Journal, containing Dr. Fitch's instructive and interesting article on the Hessian fly (Cecidomyia destructor), I beg leave to offer, through the same medium, my thanks for the kind manner in which he differs from me in opinion; and crave his indulgence while I point out a slight error in his statement, which has arisen from misinformation.

After referring to the theory advocated by me, in the Transactions of the American Philosophical Society, Philadelphia, in 1840, and Dr. Coates's communication to the Academy of Natural Sciences, in 1841, and published in the Journal of their proceedings, he goes on to state, in page 11, that Miss Morris's theory has been proved to be incorrect, and that "we have met with no further attempts to sustain it;" consequently, that it has not been sustained.

If Dr. Fitch will have the kindness to refer to the August number of the Proceedings of the Academy of Natural Sciences, he will find a full statement of my observations during the summer of 1841, which was accompanied by a series of specimens of a Cecidomyia, from the egg to the perfect fly, obtained by me, as there described.

That this statement and these specimens have escaped Dr. Fitch's notice, is evident; a circumstance which I deeply regret, as it obliges me thus publicly to call his attention to them. If I have mistaken some new insect for the Cecidomyia destructor, I must plead as an excuse, their accurate resemblance even under a high magnifying power, to Mr. Le Sueur's beautifully accurate drawings, accompanying Mr. Say's as accurate descriptions of the fly, that "appears early in June, deposits its eggs, and dies." I will now ask Dr. Fitch what fly was it that did appear early in June, in such numbers, in this neighborhood, in the years 1836, '40, and '41?

If Dr. Fitch will prove that the flies I so carefully watched for so many years, whose larva feeds in the centre of the straw, as seen by hundreds in this neighborhood, is "the fly he suspects it to be," I will acknowledge my error as frankly as I now maintain my difference of opinion.

I do not, nor have I ever doubted the statements of gentlemen so learned in the science of Entomology as Messrs. Herrick and Dana; their assurance that they had seen the insect in its different states of egg, larva, pupa, and perfect fly, was sufficient to satisfy me that it was so; I therefore, in all fairness, claim the same indulgence from them and others, when I state that I saw, captured, and glued to a piece of paper, a fly, while in the act of depositing her eggs on a grain of wheat, so like the drawing made by Le Sueur, of Say's Cecidomyia destructor, that it not only deceived me, but all to whom I showed it. And that this fly and eggs. I did present to the Academy of Natural Sciences, is beyond question; and that subsequently I did procure larvæ and pupæ of this species, in the centre of the straw, is equally beyond doubt, as shown in the Journal ot the Academy of Natural Sciences, August number, page 66—which straw, larvæ and pupæ, are now in my possession. Again, I ask Dr. Fitch what is the name of this fly?

The concluding paragraph of the communication here referred to, will show that my opinions have not altered since 1841: "From this series of facts, it might be presumed that the history of this interesting and destructive insect was decided; but the statements of observers whose information and accuracy cannot be questioned, prove discrepancies in its history, that can only be reconciled by supposing that there are two species under observation. The species now presented, will agree with Mr. Say's statement, that 'the fly appears early in June, lives but a short time, deposits its eggs, and dies.' The remainder of Mr. Say's history must apply to that species which has so frequently been observed to deposit its eggs on the leaf."

I have referred above to the drawings of Le Sueur, which confirmed my opinion that the insect I was observing, is Say's Cecidomyia destructor. On comparing these drawings with those of Dr. Fitch, which he speaks of as being accurately correct, (which I do not question,) I find so marked a difference, that I am certain I should not have been misled by them.

I do not presume to decide; but there appears to my unlearned eye a sufficiently marked difference from which to describe a species. It would be impossible for me to give an idea of the number of specimens that, in the summer of 1841, I examined through a microscope, with Le Sueur's drawings by my side. Suffice it to say, I did little else for two months; and so perfectly identical did these specimens appear with the drawings, that after each examination I rose with renewed admiration for the genius of the distinguished artist.

I have now before me files of pamphlets and newspapers published since 1840, denying the truth of the theory advocated by me. In some it is asserted that I have mistaken a weevil or a curculio for the Hessian fly; in others, that I have been watching the Cecidomyia tritici; while a third declares it to be a Bombyx; and a fourth, that I know nothing about the matter. To all this I have become accustomed; but I must confess that, after all the evidence I gave in the shape of actual specimens, deposited in so public a place as the Academy of Natural Sciences in Philadelphia, I feel some surprise at being expected to confess myself in error, before I have equally strong evidence that I am so.

M. H. MORRIS.

Germantown, March 8th, 1847.

FOREST TREES OF MASSACHUSETTS.

Report on the Trees and Shrubs growing naturally in the Forests of Massachusetts. Published, agreeably to an order of the Legislature, by the Commissioners on the Zoological and Botanical Survey of the State. Boston: Dutton & Wentworth, State Printers, No. 37 *Congress street ;* 1846, pp. 547, 8vo.

This report is from Mr. Geo. B. Emerson, Chairman of the Zoological and Botanical Commissioners, appointed under the law authorizing the Geological Survey of Massachusetts. It is the concluding work of the survey; and as a result, it is what the public expected—an interesting and valuable work, the merits of which the people of Massachusetts know how to estimate. It is illustrated by seventeen finely executed plates.

In this work the trees and shrubs are described at length; the limits of the species, the uses of the timber, and its comparative value for fuel. Much interesting matter is introduced under the head of each species, and which imparts a high degree of interest to the general reader. We cannot attempt to go into details, however, in these matters, which are introduced in a running head, under the description of species; but we propose to make rather full extracts from an introductory part, where the author has taken up the special treatment of forest trees, under the general head of *thinning* and *pruning*. To proceed at once to the subject, the author remarks:—

"The *principle* on which pruning and thinning should be conducted, is a very plain and intelligible one. It is, that every tree and every branch should be allowed to have an ample supply of air and light. When, therefore, two trees are so near that their branches extensively intermingle, one should be removed; and, generally, it should be that one which is much taller or shorter than the neighboring trees.

"In pruning, that branch should be shortened which encroaches on other branches of its own or another tree. It should not be cut off close to the stem, as, in that case, the wound will be long in healing, and the root* which supplied the branch, being left useless, will wholly or partly perish, and, by its decay, will infect and weaken the whole tree. It should rather be taken off at the distance of a foot or more from the stem, just above a vigorous shoot, which shall be left to grow towards a space in which it will find a plentiful supply of air and light. The shoot thus left will sustain the life of the shortened branch, and will continue in action the root by which it had been nourished.†

"The mode of thinning and pruning, will be governed in some measure by the end in view. If the object is to produce a full grown tree, in its true character, developing itself according to its natural tendencies, all or most of the branches will be left, and care be taken to give them space; and, as every branch swells

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* "It is almost universally found, that a large branch corresponds to a large root, and the reverse; and this is true, whether the root, placed in favorable circumstances, determines the growth of the branch above it, or the branch, propitiously situated, causes the growth of its corresponding root."—*De Candolle, Organographie Vegetale*, Tom. I., p. 162.

† See a "Treatise on the Management and Cultivation of Forest Trees: By John Smith, Gardener and Forester to the Earl of Bute." The chapters on thinning and pruning are interesting, as giving illustrations, by a practical man, of scientific principles which he had learnt only from observation.

the trunk, a similar course will be pursued, where it is an object to get the greatest possible amount of wood. In both cases, those stems and branches only will be removed, which interfere with the rest. A crowded growth will be allowed, and the lower lateral branches will be removed, where it is desirable to get a lofty trunk and head."

Mr. Emerson gives the result of his enquiry relating to the proper time for felling timber for fuel. The following useful rules we give again in his own languge, as we find it impossible to condense the matter, without injury to it:—

"From the answers returned, I find that, in felling for timber, the practice is to select suitable trees, from any part of the forest. No instances have come to my knowledge, of extensive woods, cultivated with express reference to the production of timber. In felling for fuel, the practice *has been* to select the old and mature trees, especially such as have begun to decay. It has now become nearly a universal practice to cut clean and close. Experience has uniformly shown this to be most economical. Several of my correspondents have subjoined the reason. One of them writes,—"Trees which remain where woods are thinned, are much shaken by the winds, and often destroyed. Again, unless the timber be all or nearly all taken off, the new growth is shaded, sparse and feeble. But where a new forest springs up, it accommodates itself to all circumstances of wind and tempest." Another says,—"Some persons in this town have trimmed up young white oak and walnut (hickory) woods, clearing the undergrowth, when the wood itself consisted of young shoots of 10 or 12 years of age. The result of this experiment does not seem to justify a continuation of the practice." Experience here seems to confirm a well known principle, that the quantity of wood formed depends upon the number of the branches, or rather upon the extent of surface of the leaves. To the question,—"How soon will a wood, which has been cut entirely down, renew itself so as to be profitably cut again?" the answers are very full and satisfactory, though very various. The object is every where supposed to be fuel. Some give a definite period, varying, for different places, from 15, 17, 18, 20, to 25, 30 and 35 years. The average of ten such is 23 years. Others speak less definitely, from 15 to 20, 17 to 30, 20 to 25, 20 to 30, 20 to 33, 20 to 40, 25 to 30, 25 to 35, 30 to 35, for woods of miscellaneous growth. The average deducted from fourteen such statements, is, from 21 to 28. The general average from all is a little over 24 years. These statements are probably as definite as the case admits. Difference of situation, exposure, soil, and kind of trees, would of necessity lead to them. For particular trees, the answers are more precise. The white or gray birch is of most rapid growth, and springs at once from the stump. This may be profitably cut in from 10 to 20 years; a growth of maple, ash and birch, black, yellow and white, in 20 or 25; oaks in from 20 to 33. Where the trees are principally oak, white, black and scarlet, the forest may be cut clean three times in a century. Cedar swamps, which grow from seed, cannot be profitably cut in less than 40 years. Pitch pines, which also spring only from seed, are very slow at first, and require from 40 to 60 years to be in a condition to be felled. In many places, the experiment has been tried of burning over the surface, ploughing, and sowing with rye. When the trees have been of hard wood, this practice has been strongly condemned. In the case of the pitch pine, it is reccommended. The seedling pines make much more rapid progress when the surface has been softened by cultivation.

"An intelligent gentleman of great experience, A. M. Ide, Esq., of South Attleborough, gives me a statement of some important facts bearing upon the subject. "Having been, for thirty years past, more or less engaged in buying woodland and cutting it off, I wish to state that I know, from careful observation, that an acre of good land, where there is a mixture of the several kinds of oak and walnut, (hickory,) cut off while young and thrifty, will produce, during the first 25 or 30 years, a cord of wood yearly." "I believe that most kinds of hard wood are worth twenty or thirty per cent. more, for fuel, at the age of 25 years than at 75." This important fact is confirmed by many of the wood-growers in the Old Colony, and in other parts where the woods have been repeatedly cut down. It is remarkable that all the facts and testimony lead to the same conclusion. The trees best for fuel shoot again most readily and vigorously when cut under 25 years. The wood is formed within that time as rapidly, taking a forest together, as at any other age; and, for fuel, it is then of most value.

"In cutting with a view to future timber, the tree should be felled as close to the ground as possible, as the shoots will then be erect. In cutting with a view to fuel, it is of less consequence. Several suckers will be thrown out, all of which will be curved at base, but they will all thereby, have more room to grow.

"To the question,—"Stumps of trees of what age, when felled, will shoot up most vigorously? Is there any age at which they cease to shoot? What trees will not shoot from the stump?" the answers are equally full. To the first of these questions, the uniform answer is, that the stumps of young, healthy, growing trees, shoot most vigorously. They should not be under 15 years, nor much over 20. The almost uniform answer to the second question, is that shoots will not come from very old trees. From those of old trees they spring up, but die in one or two years. Stumps of trees that had begun to decay, seldom give any shoots. In some cases, suckers come from the roots of old trees, but not from the stump. A single individual thinks that the power of throwing up shoots from the stump, never ceases during the life of the tree.

"As to the third question, all agree that evergreens never give permanent shoots from the stump. Several persons, who have attended the growth of the sugar maple say, that the stump of this tree makes no shoots; and the same is said of the beech.

"As to the season of the year most favorable for felling a forest, when the object is to have it renew itself speedily, the testimony is various, but not absolutely discordant. All agree in saying, that the tree should be felled when not in leaf. The majority say, generally, in the winter months; some, between November and April. A correspondent in Plymouth, my friend G. P. Bradford, who kindly took great pains to get imformation extensively from the wood-growers in that neighborhood, says, "It is generally considered, by those well acquainted with the matter, much preferable for the future growth, to fell a forest in April and May. The wood is not so good as when cut between November and April." This is confirmed by several other persons who have enjoyed means of extended observation. The convenience of the wood-cutter will generally lead him to fell the forest in the early part of the winter; and, probably, taking into consideration both the quality of the wood cut, and the welfare of the future forest, this may be best.

" When the object is to destroy the growth, summer is universally declared to be the best season to fell a forest. As to the month, opinions differ. Many say, August, or late in summer; some say, June and July, or midsummer. Mr. A. C. Metcalfe, a very intelligent farmer of Lenox, says,—"In August, or when the tree has attained its full growth for that season." This seems to be the true period, at whatever time it takes place; when the wood is formed and before it has hardened, and the materials are laid up in the trunk and root, for future growth. Mr. A. Bacon describes a conclusive experiment. "A gentleman residing in this vicinity, effected the clearing of a lot of young walnuts, (hickories,) oaks and birches, in the following manner. He commenced cutting about the first of March, and felled successive portions as he found leisure, till about the first of July. That portion which was cut between the 18th and 30th of June, was killed to the letter. Those which were cut before the leaves put forth, were most prompt in the renewal of their sprouts."

"The injuries which a forest sustains from a variety of causes, they are enumerated as follows; browsing, pruning, a thin soil, exposure to sea breezes, high winds and frosts.

"The first of these, is completely within the control of the forester, is the browsing of cattle. This is highly injurious to a forest in every state. It is destructive to the young trees, to the lower branches of taller trees, and to the undergrowth, which in an old forest, is the hope of the future. Sheep and horses are no less injurious than cattle. All should be entirely excluded from woodlands intended to be valuable as such and to renew themselves.*

"I have already spoken of pruning. Where the object is wood, it may be doubted whether any pruning is advisable, except in the case that a branch of one tree materially interferes with the growth of another. Plants receive food by their roots, and digest and convert it to their various products, by and in their leaves. Both roots and leaves should therefore be left to extend and expand themselvs as freely as possible; the one to occupy all the space just below the surface of the ground, the other to gain all the air and light within their reach above.. Whatever checks this free expansion, has a tendency to lessen the product of wood.

"On thin soil the roots cannot penetrate far, and a tree, surrounded by others, will soon exhaust the proper nutriment within its circle, and must then begin to fail. As soon as this happens, it must be removed and trees of other families must be sown or planted in its stead. The proper treatment for thin soils, is therefore, a rapid alteration of crops.

"Most forest trees are injuriously affected by the sea-breeze, and we generally find them stunted and dwarfed by its influence.

"The remedy is to plant numerously the hardiest trees along the seaward border. Those that most successfully resist the sea-breeze, are the sycamore or plane tree, the linden, the poplars, particularly the balm of Gilead, and many of the pines. Almost all trees may do it when growing in large masses. The effect will then be less and less,—rapidly diminishing as you recede from the sea. On the capes and headlands projecting into the Atlantic, along the coast of Massachusetts and Maine, and exposed to the terrible northeast winds, the undisturbed original forests, when half a mile wide, have in the middle as large trees as are due to their depth of soil.

"It is often difficult to make trees begin to grow near the sea;

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* Where a forest is to be renewd artificially, and where the trees are out of the reach of cattle, there is no objection to their grazing among them. One considerable recommendation of the Duke of Athol's mode of redeeming lands by planting larchs. is, that the groud is improved for pasturage by the growth of grass under the shade of the trees.

sometimes it is impossible, without protection. But a low wall of loose stones seaward, is sufficient to protect young trees near it until they get a little higher than the wall. The successive rows inland will be better protected, and will rise each higher than the preceding; until at the distance of a few rods, they may rise to a tolerable hight. When a belt of trees is once established, in such a situation, it should be kept undisturbed as long as it will serve the purpose of protecting the trees within, though it may be of no other value.

"A course altogether similar should be taken in planting a much exposed hill. By beginning at the bottom and gradually planting upwards, the top may at last be clothed; as every belt of trees of a few feet in hight, will protect a younger one a little higher on the hill.

"Wherever trees are planted for use in the arts, it is important to give them the most rapid growth possible. Of wood growing on the same soil, that which grows the most rapidly is strongest.

"That of which the circle of growth is narrowest is also weakest.* This fact is familiary, known to ship-builders, makers of lasts and trenails, and of all of those articles which require great strength. The reason is obvious. The circles of annual growth are separated by zones of loose, porous structure and inferior strength.

"The strength of wood is proportioned to its weight. And as young trees grow more rapidly than old ones, they are more valuable as fuel. Round wood of oak or maple gives more heat than that which is so large as to require to be split. This fact shows the wastefulness of burning on the ground the undergrowth and the trimmings, in clearing for cultivation or cutting for cord wood. Heart wood is heaviest, and the weight diminishes on proceeding outwards to the surface or upwards to the top of the tree, but much less in old trees than in young growing ones. The sap wood of oak was found by Decandolle to fall short of the heart wood in weight, in the proportion of 6 to 7.

"It has long been known that summer or early autumn is the season most favorable for the felling of timber, where the object is strength and durability. One reason why timber has not usually been cut at that season is, that most of those who fell trees are at that season occupied with their farming. The felling of trees is their winter employment. Nearly a quarter of a century

* Buffon, II., 307. A circle of wood is annually formed on the trunk of a tree, between the outer previous circles and the inner bark. The space intervening between the annual circles or layers, is loose and porous, and contains very little solid substance or strength. The more frequently, therefore, these weak spaces succeed each other in a given thickness of wood, the less must be the solidity and strength of the wood.

ago, Timothy Pickering showed by experiments which he adduced by sound reasoning, that summer is better than winter for this purpose. A writer in the N. E. Farmer, who "has wrought more timber than most men, and for more uses than he knows of," says, he has found soft maple, cut in September, three times more lasting than ash or walnut cut in winter; that he has found the sap-wood of oak cut in February and March, partly decayed in September, and the sap-wood of timber cut in May and June, decayed in a year, while the sap-wood of trees felled in September was perfectly bright and sound after two years; and that, from many observations he has made, he is satisfied that September is the best time for felling trees; and that if the tree be disbarked in June, and allowed to stand till September, the timber will be stronger and more durable. He has seen this proved with regard to elm, walnut (hickory,) and maple, which are considered the most perishable of the trees used for timber. The same writer says,* that maple wood felled in June is liable to white rot, while that felled in September remains sound in the same situation; and that timber felled in September will not suffer from red rot or from powder-post. It seems reasonable, that a tree felled after the growth for the year is completed, and before the leaves have fallen, should have all its wood more mature, and should, at the same time, be prepared to be more easily and thoroughly seasoned, than if felled at any other season. The evaporation which takes place from the surface of living leaves is very great. If, therefore, the tree is felled while the leaves are fresh, their evaporative action, which continues for some time after the tree has fallen, will speedily dissipate all the unappropriated moisture which the trunk contains. If, on the contrary, the tree is felled after the leaves have been shed, all this moisture must remain to be slowly thrown off by the usual process of drying. If, again the tree is felled earlier in the season, while full of sap, and when the newly formed wood has not yet been ripened by the action of the sun, there must be much of crude and acrid juices, not easily to be got rid of, and many particles of immature wood at least in the outer layer, which will render the process of seasoning slower and more uncertain.

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* N. E Farmer, VI., 394. He subjoins a table of the comparative value of timber felled at the two seasons of the year mentioned, which he thinks correct or nearly so:—

Oak,	cut in September,	10.0—in June,	4.5
Maple,	" " "	10.0—" "	2.4
Walnut, (Hickory),	" " "	10.0—" "	2.5
Elm,	" " "	10.0—" "	1.6
Ash,	" " "	10 0—" "	3 2

The four last, compared with white oak, provided all were felled in September will stand thus:—

Oak, 10.0—Maple, 5.5—Walnut, 6.2—Elm, 4.5—Ash, 5.6

"There is much evidence to be found in books and in the experience of ship-builders, that sticks of timber cut in the end of summer, and seasoned only by this speedy action of the leaves, often out-last winter-cut timber, which has had years of seasoning.

"The naturalist Buffon, after numerous experiments, carefully made on a large scale, and continued through many years, arrived at the conclusion that nothing contributes so much to the solidity, and durability of timber, as completely stripping the trees of their bark, some years—at least three, before they are to be felled. This should be done in the spring, when the bark is most easily separable. The tree continues to put forth leaves, and to expand and mature them for several successive seasons. But as no new wood can be formed, after the bark is removed, Buffon supposed that all the action of the leaves goes to add to the substance of the wood previously formed.* It is thus increased in density and weight; and he found universally, in the same kind of wood, strength is proportional to weight. By this process, the sap-wood was rendered as dry, hard and strong, as hard-wood, and in some instances even stronger. Timber managed in this way was found to be sometimes a fourth part stronger than that from trees in the same forest, and in all other respects precisely similar, treated in the usual way; that is, felled with the bark on, and dried under the open sky or under sheds."

We have been rather full in our extracts from the introduction to the report. We have been induced to do so because the whole subject bears so closely upon our own article, but occupies so large a part of this number, and besides it seems to us that the parts given are highly important and will be read with profit by our patrons.

COMPARATIVE VIEW OF RAISING A CROP OF WHEAT IN ENGLAND AND AMERICA.

BY C. N. BEMENT.

In looking over the 12th vol., of the "Farmers' Magazine," published in London, I find the total cost of raising an acre of wheat and sending it to market, is stated at £12 15s 6d sterling. This estimate allows the tenant for his labor £1 16s sterling. The gross product of the acre for wheat, straw feed, &c., is stated at £12 11s. The value of the wheat is stated at 52 per quarter.

This statement shows us that the United States is a natural re-

* This it probably does by appropriating the substance destined for new layers of wood, to lining and filling up the cells or tubes, of which woody fibre is composed.

gion for growing wheat, when compared with England. In our western States, a farmer can purchase a farm of 200 acres, fence it, and break up 100 acres for $1200 or $1500. He can put on a house and barn for $500, making the whole cost $2000. His first crop, every thing favorable, will bring him, on an average, $1000, and his second 100 acre's crop of wheat, $1000 more. His lands and improvements are now paid for. The third year, if 150 acres are put into wheat, the product will be $1500.

Now, in England, according to the work above quoted, the charge on one acre of wheat for the two years, is 10s sterling; and poor, highway, and church rates for two years, 8s sterling—our lands have no such charges as this. Our farmers may well be satisfied with their own country.

In the State of New York, I am informed, that wheat lands may be purchased from $30 to $50 per acre, in improved farms. Every 100 acres of wheat yields from $2000 to $2500 gross income.

It is clear then that with free competition, the Uuited States will command the wheat and flour markets of Europe and America.

One fact, however, requires the serious attention of the American husbandman. It is calculated by McCulloch, that the increased average product of wheat in England, since 1821, probably from improved implements, and a more enlightened and scientific cultivation, now at 26 bushels to the acre, being an increase of 9 bushels to the acre, which is about double to that of the State of New York at the present time.

In the county of Monroe, the best wheat growing section of the State, only 19½ bushels is the average.

Farmers of America! are you satisfied to rest with only obtaining from 12 to 13 bushels of wheat to the acre? Sixty bushels per acre has been raised the past season; and what has been done, *can* be done again. It is only to let our heads assist our hands, and we can increase the average very considerably. It is in this way that great results can be obtained.

EXPERIMENT IN PLANTING POTATOES.

BY. C. N. BEMENT.

On looking over my *Diary* a few days since—which I kept during my residence on the farm—I found the following, which I offer to the public gratis, it being all it is worth.

I had understood from some publication or other, that it was a nice piece of economy to plant the eyes only of potatoes, and give the hearts to the pigs. Knowing well, too, that a farmer who would wish to thrive, must save all he can and waste nothing, I thought it was a piece of economy worth attending to. I therefore fed the hearts to the pigs, and I suppose they did the beasts some good—the dissertations of some writers to the contrary notwithstanding. It struck me, however, that though potatoes would grow from eyes, and that hearts would fat pigs, whether these same hearts might not be more valuable as affording nutriment to the young shoots of the potatoes than the pigs. I therefore weighed two pounds, and after cutting the eyes out, planted them in four hills—the eyes and hearts being equal in weight—each one pound. Four other hills I planted with two pounds of potatoes, cut in the ordinary way, eye and heart together; and also, four other hills with two pounds planted whole, and on raising them in the fall, and weighing the crop, the eyes, without heart, weighed fourteen pounds and a half; eye and heart, cut, twenty-seven pounds. They were all of the same variety—pink-eyes. The ground was equally good, and though the season was too dry, they all fared alike. Four hills of the red potatoes, planted in the same ground, and of the same weight, yielded but thirteen pounds.

The experiment is on a small scale, but it is sufficient to prove to me, that the taking the plants from the cuttings, is robbing them of that which neither enriches the pigs much, but makes the cuttings poor indeed. This experiment also serves to show that whether potatoes are cut or planted whole, the difference is of no consequence. What is gained by cutting, would not pay for the labor. As to the red potatoes, I must confess I was *beat*—why they should give only half as liberally as their neighbors, the pink eyes, I know not. I knew long since, as every one knows, that some kinds of potatoes are much more prolific than others; the worst for eating, being generally the greatest bearers.

POTATO DISEASE.

Friend Emmons:—Agreeably to thy request, I now propose to give thee some account of my observations on the potato disease, and the conclusions which I have drawn therefrom.

When the disease first made its appearance in my crop, I became satisfied that its nature was such that unless a remedy could be found it would eventually destroy that valuable esculent. I therefore noticed it at every stage of its progress, in order, if possible, to ascertain its cause, and soon found that the vines were affected before the tubers, that the leaves first began to curl as if they had been in contact with fire, and in a short time the stocks became affected and dried up, long before the usual time for them to be ripe. This suggested the idea that the disease was atmospheric. When I dug my potatoes, I found that the part of the tuber attached to the vine was affected before the opposite end, which showed that the disease was communicated from the vine; other observations confirmed me in the conclusion, that the disease was atmospheric.

My next inquiry was, what is there in the atmosphere to produce this effect? A little consideration pointed me to its *oxygen*, which is known to chemists as the great agent of decay. But here an objection arose; for if oxygen was the cause, why had it not produced this effect long ago. This was a question, that for a time I was unable to solve to my satisfaction. At first the idea suggested itself, that the plant had deteriorated, and become weak, and unable to bear the effects of the oxygen as well as formerly, and that it would be necessary to raise a new plant from the seed. Accordingly I saved some balls for that purpose, when I learned that the experiment had been tried without any beneficial result, in districts where the disease had existed for some time. I was now more fully satisfied that oxygen was the cause of the disease, but could not account for all the phenomena attending it, except on the supposition of an excess of that principle. At length in perusing Leibig's Agricultural Chemistry and Physiology, I found that he stated as a fact that oxygen had been known to have been on the increase for a thousand years, and at the present time it was in considerable excess. This I considered a confirmation of the correctness of my conclusions in regard to the subject, and still consider it to be so. And such observations as I have been able to make since that time, all tend to establish my theory.

I also noticed that many other things were affected, by what seemed to me to be the same disease. Several kinds of fruit, and forest trees particularly, the Quercus alba, or white oak, among the latter, the lower leaves of which (and especially those that stood in the open field, where by the free circulation of air, a large amount of oxygen came in contact with them,) presented indications of disease, about the middle of the 8th month, (August,) similar to that of the potato plant. The outer ends of the petals of the apple, plum, and quince blossoms turned brown, even while hanging on the trees. A circumstance which I believe has not happened until within a few years.

Having thus become satisfied of the cause of the disease, my next inquiry was, by what means can it be prevented? And here my attention was turned to quick lime, knowing it to be one of the greatest absorbents of oxygen in nature. I thought that this article thrown on or about the potato vines while growing, would so absorb the oxygen, as to take off the excess and prevent its deleterious effects. This idea I mentioned to one of my friends, he tried the experiment with good success. I intended to have made the trial myself last season, but lime was not to be had short of sixteen miles, and being called from home at the time the experiment should have been made, I did not make it until after my return, when it was too late in the season to produce its full effect; but still I procured and used it, and my potato vines were kept green some two weeks longer than those of my neighbors, and when I dug my potatoes they were but little affected, being generally good and sound.

As a further confirmation of the correctness of the theory, I have had the boldness to advance, I may mention the following circumstances, namely. Two of my friends complained to me that their gooseberries had been entirely destroyed for several years, by a disease in the form of a blight or mildew. It occurred to me that the cause was the same as that which produced the disease in the potato plant, and I advised them to throw lime on them; they did so, with entire success. The following circumstance will show the effect of lime on fruit trees. A friend of mine from Ulster county, informed me that a neighbor of his had a fine row of plum trees, which blossomed well every year, but bore no fruit. He thought the failure was caused by insects, and for the purpose of destroying them, threw fine lime over the trees while they were in blossom; the result was, he had to brace up his trees to prevent their being broken down by the excessive crop of fruit.

I would therefore recommend that farmers should use dry fine lime on their potatoes as soon as they are fairly out of the ground, and again after hoeing; the lime will not be lost, if it does no good to the crop, it will enrich the land; but I think its good effects as a remedy for the disease will be apparent, and it will cost but little to make the trial.

Thus far I have considered the disease in its effects on the potato while growing in the field, I will now consider it in its effects on the potato after being taken from the ground.

I have noticed that when potatoes were dug early and put into an upper room, or in a cellar, a considerable part of which is above ground, where a candle would burn clearly, (thereby denoting the presence of much oxygen,) they would decay, while those which were placed in a close dark cellar immediately after digging, have kept well. Last winter a person in Albany requested me to bring him ten bushels of Carter potatoes, I did so; they were, as far as I could discover, entirely free from disease. About two weeks afterwards I saw him, when he told me that they were rotting; I replied they were sound when I brought them, which he acknowledged. I saw him again in about two weeks, when he told me that on examining them, he found that only those that were on the outside of the heap (as they were laid on the basement floor,) were affected, and that on observing the circumstance, he had them taken up and put into barrels, and that now they kept well.

My practice is, to get my potatoes into the cellar as soon after they are dug as may well be, not leaving them to be affected by the influence of the atmosphere.

I have thus given my views on this interesting subject, hoping that if they should not be found to be correct, in every respect, they may lead to more correct discoveries from abler and more scientific persons. In conclusion, I would recommend that those engaged in agriculture, should make the experiment here proposed, and such others as their minds may suggest, in order, if possible, to attain to a correct knowledge of the disease and its cause, so that a remedy may be found. Very Respectfully,

CORNELIUS CHASE.

Chatham, Columbia county, N. Y., 1847.

ON THE BEST MODE OF FEEDING CATTLE.

BY PROFESSR JOHNSTON.

The following is the substance of a lecture delivered at Inverness, before the Highland Society of Scotland. After a few preliminary observations, the lecturer observed—

That he appeared before the meeting as the representative of the Agricultural Chemistry Association of Scotland. They had all heard of that Association, and many of them were members of it. The object of the Association in having this meeting was twofold. Every one, acquainted with the state of agriculture in different parts of Great Britain, cannot have failed to observe certain practices in operation, in various parts, of which agriculturists in general might profitably avail themselves. By going into different counties, they found practical men possessed of knowledge, the diffusion of which would be of the greatest possible advantage to the general mass of the agricultural community. Now, the purpose of the Agricultural Chemistry Association had in view—in connection with these general observations—was to collect all the information in their power, through their officers or organs, or through meetings such as this; and, having collected that knowledge, their next great object is to diffuse it in such a way as to be productive of the most beneficial results to agriculture in general. Like scattering seed through their fields, the diffusion of that knowledge would produce vegetation in spring, and fruit in autumn, and the more liberal the deposit, the more abundant, the return. They were here met together, consequently, in possession of a mass of knowledge in regard to the objects of the Association, so that the Agriculturists present might aid them in the diffusion of knowledge. In selecting topics for discussion at these meetings, they looked at the character of the country, and enquired of practical men in the district what topics were best suited for the purpose of affording useful information; and as the question of the use of prepared food for cattle was one of very general interest in this as well as in other parts of the country, it was to form the first subject of this morning's conversation. The second subject, on the other hand, being one rather pastoral than agricultural, had a direct bearing upon questions of great interest to the farmers of Southerlandshire, and in other districts around Inverness, and in this respect was peculiarly appropriate. In reference to the first question—the feeding of cattle—no district in the island was more interested than this. He could not tell them how much stock was shipped from Inverness last year, but he trusted Dr. Nicol, or some other gentleman, would be able to furnish them with information on the subject. He believed however, it was to a very large amount indeed; and he had no doubt but it was increased since by the greater facilities of communication with the London and other markets. As a cattle importing district therefore, the extension of sound information in regard to the economical use of food, must be of the very greatest importance; that is in what way they could grow the greatest amount of beef or mutton at the least possible expense. This he was prepared to show was to be affected by the use of certain mixed food, and prepared food. An individual going from one end of the country to another to observe the state of agriculture, will look not merely at the kind of stock, but he will more particularly observe the implements of husbandry in use throughout the various districts. In order therefore, to form an estimate of the degree of attention paid to this matter of prepared food in England, on his visit to Newcastle at the great cattle-show recently held there, he turned his attention particularly to the examination of the implements exhibited having a bearing upon this point. Amongst these he found chaff-cutters, a peculiar machine for crushing corn and other seeds, and other instruments; all showing how much regard was being paid to this subject by practical men. There was no doubt but that the subject of the quantity of food which cattle require to produce a certain weight of beef was begining to attract general attention; but before he entered upon the few points which he meent to notice in connection with this question, perhaps it would be neccessary to explain shortly the general composition of food. In all kinds of bread there were contained three different kinds of matter. First of all there was a certain quantity of fat, which the butter they ate represented; secondly, there was a certain amount of sugar; and then there was besides the third constituent, which was represented by the white of an egg. Now it was of the very greatest importance what description of food was used, and what proportion it contained of these three kinds of matter, as bearing upon the purpose it was intended to serve. Cattle had in their bodies different kinds of matter, also, but particularly flesh and fat; and the farmer should be sufficiently acquainted with the nature of food, to be able to distinguish what he should use when he wished to produce fat, or when he wished to produce fat and lean both together; and the food which was given would effect the one or the other of those purposes, according to its composition. The white of an egg or albumen would supply nothing, or nearly so, to the animal but muscle. The fat went directly to form fat. The starch in food kept the body warm, and, when fat was wanted served the purpose of making the oily matter more readily become fat in the body of the animal.

Now, in fattening cattle, as in everything else, using the proper means produced the proper effects; and after the explanation which he had given, they would see at once that a mixture of food was better than the use of one kind alone. If they wanted to lay on muscle, they would feed with food containing the largest amount of gluten; and if they wanted to lay on the fat, they would give starch and oily substances, and only a small proportion of the other ingredient. Selecting food in any other way would not serve the purpose they had in view in the most economical way. He had a table representing the different proportions of fat in the food which they were in the habit of using; but he would illustrate what he had to say by a few simple illustrations. Wheat contained two per cent of fat, and sometimes a little more; but oats contained sometimes from four to five per cent, or about double the amount which was to be found in wheat. Oats were next to Indian corn in this respect, the latter of which they were aware contained a large amount of fat. Gluten was the matter out of which the muscle was produced, and there was more of that substance in the bean or the pea, than in the oat; but the oat was better than wheat. But there was another kind of food used for fattening cattle, namely, oilcake, which contained a greater amount of fat than the same weight of any other kind of grain. Linseed, from which oilcake is made, differed from other descriptions of grain, in containing a greater amount of fat, and a larger amount of gluten likewise, with the exception of the bean. Now, practical men have derived great advantage from feeding their cattle on oil seeds; that food, from the peculiarity of its composition, laying on fat and muscle at the same time. Oilcake, however, was the best food, only when the greatest amount of fat was required; and, according to the purpose which they had in view, farmers would give their cattle other descriptions of food. It was a remarkable circumstance, that the bean and pea contained very little fat, and as the wheels of the animal system required to be greased, these kinds of grain would not serve for that purpose, although they contained what made muscle. Although beans and peas were good food, therefore, they were not good as the sole food of animals. Besides, they would observe, that from their different constituents, plenty of oil seeds, and plenty of beans and peas, would be far more profitable than if they were to give either of them singly. That was the principle upon which the use of mixed food was founded—to give all the substances the animal required, and to give them at the cheapest rate; and the researches of the scientific man were directed to discovering the means by which these objects could be best accomplished. He had selected oil seeds, but he might have taken potatoes or turnips for his illustration. He had taken the oil seeds, however, because very great attention had been recently directed to the value of those seeds in the feeding of stock, and to the culture of flax, which they knew was advancing with great rapidity in the neighboring country of Ireland, and which was even progressing in England at a great rate. He might mention a remarkable fact connected with the improvement of the flax cultivation in Ireland, that a society which was established for the encouragement of that cultivation, and which had its seat in Belfast, had an annual revenue of between £2,000 and £3,000; while the income of the Royal Agricultural Association of Ireland was less than one-half of that sum. From the progress the cultivation of flax was making in Ireland, it was very deserving of attention by those who thought a change in the rotation of crops would be useful in other parts of the country. The person who had most directed his attention, practically, to the effects of feeding stock with mixed food, and to feeding on linseed, was Mr. Warnes, of Frimlingham, Norfolk, and he (Professor J.) would point out to them the principles on which he proceeded; and they were sound scientific principles. He commenced by boiling the linseed in water until it formed a kind of jelly; then he stirred in a quantity of cut straw and chaff, and crushed corn. The mixture was then poured into moulds, and afterwards served to the cattle, warm, which they liked remarkably well. With this food the cattle throve, and acquired beef in an extraordinary manner. By this system of feeding, Mr. Warnes said he could compete with any man, whether foreigner or not, as he could send cattle to Smithfield for 4½d. per lb., and pay him an ample return; and in illustration of this, he gives the results of two experiments, which he would read to the meeting, and which were as follows:—

Since he followed out box-feeding, he knew not a single instance where he had not realized £8 for every head of cattle he had kept for six months. At the farm where he now resided, he had reared for market the following cattle, after only six months' box-feeding:—

7 Durham steers, cost £8 10s. each, sold for £19 10s. each, - - - - - - -	£77 0 0
6 Scotch steers cost £19 each, sold for £22 10s. each, - - - - - - - -	85 0 0
1 Cow cost £5 5s., sold for £15, - - -	9 15 0
4 Scottish steers cost £10 each, sold for £20 each,	40 0 0
	£201 15 0

The above cattle were bought in and disposed of within six months. They consumed, with the following now in herd, nineteen acres of turnips, about fourteen quarters of linseed, and a few bushels of barley-meal, with several acres of pea-straw:

3 Durham heifers, estimated value above the cost price, - - - - - - - -	£22 10 0
2 Irish steers, - - - - - - -	13 0 0
5 Small steers and heifers, - - - - -	30 0 0
3 Calves, and butter from two cows, - - -	11 0 0
	£76 10 0
Deduct from 14 quarters of linseed, mostly grown upon the farm, £35, also for barley, £4, - -	39 0 0
	£37 10 0

In reference to Mr. Warnes's experiments, too, it is to be observed that the value of the manure was very much increased in comparison with that derived from the ordinary method of feeding. But, besides this, there was another method of feeding of which he would speak from personal observation, and which he had witnessed in the neighborhood of Northallerton. He went to that place because he had heard that Mr. Marshall was keeping double the amount of stock, with the same quantity of turnips, that he had been in the habit of doing only two years ago; the other food used being ground oats, barley, rye, and old beans, and chopped hay, instead of straw at times; but the cattle did best with the straw. Hearing, as he had stated, that Mr. Marshall kept double the stock upon the same amount of turnips, by his system of feeding, he (Professor Johnston,) was very anxious to see the mode of carrying his system into operation, and went down to Yorkshire for that purpose. There he saw about 200 head of cattle feeding, a portion of which was sold off every week, and their places supplied by others. What struck him as very remarkable, was the state of absolute rest in which he found the cattle. There was not a single beast upon its legs; no motion was observed, which, they were aware, was a circumstance favorable for fattening. In connection with this subject he got the following information, and in order that they might fully understand it, he would present it in a tabular form. It was as follows:

Linseed, 2 lbs., boiled for 3 hours in 4 gallons water.
Cut straw, 10 lbs., } mixed with jelly.
Growing corn, 5 lbs. }

To be given in two messes, alternately with two feeds of Sweedes. Now, the mode in which the linseed was boiled was of considerable consequence. In the first place it was boiled for three hours. The jelly was then poured upon crushed grain and cut straw, much in the same manner in which a man made mortar, being mixed together with a shovel and allowed to stand for an hour. It was then stirred again, and after a lapse of two hours it was given to the cattle in a hot state, and the result was, that if the animals are fed regularly on this kind of food and turnips alternately, they remain in a state of extraordinary quiet. They become exceedingly fond of it, and commence bellowing whenever they hear their neighbors being served before themselves. The practice was to give them a meal of the linseed mixture at six in the morning, turnips at ten, another mess of linseed in the afternoon, and turnips again in the evening. When he saw them first in the morning, it was after they had got their mess, and he was much astonished to see them, on visiting them on the second occasion, when they were all on the *qui vive* for their meal. Two things were to be observed in regard to this system of feeding—first, that it consisted, in addition to turnips, of a mixture of grain, straw and linseed in certain quantities, given hot; and the result was double the amount of stock kept on the same amount of land. The proportion of turnips which could be grown upon a farm usually determined the amount of stock a man might keep; and, if by an improvement in the system of feeding, the quantity of cattle could be doubled, by turning the money twice instead of once within a year, the farmer would obtain double the profit. But this was not the only advantage; he would double the manure which he made at the same time, which would contribute very much to the fertility of his land; he being enabled, by the use of this linseed, to return more than he took out of it. The proportion of the food had other important consequences in regard to manuring the soil. The crushing of the grain and seeds, by reducing them to the minutest particles, made the substances of which they were composed more easily assimilated to the food of plants, and made it better manure, because of the extreme division which it had undergone. Now, they would observe that, by having this large additional amount of manure, they would get larger crops, and introduce a system which would go on annually increasing the amount of their produce, and consequently the amount of their profits. This would enable them to farm higher, and, by farming high, they would keep that place which, he was sure, they now occupied in the history of the world. He would likewise direct their attention to the use of linseed, and the preparation of food, as being of great value in keeping working animals in good condition; but on this point he would not detain them by giving a special detail of facts, as the same general principles applied in the one case which applied in the other. As he had occupied the attention of the meeting at considerable length, he would conclude for the present, reserving any additional remarks which he had to make, and the replies to any questions which the company might think he could usefully answer, until after the general discussion was ended.

REMARKS ON THE FORMATION OF CRYSTALS OF ARGENTIFEROUS GALENA, BY SUBLIMATION.

BY C. T. JACKSON.

At the meeting of the American Association of Geologists and Naturalists at Boston, New Haven and New York, I proposed to account for the origin of several metalliferous veins, by sublimation of their ores or constituents. In favor of this theory, I mentioned that a considerable loss was sustained in smelting lead ores, owing to the evaporation of the sulphuret of lead at the temperature required for its reduction; and called the attention of geologists to the quantities of sulphuret of lead which rise in the chimneys of smelting works, and to the particles of sulphuret of lead which fall on the roofs of the buildings, and on the surrounding soil.

It was ascertained by Berthier, that when galena is kept fused in a crucible, lined with charcoal, in which the reduction of the lead could not take place, a considerable portion of the galena was actually lost by sublimation. It is also known, that although silver is regarded as fixed in the fire, and does not volatilize when exposed for weeks to the heat of a porcelain furnace, it is partially sublimed with the vapor of lead in the process of cupellation; and that the last portions of litharge blown over, contains a notable proportion of silver.

It appears probable, that argentiferous galena is also volatile under certain circumstances; and from some phenomena which I observed at the Shelburne mines, and in the crystals of lead ore which I have examined, it would seem that the origin of those veins and crystals can be demonstrated to have arisen from vapor of the ore.

A cavern was struck by the miners, at the depth of about twenty feet, and the walls of this crevice were found to be covered with crystals of argentiferous galena, associated with brown spar and quartz. The crystal of argentiferous galena are in the forms of octahedra, having their solid angles replaced by single planes, and rhombic dodecahedra with their surfaces rounded and dimmed by decrystallization, or by irregular deposits of minute particles of the ore. There are also some cubic crystals which have their surfaces much altered, and their angles effaced or blunted, and which present depressions in the planes of the cube, as if the ore had sunk, in a semi-fluid state, into a cavity.

Some of the crystals exhibit the most decisive proof of their ingenious origin, and have undergone a sort of eliquation, the interior of its mass having flowed out, and left the exterior crust in the form which the crystal originally assumed on cooling of its surface. Some of these crystals are somewhat larger that a hen's egg, and form very beautiful specimens to illustrate the origin of the ore, and would ornament the cabinet of a mineralogist.

We may suppose that the cavern in which the crystals occur, was originally filled with molten galena, and that the ore ran out from it into other crevices, and left the cooled and crystallized ore on the walls; or that an open crevice allowed the vapor of lead ore to sublime into the chamber, and that the crystals were deposited on its surface by their cooling action.

The appearance of the walls seem to indicate the latter theory as the most reasonable; for the crystals of lead ore were deposited upon the quartz and brown spar crystals, which do not appear to have been bathed in the molten ore. I should assign the same origin to the resplendent octahedral crystals of black cupriferous blende, which are sprinkled over the surface of this cavern, and to the crystals of copper pyrites which are associated with the lead ore.—*Boston Journal of Natural History.*

We do not hold ourselves responsible for the statements and opinions of the contributers to this journal. We prefer to give the articles of our correspondents in their own words. It is then optionable with us to state our opinions and views or not, or make what we consider corrections.

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OF

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This work will be issued hereafter monthly, at two dollars per annum payable in advance. It will form two volumes at the close of the year of three hundred pages each, and will be illustrated by plates and wood engravings.

The object of this Journal is to disseminate useful knowledge relating to Science, the Arts, and Agriculture, and to promote sound views in education. It is in fine designed for a farmers' magazine, and no efforts will be wanting to make it a welcome visiter in his family.

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E. EMMONS,
A. OSBORN.

Albany, January, 1847.

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No. XIII. MAY, 1847.

THOUGHTS ON REQUISITES OF FARMING.

BY PROF. J. DARBY.

It has been a prevalent idea, in this country at least, that to be a good farmer, required little or no exercise of intellectual power; that physical ability was alone requisite for the successful conduct of all farming operations. To hoe, plow, and perform other like necessary duties, with skill and adroitness, were the only essential qualifications of one devoted to the cultivation of the soil. The routine of the father was the routine of son, without variation or change. No matter how learned or intellectual the owner of a farm might be, his farm afforded no scope for the operation of his abilities, farther than making his bargains and ornamenting his estate. It is well known that the meaning of the phrase, "to be educated for a farmer," was, that "reading, writing, and cyphering," constituted the sum of all necessary attainments. To bestow a liberal education on a boy devoted to the farm, was not to be thought of; a most profligate waste of money, all would have considered it, to be thus employed.

The origin of these ideas we shall not attempt to trace. That they are false, degrading and injurious to the best interests of society, there can be no doubt.

The establishment of such journals as yours will dissipate these false notions; and we see in their origin, harbingers of a brighter day; and we trust that the time is not far distant, when a farmer uneducated in all the varied laws and phenomena which he is called to manage and control, will be a much rarer coincidence than it now is to find an uneducated lawyer, doctor, or minister.

Who needs mental training, if he does not who labors amid arrangements the most complicated, and agencies the most subtle and refined, and whose only hope rests on the proper guidance of the one, and the appropriate action of the other? It is true, these arrangements and agencies will bring about happy results, although not understood and controlled, provided we do not, in our ignorance, nullify their effects. But how much more subservient to our interests and happiness would they become, were we to make ourselves their intelligent masters, and guide them at our will. To study these arrangements, and search out the laws that guide these agencies, is the appropriate business of the farmer. And where is there a field of more rich and varied interest? As he scatters the inanimate seed in the earth, and traces the varied changes to life and beauty; as he contemplates the mysterious energy that will soon be acting within its bosom, and producing results that mock human contrivance and skill, an energy at once most powerful and mild, giving forth products that the chemist cannot imitate or produce, and working by an apparatus the most exquisitely delicate and fine, how must his imagination be aroused, and ascend to the Source of light and life, the great cause of these mysterious agencies, put in requisition to administer to our daily happiness and wants? How must his admiration be excited, when he sees the sunbeams weaving a texture, in fineness and perfection as far exceeding the finest fabrics of human art, as they do the coarsest canvass that form the sails of a ship, or the bags for cotton? And who but has felt it, can tell the pleasure to be derived by the varied hues of the opening flower, when he has seen the skill that has managed their production and composition? It is not so much the exhibition that strikes the eye of the most careless observer, that arrests his attention, as the agency by which these effects are produced. He draws his pleasure from a deeper source, closed but to laborious industry.

All admire the result produced by the action of any complicated engine; but how much more does he admire, and how much deeper is his joy, who, by proper education as an engineer, reads the design in the adjustment of every wheel, and beholds the ingenuity that produced every varied motion. The same difference in the joys conveyed by the eye of intelligence and ignorance, in viewing any production of nature. One sees a pretty flower, the other the skill and workmanship of a God. To disclose her real beauties, Nature need be interrogated. True, she often hangs out an alluring sign, to arrest even the attention of the careless and idle, and bestows blessings on the ignorant and ungrateful; but to her votaries only does she raise the veil that covers her hidden mysteries and choicest treasures. The former may daily wander amid the most magnificent exhibitions of her matchless skill, and see them not. He may revel on her bounties, and behold not the array of means and agencies employed in their production. He may be like the ass in the china shop, unmindful of the skill and beauty of the works by which he is surrounded.

To understand the constitution of the various objects with which the farmer has to deal, and the laws by which their production is governed, and the agencies by which they may be modified and changed, needs much mental labor and diligent observation. To be an intelligent farmer, in other words, puts in requisition all the powers of the best intellect. He needs to go to the bottom of things. Superficial knowledge is of no use to him. He must learn the very elements; and commencing at these, go by actual observation through secondary causes as far as the present state of knowledge permits, and press with untiring industry to the point of observation where he may see through Nature, Nature's God. To get to that point of vision—the highest intended to be reached by man, and at a lower point he need not stop—from which he may see on the one hand the mighty energy that moves the universe, and on the other the vast and complicated machinery of which it is composed, moving with no jarring pinions or clashing wheels, but all is harmony and order, where to our untrained faculties all seems confusion, and the accomplishments of chance. Instead of practical results, the farmer needs principles. Empiricism has been here the ruling goddess, for ages past; and the opposing and conflicting results, which her labors produce, teach us, if we will learn, that she is not to be trusted. Experiments, to be useful, must be guided by an intelligence derived from a careful study of the conditions of existence, and the modifying influences to which the objects of experiment are subject.

We would not be understood to say that blind experiment has never accomplished any good result; far from it. The experiments of late years, in the various subjects of the farming interests, are signs of better times. Although these experiments have been guided generally by no principle, and in perfect ignorance of the simplest laws that govern animal and vegetable being; yet they have conducted to many empirical results of high value. That these experiments have been made in ignorance, and without principle, our agricultural journals and reports teem with proof. The labors and treatises of the alchymist of the middle ages, bear the same relation to the science of chemistry now, that the practice of farmers and our agricultural journals do to the true science of farming. This noble department of human industry—the one on which all others directly or indirectly depend, has been the last to receive an impulse from modern discoveries. While the magnificent results of scientific research have enriched every field of human interest, and scattered blessings innumerable on every hand, it seemed, until within the last few years, that *this*, the oldest department of man's labors, was to go down to posterity unchanged from what it was, in times long past, beyond which no record extends.

Agriculture, ten years ago, was but little different in discovered and established principles, from what it was two thousand years ago. The bard of Mantua wrote with as much philosophy on the conduct of the farm, as many who have written for agricultural journals within our own observation.

The essays that have appeared in this country, and especially in Europe, within the last two years, on the failure of the potatoe crop, will stand a monument of the knowledge of vegetable physiology at the present time. While some of them, perhaps one in ten, are profound, and do honor to science, the others exhibit a heedlessness of all principle, that is truly astonishing, when we consider the sources whence some of them have emanated. If it was not that the essays were on farming, we should imagine ourselves carried back to the days of Paracelsus and Albertus Magnus; for in no other department of human knowledge could so palpable violations of all known principles be advanced, and not bring on the heads of the perpetrators the just retribution of universal contempt.

But, in farming and animal magnetism, impunity reigns over all absurdities!

It has been an established idea, it would seem, that to write for farmers, articles that they would read and appreciate, one must deal in a certain class of facts. They must be "practical facts;" they must be facts not too far removed from dollars and cents. To descend to elementary principles, and get to the origin of things, is getting too far removed from the "*primum mobile*" of the farmer's efforts. We reverse in this department, the ancient adage, "*Qui a nuce nucleum esse vult, frangat nucem.*"* We have been attempting to get at the kernel, without first cracking the nut; and after centuries have past, we find the science of agriculture "*in statu quo.*" The nut *must* be cracked by every one who expects to manage a farm in a rational and consistent manner. In other words, he must commence and learn the very elements of his science, and let a nobler motive than the mere accumulation of money animate him; and even if it should not, the right way is the surest way in the long run, even if we can be moved only by gain. If it *has* been the case, that the empirical practice has been the prevailing one over this interesting and important field, we mistake the signs of the times, if there is not a

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* He who would eat the meat, must first crack the nut.

different practice coming into vogue. When such works as have emanated from the press within the last few years, can be sold to farmers, and understandingly read by them, and agricultural journals of high scientific character can be supported by the same class, it is certain that reason shall soon control, where, in former times, it has had but little influence.

ON THE GRASSES.—No. II.

BY S. B. BUCKLEY.

Since writing the first number, we have concluded to give short descriptions of all our native species, including also those introduced into the United States from other countries, and now naturalized, or partially naturalized. We shall briefly describe those which we consider as unworthy of cultivation by the agriculturist, and dwell more at large upon those species which are useful or injurious to the farmer.

Poa of Linneus.—Meadow Grass.

Spikelets: two or many flowered; flowers distichous, hermaphrodite; glumes two, pointless, subequal; palea two, pointless; lower, keeled or concave; upper, two-keeled; stamens one to three; ovarium sessile, glabrous; styles two, terminal; stigmas plumose; caryopsis free or adhering to the upper palea; leaves mostly flat; spikelets pedicillate, paniculate, or rarely racemose, sometimes sessile; flowers sometimes dioecious.—*Linn., gen. n.* 83, *excel. sp. Kunth gram.* 110.

Poa pratensis, Linn.—Meadow Grass—Kentucky Blue Grass.

Root perennial; culm terete; smooth, erect, one to three feet high; leaves keeled, linear, radical; cerves very long, panicle rather crowded and spreading; spikelets crowded on the branchlets; ovate, acute; two to five flowered; glumes unequal, sharply accuminate; lower palea lance ovate, five nerved; upper palea linear accuminate.—*P. viridis Muhl. Gram., p.* 138*; Ell.* 1, *p.* 159*; Nutt. Gen.* 1, *p.* 66*; Pursh.* 1, *p.* 79*; Beck, p.* 410.

For a further notice of this grass, see the January number.

Poa Compressa, Linn.—Blue Grass—Wire Grass.

Root creeping; culm genicolate, much compressed; decumbent, smooth; eighteen to twenty-eight inches long; leaves linear, short keeled; ligules short, obtuse; panicle compressed, somewhat secund; spikelets ovate, oblong; three to nine flowered; glumes shorter than the lowest flower; lower palea ovate oblong—*Linn.*, *Sp.* 1, *p.* 69. Also described by most authors on European and American grasses. Flowers June, July.

This grass varies much in its appearance. On dry soils it grows in tufts having rigid wire-like culms, and small, short, compressed panicles, the culms rarely exceeding eight or ten inches in length; the whole having a dark green color, inclining to blue. Such is its general appearance on stubble land, in wheat fields and dry pastures, in Western New York. It is so tenacious of life that it is difficult to be subdued by summer fallowing, as a small quantity of dirt adhering to the roots is sufficient to keep it alive. To destroy it, the ground should be thoroughly harrowed soon after plowing, and the use of the cultivator will be found highly beneficial. Hence this grass is regarded as a pest in our wheat growing fields.

On the rich warm soil of Kentucky, the culms of this grass sometimes attain the length of twenty-eight inches; and in the rich meadows and pastures of Western New York, it grows about two feet high, nearly erect, with the culm and leaves of a bright green color.

It forms a highly nutricious food, but is unworthy of cultivation on account of its tenacity of life, general diminutive size, scanty production, growing in tufts, rarely forming a sward. Supposed to have been introduced from Europe, and now extensively naturalized in the Northern and Western States.

Poa Trivialis, Linn.—Rough Meadow Grass.

Root perennial; culm and sheaths somewhat scabrous; leaves smooth, narrow; ligule oblong-lanceolate, acute; panicle equal diffuse, large pyramidal, somewhat verticillate; spikelets, three to four flowered; ovate flowers webbed at the base; glumes unequal scabrous, very acute; palea unequal, scarious at the apex; lower palea obtuse, pubescent at the base; culm two to three feet high.—*Linn., sp.* 1, *p.* 67; *P. stobonirea Muhl. Gram., p.* 179; *P. scabra. Ehr. Fl. fr.* 3, *p.* 59; *P. dubia Leers, herb., t.* 6, *f.* 5. Flowers June to August.

Considered as a naturalized foreigner; but is not as widely diffused as either of the two preceding—yet it is found as far west as Kentucky. It has some resemblance to Poa pratensis; but is generally considered by American farmers to be much inferior in value. We are not aware that it has been fairly tested or much cultivated in this country. It is grown extensively in England, and is highly esteemed. Mr. Curtis, an English writer on the Grasses, remarks, that this is one of the most valuable, either for pasturage or hay; the produce not being very early, but the yield abundant, and of an excellent quality. Mr. Sinclair also recommends it in the following words: "The superior produce of this poa over many other species; its highly nutritive qualities; the seasons in which it arrives at perfection; and the marked partiality which oxen, horses and sheep have for it, are merits which distinguish it as one of the most valuable of those grasses which affect moist rich soils and sheltered situations; but in dry, exposed situations, it is altogether inconsiderable. It yearly diminishes, and ultimately dies off, not unfrequently in the space of four or five years. Its produce is always much greater when combined with other grasses, than when cultivated by itself. With a proper admixture, it will nearly double its produce, though on the same soil; so much does it delight in shelter. Those spots in pastures that are closely eaten down, consist for the most part of this grass. For hay, it should be cut when the seed is ripe, when the yield will be more abundant and more nutritious."

Poa Annua, Linn.—Annual Meadow Grass.

Root annual, culm compressed; cespitose three to eight inches long, geniculate, smooth; panicle spreading; spikelets ovate, oblong; three to six flowered; glumes unequal, ovate, lanceolate; lower palea ovate, obtuse, five nerved; upper palea lance linear, white, with two green marginal keels.—*Linn., sp.* 1, *p.* 68. Flowers throughout the season.

Frequent near paths and road-sides, throughout the United States: it also abounds in most European countries. Loudon says it is the most common plant in all temperate climates, and perhaps in the world. In the American Farmer's Encyclopedia, under Poa annua, the sentence commencing with, "This grass, which Dr. Darlington calls meadow Poa," and the remainder of the article, is intended for Poa pratensis, instead of Poa annua.

Poa Pugnans, Nutt.—Sharp-leaved Meadow Grass.

Culm erect, smooth, slightly compressed, cespitose; radical leaves long and narrow, those of the culm usually two, short and acute; panicle small, spreading; branches flexuose, few, mostly by twos or threes; spikelets somewhat crowded at the extremity of the branchlets; flowers webbed at the base; glumes unequal, lanceolate; lower palea ovate, lanceolate, obtuse, scarious at the apex; upper palea shorter, linear lanceolate; caryopsis oblong, linear, channelled on one side; culm one to two feet high; root perennial.—*Nutt., gen.* 1, *p.* 66; *P. autumnalis Ell., sk.* 1, *p.* 159; *P. flexuosa Muhl. Gram., p.* 148, (*not of Smith;*) *P. cuspidata Bart., fl. Phil.* 1, *p.* 61.

Moist rocky places, and in the woods of Western New York; also in Pennsylvania, South Carolina and Georgia. Cattle and sheep are fond of it; but it grows sparingly in our woodlands, with a weak, slender culm. Flowers April, May.

Poa Laxa, Flaenke.—Few-Flowered Alpine Meadow Grass.

Culm erect, cespitose, six to eight inches high, leaves setaceous or narrow linear, smooth; panicle contracted; branches flexuose, in twos or threes; spikelets ovate, pubescent, about three flowered; glumes lanceolate, subequal, slightly scabrous on the keel; lower palea ovate, somewhat obtuse, hairy at the base; upper palea very narrow, rough on the margin.

Grows on the mountains of Europe, and on Mount Marcy, in the State of New York.

Poa Nemoralis, Linn.—Wood Meadow Grass.

Panicle spreading, branches capillary, scabrous, three to five together; spikelets, two to five flowered, lanceolate, or lanceolate ovate, flowers racemose, distant; glumes unequal, palea lanceolate smooth on the sides, scarious on the margins, hairy near the base; root perennial, culm one to two feet high. Flowers May, June.

Grows in the woods of Yates county, and probably in most of the counties in the western part of New York. It has been found as far west as Kentucky, and is also a native of Europe. Sinclair recommends a variety of this species, which he names Poa nemoralis, var. augustifolia; remarking, that, "although the produce is inconsiderable compared to that of many others equally nutrient; yet the early growth of this grass in the spring, and its remarkably fine, succulent and nutritive herbage, recommend it strongly for admission into the company of the superior permanent pasture grasses. Flowers May, June.

Poa Serotina, Ehrh.—Red Top—Late Flowering Meadow Grass.

Panicle diffuse, elongated; branches verticillate in fives or sixes; spikelets ovate, lanceolate, accuminate; three to four flowered, tinged with yellow at the apex; glumes oblong lanceolate, very acute; palea lanceolate, somewhat obtuse, yellowish at the tip, pubescent at the base; culm two to three feet high; leaves smooth; those of the culm three to four lines wide, four to five inches long; root perennial.—*Ehrh. Gram.*, 82; *Derby. Bot., gal.* 1, *p.* 523; *Beck, Bot., p.* 410; *Torr., fl. S. N. Y.*, 2, *p.* 458; *P. palustris Fl., fr.* 3, *p.* 60, *et* 5, *p.* 272, (*not Linn.*); *Muhl. Gram., p.* 150; *P. fertilis* "*Host. Gram.*, 3, *p.* 10, *t.* 14;" *P. crocata Mich., fl.* 1, *p.* 680. Flowers July.

Wet meadows in Northern and Western States, and Europe. We have specimens from Italy, labelled "Poa fertilis," which agree very well with the plant as found here. According to Michaux's Flora, Poa crocata was found near the rivers flowing into Lake Mistassimiis, in British America; and the plant as found there, may yet prove distinct from P. serotina. Our specimens from Prof. Short, of Kentucky, labelled "Poa crocata, Mich., meadows of Ohio," are scarcely distinct from P. serotina.

This is one of the most valuable grasses, especially for moist meadows, the yield being abundant, and of an excellent quality. During the present winter we have kept a flock of sheep alternately with clover and hay, composed mostly of Poa serotina, which was mowed when ripe, about the 5th of August. The sheep are now in good condition, and eat the meadow grass with a high relish. It is highly esteemed in Europe, ranking among the best grasses for irrigated or wet meadows. We think it superior to timothy for cattle or sheep, on account of its more tender culms.

Eragrostis, Beauv. Spikelets five, many flowered, compressed, paniculate; lower palea membranaceous; three nerved, upper palea two keeled, keels ciliate, persistent; Caryopsis deciduous with the lower palea.

Poa Eragrostis, Linn.—Strong-scented Meadow Grass.

Panicle spreading equal branches, slightly pitose in the axils; spikelets ovate, oblong, fifteen to twenty flowered; glumes subequal, culm oblique, or decumbent geniculate, glabrous, branching at the base, one to two feet long; leaves two to four lines wide, attenuate, ligule short, bearded; root annual.—*Linn., sp.* 1, *p.* 68; *Ell., sk.* 1, *p.* 161; *Torr.*, 1, *p.* 115; *Darl. Fl. Cest., p.* 79; *Briza Eragrostis Linn., sp.* 1, *p.* 113; *Pursh.*, 1, *p.* 81; *Mich.*, 1, *p.* 72; *Ell., sk.* 1, *p.* 161; *Megastachya eragrostis, Beauv. Agrost., p.* 74; *Eragrostis Major Hist. Gram.*, 4, *t.* 34. Flowers August, September.

Emits a peculiar odor when first gathered. Introduced from Southern Europe, and now found in nearly every section of the United States; as far west as the Mississippi, and south as far as Florida. Frequent on the sandy banks of streams, and sometimes in the field and garden. It is a beautiful species, but of little use to the farmer.

Poa Rigida, Linn.

Panicle secund, lanceolate, coarclate, rigid; branches alternate, spikelets five to fourteen flowered, linear, smooth, rigid; florets loose, or a little remote; glumes keeled, serrulate, palea ovate, somewhat acute, purple; leaves narrow, acute, smooth, rigid; stipules membranaceous.—*Linn., sp.* 110; *Ell., sk.* 1, *p.* 164; *Derby, Bot. Gal.*, 1, *p.* 525; *P. cristata Tralt., p.* 80; *fide Ell. Megastachya rigida, P. de Beauv.*

Dry sandy soils in the vicinity of Beaufort, South Carolina, (*Elliot.*) A European species, which we believe has not been introduced into the Northern States.

Poa Reptans, Michx.

Culm branched, creeping, nodose, rooted at the joints; spikelets oblong, or linear lanceolate, fifteen to twenty flowered; flowers accuminate, panicle contracted or sparingly spreading; leaves numerous, attenuate and accuminate, one to two inches long; glumes acute, very unequal, carinate, keel green, margins white, scarious, palea unequal, accuminate; lower palea three nerved, upper palea ovate, hairy on the keels; root annual—*Poa hypnoidas Lamark.; Lam. ill.*, 1, *p.* 185; *vide Pursh Eragrostis reptans Nees.*, "*in Mart. fl. Bres.* 1, *p.* 514," *ex Torrey.*

Sandy soils; frequent especially on the banks of rivers in nearly every section of the United States. Sometimes the creeping culms extend two feet, sending forth roots at the joints. A small, handsome, delicate grass, of little use to the agriculturist.

Poa Pilosa.—Pilose Meadow Grass.

Culm caspitose, oblique, geniculate, hairy in the axils; panicle capillary, branches alternate, or opposite; spikelets linear, five to thirteen flowered, flowers ovate, accuminate, not webbed at the base, of a dark lead or purple color; glumes unequal, ovate, accuminate, membranaceous; lower one smaller; lower palea ovate, scabrous or slightly pectinate on the keel; upper palea persistent on the rachis; caryopsis oblong, brown; leaves linear lanceolate, five nerved, pilose at the base, ligule bearded; culm six to fourteen inches high, branching at the base; root annual.—*Linn., sp.* 1, *p.* 68; *P. pectinacea Michx., fl.* 1, *p.* 69; *Pursh., fl.* 1, *p.* 81; *P. tenella Pursh., l. c., Eragrostis pilosa Beauv. Agros., p.* 71. Flowers July, August.

New York and Western States, to South Carolina and Louisiana.

Poa Hirsuta, Michx.—Hirsute Meadow Grass.

Panicle very large, much branched, spreading, branches divaricate, hairy in the axils; spikelets oblong, five to fifteen flowered; culm stout, rigid, erect, one to two feet high; leaves lanceolate, long, hairy near the base, sheaths longer than the joints, the lower ones hairy, ligule bearded; spikelets purple, lance oblong; root annual.—*P. spectabilis Pursh., fl.* 1, *p.* 80.

Cultivated fields in New York and Pennsylvania, to Carolina. This grass is often troublesome in corn-fields. When young, cattle or sheep are fond of it, preventing its arrival at maturity on summer fallows.

Poa Capillaris, Linn.—Hairy Meadow Grass.

Panicle large, spreading, branches capillary and much divided, smooth; spikelets, two to five flowered, at the extremity of the branchlets, flowers not webbed, purple; culm and panicle ten to twenty inches high, much branched at the base, sheaths hairy at the throat; leaves linear; glumes unequal, acute, keel scabrous, palea ovate, acute, caryopsis ovoid, yellowish brown, hairy at the apex.—*Linn., sp.* 1, *p.* 68.

Dry sterile fields, from New York to Carolina, and as far west as Kentucky.

Poa Refracta, Muhl.—Refracted Meadow Grass.

Panicle very large, diffuse, hairy in the axils of the branches; branches refracted, scabrous and pectinate under a lens, flowers pistant, racemose; spikelets oblong linear, fifteen to twenty flowered; glumes unequal, lanceolate, accuminate, slightly serrate on the keel; palea unequal; upper palea oblong linear, lower palea ovate acute, keel serrate under a lens; caryopsis oblong spheroid, yellowish brown; leaves six to ten inches long, linear, hairy on the upper surface; lower surface smooth and striate; stem, including the panicle, one and a half to two feet high; root perennial.—*Muhl., p.* 146; *Ell., sk.* 1, *p.* 156.

In the pine barrens of Carolina, Georgia and Florida, in damp soils.

Poa Tenuis, (Ell., sk. 1, p. 156.)—Slender Meadow Grass.

Panicle very large, branches verticillate, slightly hairy in the lower axils; branchlets numerous, divaricate, capillary; spikelets two to three flowered; glumes unequal, ovate, lanceolate, acute, nearly transparent; palea ovate, lanceolate, acute, slightly keeled, anthers and stamens brown; leaves twelve to eighteen inches long, rough, sparingly haired, sheath with long hairs in the throat; root perennial; culm oblique or erect; often several culms from the same root, and decumbent from the weight of the large panicle, which is sometimes more than two feet long, and twelve to sixteen inches in diameter. Flowers July, August.

Wet places, banks of streams, in rich soils; Carolina, Georgia, Florida and Alabama—where we have often seen it in corn or cotton fields, in spots not subjected to the plow.

Poa Obtusa, Muhl.

Panicle contracted; spikelets ovate, obtuse, about five flowered, not webbed at the base; glumes unequal, small, acute or obtuse; palea nearly equal, ovate, obtuse, smooth, slightly nerved.—*Muhl. Gram., p.* 147. Culm erect, twelve to eighteen inches high; leaves of the culm six to ten inches long, and two to four lines wide, often revolute, smooth; spikelets numerous on capillary branches, in a close contracted panicle; caryopsis oblong, ovate.

Grows in wet places, and on the border of ponds in Pennsylvania, New Jersey and New England. It flowers in August and September. Muhlenburg remarks that it is "*bonum pabulum,*" or a good food.

Poa Maritima, Huds.

Panicle slightly branched, contracted; spikelets oblong terite, about five flowered; flowers rather obtuse, at length loose, slightly nerved.—*Huds., aug.*, 42; *Poa arenaria, Retz.* Stem erect, about eighteen inches high; leaves small, narrow, and with the stem smooth; glumes unequal, obtuse; palea nearly equal, slightly obtuse.

Salt marshes near the sea-coast of New England. It is also a native of Europe.

* * * Acheropus, Trin.

Spikelets in a contracted spikelike panicle; lower palea coriaceous, many nerved, not keeled, nerves not prominent, margin membranaceous.

Poa Michauxii, Kunth.—Spiked Salt-marsh Poa.

Panicle contracted, spiked; spikelets ovate oblong or ovate, smooth, five to ten flowered; leaves distichous, involute, spreading, rigid.—*Kunth's* "*Gram.*, 2, *p.* 533," (*not of Linn.;*) *Uniola spicata Linn., sp.* 1, *p.* 71; "*U. distichifolia Roem. and Schult., sy. s.* 2, *p.* 596, (*not of Labill;*") *Festuca distichifolia Michx., fl.* 1, *p.* 67; *Briza. spicata Lam. Enc.*, 1, *p.* 405; *Brizopyrum spicatum Hook. and Arnott.* Culm erect, about a foot high; root creeping, perennial; glumes unequal, lower one acute, upper one rather obtuse; stamens three, anthers vary in color from purple to white.

Grows in marshes along the sea-coast, from Massachusetts to South Carolina.

Poa Debilis, Torr.—Weak Meadow Grass.

Panicle loose, few flowered, somewhat spreading, the branches mostly in pairs, flexuous; spikelets ovate, obtuse, two to three flowered, flowers webbed at the base; lower palea oblong, obtuse, slightly three nerved; leaves and sheaths smooth, ligule oblong, acute.—*Torr., fl. S. N. Y.*, 2, *p.* 459. Perennial, culm one to two feet high, erect, slender, terete, smooth; leaves generally two to three inches long, and about two lines wide, very acute and somewhat pungent.

The weak meadow grass is quite common in woods and along the shady banks of streams of the Northern and Western counties of the State of New York. It is a new species, lately described by Dr. Torrey, in the New York State Flora. It has been confounded with Poa pungens, by some botanists; from which it differs in its smoother and more obtuse spikelets, which are also fewer flowered. Its radical leaves are procumbent and short, while those of the Poa pungens are erect, and often six to eight inches long. It flowers in May.

Poa Ciliaris.

Culms cespitose, procumbent; panicles terminal and axillary, glomerate and somewhat compressed; spikelets broadly ovate, oblong, obtuse; eight to twelve flowered; glumes unequal, smooth, acute; palea nearly equal, rather obtuse, the lower ones shortest, keeled, margin of upper palea very ciliate; throat of the sheaths ciliate; leaves about three lines wide, very acute, smooth; culms about twelve inches long. Flowers in June, July.

Grows on the dry road-sides at Allenton, in Wilcox county, Alabama, where it has been apparently introduced. We have not met with it elsewhere in the United States.

Glyceria Acutifolia, Torr.

Panicle elongated simple, appressed; spikelets linear-terete, four to twelve flowered; florets attenuated, acute, indistinctly nerved; leaves short, erect, (*Torr., fl.* 1, *p.* 104;) festuca brevifolia, (*Muhl. Gram., p.* 167;) culm about eighteen inches high, somewhat compressed; leaves smooth, four to six inches long; ligule elongated; panicle slightly nodding, the lower part concealed in the sheath of the upper leaf; glumes unequal; lower palea lanceolate, attenuate, and very acute, shorter than the upper palea; caryopsis oblong grooved on the upper side.

Habit similar to the preceding species, from which it is easily distinguished by its acute flowers and nerveless palea. It seems to be rare in Western New York, but is found near Troy and in the vicinity of New York city. It also grows in some parts of Massachusetts, Delaware and Maryland. From its resemblance to the preceding, we should judge that it would be readily eaten by all kinds of stock.

Glyceria Dentale, (plate 2, fig. 3.)—Toothed Manna Grass.

Panicle spreading, branches flexuous, mostly by twos; spikelets ovate lanceolate, rather distant, about five flowered; glumes unequal; palea nearly equal, about five nerved.—*Poa dentala Torr., fl.* 1, *p.* 107, *and fl. S. N. Y.*, 2, *p.* 461; *Triodia pallida Spring. neue entd.* 1, *p.* 246; *Uralepis? pallida Kunth.* Culms decumbent or oblique, about two feet long, round, smooth, often branching from the base and rooting from the lower joints; leaves of the culm about six inches long and four lines wide, smooth, ligule oblong, rather obtuse.

We have followed the suggestions of Dr. Torrey, in referring this species to Glyceria. This grass has an extensive range, being often found in the wet sandy places in the Northern and Western States, and as far south as Florida. With its nutritive properties we are unacquainted yet; probably it affords nourishing food to either horses, cattle or sheep.

Glyceria Aquatica, Smith.—Reed Manna Grass.

Panicle large, diffuse, much branched; spikelets oblong linear, obtuse, about seven flowered; glumes unequal, ovate, obtuse; palea nearly equal obtuse, lower one strongly nerved.—*Smith, Engl., fl.* 1, *p.* 116; "*Glyceria spectabilis Trin. in Act. Petrop.*, 6, *ser.* 1, *p.* 365;" *Poa aquatica Linn., sp.* 1, *p.* 67; *Poa aquatica var. Americana Torr., fl.* 1, *p.* 108. Culm erect, terite, three to five feet high; leaves broad, linear, smooth, accuminate; spikelets vary in color from purple to green.

Wet meadows, swamps and bogs of Northern States. It is also a native of many parts of Europe, where it is highly valued both for hay and pasturage. Many swamps and marshes throughout the Northern States, which are now nearly useless, might be rendered valuable by seeding them down with several of our large Glycerias, especially the G. aquatica, which is called the Water meadow grass, in England.

The following is from the American Farmer's Encyclopedia: "The water meadow grass is one of the largest of English grasses. It is found chiefly in marshes, but will grow on strong clays, and yields, as the Woburn experiments prove, a prodigious produce. In the fens of Cambridgeshire, Lincolnshire, &c., immense tracts, that used to be overflowed, and to produce useless aquatic plants, and which, though drained by mills, still retain much moisture, are covered with this grass; which not only affords rich pasturage in summer, but forms the chief part of the winter fodder. It has a powerful creeping root; bears frequent mowing well, sometimes being cut three times in one season. It grows not only in very moist ground, but in the water itself; and with cat-tail, bur-weed, &c., soon fills up ditches, and occasions them to require frequent cleansing. In this respect it is a formidable plant, even in slow rivers. In the Isle of Ely, they cleanse these by an instrument called a bear, which is an iron roller, with a number of pieces of steel, like small spades, fixed to it. This is drawn up and down the river by horses walking along the banks, and tears up the plants by the roots, which float, and are carried down the stream." Flowers July, August.

GLYCERIA ELONGATA, TRIN.—LONG PANACLED MANNA GRASS.

Panicle elongated, appressed; branches mostly solitary; spikelets ovate, obtuse, two to four flowered; leaves long, linear, smooth, ligule short.—*Hooker's fl. Bor. Am.*, 2, *p.* 248; *Poa elongata Torr.*, *fl.* 1, *p.* 112; *Poa Torreyana Spring.* Culm three to four feet high, erect, smooth, simple; leaves of the culm about a foot long, and panicle eight to twelve inches long, slightly nodding; glumes nearly equal, acute, keeled, transparent on the margin; palea unequal, oblong ovate, acute, strongly nerved, upper one obtuse, shorter than the lower; stamens two.

Wet places in Canada and Northern States, and among the mountains of North Carolina, where it is often abundant in wet places, formed by the dripping of water from the precipices above. It flowers in June, July.

GLYCERIA FLUITANS, R. BR.—MANNA GRASS.

Panicle secund, long, slightly branched; spikelets linear-terete, appressed, about ten flowered, flowers obtuse.—*R. Br., prod.* 1, *p.* 179; *Festuca fluitans, Linn., sp.* 1, *p.* 175; *Poa fluitans, Ell., sk.* 1, *p.* 163. Culm erect or ascending, four to six feet high, smooth; leaves six to twelve inches long, and two to four lines wide, smooth beneath, rough on the margin and upper surface; panicle twelve to fifteen inches long, often partly concealed in the sheath of the upper leaf; stamens three; anthers large, yellow; caryopsis oblong, grooved on the upper side.

Ponds and wet places. Common in the Northern and Western States, and as far south as Carolina. It abounds also in many parts of Europe. The seeds are said to be very nourishing; have a sweetish taste; and are collected in some parts of Holland, Germany and Poland, under the name of "Manna Seeds," and used in soups and gruels. The flour from the seeds, makes bread very little inferior to that from wheat. Geese, ducks, and fish, feed upon the seeds, and trout are said to thrive greatly in streams where this grass grows abundantly. This grass is eaten greedily by all kinds of stock; and in some parts of England it is highly esteemed, especially in Cambridgeshire, where it is said to give the peculiar taste to Cottenham and Chidder cheese, (*Loudon's Encyc. of Agri.*)

It will not flourish, except on land that is constantly under water, or converted into a bog or swamp. We have noticed that it flourishes very well in Western New York, in places which are partially inundated, or very moist, but nearly dry during the months of July and August, at which time the grass arrives at maturity in this climate; hence we conclude it might be cultivated to advantage by those who have such grounds, as it might be gathered for hay during those months. Its growth would also be profitable in artificial fish-ponds, that the fish might eat the seeds. There are many sections of the Southern States where its cultivation might be introduced with advantage, since it seems well adapted to the climate.

Glyceria Canadensis, Trin.

Panicle large, diffuse, semiverticillate branches, mostly by threes, at length pendulous; spikelets broadly ovate, obtuse, about five flowered.—*Torr., fl. S. N. Y.*, 2, *p.* 466; *Hook., fl. Bor. Am.*, 2, *p.* 249; *Briza. Canadensis Michx., fl.* 1, *p.* 71; *Poa Canadensis, Beauv. Agrost., p.* 155; *Poa aquatica Pursh., fl.* 1, *p.* 80.

Culm erect, two to three feet high; leaves scabrous; sometimes longer than culm; ligule lacerate obtuse; spikelets ovate before flowering, but afterwards broad, with the upper florets slightly recurved; glumes unequal, small, acute; lower palea ovate, acute, nerved; upper palea shorter, and very obtuse; stamens two; caryopsis, oblong, brown.

Grows in wet meadows and swamps, in Northern States and Canada.

Glyceria, R. Brown.

Name derived from Glukus, a Greek word, signifying sweet, in allusion to the herbage.

Spikelets many flowered; flowers imbricate, distichous, hermaphrodite; glumes two, concave, obtuse, lower one shortest; palea two, nearly equal, inferior ovate, eliptical, round, obtuse, or obsolete, trilobed, seven nerved, upper one bicarnate; stamens two to three; ovarium sessile; styles two, terminal elongate; stigmas plumose; Caryopsis oblong, free; perennial aquatic grasses; common in the temperate regions of both hemispheres; leaves flat; panicle simple or branched, branches fasciculate, semiverticillate.

GLYCERIA NERVATA, TRIN.

Panicle loose spreading, branches very slender capillary, at length pendulous; spikelets ovate, five to six flowered; flowers obtuse, ligule oblong ovate.—"*Trin. in Act. Petrop.* 6, *ser.* 1, *p.* 367;" *Glyceria Michauxii Kunth. Gram.*, 1, *p.*343; *Poa nervata Wild.*, *sp.* 1, *p.* 389; *Poa Mich.* 1, *p.* 69; *Poa lineata, Pers. Syn.* 1, *p.* 89; *Poa parviflora Pursh.*, 1, *p.* 80; *Briza Canadensis Nutt. Gen.* 1, *p.* 69. Culm three to four feet high, erect; leaves six to twelve inches long, narrow, scabrous, smooth; panicle large; spikelets about two lines long, often tinged with purple, flowers caducous; glumes unequal, small; palea ovate, nearly equal, strongly seven nerved.

This grass is common in many sections of the Northern and Western States, abounding in wet meadows and wet places in open situations. All kinds of stock are fond of it. It forms an excellent hay, and is readily eaten by horses, cattle or sheep. In Western New-York it flowers generally during the last week in June or the first week in July; and it should be cut for hay before the seeds arrive at maturity, as they fall off soon after becoming ripe. The seeds, when ripe, feel much like sand, when handled. We can confidently recommend its cultivation, as we have tested its valuable properties, both for hay and pasturage. Its growth in many places would save much expense in draining.

URALEPIS, NUTT.—(Gen. 1, p. 62—Endl. gen., p. 97.)

Spikes many flowered; flowers hermaphrodite, distichous; glumes two, unequal, slightly keeled, rather obtuse, shorter than the flowers; palea two, lower one three nerved, concave, bifid at the tip, a subulate tooth sometimes added to the segments, sometimes the segments are awned; awns short, subulate, smooth, erect; upper palea bicarinate; stamens three, ovarium, stipilate, smooth; styles two, terminal, stigmas plumose, caryopsis round or plane convex.

URALEPIS CUPREA, KUNTH, (plate 3, fig. 4.)—TALL RED-TOP.

Panicle loose, expanding; branches smooth, flexuous; spikelets ovate, lanceolate, nearly terite, purple, shining, four to six flowered.—*Kunth's Gram.*, 1, *t.* 68; *Tricuspis seslerioides Torr.*, *Fl. S. N. Y.*, 2, *p.* 463; *Poa flava Linn.*, *sp.* 1, *p.* 68; *Poa seslerioides Michx.*, *fl.* 1, *p.* 68; *Poa quinquefida Pursh.*, *fl.* 1, *p.* 81; *Windsoria poaformis Nutt.*, *gen.* 1, *p.* 70; *Triodia cuprea*, "*Jacq. Eclog. Grem.*, 2, *t.* 21, *f.* 16;" *Tridens quinquefida Roem. and Schult.*, *sys.* 2, *p.* 599. Root perennial; culm three to five feet high, erect, hard and smooth; glumes unequal, mucronate; lower palea hairy on the back and margin near the base, strongly three nerved, the nerves projecting at the apex into cusps; the middle cusp longest, forming with the intermediate teeth a five toothed apex; upper palea ciliate on the marginal keels.

This is a harsh grass, which is not relished by domestic animals, and hence it is of little value to the agriculturist. It is occasionally found in dry sandy soils in the Northern States, and is quite common in similar situations throughout the Southern and Western States. It grows in tufts, and hence is unsuited to form a turf. Pursh states that this is "a most excellent grass," and that he has "seen mountain meadows in Pennsylvania, where they mow this grass twice a year; producing most excellent crops each time, without manure, or any other trouble than the mowing—lasting for the space of sixteen years, without the least decline in the crops—the soil at the same time being a very indifferent one." However excellent this grass may be in the mountain meadows of Pennsylvania, it certainly is little esteemed in other sections of the United States.

NOTES ON NATURAL HISTORY.

BY JAMES EIGHTS.

Our approach to the La Plataen shore was during a most beautiful morning in December; the first of the summer months in the southern hemisphere, with a light breeze blowing directly in for the land, and which towards mid-day, gradually fell away into a most perfect calm. The ship had been quietly forcing her way through the light waves, when our attention was arrested by the appearance of frequent and extensive patches of a reddish brown discoloration of the water, in every direction about our path, producing much the aspect of numerous shoals. Upon repeated soundings, however, we found the depth in no single instance to be less than fifty fathoms, with mud and comminuted shells, constituting the bottom. On raising a bucket of this tinted water, and subjecting it to the focus of an ordinary pocket lens, it was discovered to be composed of innumerable small crustaceous animals, of an oval form, and about half a line in length, beautifully margined by a slight purpleish fringe, their whole external aspect presenting a striking resemblance to some of the species of Cytherina, and their rapid gyratory motion immediately reminded us of the interesting forms of Gyrinus so exceedingly common during the months of summer, in the numerous shadowy pools in our own country. These animals, no doubt, emit a phosphorescent light during the hours of darkness, when the ocean is briskly agitated into waves. Of this however, we had no direct opportunity of determining.

As the day drew to a close, a thin greyish mist was observed, gradually disseminating itself throughout the western horizon, and before an hour had elapsed, a dense mass of confluent clouds had obscured the entire heavens, and enveloped the whole scene in a veil of almost impenetrable darkness. But it came not alone, for one of those terriffic Pamparo's so much dreaded by mariners when on this coast, had set in, and continued with slight intermission, for the space of nearly three days, accompanied by some of the most intense displays of lightning and thunder, that I think I ever beheld or heard. It was truly an exciting moment; and while leaning over the vessel's side we were irresistibly led to the contemplation of the awfully grand and sublime spectacle by which we were surrounded. On every side the vast and widely extended body of water was seen, rolling with a mighty swell, and tumbling wave over wave, in sheets of liquid flame, occasioned by the extraordinary luminosity of the sea. On casting the eye aloft, all was as black as the very depths of darkness, whilst now and then a terriffic gleam of light tore through the murky mass, and shot in wild and jagged streaks across the scene, as if the presiding spirit of the storm had arisen in its wrath, and was lashing the ocean with an ungovernable fury down to its very foundations.

This extraordinary brilliancy of the sea, was unquestionably in a great measure produced by the myriad of animal forms that inhabit its waters. In many instances they were observed to attain a size sufficiently large as to render them distinctly visible to the naked eye, while at others they were diminished to such a degree as only to become sensible through that avenue to unseen glories, the microscope. They likewise varied as greatly in their structural forms as the species were everywhere numerous.

That the ocean teems with animal life, we have in abundance the united testimony of many intelligent travellers and naturalists, whose qualifications for observation and forming correct conclusions, are altogether indisputable; and often have I when leaning over the vessel's side, during the most perfect calms, discovered the sun's rays to be intercepted by numerous minute points, in such a manner as to cast their mingling shadows far below. When the waters of the sea are violently agitated during a storm, the constant friction of their bodies with the waves, cause these animals readily to emit those magnificent corruscations, which have so often been the theme of admiration, and also given origin to so much wonder and varied speculation in the developement of a cause. Fishes are not unfrequently seen, during the night, to leave a stream of splendor in their passage through the waves, which alone prove sufficient to render their forms conspicuous to the unaided eye.

In approaching these shores, and long ere the land became visible, the ship was visited by an immense congregation of butterflies, of varied and interesting species, the greater proportion of which were rather more than an inch in the expansion of their wings. They fell upon the deck and rigging for a short time in prodigious numbers and adhering to the various parts in such a manner as to present the appearance of falling flakes of snow. They were in all probability driven on their course by the prevailing breezes from the land, and either became bewildered in their flight, or were unable to make headway and regain the shore in opposition to the continuous wind.

The many instances of animals, and particularly insects, alighting on vessels at great distances from the land, are facts exceedingly interesting to the naturalist, inasmuch as they readily furnish an explanation of one of the methods by which islands situated far remote from continents, have been visited, and finally become populated by living forms, corresponding in every degree with those peculiarly indigenous to these vast expansions of land.

When we were in the parallel of the Canaries, about three hundred miles to the westward of the nearest isle, two swallows were observed flying about the ship, in an apparently much exhausted state. In a short time one of them lit upon the fore-yard contiguous to the mast, and was without difficulty obtained. It appeared extremely feeble and in a few moments it expired in my hands. It proved to be the *Hirundo rustica* of authors.

Charles Lucien Bonaparte, in a letter to the secretary of the Linnean Society, dated from on board the United States ship Delaware, near Gibralter, states, " that being five hundred miles from the coasts of Portugal, and four hundred from those of Africa, we were agreeably surprised by the appearance of a few swallows, (*H. urbica* and *rustica*) but what was my surprise in observing several small warblers hopping about the deck and rigging. These last were the *Sylvia trochilus* or hay bird."

Soon after entering the trade-winds, in latitude 20 deg. 16 min. north and longitude 23 deg. 2 min. west, we were greatly surprised by the arrival on board of a large species of acrydium (Grasshopper.) Our position was about one hundred and fifty-one miles from, and nearly to windward of the Cape de Verd islands, so that it is not altogether likely that this insect could have worked its way for such a distance, almost directly in the wind's teeth. The next nearest point of land, and from which the trade-wind almost incessantly blows, is Cape Blanco on the African coast, a distance of four hundred and twenty miles, a prodigious space for so frail an animal to be carried by the wind. It is also a little singular that about two years after, when H. B. M. surveying ship Beagle was in a position fifty miles nearer to this Cape, a similar grasshopper, and in all probability the same species, came on board and was caught, as is stated by Mr. Darwin, the naturalist belonging to that ship. The insect I obtained is at present preserved in the collection of the Albany Institute.

After the storm had subsided, we were some days in regaining the land, at a point much farther to the south, immediately where the Rio Negro disembogues itself into the sea, on the northeastern coast of Patagonia. We continued leisurely sailing along the coast, crossing the Bay of St. Matthias to the peninsula of St. Joseph, situated in latitude forty three-degrees south. The shore as we passed along, presented the appearance of a series of precipitous cliffs, stratified in nearly a horizontal position, and seemed to be composed of a yellowish colored clay, with numerous slides, or "tumble downs" as they are emphatically termed by the sailors, with occasional small ravines, worn by the drainage waters from the plains, in their passage to the sea. In pulling in for the land, we were continually surrounded by the *Spheniscus demersa*, called the jackass penguin, from the circumstance of the singular habit it possesses when on shore, of throwing back the head, and producing a sound very similar to the braying of that animal. We were likewise accompanied by several seals, who raised their dark heads above the wave and apparently gazed with silent wonder and astonishment at our appearance as we proceeded along, following in the wake of our boat, but a few feet astern, until we fairly reached the land. These animals are the *Platy rhincus jubata* of Forster, or hair seal of mariners. Several of the males, or sea lions, as they have not unaptly been named, were quietly reposing on the beach, and obstinately refused to relinquish their comfortable position, until compelled to do so by the close approximation of some of the crew. These sea-lions are provided with a hoarse roaring voice, and have their necks clothed with a long, curling mane, so that during their quiet enjoyment on the shore, and also when disturbed, present a very striking resemblance to their more formidable prototype in name, upon the land, and it was with no small difficulty, that the inexperienced observer could be persuaded into the belief of their perfect non-identity.

The men were leisurely straggling along the beach, amusing themselves by pelting the seals as they arose tumbling amid the surf, whilst we ascended a small ravine to the plain above. A condor—the first we had seen, was lazily basking in the sunlight upon a projecting headland, with drooping wings, so characteristic of the tribe to which it belongs, when digesting their food.

Upon being so suddenly disturbed, it reluctantly took to flight, soaring gracefully over our heads in gradually expanding circles, until it became lost to the eye in the remote distance toward the west.

Upon gaining the summit of the cliff, and directing the sight over the widely extended scene, a prospect was disclosed that for sterility and desolation can scarcely be surpassed on the surface of the globe. In every direction but in that toward the sea, and as far as the power of vision could extend, it was one wide monotonous plain, occasionally disturbed by such slight and gentle undulations, as scarcely at all to be discernable. The eye wandered in vain for some solitary spot of verdure to afford it a moments relief, but none was anywhere visible save a few stunted evergreen shrubs, with sombre foliage sparingly scattered along the margin of the cliff, and in a still less degree, some rigid or succulent herbaceous plant, which seemed to contend for a bare existence in some sheltered or secluded recess among the rocks. The whole scene strikingly resembled the sea, in all but its beautiful hue. No sounds but those proceeding from ourselves disturbed the profound solitude that reigned around, and were it not for the appearance of a single swallow, skimming the surface of the ground in pursuit of sustenance, the stridulous sounds of some orthopteras insects, and the well defined trail of the wandering Guanaco, it would have been difficult to realize that animated existence had ever approached the spot.

Standing pools or salinas are not unfrequent in the depressions of these plains, some of them of considerable extent, which in the winter months, when the rains descend in copious showers, become filled with brine, but when the summer sun evaporates the water it leaves them covered with a glistening sheet of white, resembling snow. This deposition is composed of crystalline salt, sometimes more than a foot in thickness, and then it becomes almost the only employment of the native Indians to transport it in large quantities for sale. Owing however to its containing foreign impurities, it is not much esteemed for the preservation of animal food. Waters that percolate this plain, and discharge themselves in trickling rills along the shore of the sea, possess at all times an exceedingly brackish taste, and the few herbaceous plants to be met with scattered along the surface, emit the same flavor upon being chewed. These salinas are margined by shores consisting of a slimy blackish mud, containing in large quantities most beautiful chrystals of gypsum, and strange as it may appear, are inhabited by numerous naked worms, or annelides and infusoria. These salt lakes are the usual resort of the flamingo, and this beautiful and interesting bird may not unfrequently be seen in some considerable numbers traversing the mud in search of a comfortable repast.

The most characteristic animal frequenting these plains is the Guanaco, (*Camelus llama*) or American camel, from its general resemblance to that well known beast of burden in the East. It has no hump, and is in every respect a singularly beautiful and graceful creature, with long slender neck and legs, and clothed all over with a dense mass of chesnut colored hair. They are frequently to be met with traversing the plain in herds of from ten to thirty, and sometimes more, moving along in regular lines, confining themselves to well beaten tracks from which they rarely diverge. When approached, they utter a shrill neighing note of alarm, and in a short time trot rapidly away in a direction towards the nearest hills. In some instances however they exhibited a considerable degree of curiosity, particularly when taken by surprise. The natives appear to be well acquainted with this peculiarity of habit, for they not unfrequently take advantage of it by throwing themselves upon the ground and performing numerous strange antics, in order to entice them within the influence of their weapons. In this manner great numbers of them are annually slain, not only for the purposes of food, but also for the construction of mantles from their skins. These animals have particular spots selected for depositing their excrement, which places are much resorted to by the Indians for the purpose of collecting the substance for fuel. It proves an excellent substitute for wood, which can rarely be obtained in sufficient quantity on these plains. They likewise are possessed of a singular habit of resorting to some favorite situation on the approach of death, to lay themselves down and die. This is generally among the light brushwood in the neighborhood of some running stream. Several of these receptacles for the dead have been discovered, profusely strewed with bones, and in no instance have the marks of teeth been visible, to denote their destiuction by wandering beasts of prey. This animal has an extensive geographical range inhabiting the entire temperate region of South America, as far as the straits of Magellan. At the period of the conquest, it was the only beast of burden the Peruvians possessed, carrying from one hundred to a hundred and fifty pounds at a load, and this for short distances only.

Wherever this plain supports a growth of grass, which is generally of a coarse, brown, wiry nature, the common deer of the country (*Cervus campestris*) may not unfrequently be seen, quietly grazing in herds consisting of from a few in number, up to a hundred or more, and when their position is to windward of the spectator, the exceedingly nauseous and disagreeable odour emitted by the buck, taints the surrounding atmosphere in such a manner as to render it distinctly sensible for some miles distant. When a person is mounted they are difficult to approach, but when crawling along over the surface of the ground, their curiosity seems to be excited to such a degree that they without hesitation gradually draw near the object of their wonder as if for its gratification, and it is in this manner that the Indians decoy them into shooting distance and destroy them in great numbers. It is in the pursuit of these animals and the guanaco, that the puma or South American lion is frequently enticed down into the plains, and their destruction is speedily accomplished by either dislocating or fracturing their necks, as the skeletons of those which have become victims to these beasts of prey, upon inspection, have universally presented this appearance.

Inhabiting the vicinity of rivers and fresh water lakes, is to be found the largest rodent, or gnawing animal, hitherto known to naturalists, the *Hydrochaerus capybara* or water-hog. I know not of its being found in this immediate neighborhood, but am informed that it is exceedingly common a few degrees to the north, particularly along the tributaries of the river Plata. They grow to some considerable size, frequently attaining a weight of nearly a hundred pounds, and when seen at a distance, greatly resemble pigs, but on closer inspection their relation to the cavies and rabbits is strikingly perceptible. They appear very tame, particularly in situations where they are not often molested by the jaguar and other beasts of prey. A fossil species closely connected with this, has recently been found in the redish clay of these plains, associated with numerous other extinct and gigantic quadrupeds.

There is another singular little animal inhabiting this place in great numbers which is rarely seen above the ground. Its habits are nocturnal, and very similar to those of the mole, burrowing in ramifying trenches just beneath the surface of the soil, for unknown distances, and throwing up small hillocks of earth before their openings. They are said to live in families of six or eight together, and when at their usual occupation, utter strange and unearthly sounds from their subterranean abode. These noises oft times greatly surprise an individual unacquainted with their habits, while passing over the plain. Sometimes it appears to proceed from directly beneath his feet, and then again it is heard repeated in quick succession from various distances around, so that in a short time from seeing nothing visible, he becomes exceedingly bewildered in endeavoring to obtain a reasonable explanation. The natives have given to it the name of Tucutuca, in imitation of this peculiar sound. It is the *Ctenomys Brasiliensis* of authors, and besides some few other species found on the pampas, an allied extinct animal has likewise been procured.

A singular feature in the landscape, is produced by the habitations of the Biscacha, (*Lagastomus trichodactylus*) which form their burrows in the clayey portion of the soil, near those spots where thrive most luxuriantly the giant thistle of the plains, upon the roots of which they are supposed chiefly to exist. In general appearance these animals much resemble the common rabbit, but differ considerably in their zoological structure, and what is a remarkable circumstance in their habits, is that they are universally found associated with the same little burrowing owl (*Athene cuniculata,*) so commonly met with among the Prairie dog villages in the western portion of the United States. These animals are endowed with the curious propensity of picking up all hard and loose substances that they occasionally meet with in their perambulations over the plain, and conveying them to their dwellings, where they may usually be seen piled up in considerable sized conical heaps before their entrances. For what essential purposes these mounds are constructed, remains yet a subject of conjecture, but the Indians profiting by the circumstance, frequently destroy their symmetry in searching for small articles which at any time may have been lost on the plain near their dwellings, and sometimes as it was stated with complete success.

The Agouti (*Cavia Patagonica*) found here, belong to the family of the Guinea pigs, and greatly exceeds them all in size, being nearly twice the magnitude of the common hare, and which it much resembles when seen at a short distance peaceably hopping over the surface of the plain in small numbers together. Their legs are remarkably long, which enables them when alarmed to make extraordinary leaps. They are exceedingly numerous, inhabiting the burrows in common with the biscacha and little owl, but when these animals do not exist in their immediete neighborhood the agouti readily forms for itself habitations of a very similar nature. This is likewise the case with the little owl. When properly dressed these animals form an excellent article of food, but is held in little repute by the wandering tribes.

There is also a small species of armadillo found quite common at this place, which is so remarkably rapid in its movements that when discovered it immediately buries itself beneath the earth so quickly, as to render it almost a matter of impossibility to obtain them. When attacked by a dog or other animal, they roll themselves up into a ball, similar to the wood-louse, and their shells being impervious to the teeth, it slips from the mouth and rolls for some considerable distance over the plain. Two other species are likewise found here, which differ some in their habits, one at least being nocturnal. Their food consists of reptiles, insects and vegetables. When roasted in the shell, this animal furnishes a delicious repast.

The most characteristic and interesting bird frequenting these plains is the South American ostrich (*Struthio rhea.*) It is frequently to be observed in flocks of from twenty to thirty, feeding on the scanty vegetation, which at times clothes the surface of the ground, and when seen from some gentle elevation, in strong relief against the intense blueness of the sky, they present a truly picturesque, though somewhat formidable appearance. When first approached they are seemingly quite tame, but on a nearer approximation they immediately spread out their short wings and sail off with an unusual speed, easily distancing the fleetest horse in his wildest career. The males can easily be distinguished from their companions by their superior size, larger heads and deeper color of the plumage, and are said while feeding to utter a peculiar deep-toned hissing note, the sound of which appears singularly deceptive to the ear, so that an individual present not suspecting from whence it proceeds, becomes frequently excited to no small degree of alarm. They are said also to feed on small fishes and moluscus animals, being frequently seen wading about the muddy shores and in the shallow waters of the sea, and likewise swimming from one rocky islet to another, in some secluded bay or rivers mouth. Their nests are merely shallow depressions in the ground, and each one generally contains from twenty to fifty or more eggs. The males are said to perform all the duties of the females in sitting on the nest, hatching out the young, and accompanying them for some time after in their perambulations over the plains. While thus occupied, these birds are exceedingly fierce and dangerous to approach, so that the Indians are sometimes obliged to defend themselves with some considerable energy against their vigorous assaults. It is a well known fact that several females deposit their eggs in the same nest; a singularly wise econemy of instinct, and happily adapted to the peculiar circumstances in which they are placed, for by no other contrivance could so large a collection be made to agree so conveniently in age. The hen lays but one egg at a time, at regular intervals of three days each; now if all those found in a nest were the production of a single hen, the time that must necessarily elapse from the commencement of laying until its termination, would in all probability cause most of them to become addled and impure, and in this manner greatly interfere with one of the most simple and beautiful provisions of nature. Single eggs are often found scattered promiscuously over the plain, and although unbroken, are universally spoiled. These no doubt have been dropped by the hens when the males are not sufficiently numerous to take charge of them during incubation. These birds are easily taken by the Indians, who, mounted on horses, surround them in extensive circles, and gradually close in until they are brought within the influence of their unerring bolas.

There is another species of ostrich, which in general appearance much resembles the rhea, and though smaller in size is a far more beautiful bird. Its plumage is of a deeper hue and most pleasingly mottled with white and black, the legs are shorter and covered much farther down with feathers; in their habits they are strikingly similar to the former species, but are found in smaller numbers herding together, and do not so readily expand their wings when taking to flight. Their eggs are fewer in number and rather smaller in size, varying slightly in form and characterised by possessing a beautiful tinge of blue. This species is rarely found in the north, but inhabits the southern portion of Patagonia, almost to the exclusion of the larger one.

In rambling over the plains one day, our men caught a curious little bird, which from its habit and general aspect, appears to hold an intermediate station between the quail and snipe, and which it greatly resembled, both in color and the peculiar markings of its plumage, so much so indeed as without difficulty to deceive the eyes of the inexperienced observer. It was easily obtained by carefully covering it with a hat while quietly squatting on the ground for the purpose of concealment. They inhabit the most sterile portions of the plain, either in pairs or small flocks feeding together, and so common as to be seen at almost all times of the day, dusting themselves in the dryest portion of the sand. It is the *Tinochorus rumicivorus* of naturalists.

Among the numerous reptiles belonging to these shores, the most remarkable of the number is a venomous serpent whose poison is of a most deadly nature. It is possessed of an exceedingly fierce and hideous countenance, and has been placed by naturalists in a position intermediate between the rattlesnake and viper, but more closely approximating to the former. As a substitute for the rattle, however, it is provided with a peculiarly formed tail, and whenever approached or irritated in any degree, it rapidly vibrates it among the rigid grass or other vegetable substances, and produces a sound not unlike the noise of that formidable reptile of the north.

A remarkable looking little toad is likewise not unusually seen in this region. It is of a perfectly black color, with the soles of the feet, and breast stained of a bright vermillion hue. It is not nocturnal like its associated species, but found during the hottest hours of the day quietly basking in the sunshine among the dry sandy hillocks and naked clayey portions of the plain. The Indians have given to it a strange diabolical name not easily to be recollected when heard pronounced by them.

Besides these reptiles there is a singular lizard frequently to be observed crawling over the surface of the ground, which, when approached, immediately feigns death, and from its curiously mottled appearance, so closely resembles the earth upon which it lies, as often to be passed by an individual without being perceived; upon being disturbed, however, it speedily buries itself in the ground and as quickly becomes lost to the sight.

The above enumerated animals, with some dozen species of mice, are those most commonly to be met with by a traveller journeying over these plains.

These Pampas extend into the interior almost to the base of the Cordilleras of the Andes, a distance of nearly three hundred miles, rising up in a succession of terraces, and terminating abruptly in a direction towards the east, and although the surface presents such a bare and sterile appearance, its geological construction is of a highly interesting nature. It is unquestionably a member of the Tertiary period, though the green earth so profusely disseminated throughout some of the lower strata, might readily induce an investigator on first inspection, to assign to it a position among the rocks of the cretaceous group, of the Secondary series. Its entire thickness at this point is about seventy feet, rising up in a bold precipitous manner directly fronting the sea, and by this means affords to the geologist an admirable opportunity for inspecting its various strata. This whole formation rests in an unconformable position upon a thick mass of redish brown porphyry, and in an ascending series, the strata of which it is composed may be described in the following order:

The *first* and lowest stratum visible, is composed of a greenish sandstone made up almost entirely of particles of green-earth, associated with fine grains of sand, evidently derived from some trappean rocks. It is about six feet in thickness, and is completely charged with fossils, a few of which have a close alliance to the recent species along the shores of the sea.

The *second* is a layer of about eight feet thick, composed of a fine grained yellowish marly clay, with but few fossils.

The next in order is a coarse grained, greenish sandstone, very similar in appearance to the lowest stratum, and is likewise abundant in organic remains. It has a thickness of nearly nine feet.

The *fourth* in number is a layer of yellowish marly clay, eight feet in thickness, and with rarely a fossil.

The *fifth* is a dark bluish sand, partially indurated, though crumbling readily in the hands. It is six feet thick with no remains visible.

The *sixth* is a fine grained, yellowish, marly clay or marl, ten feet in thickness and abounding with large pectens almost to the exclusion of all other fossils.

A light bluish covered sandstone succeeds, six feet thick, with some few organic remains.

The *eighth* is a ten foot stratum, of a red and yellowish appearance composed of marly clay mingled with sand. The upper portion is much broken up, but no fossils are visible at this place.

The *ninth* and upper stratum varies exceedingly in thickness, being at this point about ten feet, while at other locations it frequently exceeds one hundred, and is chiefly made up of rounded pebbles, consisting of fragments of granite, trappean rocks, porphyry, quartz, jasper, pumice, and agates in abundance. This great covering of gravel, has in many places been entirely removed by the action of flowing waters over the surface of the plain at some far distant era, so that the stratum of sand and clay from beneath, has been frequently exposed to view, and in some instances to no inconsiderable extent.

The numerous fossil organic remains found in the above section, are characteristic of the Tertiary period, and with the exception of the giant mammalia, in all probability to its most ancient strata.

In the more recent deposites of these plains, and evidently formed by the disintegration of its strata, are at present to be found the remains of some of the most remarkable gigantic animals that have ever inhabited the globe, and which at some far distant period of time held undisputed sway, and throve luxuriantly upon the vegetation that once had an existence in this region of country, now so bare and desolate to the sight. They are to be discovered in the greatest profusion, associated with numerous recent species of shells, which may yet be found both on the land and in the sea in this vicinity, furnishing to the mind convincing evidence, that they lived and passed away at a comparatively recent era of the earth's history, without leaving any other indications of their existence. In some few instances, even the genera to which these animals belonged, are no longer to be met with on this great continent of the west. Those most commonly met with, belong to the following genera, and many others have been found and described by naturalists. They are nearly all about the size of the elephant, and most of them are represented by diminutive species still living about these plains: mastadon, megatherium, megalonyx, mylodon, toxodon, scelidotherium and equus.

Skirting the shores of the sea and extending beneath its waves to the distance of about one hundred miles to the east, is to be found a continous plain, and from what little is known of its nature, it appears to exhibit in a peculiar manner indications of a mnch lower and similarly constituted terrace, or step. It extends along the South American coast for an immense distance, and is familiarly known as the Brazilian and Patagonian banks. At its eastern termination it falls abrubtly into the profound depths of the ocean, and for nearly its whole extent supports an average mass of about sixty fathoms of water.

From some recent geological researches of ancient sea beaches, situated far into the interior of the land, satisfactory evidence has been furnished, of the gradual upheaval of this entire range of country, from the Rio de la Plata to Cape Horn, a distance of more than twelve hundred miles, and at this point to an elevation of four hundred feet; and as there is every reason to believe that this rise of the land is still in progress, I think we may safely infer that at some future and unknown period of time, this bank will have slowly emerged from the waters and become a part of the present existing continent, and by that means furnish a striking illustration of the manner in which these Pampas have been originally produced; and during the elevation of this great terrace, the numerous strata of which it is composed will successively appear to view, disclosing in the greatest profusion the remains of the various existing animals of the sea and neighboring land, occasionally mingled with the works of art, proving to generations yet to come, that civilized man was a denizen of the earth long e'er this widely extended plain had arisen from the waves, and become in all probability a vast and fertile scene.

On casting the eye over a chart of the Atlantic ocean, we will scarcely fail to have our attention attracted to the singular conformity of the shores of the three great continents: Europe, Africa, and America; but far more remarkable will it appear, when we contemplate for a moment the wonderful agreement in their geological construction. The primary ranges of Canada, have their equivalents in the elevated portions of Norway and Sweden, and even the mineral region of Lake Superior is replaced by the Ural mountains in Russia. The great silurian, devonian and carboniferous systems of the United States, are beautifully represented in Russia, Germany and Great Britain, and are alike accompanied by the wide spreading secondary and tertiary formations. The volcanic and trappean rocks of the Azores, Canary and Cape de Verd islands, are repeated in the West Indian group of isles, and the vast tertiary deposits of the African continent and the immense extent of the same formation in southern America, present little or no dissimilarity in their respective geological ages, as the fossil shells in some instances have been perfectly identified; and we may continue still farther, and compare the devonian rocks of the Falkland islands, with those of the same period in the vicinity of the Cape of Good Hope. This enumeration is merely intended as a general comparison. Were it necessary, however, to enter into a more minute detail, a much more particular relation might easily be furnished as an illustration.

When we reflect upon these circumstances, we are almost irresistibly led to the conclusion that the immense space at present occupied by the Atlantic Ocean, was originally a continuous tract of land, which has since been gradually submerged beneath the waves, while the mountainous regions now constituting the elevated portions of the continents on either hand, were as slowly rising from some unknown and widely expanded bodies of water. From reflections such as this, we are almost induced to give countenance to the idea that the far famed Atlantes of Plato, was not altogether based upon a vision.

The belief so long entertained, that the Earth was the emblem of stability, is fast becoming obliterated from intelligent minds since the investigations of geologists have from time to time disclosed new and important facts for their consideration. The numerous discoveries that have recently been made of the gradual rise of large tracts of land in some portions of the globe, and equal depressions in others, have satisfactorily established the theory of oscillatory movements in the earth's crust. The gentle upheaval of Norway and Sweden in the vicinity of the Gulf of Bothnia, and the depression of Greenland beneath the sea; the rise of southern America, and the slow subsidence of the Coral islands in the Pacific Ocean, are but a few of the many instances that might be produced in confirmation of its truth.

THE FARM ON THE FLATS.

"What is to be done with the farm on the flats?" said Mr. Hare to his employer, Mr. Elliot, as they were busy about the latter end of March, in putting up the fences which the winter winds had blown down.

"I heard to day," replied Elliot, "that it was sold to a man in New York."

"What is he going to do with it?"

"I understand he is coming to live on it."

"I wonder if I didn't see him at the public house last week?"

"Like as not. He was here then looking at the place."

"And he thinks of coming here to work it himself, does he?"

"I believe so."

"Well, I am thinking we shall have some smart farming. Why his hands didn't look as if they had ever had hold of any thing harder than a silk handkerchief. I suppose he will give us a real specimen of genteel farming. There are Ogden's sheep on your grain. It is too bad to have a neighbor who won't keep his sheep at home."

"My idea is, that a man must put his fence up before he finds fault with his neighbors. The rail fence between him and me is about as flat as a pancake. I suppose the sheep thought it was down on purpose for them to go in and eat wheat."

"Whose fence is it?"

"Mine, and we had better go and put it up now."

While Mr. Elliot and his hired man are putting up the fence which had taken the fancy to assume the shape of a pancake, thus leading innocent sheep into acts of trespass, we will give some account of the farm on the flats, which had recently become the property of Mr. Lord of New York.

The farm consisted of about one hundred and fifty acres, about one-half of which consisted of level land, free from stone. The remainder lay on a hillside sloping towards the south. Forty acres of flats in a hilly and stony country, was a remarkable thing, and caused the farm on the flats to be regarded as the most valuable one in the region. It was first appropriated by a Dutchman, shortly after the Revolution, and remained in the family for two generations, when it was sold to pay debts accumulated by means of strong drink. The sale was by public auction. The farm was bid off by Mr. Simpkins, a Yankee, whose chief business consisted in attending sheriff and constables' sales, bidding off property to be sold at an advanced price. Some thought that on such occasions, it often snowed, hailed, or rained, for his especial benefit—certain it is, that great bargains were often made by him on such occasions. Simpkins had sold the farm to Mr. Lord of New York, who had failed as a merchant, not without making enough, however, to buy a farm. The admirable bankrupt law having removed all obstaces in the way of his buying one, he had accordingly made choice of the one of which Mr. Simpkins held a sheriff's deed.

Early in April he came on with a number of carpenters, and made the necessary repairs on the house. A new building was erected, the object of which was a secret, and puzzled the brains of the neighbors a good deal. Time, the great revealer, showed it was designed for a dairy. Mr. Lord was not a "free spoken man," and hence few questions were asked him about his affairs, after that trait in his character came to be known.

The house was in readiness for the family about the first of May, the proper time for moving, and of consequence for commencing farming operations. At least so thought Mr. Lord. He had never moved before the first of May in his life. Mr. Lord's family consisted of himself and wife, and two daughters, nearly woman grown, and three stout Irish women, and one Irish man, fresh from the bogs. A week or more passed before the boxes, trunks, and bundles, which seemed innumerable to the relatives, were stowed away. Then Mr. Lord looked abroad over the farm, for the purpose of commencing agricultural operations. The flats naturally first attracted his attention. The stream which flowed through the valley, had risen in the spring, and carried away a portion of the fence. In consequence, the cattle of the neighborhood saw no objection to their enjoying themselves in the meadows thus thrown open to their enteiprise. They took possession of them early in the spring when the soil was soft and yielding, and accordingly they made a deep impression upon it, and as they were constant and persevering in their efforts, before the first of May, the surface presented in its appearance, a very close resemblance to a mortar bed. Mr. Lord wondered whether all meadows looked so in the spring, but he had no disposition to ask any of his neghbors, on account of a slight repugnance to receiving information. He looked at his neighbors' meadows and saw that the turf was smooth and green; but then their meadows were not on the flats, and hence would naturally assume a different appearance. It was plain that his meadows needed fencing. So he went at it, or rather his Irishman did without delay. Mr. Lord was always present, and by his minute and unintelligible directions, prevented him from doing more than half as much as he would otherwise have done. This Mr. Lord called overseeing.

"Mr. Lord, when is the dairy woman to begin to make butter and cheese?"

This inquiry was made by Mrs. Lord about a week after they were settled.

"It is time she begun, certainly," said Mr. Lord.

"And what will I be making butter and cheese of?" said the dairy-woman, who overheard the question and reply. "Not a cow nor a pig have I had a living sight of yet about the place."

"You don't want pigs in a dairy," said Mr. Lord.

"Is it pigs you are speaking of? Who ever heard of a dairy without pigs? And what else will I do with my whe,

"I must buy some cows immediately. They had es ped my mind."

It was plain that Mr. Lord reasoned justly, when he came to the conclusion that in order to produce butter and cheese, he must have some cows. Accordingly he set out on a short tour for the purpose of purchasing a half a dozen first rate cows.

"If your honor would just let me have a sight of the beasts first, I could tell if they are worth the money," said the dairy-woman.

This remark was not well received, for it implied a deficiency of knowledge in regard to cows, on the part of Mr. Lord. He had gone but a short distance before he fell in with a drove of cattle. On inquiry he learned that they were destined to the New York market. They must therefore be superior to any offered in the country market. The drover soon saw what kind of a customer he had to deal with. He sold him six cows at a price considerably higher than he expected to get in New York. A lad in his service drove them to Mr. Lord's barn, where they were soon reviewed and fed with great complacency by their new owner.

"I have been so fortunate as to procure six of the finest cows in a large drove," said he, with considerable animation to his wife.

"We can have some fresh butter then of our own making."

"A great abundance of it."

"Margaret," said Mrs. Lord, "I should like a little fresh milk. The cows have come. While you go to see them; just milk part of a bowl full for me."

Margaret took her pail and went to the yard. "He assured me that we should have no trouble in milking them," said Mr. Lord. "They must be gentle."

It was not long before Margaret was seen returning with an empty pail, a red face, and something in the general movement of her person, indicating a disturbance of feeling, very nearly approaching to irrascibility.

"Where is the milk?" said Mrs. L.

"Sorrow a bit of milk will you see from the cratures this summer. Havn't they been fatted for the slaughter, and dried up months ago?"

"He said we should have no trouble in milking them."

"The more's the pity. Little trouble indeed is one like to have when there is no more milk about them than there is in the dry straw."

"Mr. Lord recollected that in his inquiries, he had said nothing about *milch* cows. In fact the distinction which he now found to exist among those worthy animals, had never been the subject of distinct apprehension with him. He was somewhat at a loss to know what to do, and was half-inclined to ask advice. He resolved to make another effort. He went to his nearest neighbor and inquired if he had a cow for sale, a cow that gave milk."

"I have a cow," said the farmer, "that gives first rate milk, and a great deal of it."

"Will you sell her?"

"I may, if I can get my price."

"How much do you ask?"

Instead of giving a direct answer, Mr. Burke began to expatiate on the excellence and quantity of the milk furnished by said cow. A bargain was at length struck.

"If you find that she don't give as much as I tell you, it is no sale."

The cow was driven home. A large quantity of tempting food was given her, and Margaret was summoned to pronounce her judgment upon her. Margaret brought her pail, and commenced filling it. She began to be quite warm in her praises of the creature. Suddenly the cow dealt her a blow with her hind foot, that threw the line of gravity considerably without the base, and the natural consequences followed. After a somewhat violent outcry, and the vehement assertion of her belief that she was murdered, the dairy-woman arose, and threatened to resign her office at once, unless the offending animal was at once expelled from the premises. The cow was driven back to her former owner, who declined receiving her and refunding the money, till it was shown that he had not stated the facts correctly, as to the quality and quantity of her milk.

"How are we ever to milk her?" said Mr. Lord.

"Oh, I don't know. You must do it the best way you can. If you had asked me, I should have told you, she was not very gentle: we used to chain up her legs."

Mr. Lord was somewhat at a loss to know what to do. He concluded at last to depart from his theory, and ask the advice, or rather employ the knowledge of some one of his neighbors. Mr. Hare happened to fall in with him while in that state of mind.

"I wish you" said he to Mr. Hare, "to go to-day and buy me a couple of good cows, if they are to be had."

"There is no difficulty about it. Mr. Dobbs has two that he wants to sell. I lived with him last summer, and know them to be first rate."

"I wish I had known it."

"Well, I wanted to tell you about them, but I rather got the idea that you didn't want any body to speak to you about your matters, unless you spoke to them first. In the city, I suppose it is different, but in the country we can't very well get along without depending a good deal on one another."

He then went to Dobbs's, and soon returned with the cows in question. They proved, in the judgment of the dairy-woman, to be "perfect beauties." He purchased the Burke cow himself, and employed the next evening in constructing a machine which he called a milking machine. It was a device calculated to thwart all efforts on the part of the vicious animal to repeat the act perpetrated on the person of Margaret.

The fences around the meadows were replaced, but the meadows were very slow in putting on their covering of green.

"Don't you mean to plow up your flats?" said Mr. Chambers, an excellent farmer, who lived a couple of miles distant from Mr. Lord: "I was along your way yesterday, and saw that they had been cut up dreadfully by the cattle, and I wondered you were not plowing them and getting them ready for corn. I had a great mind to stop and tell you about it, but I was in something of a hurry then."

"I don't intend to plow my meadows," said Mr. Lord coldly.

"Oh, very well, every man must have his own way about his own work."

As it is probable that the reader is satisfied with the specimens he has seen of Mr. Lord's farming, we will "leave him alone in his glory," and go home with Mr. Chambers.

Mr. Chambers drove on homewards, doubting in his own mind whether the country would derive as much benefit as was supposed, from the fact that numbers of the mercantile and professional classes were hastening to become practical farmers. As soon as he got "his work out of the way," he went to talk the subject over with his friend Ripley. Mr. Ripley thought the golden age would return, provided all men would turn farmers, and the state would found a college for their education. He was not, (as may well be supposed,) a farmer himself; that is, a practical, every day farmer. He had money enough at interest to support him, and besides had a dozen acres of excellent land, on which he tried experiments, and from which, in spite of his experiments, he often took heavy crops.

"Well," said Mr. Chambers, "I have seen a fact to-day that supports my reasonings. I was along by the farm on the flats to-day, and it is managed pretty much as I should expect from the hands it is in."

"Farming is new business to Mr. Lord, and he can't expect to succeed all at once."

"He will succeed in spoiling the best farm in town, I guess. But what else could be expected? Take a man that has never seen a farm till he is forty years old, and how can he know any thing about what ought to be done? And then such men almost always know too much to be told any thing. You may depend upon it, it is only a damage to the country when men who are not brought up to it, go to farming. It don't make any calling more respectable to have an incapable man enter it, whoever he may be."

"Such cases," said Mr. Ripley, "only prove what I have always insisted on, that the state should found and support institutions, in which men shall be taught the knowledge necessary to skilful agriculture."

"I doubt whether such men as Lord would be found in the schools if they were as thick as blackberries. But I will talk with you about a college to teach farming. You would have it founded at the expense of the state?"

"Yes. The farmers pay all the taxes, and there is no reason why a part of the money raised from them should not be expended for their benefit."

"I agree with you there; that is, that the taxes should be expended for their benefit as well as others. Then the question comes up, would a farmer's college be for their benefit?"

"Certainly; that is too plain to need proof."

"I don't see it in that light. I don't see, in the first place, what our boys would learn there which they can't learn in our schools and colleges which are already established."

"Why, there would of course be a model farm connected with the college, and there they would see experiments tried, and the best modes of culture practically illustrated."

"The way that would work, according to my way of thinking, would be this. The farm would be a first rate one to begin with, and then there would be the state treasury to draw upon to carry it on with. Every thing would be after the most expensive order. All sorts of tools and machines must be used, and manures of every kind. It is most likely that the farm would look well. Now it might be very well to have our boys get their ideas of farming on such a farm, if, when they set up for themselves, the state would give each one of them a good farm, and stock it, and furnish them with tools, and what not; but if they have to come home and take up with fifty acres of stoney side hill, like mine, I doubt whether their ideas of farming gained at college would do them much good; whether they would grapple with the stone and brush, as well as they would if they had always stayed with me. They would pretty much all of them come home knowing more than their parents, and the old ways would be given up and the new ways could not be carried out for want of capital."

"You would have them kept in ignorance that they may be contented."

"No, I would have no such thing; but I would not have them form habits which are not adapted to their circumstances, I would not place my boy for three or four years, where he would form habits of dress too expensive for his means; nor would I on the same principle, have him form habits of farming that are too expensive for his means. But as to habits of farming, they would not be formed at any college you could make. They are to be formed at home if they are formed at all. Just consider one point more. They see what is going on by way of culture and experiment. Perhaps they are required to take a part. They know it is all at the expense of the state, and no matter how much is wasted. Will habits of economy thus be formed, and in regard to most of us, can we prosper by farming, unless we are economical in all matters pertaining to our business?"

"The officers must take care that nothing be wasted."

"When did officers in the pay of the state ever do that thing effectually? It would be very easy to spend a half a million on such a college as you propose, and some men would make money out of it; but that the real farming interest would be benefitted I do not believe."

"You are willing to be taxed then to help support colleges that do nothing for the farmer?"

"No; but I think the colleges I am taxed to support are of some benefit to the farmer. When Jacob was in college I had him make some inquiries, and he found that three-fourths of his class were the sons of farmers. I don't think we pay more than three-fourths of the money that is appropriated to colleges."

"He was taught nothing about farming there."

"Yes he was, he got a good education; learned to observe and to think, and was able to tell me about the different kinds of soils on my land, and what were the best manures. He said the books differed so much that it was not safe to follow any of them too far. Since he left college he has kept observing and reading, and I guess knows as much about farming as any of your scholars would who should go to your agricultural college, and he don't know any the less for working at home with me. Now I say, let us give our boys a good education. Let us make our common schools and academies better; let us have our boys taught to study and think and observe; let them go to college if they wish to; let them study in the schools more things which have a bearing on farming, as they could, if we would keep them at school longer: but let the practical part be learned at home. If a boy can't learn practical farming from his father, he will never learn it at college."

"Suppose the boy's father is not a farmer?"

"Then let him live out to a good one. That will be the best school for him. Rich men who have landed property, or wish their sons to have, would send them to your college, and then put them on to great farms; and pretty soon the idea would be, that the farmers of the college are not to work themselves much, but oversee others; just as friend Lord oversees his Irishman. Now you know as well as I do, that the great mass of farmers must work hard with their own hands or they cannot get a living."

At this moment a debtor of Mr. Ripley called either to pay the interest of his debt, or to borrow more money. Mr. Ripley was therefore obliged to break off the conversation, and Mr. Chambers went home, and went to bed.

OBSERVATIONS ON THE GEOLOGY OF LEWIS COUNTY.

BY FRANKLIN B. HOUGH, A. M.

The geological survey, authorized by the Legislature of New-York, having been nearly completed, and the results published, an account of the geology of particular districts may appear superfluous. But when we consider the extent of territory required to be examined by each of the gentlemen employed in the survey, and the absence of former observations to guide them in their researches, it is evident that the time allotted for its completion could not allow of that minute and local detail of geological phenomena, which is often of the highest importance in determining the age and identity of rocks, and in solving many of the intricate problems which present themselves to the votaries of that science.

In this article, the writer will principally restrict himself to the notice of phenomena not enumerated in the report of the Geologist of the Third District, and to a fuller detail of such facts as may have been mentioned in the report above referred to; and to which additional facts might be adduced, to amend or confirm the conclusions arrived at.

There is perhaps no department of Geology more deeply interesting, than the study of the earlier formations, and tracing the organic forms of existence, from their primeval characters, up through the different geological eras to the present time. Such is the character of a portion of the rocks of Lewis county, which, though wanting in several of the earlier strata, yet furnish an abundance of fossil remains of an exceedingly remote period, and exhibit evidence of having been produced under widely different conditions.

In describing the geological characters and mineral contents of the rocks of this county, I shall begin with the oldest formation, and proceed in the order of time to the latest. The county is nearly equally divided by the Black river; and nothing could be more widely different than the agricultural as well as geological characters of the country on its opposite sides.

From the High Falls to the northern border of the county, a distance of about forty miles, the river has a very gentle descent; so slight that a dam at Carthage was alleged to have caused much damage by overflowing lands thirty miles above, and give rise to expensive litigations. An estimate, made in pursuance of an act passed March 20, 1828, incorporating the "Black River Canal Company," places the descent in the distance at fifteen feet, which is probably much too high.

It derives its color principally from the tributaries on the eastern side, which arise in the swamps of the primary region, and which often contain ores of iron and manganese. The streams that descend from the west are generally limpid, except such as derive their origin from the swamps underlaid by slates and shales.

The tract of country east of the river, and to a distance varying from one-fourth to one mile to the west, is entirely primitive; being composed of gneiss rock, and constituting the western margin of the great Northern Forest of New-York. The mineral characters of this rock vary but slightly, being composed principally of feldspar, with variable proportions of quartz, hornblende, and particles of magnetic iron ore.

It usually presents a mottled appearance; but the prevailing color is reddish, or flesh colored. Its texture is coarsely crystaline, and it presents a kind of irregular and confused stratification, with none of that uniform continuity that is observable in strata of sedimentary rocks. The laminæ or strata (if so they may be called) seldom preserve a uniform width, being alternately widened and contracted, or terminated abruptly, and often crossed by irregular and tortuous veins of quartz, apparently the result of segregation.

We frequently meet with large masses of the constituent minerals of the rock, occupying a space by themselves. This is particularly observable at a mine of magnetic iron ore that has been wrought to some extent, in the town of Greig, on the land of Messrs. Johnson and Wardwell.

The ore is here interstratified with the rock, and of sufficient abundance to be wrought with profit, if it could be freed from the iron pyrites that is everywhere uniformly distributed through the ore, and in such quantities as to materially injure if not wholly destroy it in reducing.

It also yields, upon analysis, a trace of copper. The constituent minerals of the rock appear at this place to have been separated by their chemical attractions, while the mass was in a yielding condition. The amount of ore that exists here has not been determined. The bed seems to widen as it descends; but it is much mixed with the rock, and its situation is unfavorable for drainage.

Only a few tons have been raised from the mine, and the working is at present suspended.

The prevailing direction of the strata of gneiss in the county is ENE. and WSW., frequently varying several points from this course, and they dip uniformly at a very high angle, usually to the north; but in some localities the dip is vertical. At a very few places the dip was observed south. The face of the country throughout the primitive region is broken and hilly, the rock frequently appearing above the soil, and sometimes rising to the height of fifty or a hundred feet.

These upheavals are generally small in extent, and almost destitute of soil or vegetation. Their summits are rounded, with every appearance of having been exposed to violent currents of water or other denuding causes; and their northern and southern sides are usually precipitous, while the ascent is more gradual on their eastern and western extremities. The northern sides of these elevations are usually more smoothly worn, and often furrowed irregularly; but this fact is not so observable in this as in Jefferson county.

No continuous line of elevation is observed in this region; and the summit of the highest primitive rock is believed to be less than one hundred and fifty feet above the general surface.

Throughout the whole range of the primitive region in the county, there occurs little to interest the mineralogist, except on its northern border. The minerals which compose the gneiss, exhibit very little variety, and no crystaline forms of any kind have been observed but in the neighborhood of the primitive limestone of Diana. A brownish colored hornstone is seen investing the surface of the gneiss in Martinsburgh, at the point where the Roaring brook is crossed by the East road. It seems to have been deposited subsequent to the period when the strata assumed their present inclination, as their abraded edges are incrusted by the mineral, and it is entirely superficial. With the exception of a few grains of garnet, and a few scales of mica occasionally observed, the foregoing is a complete catalogue of the mineral contents of the gneiss rock of Lewis county, except where it is in the vicinity of the white limestone, which breaks out frequently among the ledges of gneiss along the entire northern border of the primitive region.

The texture of this limestone is usually so coarsely chrystaline, as to destroy its value for architectural purposes, and the only uses to which it is applied are for burning into lime, and as a flux for iron ores.

Its color is usually a pure white; in some localities it is pervaded by a delicate tinge of blue, which however fades upon exposure to the light, while in others it is colored red, of different shades, by iron ore.

The lime made from this stone is of a very superior quality and strength, and the stone itself being ground without burning, and added to the mortar intended for the "hard finish," is said to give the work a beautiful lustre.

No signs of stratification are to be found in this rock, as observed in this county, it being entirely homogeneous in texture, and breaking equally well in every direction. It is *not* on the margin of the gneiss and between that and the early sedimentary rocks, but is almost always surrounded by ledges of the gneiss and appearing to be coeval with it.

To the mineralogist, there are few localities more inviting than is presented in the northern part of Lewis county, in the town of Diana and in the vicinity of the Natural Bridge, whether the *variety* or *number* of minerals be considered.

The principal locality is about one mile from the last mentioned place and on and near lands owned by Mr. Enoch Cleveland.

On the north side of the road and a short distance from it, there occurs in connection with the primitive limestone a locality of tabular spar, with coccolite; these minerals also occur with augite, in the immediate vicinity of the village of Natural Bridge, but of not so fine a quality as at the first mentioned locality.

In a vein in the same rock on the opposite side of the road, there is found pyroxene of a jet black color, associated with the variety of scapolite known as *Nuttallite*, crystalized in the usual form of that mineral, but with the angles rounded as if by fusion; with sphene in imperfect crystals, phosphate of lime in small crystals and beautiful crystals of the mineral for which the name *Lederite* has been proposed.

In an adjoining field a short distance east, these minerals have been found in greater perfection with large crystals of feldspar, and more rarely large and beautiful crystals of *zircon*.* The latter mineral is far from being common, only a few crystals having been found; the largest of which was about two inches in length and a fourth of an inch in diameter, being a regular square prism terminated by the four sided pyramid. Specimens presenting most beautiful groups of these minerals may be procured by blasting the rock, and doubtless other localities will be hereafter discovered in the vicinity that will yield specimens of equal beauty.

Not far from the locality last mentioned to the north, there occurs in large quantities a singular substance which formerly attracted some notoriety from its being thought to be *silver ore*, a belief to which the owner still (no doubt conscientiously) adheres. Small quantities of this have been reduced in a small blast furnace erected for the purpose, and a very hard and brittle metal, not easily tarnished, was procured. This most probably was a kind of highly carburetted iron or natural steel. This mineral is of a greyish or greenish black color, a finely granular fracture,

* This mineral was first observed at this locality by Mr. Luke Wilder, of Lowville, a gentleman who has done much to elucidate the mineralogy of this section of county.

and faintly glimmering lustre with a specific gravity of 4.0 and its streak and powder is greenish grey.

It is probably an impure iron ore, containing much graphite and some chlorite; it is said to have yielded upon analysis 22 per cent of iron.

Its geological situation is between gneiss and Rensselaerite or steatite, which here occupies a place of considerable extent in the primary rocks, and appears to be of the same age with the gneiss and white limestones of its vicinity. Associated with it is a rock of trappean (?) character of a grey color, exceedingly compact and tough, and containing every where disseminated through it in great abundance, grains and cubic crystals of iron pyrites. Near the surface, and where it has been exposed to the water, the sulphuret of iron has been removed, leaving the rock spongy and porous. Some specimens of this cellular rock of a light grey color, resemble certain varieties of lava. Large opaque crystals of quartz occur in a vein in the gneiss in the immediate vicinity. Some of these crystals are aggregated in a confused manner, exhibiting upon being broken a radiated appearance.

The Rensselaerite of this locality exists in large quantities, composing a ledge of considerable extent and is accompanied by serpentine, of a dull greenish color, nearly opaque, and highly variegated. The fractured surface of the serpentine is without lustre, and although it receives a good polish, yet it wants that translucency which gives beauty to articles made from this mineral. The general color of Rensselaerite is grey, with veins of white, and irregular patches of brown and black; it is easily wrought and may be procured in sufficiently large masses to be used for a great variety of architectural and other ornaments.

About half a mile from this locality to the northwest, quartz is found in drussy crystals, and coating thin masses of chalcedony, in seams and cavities of the gneiss, which is here composed of a large proportion of this mineral. Small specimens of fortification agate are common, and the chalcedony is sometimes found free from its investing quartz in mammary concretions or disseminated in nodules through the rock. Augite associated with tremolite and a reddish brown sphene, is found near the village of Natural Bridge, but not *in situ.* The augite is of a dark green color, and the tremolite is sometimes found tinged with a beautiful pink color.

If to the minerals above enumerated we add *graphite*, in small scales everywhere common, and minute quantities of magnetic sulphuret of iron, we shall have completed the catalogue of minerals hitherto observed in this vicinity.

At Indian River Lake, about two and a half miles from Louisburg, a bed of specular iron ore has been opened, and wrought to same extent. Owing to the want of good roads and bridges, this ore has not been used to any considerable extent, but a furnace is being erected in its vicinity which is intended to work this ore, From the trial that has been made of it at the Louisburg furnace, it was found to be of a good quality, and the cheapness of fuel in this section will enable the manufacturer to derive a profitable return from his investment. One drawback to the manufacture of iron in this section of the state exists, and must continue to exist until a more direct means of communication is opened; and that is, the remoteness from market, and the expense of transportation. Whenever this check shall be removed the iron manufacture will assume an importance second to none in northern New York, as our resources are unbounded and the demand must continue forever unlimited.

The geological situation of this, like every other bed of specular oxide of iron in this portion of the state, is between the primitive and the Potsdam sandstone; so constant is this association that wherever the two rocks occur we may reasonably *expect* to find more or less of specular ore between them. Numerous localities occur where the two formations come in actual contact with nothing intervening, but in no case has the writer ever observed a bed of specular oxyde of iron, without the Potsdam sandstone being either immediately over or in the immediate vicinity of the ore. The whole association is sometimes found inclined at a high angle, as at the Keene ore bed in the town of Antwerp.

The agricultural character of the primitive region is uninviting, and it requires the most diligent cultivation to yield even tolerable crops. The soil is generally light and sandy, producing the crops usually cultivated in diminished quantities, and affording but a thin and scanty growth of grass; it is however peculiarly well adapted for the growth of melons.

Extensive districts in this region were formerly covered by pine timber, much of which has been removed for lumber, while immense quantities remain, but too remote from the settlements to be brought into market before means of communication are opened. The soil occupied by the pine timber is less valuable than that of other kinds of wood, and it must necessarily be a long period before the whole or indeed any considerable part of this district is brought under cultivation.

The narrow strip of land underlaid by the primitive rocks west of the river, does not differ materially from the limestone lands above it, being in some places liable to inundations from the river, which in high water contains a great amount of sediment, and receiving the alluvion brought down by the smaller streams from the transition rocks above it. The sandy region of the primitive is very liable to frosts, which often cut down the tender grain in the early part of summer, or destroy it before ripe in autumn. The corn crop is more liable than other grains to be injured by these frosts. It is yet to be determined whether this condition will be improved when the forests are cleared up and the land brought under cultivation, or whether it is owing to some peculiar quality of the soil which enables it to recieve less, or radiate more of solar heat. A light sandy soil must be very liable to excessive radiation of caloric by night, and will no doubt be found to be the true cause of these frosts which occur so frequently in such soils, while neighboring districts exposed to equal conditions but of a different quality of soil are exempt.

There are several places in the town of Diana where the primitive is overlaid by the Potsdam sandstone, as near Louisburg, near Harrisville, and in the vicinity of Indian River Lake. These cappings of sandstone are all of limited extent, and isolated from each other, distinctly stratified, with the strata in one or two places highly inclined, and so far as observed, entirely destitute of fossils.

An interesting locality of this rock, occurs in the town of Martinsburgh, resting upon the gneiss and passing under the limestone. This occurs on Roaring brook, and near the East road: the strata are nearly horizontal or conforming to the slightly undulating surface of the subjacent rock, and do not in all exceed six feet in thickness.

It is made up of smoothly worn pebbles of quartz, and grains of sand, consolidated in whole or in part by an oxide of iron, which tinges it of a reddish color, and occasionally considerable masses occur of a greenish color, or mottled with green and red.

This is the first observed locality of the Potsdam sandstone west of the great primary nucleus of northern New York, and adds a new fact to confirm the law of uniform succession of rocky strata as observed in the different members of the New York system.

It also in a striking manner illustrates the *thinning out* of strata which often occurs; the formation occurring in great perfection in St. Lawrence and the other northern counties, while at this place it is reduced to a thin and unimportant stratum, and so altered in lithological character as to be scarcely recognized except by its association as the same rock.

Another fact of still deeper interest might here be alluded to, namely, the entire absence of a member of the New York system —the calciferous sandstone, which occurs so fully developed both north and south of this locality. Whether this intermediate district occupied an insular position during the deposition of the calciferous sandstone, or whether it was deposited uniformly over the entire surface, and afterwards swept away prior to the deposite of the succeeding rock, our present knowledge may not enable us to answer satisfactorily, but most probably the former would be the more natural method of accounting for the phenomenon.

A few superficial strata of that member of the calciferous that contains the *fucoidal layers*, have been observed in the northern edge of Lewis county, but they are of very little extent and only in isolated patches.

(To be continued.)

WINTER INSECTS OF EASTERN NEW YORK.

BY ASA FITCH, M. D.

It is the object of the following paper, to describe those insects of Eastern New York, which occur in their perfect state in the winter, and are peculiar to that season and the early part of spring. They are objects of curiosity, as coming forth to our view in full maturity and vigor, at that time in the year when almost every other member of the animal and vegetable kingdoms is reposing in torpidity under the chilling influence of solstitial cold. In an economical aspect, they possess but little importance, their period of life being limited to that season when the field furnishes no herbage, the garden no flowers, and the orchard no fruits, on which they can prey. They are chiefly interesting, therefore, merely as objects of scientific research—as forming integral parts of that vast array of animated beings, with which the Father of Life has populated our world, and rendered it vocal with his praise.

Hence it is to the scientific rather than the agricultural reader, that the following pages are addressed. To him they will be sufficiently intelliglble, without such illustrations as have accompanied our previous contributions to this Journal.

A few words respecting the analogies of the two first species here described, may not be devoid of interest to the general reader. A small insect, destitute of wings, and bearing some resemblance to a flea in its general aspect, is found in the winter season, upon the snow in the northern part of Europe, and also occurs upon the Alps and the Hartz mountains. It has been known for nearly a century, and from its singularly anomalous characters, naturalists have been much perplexed to determine in which particular family of the insect tribes it might with the most propriety be placed. Linnæus was the first to classify and name it. He regarded it as possessing more analogies with the species associated in his genus *Panorpa*, than with any other insects, and accordingly arranged it with them, bestowing upon it the specific name *hyemalis.* But, inasmuch as it differed from the Panorpidæ in some prominent particulars, such as possessing the faculty of leaping, and being furnished with an ovipositor similar to many grasshoppers and crickets, Panzer, at a subsequent day, placed it under the genus *Gryllus.* More recent naturalists, however, have concurred in the propriety of the location originally given by Linnæus, and to obviate, in some degree, the incongruity of its situation, Latreille was induced to construct for it an independent genus, placed beside Panorpa, to which genus he gave the name *Boreus.* The *hyemalis* has remained to this day the sole species of this genus, no other insect having similar characters, having been discovered in any part of the world. Two years since, in the month of March, searching carefully upon the melting snow, to find if possible in this vicinity, a rare and singular insect which has been lately discovered in Canada—the *Chionea valga*, a fly destitute of wings—though unsuccessful, my labors were rewarded with an equally acceptable return, an insect cogeneric with the curious *Boreus hyemalis* of Europe. Since that time, I have met with numerous specimens, and have also found in the same situations, several individuals of a third species pertaining to the same genus. From these specimens I draw the following detailed characters of the

Genus BOREUS, *Latreille.*

Polished and shining. *Head* sunk into the thorax to the eyes, which are prominent; ocelli wanting. *Rostrum* long-conical, twice or thrice as long as the head from which it gradually tapers, projecting downwards at right angles with the body, or more or less inclined backwards under the breast, its front side clothed with minute hairs. Maxillary *palpi* reaching beyond the tip of the beak; terminal joint longest and slightly thicker than the others, long ovate; basal joints cylindrical, half as long as they are broad. *Antennæ* inserted in the middle of the front, their bases nearer to the margin of the eyes than to each other, reaching half the length of the abdomen in the females and to its tip in the males, thickly set with very short minute hairs; filiform, hardly thicker towards their tips, composed of twenty-three joints; two basal joints thickest, the first sub-cylindric, the second obovate; succeeding joints short-cylindric, compact; terminal joint ovate. *Thorax* cylindrical, scarcely as broad as the head. *Wings, in the males,* rudimentary and not adapted for flying. Upper pair represented by two coriaceous pseud-elytral scales which reach rather more than half the length of the abdomen; these are broadest at their base and gradually taper to an acute point, the length being over four times as great as the breadth; they are very convex above and concave on their under sides, and thus when detached, bear some resemblace to the chaff-scale or glume of a small kernel of grain; the apex is armed with a straight thorn-like spine which is directed backwards and downwards; the inner margin is studded with a row of small teeth, which are longer and more distinct towards the apex of the pseud-elytron; these teeth are inclined backwards, and at their points they are strongly curved in the same direction; both the outer and inner margins are minutely ciliated with short hairs. The under wings are represented on each side by a curved bristle which lies under the pseud-elytron and within its concavity; it scarcely exceeds the pseud-elytron in length, is slightly dilated at its base, curves inwards and downwards, is almost hooked at its tip, and gives off an occasional short hair. *In the female* the wings are entirely wanting, the only vestiges of them being two minute scales occupying the place of the upper pair: these scales are circular and scarcely the hundredth part of an inch in diameter in *B. nivoriundus*, slightly elongated and a third smaller in *B. brumalis*; they are convex above and concave beneath, and attached to the thorax by a short broad pedicel; their edges are ciliated with minute hairs; their upper surface is also thickly set with very short, erect hairs, and is crossed by an elevated rib or slight keel. *Legs* long, particularly the posterior pair, the length of which exceeds that of the body; their several joints cylindric and densely clothed with short minute hairs; the first tarsal joint half as long as the tibia, the four remaining joints successively shorter, terminated by two small, slender, simple hooks. *Abdomen* oval, depressed when exsiccated, the segments distinctly marked by strongly impressed transverse lines, and clothed with fine appressed hairs: in the males it is nearly cylindrical, but little broader than the head, truncated as it were at its apex and turned upwards; tip of the last segment furnished with two stout sharp-pointed hooks, each with an acute tooth in the middle of its inner edge, and pilose along its outer edge; these hooks are susceptible of being extended in a line with the body, but are commonly strongly recurved upon the back, shutting down upon and grasping a small scutel-like process which projects upwards at the base of this segment. They are thus recurved in coition, the male organ being exserted from between their bases. *Ovipositor* robust, about half as long as the abdomen of the female, projecting backwards in a line with the body, composed of a three-jointed semicylindrical piece above, and two ligulate valves below; the latter have their lower edges held in contact, thus forming a little gutter, and on the under-side towards their tips they are finely serrated; of the upper piece, the middle joint is much the longest, and is lined beneath on its concave side with a membrane which becomes distended with fluid when the abdomen is pressed upon; the short terminal joint is susceptible of being inclined obliquely downwards, thus, at least partially, closing the end of the ovipositor; the upper and lower pieces are widely separated in coition to enable the tip of the male abdomen to approximate that of the female.

1. Boreus nivoriundus. *The Snow-born Boreus.*

Shining black or brownish-black; rudimentary wings, thorax above, with the rostrum and ovipositor excepting their tips, fulvous; legs dull fulvous.

Length, male twelve-hundredths of an inch; female, 0.15, or including the ovipositor 0.18.

Head black, highly polished, glabrous. Eyes black. Rostrum fulvous and feebly diaphanous, the mouth and palpi black. Antennæ black, two basal joints sometimes fulvous-brown. *Thorax* black on the sides, above varying in color from dull fulvous to cinnamon yellow, the basal half of the prothorax being black. *Abdomen* black, brownish black, or dull fulvous-brown; terminal segment fulvous or cinnamon-yellow, its hooks in the males cinnamon-yellow, their tips and teeth black and highly polished; ovipositor in the females diaphanous, fulvous, sometimes inclining to rufous, black at its tip. Rudimentary *wings* cinnamon-yellow, in the males often of a duller hue towards their tips; rudimentary inferior wings in the males of the same color as the superior. *Legs* lurid-yellow and sub-diaphanous, with a slender black annulus at each of their articulations; three last joints of the tarsi wholly black.

Closely allied to the *B. hyemalis*, which, however, appears from Rambur's Neuroptera, the Penny Cyclopœdia, and the beautiful colored figure in Westwood's Introduction, the only definite authorities to which I am able to refer, to have the basal two-thirds of the antennæ of a russet color, and the rudimentary wings and the legs strongly inclining to red. Our species presents no tinge of rufous, except sometimes in the ovipositor; and the antennæ, black to their bases, is a decided distinctive mark.

This insect is by no means rare, being found upon the snow in forests in warm days, so early as December, and becoming more common as the season advances. I have met with it the most plentiful in April, when there has been a fall of snow in the night, succeeded by a warm forenoon of bright sunshine. Appearing so suddenly, in numbers, upon the clean, dazzling white surface thus spread over the earth, at the first thought it seems to be literally bred from the snow. I have not yet searched for it in the moss of tree-trunks, but doubt not that like the European insect, ours will also occur in this situation. When observed upon the snow, it is almost always stationary; and when approached by the hand, it commonly makes a leap, to the distance of a few inches only, its saltatory powers appearing but feeble.

2. Boreus brumalis. *The Mid-winter Boreus.*

Polished deep black-green; legs, antennæ, rostrum, and ovipositor black; rudimentary wings brownish-black.

Length, male 0.10; female 0.12, or including the ovipositor 0.15.

This species presents no very obvious characters beyond those already given. Its body is highly polished, shining even with a metallic lustre, whilst the eyes, antennæ, rostrum, and legs, reflect the light but feebly. The ovipositor is pure black, but equally splendent with the black-green abdomen. The scales which occupy the place of the wings in the females are but faintly perceptible, appearing like two minute greyish-black spots on the thorax. In the living insect, there is a light fulvous vitta, obvious to the naked eye, along each side of the abdomen, at the lateral suture; this is frequently obliterated or but imperfectly discernible in the dried specimen.

So far as I have at present observed, this appears abroad earlier in the season, and in colder weather than the preceding, though occasionally found associated with it on the last snows that fall in the spring. It is much less common than the other.

3. Perla nivicola. *The Small "Snow-fly."*

Black; wings grey, unclouded, a third shorter than the abdomen in the males, a third longer in the females.

Length 0.20, wings expand 0.45; males smaller.

Head shining, clothed with very short, fine hairs. Palpi brownish-black, sub-diaphanous. Antennæ reaching half the length of the wings, black, setaceous, about thirty-jointed; joints obconic, basal one largest. *Prothorax* flattened, its margins more smooth and shining, its disk rugulose, with a few shallow impressions; an impressed transverse line near the base and another near the apex. *Abdomen* shining, with a broad pale fulvous dorsal vitta which does not extend onto the two last segments; venter with a tint of obscure pallid at base. Setæ as long as the abdomen, black, setaceous, clothed with short whitish hairs; joints from thirteen to about eighteen in number, obconic, gradually shorter towards the base. *Legs* black, joints cylindric. Tibiæ obscure pale brown except at the tips, sub-diaphanous, grooved longitudinally. Tarsi, basal joint longest, second joint very short. *Wings* reaching half the length of the setæ, finely ciliated at their tips and along their inner margins; grey, diaphanous, immaculate; nervures black, robust, and very strongly marked, particularly on the upper pair which have five closed cells in the disk. The male is smaller, with the wings reaching but two thirds the length of the abdomen, its palpi and entire tergum black, and the tibiæ darker than in the female.

On warm days in the latter half of winter this species may be observed crawling with hurried steps upon the snow. It becomes most numerous about the time the snow finally disappears, and is then often seen on shrubs, fences, and buildings, and not unfrequently finds its way into our houses. It is extremely common, occurring most abundantly in the vicinity of streams of water, in which element the previous stages of its existence are passed. When first excluded from its pupa state, it is of a pale yellowish color, but gradually changes to black, this change commencing upon the thorax. Copulation occurs immediately after the female comes from the pupa state.

4. NEMOURA NIVALIS. *The Large "Snow-fly." The "Shad-fly."*

Black; wings griseous, faintly banded, double the length of the abdomen.

Length, males somewhat under, females over half an inch; wings expand about an inch.

Head covered with minute whitish hairs, which are longer and more obvious beneath the bases of the antennæ and around the mouth. Vertex with an obtusely impressed transverse line immediately back of the two posterior stemmata, and a longitudinal medial one, reaching from the former to the neck. Antennæ black, clothed with very short minute hairs, slender, setaceous, as long as to the tips of the wings in the males and somewhat shorter in the females, composed of about sixty joints; basal joint short-cylindrical, its diameter double that of the third and following joints; second joint intermediate between the first and third in diameter, its length and breadth about equal; the remaining joints obconic, gradually diminishing in diameter and increasing in length toward the tips. Palpi clothed with very short, minute hairs, black; basal joints of the maxillaries lurid and slightly diaphanous, penultimate joint rather the shortest and obconic, the joint preceding it longest and obconic, the terminal joint oval, and scarcely as thick as the others. *Prothorax* square, in the females scarcely broader than it is long, somewhat narrower anteriorly, posterior angles rounded, all the margins slightly and obtusely elevated, the posterior one more obviously so, often with a dull fulvous spot at the base, or with this color spread over the posterior part of the raised margin, and more rarely a similar spot at the middle of the apex; disk sometimes showing an impressed transverse line, and a longitudinal dorsal stria. Exposed portion of the *mesothorax* much elevated above the plane of the prothorax, forming a transverse ridge between the bases of the wings; clothed with short hairs; often with traces of dull fulvous around the wing-sockets; the portion of the mesothorax and metathorax covered by the wings smooth and shining. *Abdomen* reaching but half the length of the wings; sutures of the tergum in the female more or less widely marked with dull rufous; tip, in the female only, furnished with two short, filiform setæ, scarcely equalling in length the segment to which they are attached; setæ pale lurid, sub-diaphanous, hairy, composed of about eight joints. Each segment of the venter with two transverse impressions, one situated towards each posterior angle. Male organ exserted, forming a conical lurid point near the base of the last ventral segment. *Femurs* cylindrical, black, clothed with white hairs, which are longer and more distinct in the females, inner side with a narrow deep groove which is dilated towards the apex. *Tibiæ* cylindrical, about half the diameter of the femurs, grooved, lurid-brown, diaphanous, the ends and inner sides black; apex slightly incurved and armed with two short spines on the inside. *Tarsi* black, composed of three joints, whereof the middle one is slightly shorter; two claws and an intervening pellet at the tips. *Wings* griseous, when closed showing faintly two paler bands, one near the middle and the other back of it; edges ciliated with fine, short hairs. Upper wings diaphanous, grey, faintly marked with a darker cloud back of the middle, and another occupying the tips, but not reaching to the edge, these clouds becoming wholly obliterated in cabinet specimens; nervures black. Lower wings grey, sub-hyaline, nervures black.

When recently excluded from the pupa, the abdomen, except at its tip, is of a dull rufous color; this gradually becomes darker, and finally pure black. For a time after the venter has become wholly black the tergum continues dull rufous with a black band on each segment, which band does not reach the lateral margins. These bands increase in size, and at length the whole tergum is overspread with pure black.

It is not uncommon to meet with specimens of this and the preceding species, infested with a minute parasite of the family Acaridæ. These parasites are of a bright vermillion-red color, and fix themselves, one or more, at the sutures of the tergum, not quitting their hold after the death of the insect, unless disturbed.

This species begins to appear, soon after the Small Snow-fly is first met with. It occurs in the same situations, is nearly as abundant, and remains for a time after that has disappeared. One of the purposes served by these prolific insects in the economy of nature, doubtless is, to supply with food the fish of our streams, at this early period of the year. The larger of these species, continuing to be abundant when the the shad first come into our rivers, has evidently received one of its popular designations in allusion to this fact.

We regard this as the American analogue of the European *Nemoura nebulosa*, Linn. But, from several points in the extended description of that species given by M. Ramber, (*Suites a Buffon, Insectes Nevropteres,* Paris, 1842,) it is quite obvious that ours is a distinct insect.

5. Culex hyemalis. *The Winter "Musketoe."*

Thorax cinereous, with a broad black vitta on each side; extreme tips of the wings and two spots on their anterior margins black, with two intervening sericeous yellowish-white spots.

Length 0.22; to the tips of the wings 0.28, or including the beak 0.39.

Head cinereous-pubescent, occiput black-pubescent. Proboscis black, its apex cinereous. Palpi black, the tips varied with gray. Antennæ black, tips brown. *Thorax* cinereous-pubescent, with a broad rufous-black vitta on each side, passing above the wing-sockets; the vitta often edged on its upper side with yellowish-white; a very slender, black, dorsal line, often partially obsolete. Scutel glabrous, dark brown. Poisers black, their pedicels white. *Abdomen* clothed with longish gray hairs, black or dark brown, with two rows of whitish spots on each side; in the males obscure white, the posterior margins of the segments black. *Wings* subhyaline, with two blackish spots on the anterior margin, separated by a conspicuous glossy yellowish-white spot; inner spot with a strong notch on its posterior side which is formed by a yellowish-white dot, and a similar dot is placed on the inner side of this spot; outer spot with an oblique yellowish-white band on its outer side, beyond which, at the tip of the wing, is a slight blackish transverse spot. Under a magnifier, these spots are found to be produced by the colors of the scales upon the nerves of the wings, which scales are regularly and beautifully dyed with black and yellowish white, as follows: the posterior or anal nerve has black scales the last half of its entire length, and also at its base: the next or interno-medial nerve, which forks in its middle, is clothed throughout with black scales, including both its branches: the next or externo-medial has black scales on the basal fourth of its length, two broad annuli of black scales on its middle, another annulus at its fork, and a fifth series at the tips of each of its branches; the next is clothed with black scales through its entire length: the next is black where it first becomes plainly visible in the middle of the wing, again for a short distance after the origin of the preceding nerve, again for a considerale space at its fork, and again at the apex of its posterior branch only: the costal and the marginal nerves have black scales from their bases; these become much more dense at the black spots of the anterior margin, and are replaced by yellowish scales only between these spots and beyond the entire one. *Legs* black; femurs pale towards their bases; tips of femurs and of tibiæ whitish. Coxæ pale.

The Winter Musketoe is met with in the last days of autumn and again for a short time in the first days of spring, and specimens are occasionally found in any of the winter months. It is a somewhat rare insect, which no one can fail to distinguish clearly by the marks on its wings as above described.

6. CHIRONOMUS NIVORIUNDUS. *The Snow-born Midge.*

Black; poisers obscure-brown; wings pellucid-cinereous, their anterior nervures blackish.

Length about 0.15 to the tip of the abdomen in the males; females a third shorter.

This species is black throughout, and clothed with fine black hairs. The *thorax* has three slightly elevated longitudinal ridges immediately forward of the scutel. The *wings*, when the insect is at rest, are held against the sides of the abdomen, often vertically in the males, but more commonly in the females with their inner margins in contact, thus forming a steep roof covering the back. They are diaphanous, of a cinereous tinge, and feebly iridescent. Their inner margins towards their bases are slightly arcuated. The submarginal or postcostal nervures, those which bound the closed basillary cell, and which proceed from this cell to the margin, are particularly obvious, being of a blackish color, excepting the nerve which proceeds from the inner angle of this cell to the apex of the wing, which, with the nervures inside of it, scarcely differ in color from the surface which they ramify. The *poisers* are obscure-brownish, truncated at their apices, the capitulum being in the form of a reversed triangle. The *abdomen* in the females is shorter than the wings, somewhat compressed, approaching to an ovate form when viewed laterally, with the venter often of a dull brownish tinge: in the males it projects beyond the tips of the wings, is slender, cylindrical or very slighly tapered towards the tip, with some of the terminal segments separated by a strong contraction.

This is a very common species, appearing upon the snow in the winter season, and upon fences, windows, &c., in the fore part of spring, the males and the females being about equally numerous. The beautiful plumose antennæ of the former distinguish them at a glance from all other insects abroad at this season. At times they may be met with in immense swarms. April 27th 1846, in a forest, for the distance of a fourth of a mile, they occurred in such countless myriads as to prove no small annoyance to the passer, getting into his mouth, nostrils and ears at every step, and literally covering his clothing. These had probably hatched from the marshy border of an adjoining lake, on this and the preceding days, the weather having been remarkably warm and dry. The wings appear to be more hyaline and iridescent in those individuals that come forth earliest, but I am unable to detect any marks by which they may be characterized as specifically distinct from those which appear at a later day.

7. Trichocera brumalis. *The Mid-winter Trichocera.*

Brownish-black; wings and legs pallid at their bases; poisers blackish, their pedicels whitish.

Length of the male 0.18, of the female 0.25, the wings expanding twice these measurements.

Thorax with an obscure grayish reflection. *Abdomen* in the males cylindrical, slightly narrower towards the tip, in the females elongated-oval, and pointed at the tip; each segment with a strongly impressed transverse line in its middle, and the posterior margin elevated into a slight ridge. *Ovipositor* fulvous, sometimes tinged with blackish. *Wings* hyaline, faintly tinged with dusky; inner margins ciliated with quite short hairs; nervures blackish. *Legs* very long, slender, and fragile, blackish; femurs brown, gradually paler towards their bases.

Common in forests in the winter season, coming out in warm days, flying in the sunshine, and alighting upon the snow, its wings reposing horizontally upon its back when at rest. Even when the temperature is below the freezing point, and the cold so severe as to confine every other insect within its coverts, this may be met with abroad upon the wing. It is a plain, unadorned species, closely allied in its characters and habits to the European *T. hyemalis*, but in a number of impaled specimens before me, I can detect no stripes or bands upon the thorax; whilst the very obvious character of the legs and wings being pallid at their bases, I do not find mentioned as pertaining to that species.

8. Podura Nivicola. "*The Snow-flea.*"

Black or blue-black; legs and tail dull brown.

Length 0.08.

Body black, covered with a glaucous blue-black powder but slightly adherent, and sparingly clothed with minute hairs; form cylindrical, somewhat broader towards the tail. *Antennæ* short and thick, longer than the head. *Legs* above blackish, beneath dull brown and much paler than the body. *Tail* of the same color with the venter, shortish, glabrous on its inner or anterior surface, with minute hairs on the opposite side; its fork brownish.

Though found in the same situations as the European *P. nivalis*, ours is a much darker colored species. Say's *P. bicolor* is a larger insect than the one under consideration, and differs also in size and in the color of the tail or spring. From the habits of the present species, we should infer that it might be abundant in all the snow clad regions of the northern parts of this continent; it may therefore prove to be identical with the *P. humicola* of Otho Fabricius (Fauna Gröenlandica,) of which we are unable to refer to any but short and unsatisfactory descriptions, which do not coincide well with our insect.

This is an abundant species in our forests in the winter and fore part of spring. At any time in the winter, whenever a few days of mild weather occur, the surface of the snow, often, over whole acres of woodland, may be found sprinkled more or less thickly with these minute fleas, looking, at first sight, as though gunpowder had been there scattered. Hollows and holes in the snow, out of which the insects are unable to throw themselves readily, are often black with the multitudes which here become imprisoned. The fine meal-like powder with which their bodies are coated, enables them to float buoyantly upon the surface of water, without becoming wet. When the snow is melting so as to produce small rivulets coursing along the tracks of the lumberman's sleigh, these snow-fleas are often observed, floating passively in its current, in such numbers as to form continuous strings; whilst the eddies and still pools gather them in such myriads as to wholly hide the element beneath them.

REMARKS ON THE STRUCTURE OF WOOD.

Illustrated by a Plate.

BY E. EMMONS.

Structure in organized as well as unorganized beings furnishes the most certain and reliable criteria for recognizing the families to which they belong. The minute and anatomical structure of the teeth of fish and quadrupeds may always be employed as a means for distinguishing the genera and species. Structure too, in unorganized bodies is equally characteristic. The law of attraction, or the electric force so called imparts regularity to the movements of the atoms as they approach each other; and hence, the component particles of the same substance are always arranged in the same manner. The body produced is built up by regular and as it were concerted movements of its molecules, there is therefore, not only a regular external form, but also a regular arrangement of the interior. Such bodies are termed chrystals. A physical law governs the arrangement of all the atoms which enter into their composition, and though the perfection of the arrangement may depend upon external circumstances, still the force itself is never absent.

The law of structure, however, as it appears in organized bodies is quite different. It is a force which belongs solely to living beings, and which for the time overcomes it. One remarkable distinction which may be observed in the operations of those two forces is, that the former produces angular, and the latter curved forms, or a tendency to curved forms. It is not my purpose however to dwell upon these well known facts. The doctrine which I wish to state is, that the internal structure of all organized beings is the same in the same species, and if determined, may be employed as a means for distinguishing them. I have already referred to the use which is made of the structure of teeth, and ivory, and also bone, for the discrimination of species in the animal kingdom; so it is believed that the structure of vegetables, may be employed more effectually than it has hitherto been for the correct determination of species. Structure too, it may not be out of place to say, has been employed as the basis of the most philosophical methods of classification. It is upon characters which depend upon, or such as are derived from structure, that we discover the most intimate relationship. Though the external form depends upon structure, still it stands only in the second place to it in importance. The structure as developed by dissection must always occupy the first, and furnish the basis for all arrangements which can claim a title to the natural, or that founded upon resemblance. It is often difficult by the ordinary mode of examination to determine the relationship of beings; if however our proceeding is directed to their structure, our conclusions can scarcely fail of securing the end we seek. The nearer the structure of individuals approach each other, the nearer will be their relationship; and vice versa, the nearer the relationship, the closer will they resemble each other in their structure. In studying the species composing a genus it is often found, that two species belonging to it, depart farther from each in structure than two other species of the same genus, and the species of some genera are altogether more natural than the species of another genera. This is easily shown in many instances of forest and fruit trees. In some, the structure seems almost identical, differing only perhaps in the size of elementary parts, while their arrangement is so close that points of distinction cannot be fairly made out. In other species the differences are so obvious that by a glance of the eye we are able to discover them. In the former, the affinity without doubt is much closer than in the latter.

In trees and shrubs little attention has hitherto been given to the arrangement of tbe elementary parts which make up the stem or trunk. In exogens the annual layers and the medullary rays, the vessels, etc., have been described in almost every botanical treatise, but in describing their arrangement all trees and shrubs are spoken of as though a perfect similarity every where prevailed; but it is supposed that such diversity exists that the characters which may be drawn from them, will aid essentially in determining genera and species. Here is at any rate an interesting field of research, and though very important results may not grow out of it, yet the curious and interesting structure, beautiful in all respects, will itself repay the observer abundantly for all his pains and labors. There is one point which renders the investigation more interesting, and which adds also to their value, the fact that the observations may be made with a common single lens of an inch, or an inch and a half focus, so that no expensive apparatus is required to conduct them to a satisfactory issue. To prepare the wood for examination it is necessary only to make a clean transverse section of the stem with a sharp knife, being careful not to bruise the surface in the operation; or what is better in some cases, procure a thin shaving by a sharp plane in the same direction. This on being placed between glass plates with gum arabic, will give a very satisfactory view of the structure of the wood.

No doubt some botanists will regard the mode as rather coarse and attended with too little nicety and expense, still it is one which will be found to answer very well and to be within the practical reach of all, whereas an expensive microscope, together with an expensive slicing instrument places it beyond the means of most persons who study botany in this country.

As it is not my purpose at this time to enter upon a detailed description of the structure of wood as it appears under a single lens, I shall proceed at once to give a very brief description of the four samples of wood, the structure of which is given upon a steel plate. These were selected almost at random, and are less beautiful and interesting than many others, as any one may satisfy himself by inspection and comparison.

In the examination of wood the principal parts to be noticed are the tubes or sap vessels, which may be divided into primary and secondary, and the medullary rays both of the wood and bark. There is but little diversity in the arrangement of the medullary rays; in some woods those which commence at the pith extend to the circumference while in others they never do—their thickness too is quite different, yet in general arrangement it is the same in all woods. The tubes or vessels however differ both in size and arrangements in different species of vegetables. The primary, which are the largest and most conspicuous, are first formed in the spring of the year; the secondary are distributed through the remaining part of the annual layer in a very peculiar manner, and this arrangement in different genera at least is quite different.

In illustration of the foregoing statements I now refer the reader to the engravings. Pl. 3, Fig. 1, is a section of the chestnut, enlarged about four times. It consists as will be seen of series of segments of rings which are the annual growths of the tree; each ring is formed of two parts, the first which is filled with large tubes and is the first growth of the wood for the year; the second is more compact and is perforated by the secondary tubes or sap vessels, and which are arranged in lines nearly parallel with the medullary rays. In the general arrangement of these parts there is quite a strong resemblance to the oaks.

Fig. 2, is a transverse section of the elm. (Ulmus Americana.) It will be observed at once that the structure of the elm is quite different from the chestnut, the serges of primary pores are different, and especially are the secondary ones arranged in a mode as different as possible. There is in fact a very beautiful appearance in this arrangement. So far as my own observations extend this peculiarity of the secondary tubes or vessels is not found in any other wood; the red elm resembles this in some respects, still it is not difficult to distinguish them from each other.

Fig. 3, is a section of the paw-paw tree. The wood is yellowish; the primary tubes very close and the secondary in narrow and rather interrupted lines, approaching to parallelism with the annual layers. The bark of this tree is close and compact, traversed by the medullary rays arranged in pointed groups, converging to the outside.

No. 4, is a section of bass wood. It is doubtful whether it is possible to make the usual separation of the sap vessels into primary and secondary. They are exceeding small, but very numerous. The medullary rays also, are exceeding thin and distinct, only for short distances. The wood as is well known is very close grained and compact, although it is one of our lightest woods. The medullary rays of the bark are arranged very much as in the paw-paw, and which seem to form the corky matter which intervenes between the converging groups. In most woods the external cracking of the bark is occasioned by its medullary rays,—or rather the irregular longitudinal lines in which the bark cracks are determined by the groups or clusters of rays. It is by no means true that this peculiar arrangement of the rays in the bark universally prevails—for it is quite common to find the bark made up of rings or deposits arranged in parallelism with the annual layers of the wood. I find in fact as much diversity existing in the structure of the bark as in the wood, so much so that a section of the bark itself and alone would be sufficient to determine the species. I am well aware that it is necessary in putting forth a new doctrine to be guarded, and especially not to claim for it too much importance. I do not mean therefore to assert that genera and species can be determined always by an inspection of a transverse section of the stem or

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A single row of vessels appear to mark the commencement of the year, but the vessels themselves are but little larger than the secondary ones.

trunk, yet is by no means difficult in many instances. The examples given in the plate will, I think, be sufficient to prove that there is much in the doctrine I have attempted to establish, and the reader can if he pleases compare several other kinds of wood which may be at hand, and thus satisfy himself of its value as a means for discriminating genera and species.

VOLATILITY OF METALS.

Few persons are aware that the metals are volatile. Mercury, lead, copper, zinc, etc., are all more or less susceptible of assuming a state of vapor. Zinc at a red heat flies off into the air, and condenses in cooling into white downy matter, like the lightest of cotton. Lead also rises into vapor in the process of smelting, and is diffused in invisible particles through the atmosphere. It becomes a poison in this state, and is injurious to workmen. Mercury is surrounded by an atmosphere of its own particles at the common temperature, and wastes slowly. That copper is volatile at a comparative low temperature, may be proved by holding a slip of the metal in the flames of a lamp, when the flame is colored green by the escape and volatilization of the metal. Hence in the reduction of the ore, much escapes, and is wasted in the process *when* conducted in the ordinary way.

A few metallurgists being aware that much was lost in this way, have devised plans for condensing the volatilized metal. Thus it is stated in a Merthyr paper, that Messrs. Vigors & Co., in Cwm Avon, have constructed a tunnel for consuming and conveying copper smoke, 1,100 yards in length, viz., from the smelting furnaces to the top of the high hill towards the north-west, called Molly Mynyddau. In this elevated spot the small quantity, if any, that will escape precipitation, will find its way into the air. Few persons, probably, are aware of the immense quantity of copper thus saved to the proprietors, which in former times was deposited in the neighboring lands, subjecting them to most expensive actions. In a tunnel not long since made by Messrs. Williams & Co., in their works on the Swansea river, 200 tons of copper were taken out, which had been precipitated in the short space of one year—the value of this was £2,000, and much was still left in the tunnel. Chambers are made in the tunnel for attracting the smoke, which is further promoted by the use of steam, so that little of it is allowed to reach the place of exit till it has deposited *in transitu* all its substance. This material, therefore, which not only was formerly lost, but did serious mischief to the adjoining lands, thereby entailing law-suits of ruinous expense, becomes now a matter of profit.

COAL ASH—ITS NATURE AND PROBABLE VALUE AS A MANURE.

The question has no doubt often arisen whether the ancient vegetation was analagous in its inorganic matter to that of the present day. Reasoning from those facts which we are sure of, very few doubts can remain as it regards the position that plants were constituted as they are now, that the same elements entered into their composition. The soil being derived from the same rocks as now, and the same forces which gave them birth, and which also sustained them, go to prove the validity of the assumption.

But a question will arise on reflection, that admitting this position, do the preserved plants still retain the elements which nourished them when living. Have they not been dissolved out under the vicissitudes to which they have been exposed, and that some other substances have been substituted in their place. This question can be only answered by analysis of the ash which is left in the combustion of the coal, though the idea would probably be entertained without resorting to this process, that very likely the most soluble, such as potash and soda, would disappear. Having been engaged for some time in the analysis of the ash of the different vegetables, these several questions came up for solution, and accordingly a few analyses were made. The following result will express generally the composition of coal ashes.

Analysis of the Ash of the Peach Mountain Coal.—Color Grey.

Silex and silicates,	79.34
Sulphuric acid,	1.50
Chlorine,	.06
Carbonate of lime,	8.36
Phosphate of lime, and phosphate of per oxide of iron,	4.50
C. magnesia,	1.84
Alumina and per oxide of iron,	2.00
	97.50

It appears from the above analysis that we may suspect the presence of the phosphate of lime in coal ashes, and hence practically that they are important in agriculture, even though we omit to notice the carbonate of lime and magnesia which they contain. The alkalies were not sought for. Leaving their value in agriculture out of account, this and other analyses seem to prove that the ash is truly in a great measure the ash of coal plants. If so, we may infer that the composition of plants of the coal period was not greatly dissimilar to that of the plants of the present day.

CORRECTION OF COL. WAILES'S COMMUNICATION.

We give place to the following communication from our friend Prof. Gale, for the purpose of correcting, as far as can be at this time, the erroneous impressions which are entertained in regard to a report which appeared in this Journal, of the doings of the Geologists and Naturalists, at New Haven, in 1845.

We did not attend that meeting, and for our report of the proceedings depended upon the professional writer of the New York Tribune. We supposed that as matter of fact we could rely upon the reports furnished from that source, but it seems that we were mistaken. We were aware at the time that there was manifest in the reports of that meeting attempts at ridicule generally, or perhaps as it would rather appear, attempts to be witty on the part of the speakers. This, we have no doubt, was a flourish of the reporter, made perhaps for the purpose of giving a little more life to discussions, which it was supposed would be dry and uninteresting to the general reader. Some three or four months after the meeting, we received a letter from the editor of the American Agriculturist, in which Col. Wailes very properly requested to be set right, as it regarded his communication. As this came soon after the issue of a quarterly number, it so happened that at the next issue the letter was mislaid, and hence the apparent indifference to Col. Wailes's request. We did not know nor feel at the time, that the matter was of so much consequence, but Dr. Gale better explains the whole matter, and we therefore do not hesitate to publish it almost entire, expressing our regret that any occasion should have been given by ourselves for complaint from any quarter.

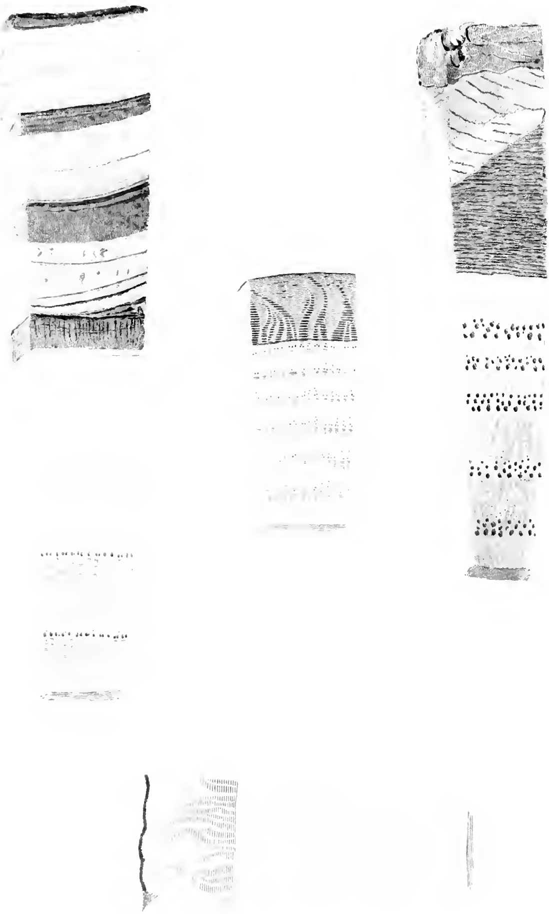
U. S. Patent Office, 8th May, 1847.

MY DEAR SIR:

I have had it in mind to write to you for several months; but changing my residence in the mean time, from New York to Washington, and giving my first course of lectures on Organic Chemistry in the Medical College here, besides entering on new duties as Assistant Examiner in the Patent Office, I have hitherto been prevented. Having passed nearly two years at Jefferson College, near Natchez, I became much interested in the geology of its vicinity, which at that time had scarcely attracted public attention. Several papers you know have been read on that subject before our Geological Association, by Wailes, Forshay, Riddel, Dickerson, &c. At the meeting of 1845, Col. Wailes made a communication through Prof. Silliman, Jr., which was commented on rather severely at the time, exhibiting to ridicule the author and his subject; and so also in the account of the transactions published in the American Quarterly Journal of Agriculture and Science. The author felt deeply wounded, feeling that he was treated with unfairness and injustice. I was unfortunately detained from being present at that meeting by business, but I read the discussions with great interest, as published in the newspapers, but was sorry to find that the maiden effort from that quarter should have been made a subject of ridicule, and so published to the world. I am personally acquainted with most of the gentlemen who have contributed from that quarter, except perhaps Dr. Dickerson, whom I met for the first time at the meeting in New York. Col. Wailes I have known intimately these ten years. He is an estimable man, and a correct observer of facts, on whose accuracy and judgment in any department he has investigated, I would rely on. In the account above referred to, 1845, the paper by Dr. Dickenson is commended, while that from Col. Wailes is treated very differently, to say the least. But to return to the subject of the two papers of 1845; after introducing the paper of Col. Wailes, you seem to blend or confusedly mix up the statements of Wailes and Dickerson, attributing to the former that which he denies or doubts, while the same things are claimed and contended for by the latter. See American Quarterly Journal of Agriculture and Science, vol. ii., pages 168–9. "Above all other remarkable facts, there has been found actually, *a piece of the human skull*, with the nondescript blind animal, before described," &c., &c. Now this is the language and opinion of Dr. D., yet in the account above referred to, it seems to come from Col. Wailes, who disclaims it and scouts at the very thought; I will give you his own words as expressed to me in a letter of October 3d, 1846. "You are aware that a paper was expected from me, and you will *now* see why I declined it. The paper to which you allude in your last as coming from me, extracts from which were read at the geological meeting in New Haven, was not designed for that purpose, but was on the contrary a report hastily drawn up to be read before an agricultural association, composed of plain farmers, men of very different attainments and views from those composing this meeting. The paper was placed in the hands of Prof. Silliman, then in our neighborhood, and chiefly for the purpose of indicating some of the localities of fossils in this state, and which paper he could examine when more at leisure, but he was permitted to use it at his discretion; that he was judicious I have no doubt. But let me call your attention to the notice given of that paper by a member of the association, in the American Quarterly Journal of Agriculture and Science, vol. ii., p. 168–9. Was there ever a more ridiculous perversion? The facts of a celebrated *waterfall*, and the nonsensical statement of a "piece of a human skull," belonging to an animal that walked upright! I am entirely guiltless; and I presume it was from no other source than the author of the paper previously referred to, which speaks of stalactites associated with the bones of the mastodon in Natchez bluffs. Now you and I know that no mastodons were ever found in this locality, but in the mastodon ravine where the human bones were found, land-slides are of common occurrence, and it is in these that the bones are often laid bare, and nothing is more natural than that the human bones from the graves of the early settlers (and such are frequently met with,) should from the same causes find their way into the ravines, and intermix with the bones of the extinct animals. How preposterous to assign the two to the same geological epoch, because they happen to be found in proximity. Now Dr. Emmons's attention has been called to this subject, but so far as I have yet learned, nothing to extenuate or explain has been done by him. You cannot therefore be surprised that I should feel reluctant to expose myself to similar misrepresentations."

Such, my dear sir, are the facts in the case, which I think must show, if evidence were necessary, that the gentleman has been misrepresented; and although he states that your attention has been called to the facts, without noticing it, I could think but that he might be mistaken, and on that account I have taken the liberty to write you, hoping and trusting that if his impressions are well grounded, that they may be removed without delay. The new and surprising fact, if such it prove to be, that human bones are found in place with extinct genera, as was announced and contended for by Dr. Dickenson, requires confirmation, and I know of no man so favorably situated, and none under the circumstances so capable of deciding the question as Col. Wailes, who has lived for the last twenty years in the immediate vicinity of the locality which has furnished most of the specimens above alluded to. At the meeting in 1845, I believe Dr. D. announced the fragment of a *human skull* with the "nondescript," (Mylodon of Owen.) In 1846 the same gentleman announced the iliac bone under similar circumstances. Col. W.'s opinion on this subject I have already given. But at my earnest request I hope he will be induced to investigate the subject somewhat further. I intend to attend the next meeting of the association, when I hope to see the question set at rest. Yours truly,

L. D. GALE.



AMERICAN JOURNAL

OF

AGRICULTURE AND SCIENCE.

This work will be issued hereafter monthly, at two dollars per annum payable in advance. It will form two volumes at the close of the year of three hundred pages each, and will be illustrated by plates and wood engravings.

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E. EMMONS,
A. OSBORN.

Albany, January, 1847.

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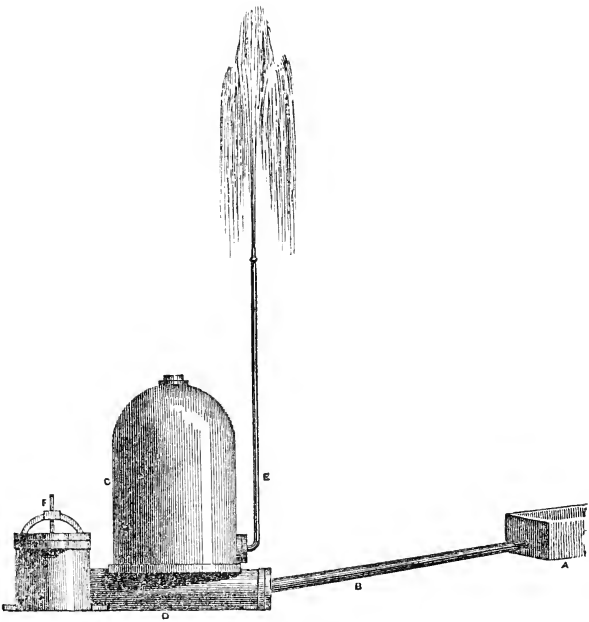
No. XIV. JUNE, 1847.

HYDRAULICS FOR FARMERS—APPARATUS FOR RAISING WATER.

BY C. N. BEMENT.



Birkinbine's Ram—Fig. 1.

Among all the devices or contrivances for conveying water from a lower to an upper level, nothing as yet has been discovered equal to the Hydraulic Ram. It is a very ingenious and effective machine for raising water by its own impulse, and comes nearer to a *perpetual motion* than any other machine that has ever fallen under my notice.

If a column or body of water, moving rapidly under a head, through a pipe, is suddenly checked, its tendency is to burst the pipe. This is well known in all places where there are water-works, from the bursting of the leaden supply-pipes, where these are not strong enough, on the sudden shutting off the hydrant cocks. If a small hole is made in the pipe, just above the cock, the water will escape from it in a very high jet, much higher than the head, whenever the cock is shut. It is this principle which is brought into action in the hydraulic ram. If a small straight upright pipe is attached to the hole, just mentioned, in the main pipe, having a valve shutting downwards, which will permit the water to pass upwards, but not to return, each opening and shutting of the cock will force up into the smaller pipe a quantity of water in proportion to the head upon the main pipe, until the weight of the water in the smaller pipe is greater than can be moved by the *momentum* of the water in the main pipe, when the latter is suddenly closed.

Every person accustomed to draw water from pipes that are supplied from very elevated sources, must have observed, when suddenly closed, a jar or tremor communicated to the pipes, and a snapping sound, like that from small blows of a hammer. These effects are produced by blows which the ends of the pipes receive from the water—the liquid particles in contact with the plug of a cock, when it is turned to stop the discharge, being forcibly driven up against it by those constituting the moving mass behind.

Waves of the sea act as water-rams against rocks or other barriers that impede their progress; and when their force is increased by storms of wind, the most solid structures give way before them.

The increased force water acquires when its motion is accelerated, might be shown by a thousand examples. A bank or trough that easily retains it when at rest, or when slightly moved, is often insufficient when its velocity is greatly increased. When a deep lock of a canal is opened to transfer a boat or vessel to a lower level, the water is permitted to descend by slow degrees. Were the gates opened at once, the rushing mass would sweep the gates before it, or the greater portion would be carried in the surge quite over them, and perhaps the vessel also. A sluggish stream drops almost perpendicularly over a precipice; but the momentum of a rapid one shoots it over, and leaves a wide space between. It is so with a stream issuing from a horizontal tube. If the liquid pass slowly through, it falls inertly at the orifice;

but if its velocity be considerable, the jet is carried to a distance, ere it touches the ground.

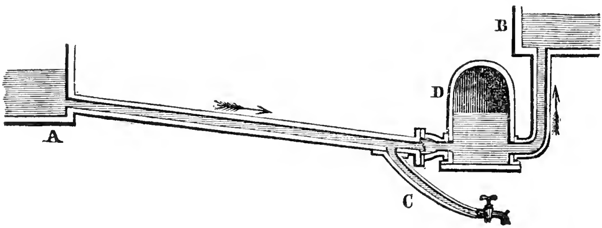
That the force which a running stream thus acquired may be made to drive a portion of the liquid far above the source whence it flows, is obvious from several operations in nature. During a storm of wind, long swelling waves in the open sea alternately rise and fall, without the crests or tops of any being elevated much above those of the rest; but when they meet from opposite directions, or when their progress is suddenly arrested by the bow of a ship, by rocks, or other obstacles, part of the water is driven to great elevations.

The hydraulic ram raises water on precisely the same principles: a quantity of the liquid is set in motion through an inclined tube, and its escape from the lower orifice is made suddenly to cease, when the momentum of the moving mass drives up, like the waves, a portion of its own volume, to an elevation much higher than that from which it descended. This may be illustrated by an experiment familiar to most people. Suppose the lower orifice of a tube (where the upper one is connected to a reservoir of water) be closed with the finger, and a very minute stream be allowed to escape from it in an upward direction, the tiny jet would rise nearly to the surface of the reservoir. It could not of course ascend higher. But if the finger was then moved to one side, so as to allow a free escape, until the whole contents of the tube were rapidly moving to the exit, and the orifice then at once contracted or closed as before, the jet would dart far *above* the reservoir; for, in addition to the hydrostatic pressure which drove it up in the first instance, there would be a new force acting upon it, derived from the *momentum* of the water. As in the case of a hammer of a few pounds weight, when at rest on the anvil, it exerts a pressure on the latter with a force due to its weight only; but when in motion by the hand of the smith, it descends with a force that is equivalent to the pressure of perhaps a ton.

At a hospital in Bristol, England, a plumber was employed to convey water through a leaden tube, from a cistern in one of the upper stories, to the kitchen below; and it happened that the lower end of the tube was burst nearly every time the cock was used. After several attempts to remedy the evil, it was determined to solder one end of the smaller pipe immediately behind the cock, and to carry the other end to as high a level as the water in the cistern. And now it was found that on shutting the cock, the pipe did not burst as before, but a jet of considerable height was forced from the upper end of this new pipe. It therefore became necessary to increace its height, to prevent water escaping from it; upon which it was continued to the top of the hospital, being twice the height of the supplying cistern: but when, to the great surprise of those who constructed the work, some water still issued. A cistern was therefore placed to receive this water, which was found very convenient, since it was thus raised to the highest floors of the building, without any extra labor. Here circumstances led the workman to the construction of a water ram, without knowing that such a machine had been previously devised.

It is now more than fifty years since the first discovery was made known, and it has, until within a few years, been regarded more as a scientific toy, than of practical utility. It is a matter of surprise, too, that so beautiful a contrivance should have laid dormant and neglected, and scarcely known, except to the scientific.

The first person who is known to have raised water by a ram, designed for the purpose, was Mr. Whitehurst, a watch-maker of Derby, in England. He erected a machine similar to the one represented by the next figure, in 1772.



Whitehurst's Ram—Fig. 2.

A represents the spring or fountain, the surface of the water in which was of about the same level as the bottom of the cistern, B. The main pipe, from A to the cock at the end of C, was nearly six hundred feet in length, and one and a half inch bore. The cock was sixteen feet below A, and furnished water for the kitchen, &c. When opened, the liquid column in A C was put in motion, and acquired a velocity due to a fall of sixteen feet, and as soon as the cock was shut, the momentum of this long column opened the valve, upon which part of the water rushed into the air-vessel and up the vertical pipe into B. This effect took place every time the cock was used; and as water was drawn from it at short intervals, for houshold purposes, "from morning till night, all the days in the year," an abundance was raised into B, without any exertion or expense.

Such was the first water ram. As an original device, it is highly honorable to the sagacity and ingenuity of its author; and the introduction of an air-vessel, without which all apparatus of the kind could never be made durable, strengthens his claims to our regard. In this machine he has shown that the mere act of drawing water from long tubes, for ordinary purposes, may serve to raise a portion of their contents to a higher level; an object that does not appear to have been previously attempted, or even thought of. Notwithstanding the advantages derived from such an apparatus, under circumstances similar to those indicated by the figure, it does not appear to have elicited the attention of engineers; nor does Whitehurst himself seem to have been aware of its adaptation as a substitute for forcing-pumps, in locations where the water drawn from the cock was not required, or could not be used.

Montgolfier's Ram.

To Montgolfier, of France, are we indebted for the discovery, or rather the improvement of this useful machine—hence its name, *Montgolfier's Ram.*

The *belier hydraulique* of Montgolfier was invented in 1796. Although it is on the principle of Whitehurst's machine, its invention is believed to have been entirely independent of the latter. But if it were even admitted that Montgolfier was acquainted with what Whitehurst had done, still he has, by his improvements, made the ram entirely his own. He found it a comparatively useless device, and he rendered it one of the most efficient. It was neglected or forgotten, and he not only revived it, but gave it a permanent place among hydraulic machines, and actually made it the most interesting of them all.

The device by which Montgolfier made the ram self-acting, is one of the neatest imaginable. It is unique. There never was any thing like it in practical hydraulics, or in the whole range of the arts; and its simplicity is equal to its novelty and useful effects. Perhaps it may be said that he only added a valve to Whitehurst's machine. Be it so; but that simple valve instantly changed, as by magic, the whole character of the apparatus.

Montgolfier's great improvement, which made the machine self-acting, was to substitute an outlet valve, shutting upwards, in place of the cock used by Whitehurst, which valve was weighted so as just to open when the water in the main pipe was in a state of rest. But the moment the outlet valve was opened by the weight upon it, the water which then rushed out acquired a power in addition to its gravity—*the power of its momentum*—which was sufficient to close the outlet valve, when the same effect was produced that was produced by the shutting of the cock, and a jet of water was thrown upwards into the smaller pipe, which may be called the "raising main." The water in the main pipe was thus brought to a state of rest, when the weight on the outlet valve was again sufficient to close it; and the water rushing out of it, created again the *momentum* necessary to close it, when a further supply was forced into the raising main, and so the outlet valve kept constantly opening and shutting, or pulsating, as it may be termed, and a regular stream was made to pass up the raising main. An air-chamber was attached to the last, to produce an uniform flow of water, similar to that used in a common forcing pump. But the weight on the outlet valve was an imperfect contrivance, after all; because if the head of the water varied, the weight required to be varied also; and so long as the weight was the only known method of making the ram self-acting, the machine did not get into general use, being found oftener on the shelves of physiological cabinets than on the premises of the farmer. The late improvements of using springs and screws, does away with the weights, and makes the hydraulic ram as nearly perfect as any known machine for the same purpose. A small vacuum valve supplies to the air-chamber, as well as to the air-vessel, which makes the flow from the raising main uniform, enough air to compensate for that which the water absorbs, besides aiding the opening of the outlet or escape valve, by the partial vacuum consequent on the rebound or reaction.

Montgolfier positively denied having borrowed the idea from any one. He claimed the invention as wholly his own, and there is no reason whatever to question his veracity. The same discoveries have often been and still are made in the same and distant countries, independently of each other. It is a common occurrence, and from the constitution of the human mind, will always be one.

A patent was taken out in England, for self-acting rams, in 1797, by Mr. Boulton, the partner of Watt; and as no reference was made in the specification to Montgolfier, many persons imagined them to be of English origin—a circumstance that elicited some remarks from Montgolfier. The patent was granted to "Matthew Boulton, for *his* invention of improved apparatus and methods for raising water."

For the information of those unacquainted with the operation of the hydraulic ram, it may here be well to sketch briefly its operation.

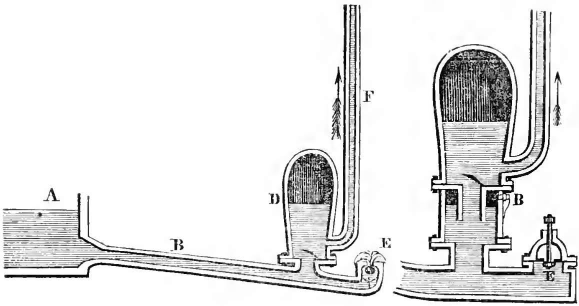


Fig. 4. Montgolfier's Ram. Fig. 3.

Explanation. The above is a sectional and simple form of Montgolfier's ram. The head or motive column descends from a spring or brook A, through the pipe B, near the end of which an air-chamber D, and raising main F, are attached to it, as shown in the figure. At the extreme end of B, the orifice is opened and closed by a valve E, instead of the cock in Whitehurst's machine before described. This valve opens downwards, and may either be a spherical one, as in Fig. 4, or a common spindle one, as in Fig. 3. It is the play of this valve that renders the machine self-acting. To accomplish this, the valve is made of, or loaded with such a weight, or adjustment of the spring, as just to open when the water in B is at rest; then, as in shutting the cock of Whitehurst's machine, a portion of the water will enter, and rise in F, the valve in the air-chamber preventing its return. Meantime the water in B has been brought to rest, and relieved for a moment of the pressure and rush of water, the pressure is insufficient to sustain the weight of the valve E, which drops, and reöpens the outlet hole at E, when the current is again put in motion, and acquires force enough to close valve E, when another portion of the water is again forced into the air-vessel D, and pipe F; and thus the operation is repeated, as long as the spring or brook affords a sufficient supply, and the apparatus remains in order. This process, or pulsation, like the click of a clock, continues until accident or wear stops the working of the valves. The valves make from twenty-five to sixty strokes per minute. The machine is set in motion by pressing down the valve E, Fig. 3.

The surface of the water in the spring or source, should always be kept at the same elevation, so that its pressure against the valve E may always be uniform; otherwise the weight of E would have to be adjusted, as the surface of the spring rose and fell.

As the ascending column of water communicates with the air in the reservoir D, this would soon be exhausted, if a fresh supply or portion of air were not introduced at each stroke of the ram. Thus when the flow of the water through B is suddenly stopped by valve E, a partial vacuum is produced immediately below the air-chamber, by the recoil of the water, at which instant the small valve at B, in Fig. 3, opens, and a portion of air enters, and supplies that which the water absorbs. In small rams, a sufficient supply is found to enter at the valve E.

Air-vessels are indispensable to the permanent operation of these machines. Without them the pipes would soon be ruptured by the violent concussion consequent on the sudden stoppage of the current of the motive column. The air being elastic, breaks the force of the blows.

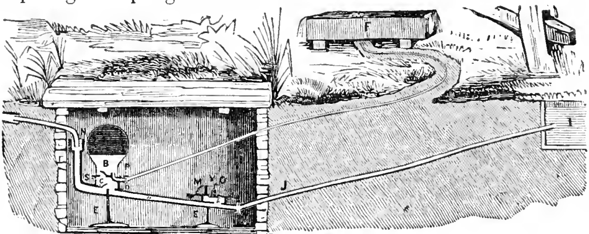
This beautiful machine may be adapted to numerous locations in the country. When the perpendicular fall from A to the valve E, is but a few feet, and the water is required to be raised to a considerable height through F, then the *length* of the driving pipe B must be increased, and to such an extent that the water in it is not forced back into the spring, when the valve in E closes, which will always be the case, if the pipe B is not of sufficient length.

The first water ram erected in this country was imported a few years since from England, at an expense of one hundred dollars, and put in successful operation at Fairy-Knowe, the residence of J. H. Latrobe, esq., near Baltimore, Md.

Within a few years, some of our ingenious mechanics have taken hold of the subject, and they are now made for a very trifling expense, in comparison to the one imported by Mr. Latrobe. Among the earliest to improve the machine, I would name B. S. Benson, near Baltimore, Md., by which pure spring water may be forced up by a stream of brook on impure water.

The following is a representation of Benson's Patent Water-ram, for raising spring or other water for supplying farms, towns, or villages. By means of this ram, persons having a small branch or spring, that will afford one gallon per minute, with a small stream of impure water, can have a portion of the spring or any other water, raised to his house or barn, through a small leaden tube. This ram, says the inventor, will raise twice the water that any forcing pump will, with the same water power, there being only three valves to keep it in motion, in place of the heavy water-wheel and piston. This ram can be driven by branch water, and raise spring or branch water to the house at pleasure, by simply turning a cock, without any derangement of the ram, and is very simple, and easy to keep in order—the valves being faced with leather, and easy of access, can be replaced by any person, there being no other part that can wear.

This ram differs from most others, in having three valves, and a passage for spring water at the head.



Benson's Ram—Fig. 5.

Description. V is an impetus-valve in chamber A, opening inwards: when open, permits the spring water to flow from reservoir N, through valve C, and driving the branch water out of the end of the pipe D, that having acted as a piston in the last stroke; also permitting the branch water to flow from reservoir I, through the pipe J, and passing through the opening of the impetus-valve V, with increasing velocity, closes the valve; thus suddenly shutting off the escape of water. The ram pipe J, being fifty feet long, and six feet fall, filled with water, being nearly an uncompressed fluid, exerts its force against the column of spring water in pipe D, as a piston, forcing it into chamber B, and closing valve C, driving it up through the air-chamber valve B—the air-chamber being supplied with air, for a spring, receives the water, and gradually presses it up through pipe P, to the required height. When the water in the long ram pipe has spent its power, the superior height of water in pipe P causes the water in pipe J to recoil, and a small portion to repass the valve, and drive the water back in pipe J, though in a rising position, continues to flow a short time after the air-chamber valve has closed and opened, and shut by the ordinary action of the machine. Thus, when the flow of the water through D is suddenly stopped by the valve E, a perfect vacuum is produced immediately below the air-chamber, by the recoil of the water, at which instant the small valve opens, and a portion of air enters, and supplies that which the water absorbs.

Strode's Pneumato-Hydraulic Engine.

Since the foregoing was written, I have received the following description of an improvement on the hydraulic ram. It is the invention of Mr. Joseph C. Strode, of East Bradford, Chester county, Penn.

"I have as yet," says Mr. Strode, "made only three different sized machines, excepting the model which I left in the Patent-office, which is of glass, and a brass one of the same size, which is now in the Franklin Institute, Philadelphia. The latter is an operating model: its linear dimensions have a ratio to this cut, Fig. 6, of about 32 to 7. This model, under a head of $5\frac{1}{2}$ feet, with a driving pipe about 15 feet long, $\frac{5}{8}$ inch calibre, forced through a $\frac{1}{4}$ inch pipe 1.8 lbs. of water 40 feet high, in one minute, which is about 324 gallons, or $10\frac{2}{7}$ barrels in 24 hours. The three sizes above mentioned have a ratio to the aforesaid model of 3, $2\frac{1}{2}$ and 2, in their linear dimensions. The largest of these is calculated to work with a 2 inch driving pipe, but will work very well with $1\frac{1}{2}$ inch. These machines will work under all heads, where they have yet been tried, with driving pipes of various lengths. I have not yet made a sufficient number of experiments to determine what the length of driving pipes of given calibre, under a given head, to force water to a given elevation, should be so as to produce a maximum per centage, nor what the length should be to force up a maximum amount, without regard to per centage; but I am well satisfied that they do not exist contemporaneously. The quantity of water used, and of that forced up, may be varied by giving the outlet valve a longer or shorter stroke, by which the number of strokes in a given time is diminished or increased; and in each individual case there will be found to be a certain number of strokes, that will cause the machine to raise the most water of which it is capable, without regard to the quantity it uses to produce this effect; but when it is desirable that the quantity of water used shall raise the most water possible, then the number of strokes must be regulated to produce this effect."

"I give you one solitary experiment that was made with my largest machine, to produce the former of these effects. It worked under a head of 12 feet; the driving pipe was $1\frac{1}{2}$ inch calibre, 40 feet long. By using 135 pounds of water per minute, 20 pounds, (which is $114\frac{2}{7}$ barrels in 24 hours,) were forced through a $\frac{1}{2}$ inch pipe 60 feet high, in the same time. The machine during this time made about 32 strokes, which was the right number, with this length of driving pipe and the attending circumstances, to force up the most water, without economising the water used. It is altogether likely, as the length of this pipe was taken at hazard, that some other length, in the same situation, would have forced up more in its maximum operation. You will perceive that the above experiment gives for the machine a little above 74 per cent. By increasing the number of strokes to 40, about 75 per cent was obtained; but the quantity raised was diminished a little, and the quantity used was diminished in a little greater ratio."

The following specification is taken from the Journal of the Franklin Institute:

"The nature of my invention and improvement consists in making use of a column of condensed air between the propelling fluid and the fluid that is to be raised; said air being condensed in a pyramidal-shaped chamber, by means of the momentum of a descending column of water—the chamber having a communication, by a small opening at its top, with another chamber, into which the spring water or fluid to be raised, is introduced, called the spring water chamber, and upon which the condensed air in the first named chamber is made to act, causing said fluid to rise through a tube placed in the spring water chamber, (open at its lower end, and closed alternately at its upper end, by means of a valve,) into a large air vessel, or receiver, of the usual form and construction, being conducted thence to its place of destination by pipes, or hose, in the usual manner.

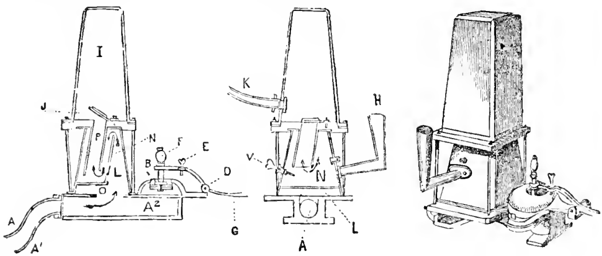


Fig. 6. Fig. 7. Fig. 8.
Strode's Pneumato Engine.

Fig. 6 is a longitudinal section.
Fig. 7 is a transverse section.
Fig. 8 is a perspective view.

Similar letters in the several figures refer to corresponding parts.

A is the main pipe for conducting the propelling water from the head, or reservoir, to the pyramidal air-chamber. The pipe descends below the level of that portion of it which connects with the air-chamber just before it reaches the said chamber, and then ascends in a curved line to it, forming a curved bend in the pipe, as at A′, for the purpose of preventing the air received at the valve B, during the time in which the vacuum is produced in the air and water chamber, as hereafter described, from filling the pipe A, as the air will not descend at said bend in the tube, so that the surplus of said air, after having filled the condensing chamber L, may be carried off by the current of water, through the valve B.

The pipe A is enlarged below the air-chamber L, as at A^2, and has an opening O into the air-chamber L, through which the water passes when the valve B is closed.

B is a valve attached to a curved, vibrating lever C, turning on gudgeons D, in boxes, as its fulcrum, having a set screw E, for regulating the descent of the valve, and a counter balance F, for adjusting the valve. When this valve B is down, as shown in Fig. 7, the water from the head flows through the opening, which it closes; when it is up, as shown in Fig. 6, the water rises into the pyramidal chamber L, through the opening O, and condenses the air therein.

H is a pipe for conveying the spring water to the spring water chamber. I is the air-chamber into which the water is forced. J is the valve for holding it. K is a pipe, or hose, for conveying the water to its place of destination. The above named parts, lettered from A to K, inclusive, are made and operated in the usual manner. The improvements are as follows:

L is a pyramidal chamber, into which air is admitted through the valve B, when it descends by the pressure of the external air, to supply the partial vacuum created in the pipe A, and chambers L and N.

This pyramidal chamber has a communication, by a small opening M, at the top, with another chamber, N, called the spring or pure water chamber; through which opening M, the air, so condensed, is forced, and presses on the spring or other water, introduced into the same through the pipe H, by which pressure the water in said spring water chamber is forced upward through a tube P, reaching to near the bottom of said chamber N, through the valve J, into the air-chamber I; said valve being represented as open in Fig. 6, and as closed in Fig. 7.

To raise water with this machine, open the valve B, and let the water flow out; then, by closing the valve B, the water, which is now in motion in the pipe A, will pass through the opening O, into the pyramidal condensing chamber L, and condense the air the same as before; the condensed air will force the spring water up the tube P, (which had entered through the pipe H, during the continuance of the partial vacuum above spoken of,) into the chamber I, and condense the air therein, until its density is equal to that in the condensing chambers L and N, below. At this time the spring water will cease to flow into the air-chamber I, the valve J closes, and the air in the chambers I, L and N commences expanding, that in the lower chambers, L and N, giving motion to the propelling fluid and driving it backward, producing a partial vacuum in the machine, and the air in the upper chamber I, forcing the spring water to its place of destination.

The said partial vacuum in the machine, caused by the reaction of the machine, as aforesaid, and the pressure of the external atmosphere on the valve B, will cause it to open again. The water from the head then flows through this valve with an accelerating movement, until it has acquired that degree of velocity as to cause the valve to close. The water having no longer any vent through the valve B, passes through the opening O, into the pyramidal air-chamber L, and repeats the operation above mentioned, successively.

In this manner the operation will continue as long as the machine remains in order, and there is a head of water to propel it. The valve V is for the purpose of supplying the chamber I with air, by admitting said air into the tube P. The said air is admitted during the time that the partial vacuum above mentioned takes place. The air thus introduced into the tube P, ascends to the top of the same, and is forced into the chamber I, at the next stroke of the machine; said valve V is represented open in Fig. 7, and may be closed or regulated by screwing the thumb-screw V.

The principal advantages this machine possesses over other machines, are:

1st. In case of forcing up pure water by the propelling power of a running stream of water less pure, there is no possibility of the impure water mixing with the pure, there being at that time a column of condensed air between the two waters.

2nd. The water being forced into the upper chamber I, by the condensation of air in the lower chamber, the valve J opens more slowly than when water alone is made the propelling medium, and also shuts more slowly, thereby preventing the water from escaping back through the valve J, after it is forced up; the valve J being nearly closed when the water ceases to flow upward into the chamber I. This advantage, upon trial, is found to be of considerable importance, enabling the machine thus operated, to force, with a given quantity of water, several barrels more of water per day than it would otherwise do.

3rd. There being no valve between the condensed air in the lower chamber and the driving water, or at the opening O, said air is permitted to act a longer time in forcing back said driving water, and thereby making a more complete vacuum than in other machines, and rendering useless the spring for opening the outlet valve B, as used in several machines.

It is not necessary that the spring water chamber N, and the air-chamber L, should be enclosed by the same envelope, but they may form separate chambers, and they may be arranged in any convenient way or manner most acceptable to the constructor, provided that the capacity of the air-chamber does not exceed a due ratio between the propelling power and the water to be raised.

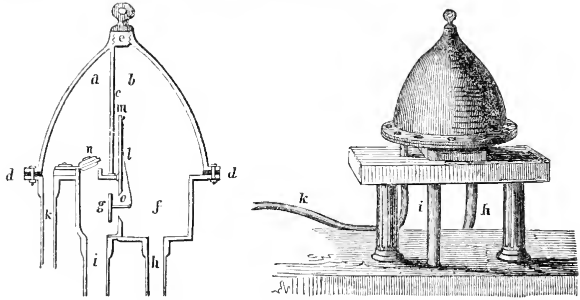
Ellsworth's Syphon Ram.

This apparatus, invented by Erastus W. Ellsworth, Esq., of East Windsor Hill, Conn., is intended for elevating water from springs, wells, and other sources, wherever sufficient fall of water can be obtained in their vicinity, for the operation of a syphon. In principle, it consists of a combination of the syphon with a machine long known as the hydraulic ram; but is different in its construction and mode of operation, from similar combinations which have heretofore been attempted, and proved of little value for practical use. It has now been operated a sufficient length of time to place its durability and utility beyond conjecture, and to give it at least a tolerably fair title to the rank of a *useful* machine.

One of these machines was put in operation by L. B. Armstrong, last fall, at the house of Mr. G. Harvey, at Sandy-Hill, Washington county, the operation of which is described in a letter to me, as follows:

Dear Sir,—I comply with your request, made at the time I was at the American, in September last, to inform you of the result of my trial of Ellsworth's self-acting pump. I did not receive the pump until some time about the first of October. The setting up occupied about ten days: and when things were all right, off she went, and has not stopped since; and what is more, it has not required a moment's attention from that time. The elevation overcome is thirty-eight feet; the fall fifteen feet, of the longest leg of the syphon. The amount delivered is half a gallon per minute, about one-sixth of the water used. There are some little alterations needed in the leather of the valves, which will add much to the effect of the syphon. But as the weather was cold when I put up the apparatus, I did not seek to make the machine do its work; and, considering certainty of operation through winter, without stopping, more desirable than a large per cent of water raised, I did not like to strain the pipes with the full power of the machine, as the quantity raised is more than is needed. For sixty-seven sturdy knocks per minute, each one something like the blow of a heavy mallet in the hand of a stalwart carpenter, "is a caution" to put down none but strong and sound pipes."

L. B. Armstrong.



Ellsworth's Ram—Fig. 9.

Its construction may be seen from the above sectional drawings, where *a b* is a hollow dome or cap, the cavity of which is divided into two distinct chambers by a partition, *c*. This dome is fastened by a flanged joint, to the circular plate *d d*, to receive the bearing of the partition, *c*. The central portion of plate *d d* is sunk into the form of a box or chest, *g f;* that part of which lying under chamber *a*, is roofed over by *d d*, but communicates with *a*, by a valve, *n*, opening upwards. That portion of the chest marked *g*, is still further enclosed by an upright plate, *m*, held to its place by a couple of wedges, not shown in the section. This plate has an orifice at *o*, furnished with a valve opening towards *g*, which is suspended on the spring, *l*. From *f* passes *h*, the long leg of the syphon, and from *g*, *i*, the short leg. In operating the machine, *i* and *n* are first filled with water through the screw-plug at *e;* as soon as the syphon is free to act, a current commences in the direction, *i*, *g*, *f*, *h*. It is this current, acting on the valve at *g*, soon overcomes the elasticity of the spring, *l*, and the orifice, *o*, is suddenly closed: the water in *i* then acts with a momentum due to its weight and upward velocity, upon the valve *n*, and a quantity of water escapes into *a*, which, when the momentum in *l* is exhausted, is prevented from returning by the closing of *n*. The moment that *n* closes, a slight recoil of the water in *i*, allows *l* to throw open the valve at *g*, and the above process is then repeated. The water which accumulates in *a*, is conducted by a curved pipe attached at *k*, to any situation above the machine where it may be wanted for use. The chambers *a* and *b*, are never full of water; they confine each a quantity of air, which, by its elasticity, equalizes the currents through *k* and *h*. These air-chambers are both indispensable to the perfect action of the machine, and if *k* and *h* are of considerable length, it will not operate at all when they are filled with water. The air in *a* is obviously under more or less pressure, in proportion to the height to which the water is elevated through *k*, while owing to the same cause operating in an opposite manner at *h*, the air in *b* is rarified, or under less than the pressure of the atmosphere. As water under pressure, in contact with air, has the property of absorbing more or less of it, and then liberating it; when the pressure is removed, the air in *a* has a tendency to diminish, and that in *b* to increase in quantity; but the position of the valves in this machine is such, that when it is in action, *a* is constantly replenished from the overplus in *b*, for the recoiling movement in *i*, above mentioned, which allows valve *g* to open, draws in a few bubbles of air from *b, f*, at *o*, which air lodges in the cavity under *n*, and is driven into *a*, by the next pulsation of the water in *i*.

Farmers, manufacturers, and others, have frequently attempted to carry water over elevated ground to some situation below the fountain head, but have been troubled, and often compelled to abandon the plan, from an accumulation of air in the more elevated portions of the pipe, which, in the course of a few days, cuts off the stream entirely, and requires it to be re-filled. This is owing either to a want of sufficient fall between the level of the supply and the point of discharge, or to some contraction in the pipe, either of which causes, acts by checking the current through the pipe to that degree, that the air liberated from the water, (owing to the diminished pressure to which the water is subjected in the higher portion of the syphon,) remains in the pipe. The only remedy is to obtain more fall, or give the pipe a freer apperture, until the current has sufficient velocity to carry the air through. A velocity of between one foot and eighteen inches per second, is ordinarily sufficient to accomplish this.

The quantity of water which the machine above described consumes, may be, to a considerable extent, regulated by a small crank, which enters at right angles with the plane of the section behind valve *g*, which, when turned, gives the valve more or less play, and may, if desired, be made to close it, and stop its action entirely. There is also a small fixture for opening and starting the action of the valve. When the apparatus overdraws its supply, and stops from that cause, the syphon pipes do not empty themselves of water, as would be the case with an ordinary syphon: the first few bubbles of air then ascend the short leg of the syphon, disturb the action of the valves in such a manner that they cease to operate, and the pipes *i n* remain full of water.

In the foot of the short leg of the syphon is a short plug, which may be drawn up a little distance into and thrust down out of the pipe, by means of an iron rod attached to it, and passing up along side the pipe, to a convenient place for reaching it. This plug is drawn up into the pipe for the purpose of stopping it when the syphon is filled, and is also used in starting the machine, when the pipes are filled and ready for operation. The starting is done by drawing the plug up and thrusting it out of the pipe pretty quickly. This acts by removing the pressure of the atmosphere for a moment from the column of water in the short leg; consequently the spring throws the main valve open, and the plug immediately passing out of the pipe, allows the machine to commence its operation.

The advantages which this syphon apparatus is claimed to possess over the ordinary hydraulic ram, are, that it can be applied in many situations, where, from the form of the location, the ram could not be used, as, for instance, where the source of supply is a well, or where, as is often the case in mills and factories, a pipe may be passed down into a place, to obtain the requisite fall, in which, from want of room, the ordinary water-ram could not be placed; that it is more commodiously situated than the water-ram for repair or regulation, inasmuch as it stands high and dry above, instead of below, the head of water which operates it; and that, when water is required to be raised to a considerable height, the elevation of the working parts of the apparatus upon the summit of a syphon, divides the load to be lifted, relieving the strain upon the air-vessel, and making the valves less violent in their action, and consequently more durable.

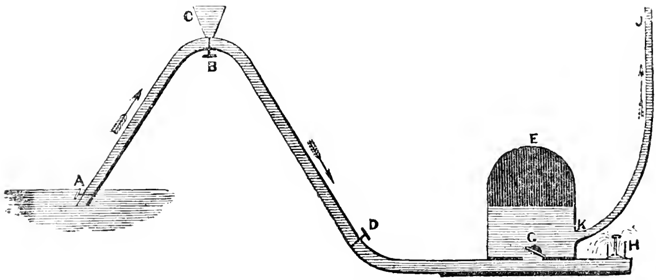
For operating this machine, not less than five feet fall should be obtained, below the level of the supply, and more than twenty is not desirable. The fall may be obtained within the distance of twenty rods, or twenty feet indifferently, and the pipes may be laid to any angle, to accommodate circumstances.

The sizes of the syphon pipes required for elevating water for domestic purposes, are ordinarily between five-eights and one and a quarter inches in diameter, according to the amount to be elevated, the height to be overcome, the quantity of supply, &c. Machines between the sizes of five-eighths and one and a quarter inch syphon pipes, can be be furnished, and ordinarily set up (exclusive of pipe), at prices ranging between fifteen and thirty dollars. The expense for pipe will of course depend on the quantity and size required.

Syphon Ram.

The following is a description of a Syphon Ram, constructed by H. H. Strawbridge, of New Orleans. Though the principle is quite against our laws of natural philosophy, still facts would seem to contradict theory. It is contended by scientific writers, that the same power might be obtained by making the driving pipe of the same length as the syphon when straightened, and placing the ram further from the head. The question naturally arises, whether there is not less friction in perpendicular than in an inclining tube, by which momentum and power is gained. In the experiment of Mr. Strawbridge, power was gained sufficient to burst his machine, by increasing the height of the syphon.

"A few years ago" says, Mr. Strawbridge, before these machines had come into use, in the United States, I caused one to be constructed near Covington, La. The fall of water requisite to work it being very small, I continued to increase it by the improvement which I am about to describe."



Syphon Ram—Fig. 7.

"A B D is a leaden pipe, bent into the form of a syphon and carried over the bough of a tree, the short leg A, B, resting in the pond or spring that feeds the machine, and the longer leg B, D, conducting to and terminating in the machinery itself, which is placed a few inches lower. C, is a funnel connecting with the interior of the syphon through an air-tight three-way cock B, of the same calibre as the syphon itself. At A, under water, and at D, a few inches lower down than the end of the pipe at A are stop cocks, also the same diameter as the interior of the pipe."

"The cocks A and D, being closed, the cock at B is opened so that water poured into the funnel C, will fill both legs of the syphon. This being completely filled, the cock B is turned so as to cut off all communication with the funnel, leaving the syphon still open. The cocks at A and D, are then opened simultaneously, when the water begins to enter the short leg of the syphon and descends the leg D in a continued stream, with a force amply sufficient to set the machine in operation."

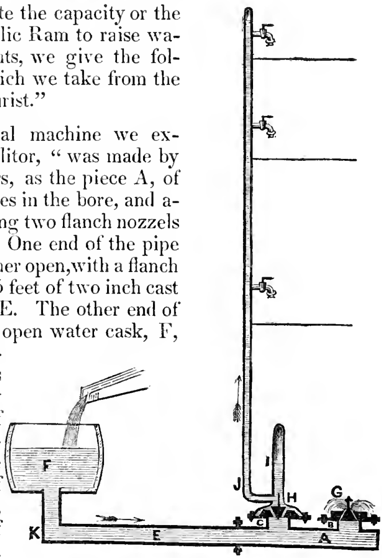
"In this manner by employing a syphon instead of a straight pipe, conducting from the spring or pond to the ram, a fall six to twelve inches, which would not afford sufficient power to work the ram, may be increased in power so as to equal that of a natural fall of many feet. A fall of one foot or more may be obtained in any situation by partly *burying* the ram, so as to place it lower than the feeding reservoir; and the escape of the waste water will not impede the working of the valve, for I have made it work at a depth of two feet under water by simply lightning the escape valve at H, of a part of its weight. A fall of five or six feet, is amply sufficient for all ordinary purposes. This will give a power of fourteen pounds to the square inch, if merely the dead pressure be taken into consideration, but a much greater power if the momentum of the descending column of water be calculated."

"My first machine" continues Mr. S., "was made entirely of wood, including the air vessel, and worked well. But when the syphon was applied and the descending current set the valves in motion, so great was the power obtained that the machine burst with an explosion like that of a swivel. The perpendicular height of the syphon when this experiment was tried, might have been about ten or twelve feet. Another put together more strongly, with cross bolts and rivets of iron, withstood the pressure, although the water was forced through the pores of the wood and stood like dew on the outside."

Experimental Ram.

In order to illustrate the capacity or the power of the Hydraulic Ram to raise water at different heights, we give the following diagram, which we take from the "American Agriculturist."

"The experimental machine we examined," says the editor, "was made by one of our subscribers, as the piece A, of cast-iron pipe, 2 inches in the bore, and about 2 feet long, having two flanch nozzels cast on it, B and C. One end of the pipe was closed, and the other open, with a flanch to connect it, about 35 feet of two inch cast or wrought iron pipe E. The other end of the pipe E led to an open water cask, F, placed seven feet above the ram, and this cask was supplied by a hose, at the rate of eight gallons per minute. Of course the fall from the level of the water in the cask, is equal to a fall of seven feet, with a stream giving eight gallons per minute."



Experimental Ram—Fig. 8.

The operation of this machine is the same as those before described.

"In the machine we saw, the strokes were seventy each minute, and plainly heard at the distance of one hundred and fifty feet. In the course of two or three minutes the pipe J, became full, and ran over the top. On measuring the quantity of water which was thus thrown up in twelve minutes, seventy-three feet above the level in the cask, it was found to be four gallons; and as during the twelve minutes, ninety-six gallons of water had passed from the water cask, into the ram, it appears that it required twenty-three gallons of water to raise one gallon to ten and a half times its own height."

"This experiment was continued and the same quantity of water, four gallons, was thrown up sixty-six feet high, in eleven minutes; fifty-three feet high, in seven minutes, and forty-two feet, in four minutes. Thus, in the first trial, the machine required twenty-eight gallons of water to throw up four gallons to six times the height of the fall. It would have been easy to have made the head of water ten, twenty, or thirty feet high, and a series of interesting experiments might be made to ascertain experimentally the relative differences in the momentum of the water descending from a greater or less distance; the fall of seven feet, however, was preferred, in order to give the machines the ability to throw up water to more than ten times the height of the fall, a difference which would not often occur. Whether a fall of seventy feet instead of seven, would have thrown up the same relative quantity of water four hundred and twenty feet is a question we confess we are not able to solve."

"The (driving) pipe E, it is found, must be thirty or forty feet long, or the valve G, will not work; almost all the water ran out of it, when the water cask was put directly over the ram. The valve made fifty strokes per minute. It is not necessary to have the pipe E a perfectly straight one, but it may be bent to suit the inequalities of the ground, and may even be bent at right angles, as shown in the sketch K. It is far better, though, to have the pipe straighter."

The hydraulic ram, when properly constructed, it is said, is not liable to get out of order, or to require repairs; lapse of time or muddy water passing through them may give occasion for trifling repairs, and when these become necessary the machine can be easily detached from the pipes and carried in one hand for convenient repairing. It is also said the height to which one of these machines can raise water is limited only by the power of valves and pipes to resist the pressure. A moderate sized one has been made to send water to a perpendicular height of three hundred feet. On this principle, works have been erected at Marley, in France, which raised water in a continuous stream, to the height of one hundred and eighty-seven feet. Indeed, a ram has been made in England, to raise one hundred hogsheads of water to a perpendicular height of one hundred and thirty-four feet, in twenty-four hours, with a head of only four and an half feet.

There are two rules for ascertaining how much a given stream of water will raise. First, find how many times higher the water is to be raised than the fall of the driving power; then by adding an 0, to the number, and dividing by 7, you can ascertain the number of gallons that will be required to force up a single gallon of water.

Second, "measure the amount of water discharged by the stream in a given time. Ascertain the greatest amount of head or fall that can be obtained, and the elevation to which the water is to be raised. Then divide the elevation by the head or fall, and the amount of water by the quotient. Deduct 30 per cent. from this result and it will give the amount delivered in the given time. For example, suppose an elevation of sixty feet, with a fall of five feet. The supply four gallons per minute, or five thousand seven hundred and sixty gallons per day.

Then 5)60=12; then 12—2760=480; deduct 30 per cent. which leaves 336 gallons per day.

If the machine is properly made and put up, it is said this rule may be depended on."

In a letter from Mr. Birkinbine, we are advised that one of his rams is now in operation, raising with a two-inch supply pipe B, over five thousand gallons of water per day, thirty feet high.

The simplicity of the machine and its operation, proves its effectiveness as well as its durability, and shows the very small amount of attention and repairs it will require to keep it in order. The ram and pipes should of course be laid under ground, beyond the reach of frost.

The very small expense of a ram, and pipes necessary to work it, being in most cases less than that of a wheel and pump, are strong inducements to adopt it in preference.

Persons wishing Rams sent to them—by measuring the amount of water (unless the supply is unlimited) their brook or spring affords per minute, the head or fall they can procure, the elevation to be overcome, and the distance to be conveyed—can have the proper Ram and pipe sent them, with directions for putting it up.

Rams (see Fig. 1), and Strode's Pneumato Hydraulic Engines, are manufactured and for sale by Henry P. Birkinbine, No. 17 South Eighth street, Philadelphia.

GEOLOGY OF LEWIS COUNTY.

BY FRANKLIN B. HOUGH, A. M.

[Concluded from page 272.]

The next rock in the ascending series is that limestone formation, which has been called by the Geologist of the Third District, the Black River Limestone," which forms a terrace, extending almost uninterruptedly through the county, and from a half of a mile to a mile from the river. The thickness of this rock cannot exceed fifty feet: and in most of the localities where it has been exposed, it exhibits three distinct varieties, differing in structure and in color. The lower strata constitute the water-lime rocks of Lowville, being at the bottom of the terrace, and having a thickness of perhaps five feet. The color of this rock is a yellowish white, with occasional masses of calcareous spar; and it is, so far as observed, destitute of fossil remains.

It has not been favorably received as a water-lime, and is not now manufactured. It is said to have been examined by the engineers engaged on the public works, who decided unfavorably upon it. The bed of the creek east of Lowville village, is the only locality where this rock, having the characters above described, has been observed; its equivalent at other localities being a reddish grey rock, with a fine grain and very compact, ringing under the hammer, and breaking with a conchoidal fracture, upon receiving a slight blow. Occasionally horizontal seams occur, whose weathered edges present a series of peculiar indentations, like those observed in the sutures of the human skull, and more rarely, portions of the rock exhibit an imperfect columnar structure, in connection with this.

This structure can be observed with readiness only on surfaces which have been exposed to the weather, the firmness of the rock preventing it from being seen on a freshly fractured surface. When the rock is broken along these sutures, each surface appears with a multitude of dentiform prominences, which exactly fill the depressions in the other. In some places, where this portion of the rock has been exposed by the water, in wearing down a channel, the characters here described appear variously modified, it being in some places dark colored, or even jet black; but throughout the whole length of the county, the lower strata of the limestone are destitute of any well characterized organic remains.

Next above the fine grained and non-fossiliferous strata, occurs a succession of even bedded strata of limestone, charged with the characteristic fossil of the series—the *Fucoides demissa*—replaced by crystaline carbonate of lime, it being the Birdseye limestone proper of geologists.

Occasionally the fossil here mentioned is replaced by fibrous spar, which exhibits upon the weathered surface of the rock a very beautiful appearance. Examples of this may be seen in Carter's quarry, near the village of Lowville.

No material could be more suitable than this for building; and in some localities it is so symmetrically divided by natural joints, as to need little or no labor to prepare it for the wall.

Where these joints do not occurr, it is observed to have a peculiar tendency to break into rectangular masses. The strata of this division are generally of uniform thickness, and vary from four to twelve inches.

The upper division of the rocks which form the first terrace of limestone in the county, is composed of a thick bedded rock, separated into large masses by natural seams, which are often widened into fissures by the action of the elements, and is constantly associated with hornstone, which occurs disseminated in nodules throughout its substance, and which seem to have been separated from the rock by segregation, before it had become solid.

This thick bedded stratum forms every where the surface mass of the first terrace, and streams of water frequently disappear, and are lost in its fissures, uniformly reäppearing at the junction of this with the impervious birdseye limerock below it. In several places the water has worn caverns of limited extent in the rock, examples of which may be seen on Roaring Brook, in Martinsburgh. Fossils are not numerous in this rock, and are, from its compactness, very difficult to extract. They however occur beautifully exposed, where the rock has been weathered, standing out in relief from the surface. Among the genera that have been observed, are, Orthoceratites, Columnaria, Orthis, Strophomena, and a Cyathophyllum, with its surface covered with minute concentric circles.

Owing to the lumpy texture of this rock, and its want of uniformity in composition, it is wholly unfit for any useful purpose. It may be observed advantageously near Lowville village, on Roaring brook, Sugar river, and in short, most of the streams that flow into the river from the west.

From the situation of this rock, between the Birdseye and the Trenton limestones, its fossil contents and thickness of strata, I have no hesitation in pronouncing it the "Isle La Motte Marble" of the New-York Reports; and identical with the Black marble of Glen's Falls, and the "Seven foot tier" of Watertown. The thickness of the stratum in Lewis county is about eight or nine feet, and appears to be quite uniform, wherever observed.

The strata of the Birdseye and the thick bedded masses above them, are nearly horizontal; but in a few places they are considerably inclined, apparently from the upheaval of the subjacent primitive. One of these upheavals may be observed about three-fourths of a mile northeast of Martinsburgh village, where the strata lie in an anticlinal position, sloping to the south, west, and north, from a hill of moderate elevation. The primitive rock occurs near the foot of the terrace, only a short distance from the hill, presenting the rounded summits usual in this region; and, although the fact cannot be demonstrated, yet we may fairly infer that such an elevation of the gneiss exists beneath the hill in question, which has given the strata their present inclination.

Another locality occurs about one mile northeast of the village of Lowville, where the Birdseye dips at an angle of about twenty degrees to the south-west; and at the base of the hill the primitive appears in an upheaved mass, sufficiently indicating the cause of the disturbance in the stratified rocks above it.

The terrace, which is composed of the rocks here described, extends without interruption through the county, gradually becoming depressed towards the north, and having an average breadth of half a mile.

The Trenton Limestone is the next rock in the ascending series, reposing directly upon the thick bedded mass which forms the surface of the first terrace of limestone. In no place, however, has the junction between the two rocks been observed, except at the village of Lowville, in the stream at that place. At other localities, where one would expect to find the two formations in contact, the rock is concealed by deposits of drift.

The Trenton rock is well exposed along almost every one of the streams that flow down from the west, which have in some places worn chasms of great depth in it, and present cascades of singular grandeur and beauty. One of the most interesting of these occurs on Deer river, about half a mile below the village of Copenhagen, where the stream is precipitated down a very steeply inclined surface, to the depth of about two hundred and seventy feet. The ravine which the river has here worn in the rock, offers one of the most suitable localities for the study of this formation and the collection of its characteristic fossils.

The Trenton limestone forms the bed of the stream, for several miles below the falls, and the whole thickness of the rock, as exposed at this place, cannot be much less than three hundred and fifty feet.

The texture of this rock at its different depths varies but little, being composed of thin shaly strata, alternating with films of slate, and thicker and more compact layers of grey limestone, sufficiently firm to be used for building, for which purpose the formation, as a whole, cannot be considered suitable.

Some thick layers of this rock, about the middle of the series, furnish, when sawed and polished, a beautiful grey marble, variegated with various shades of white and black, from the fossils contained, which sometimes appear to have made up the entire mass of the rock Its prevailing color has given it the popular name of "Grey limestone," by which it is known wherever it occurs; and the birdseye is known as the "Blue limestone," for a similar reason.

Wherever observed, its strata are horizontal, (local exceptions being common;) and from the unbroken condition of its fossils, and the uniformity of its stratification, we may infer that it was deposited in deep water, and beyond those influences which agitate the sea near its surface.

A very singular phenomenon is presented by some of the lower strata of the Trenton limestone, and one which has been observed at places many miles distant from each other, yet all having that uniformity of character which seems to indicate a common origin. I here refer to the existence of furrowed strata, whose upper surface presents a peculiar waved appearance, exactly the same as would be seen if the surface of a lake, covered with waves three or four inches high, were suddenly congealed.

These may be observed near the bottom of the cliffs at Deer river falls, about a mile west of Champion village, at the point where the Deer river is crossed by the State road, and on both branches of the Lowville creek, above the village. The direction of these furrows is nearly east and west, at the first two localities; northeast at the third, and north at the fourth.

Along Deer river, they may be observed *at several different levels*, indicating a succession of the causes that produced them, with intervening periods of cessation. Whether these waves were produced by currents of water moving over what was then the surface, and before it had been consolidated, or whether they were produced under other conditions, we may not be able to determine, with our present knowledge, further than that such causes operated but for short periods, and that they were followed by the deposition of strata on which they did not operate. Local disturbances in the strata of Trenton limestone, may be seen at four different places on Roaring brook, in Martinsburgh, below the village; below the village of Turin, near the mills; and at a few other localities. Near Turin village there seems to have been a fracture and subsidence on the northern side of the fault; but this, like all the other derangements of the strata observed, may be limited in extent.

In one locality, the strata had heaved up into a dome-shaped mass, which was made up of fragments of rock, variously inclined, while above and below the strata were entirely undisturbed.

These appearances might have been produced by impediments, which may have caused the calcareous matter of which the rock is composed, to be deposited unequally; or what is more probable, they are due to a crystaline action in the rock—a theory which is strengthened by the frequent occurrence of masses of calcareous spar, forming irregular veins along the lines of these disturbed strata.

This rock is frequently traversed by veins of calcareous spar, and more rarely by fluor spar and the metalic sulphurets. These veins are observed to pursue a course varying but little from east and west.

The principal locality of fluor spar is about half a mile above the village of Lowville, on the south branch of the Main creek, and at the foot of the first falls, not far from a neglected "*silver mine*," and occurs in a vein about six inches wide, associated with sulphuret of iron, calcareous spar, and more rarely grains of galena. Its color is a bright green, and it is crystalized in small cubes, which have a very uniform size.

The tendency which the pyrites has to decompose, inevitably destroys specimens of this mineral, if not kept from the damp atmosphere. It also was found in small quantities at the lead mine at Martinsburgh.

This lead mine occurs about one mile northwest of the village, and was first discovered in 1837, by small masses of the ore being turned out in plowing. Immediately examinations were made, which resulted in the discovery of a vein, which appeared about six inches above the surface of the rock, and was about four or five inches wide, being composed of galena, with its central portion made up of the white carbonate of lead.

A contract was drawn, securing the right of working this ore twelve years, for twelve hundred dollars, and a company organized, having at first twelve, and afterwards one hundred shares.

There are at this place three principal veins, which have been wrought; upon the most northern of these the ore was first discovered. In this vein was found octahedral crystals of lead variously modified, a variety of lead ore, presenting a peculiar arborescent lustre when broken, and beautiful crystals of calcareous spar. At the middle vein, the rock was penetrated about sixty feet, and much the same minerals procured as at the one described, except that they had a more brilliant lustre, and the crystals of spar were whiter.

At the southern vein, and at its western extremity, blende was found associated with the galena, coating sulphuret of iron, and overlaid by the lead, which was in turn invested by calcareous spar, in broad crystals, with curved faces.

Occasionally surfaces, spangled with brilliant crystals of sulphuret of iron, were found in this part of the mine. The usual crystaline forms of the spar were the six-sided prism with trihedrial pyramids; the slender pyramid, or dog-tooth spar, often coated by sulphuret of iron, and the variety known as the *nail-head spar,* formed by two low three-sided pyramids placed base to base, without any intervening prism.

In addition to the forms here mentioned, calcareous spar occurs in a ravine, east of Martinsburgh village, crystalized in the primary form, with cleavage parallel with the faces of the crystals. They are of a straw color, about half an inch on a side, and quite free from striæ.

The " lead mines" were wrought for about two years, but never with a success sufficient to cover any considerable portion of the expenses; and after the erection of a furnace for reducing the ore, and an unprofitable outlay of many hundred dollars, were finally abandoned.

The mania for mining speculation was not confined to the enterprise above mentioned; but several unsuccessful attempts were made in various parts of the county to procure *lead,* " *silver,*" and other metals, in the Trenton limestone, but with the same result. One of these excavations on Whetstone creek, about a quarter of a mile east of the State road, deserves notice, from the beauty of the specimens of calcareous spar which it afforded. These lined the surface of the rock in its seams and crevices, and occasionally detached masses of stone in these fissures were completely invested by them. A few crystals of galena, (silver!) and pyrites, (gold!) were found at this locality.

These results of mining enterprise, undertaken in the Trenton limestone, would seem to indicate that this rock cannot be depended upon as a metaliferous depository; and it is quite probable that these veins do not extend down through the Birdseye, since the latter rock is never found traversed by veins of spar, or exhibiting any trace of the metals. Should such be the case, these metals must have been derived from the rock itself, and separated from its substance by their chemical attractions; a supposition that is rendered more probable from their occurrence in successive laminæ upon the walls of the veins.

The Trenton limestone occupies two terraces, extending through the county, and nearly parallel with the river. They are, however, very irregular in outline, and occasionally broken by broad valleys, that come down from the northwest.

So irregular are these terraces of the rock, that in some places they can scarcely be recognized, while in others they are united into one, forming a commanding bluff, with a steep descent. The average breadth of surface occupied by this rock is about two miles, being wider at its northern extremity, and becoming an important rock in Jefferson county.

Along its western margin, the Utica slate, the next rock in the ascending order, appears; covering the limerock for a distance of about half a mile in width, with a thin deposit of slate, and forming the slope of the range of hills that extends through the county, nearly parallel with the river, and which is known in this section as *Tug hill.* This range of highlands, commencing in Jefferson county, gradually rises as we proceed south, attaining its greatest height (about five hundred feet) in Turin, and passes into Oneida county, it being in the same range as the hills north of Rome, and the Deerfield hills near Utica.

From the softness of the rocks of which it is composed, this hill has not that abruptness which characterizes the limestone terraces in the county; and its surface is uniformly covered deeply with a soil derived from the decomposition of the slate.

The only exposures of the rock occur along the beds of streams which have worn deep chasms in the hill-side; and so easily is the slate acted upon by the water, that the most insignificant rills have worn deep ravines in the rock.

Some of these ravines are noted for the magnificence of their scenery, which is unsurpassed by that of more noted places of resort, which lie nearer the great lines of travel; and the day will come, when the wild scenery of Lewis county will become an object of interest, and attract the attention of the lovers of Nature's works.

The falls on Deer river have been already referred to. Two other localities will be mentioned, which are worthy of particular notice, in the town of Martinsburgh—"Whetstone gulf," and "Chimney point." The former of these forms the channel of Whetstone creek, and is about three miles in length, the last mile being the only part of special interest.

The stream has here worn its way through the rock, to the depth of about two hundred feet, leaving the sides nearly perpendicular; and as the visitor winds his way along the tortuous ravine, every turn presents a new prospect, and every step a new object of interest. As he advances up the stream, the cliffs approach nearer each other, until at length they can be reached on each side by the outstretched arms, and the torrent is forced into a deep and narrow channel; while far above him rise in towering grandeur, the threatening cliffs, with a thick growth of evergreens upon their summit, casting their gloomy shadows down the frightful abyss. Into these dark recesses the sun never shines, and snow and ice are found until late in summer.

Chimney point derives its name from a fancied resemblance of a vast triangular pyramid, formed by the junction of two gulfs, to a chimney. This is on Roaring brook, about two miles west of the village; is easy of access, and can be seen to advantage without descending the bank.

On the left of the 'Chimney' is a beautiful cascade, falling from the bottom of a ravine, which has worn a channel about half way down the cliff, and whose murmur is the only sound that breaks upon the stillness of the magnificent scene.

Both of these localities are interesting, from their number and variety of fossil remains.

The junction between the Trenton limestone and Utica slate, is not seen in the county, being concealed along the water-courses by the debris brought down from the gulfs. This slate is of a black color, and where exposed to the weather, brown; fissile, and divided by vertical joints in three directions, which do not preserve a uniformity in their course. None of these joints are uniformly parallel, except those which were N. 35° W., at several localities. The other systems of joints cut this obliquely at various angles, and one of them is not usually present.

The whole thickness of the Utica slate may perhaps be one hundred feet, and at several places the dip was very gentle towards the southwest. Occasionally thin veins of calcareous spar occur in the joints, or occupying thin strata between its laminæ, which, with the exception of a sulphuret of iron replacing an orthoceratite, are the only mineral contents of this rock.

Towards its upper part, the soft black shale, which properly constitutes the Utica slate, alternate with thin strata of a hard gritty rock, which, in mineral character as well as fossil contents, indicates a transition between the Utica slate and Loraine shales. Specimens of the Triarthus Beckii, which is a characteristic of the Utica slate, have been observed associated with individuals of the genera Pterina, Cyrtolites, Trinucleus, and Cypricardites, equally peculiar to the Loraine shales.

As a fact of some interest, as illustrating the range of organic life in the earlier rocks, it might be mentioned, that a specimen of the Pterinea carinata was found near the bottom of the Trenton limestone, at Deer river falls, in a thin stratum of shale.

The proper place of this fossil is in the Loraine shales.

In no part of this series have I observed a rock that can with propriety be referred to that division of the Hudson river group, called the *Frankfort slate*, as there is no considerable portion destitute of organic remains, or possessing the characters of that rock.

At about that place, where the transition character of the rock renders it doubtful to which formation to refer it, there occurs a stratum about three inches thick, of that anomalous production which has been called the "cone in cone." The vertices of the cones at this place observed, are directed downwards; but detached masses are occasionally found, consisting of two series of these cones, with their apices directed towards each other. This phenomenon has been observed *in situ*, at but one locality, about a mile and a half southwest of Martinsburgh village; but from the constant occurrence of detached masses in all of the principal gulfs, at about the same level, we may be allowed the inference, that it exists in a continuous stratum for a great extent; or what is more probable, there may be several strata of it at about the same height in the formation.

The existence of the double series of cones above mentioned, will render it difficult to be explained on the hypothesis that it is caused by the percolation of water through the stratum charged with magnesian salts, as in that case the cones would all be placed in the same direction.

The Loraine shales form the surface rock of the greater part of Tug Hill, and are finely exposed by the larger ravines which are worn up two or three miles into the hill.

They consist of hard, gritty layers of rock of a greyish color, alternating with dark colored shale, which in mineral character differs from the Utica slate, in its not being so fissile; and by its crumbling readily into thick fragments. As a general thing the strata of this rock are horizontal, or but very slightly inclined, while their equivalents in the eastern part of the State are uniformly highly inclined.

To this however there is one remarkable exception in the county, which may be observed on Roaring brook, in Martinsburgh, in the gulf above Chimney point, where the strata for a quarter of a mile are thrown into an inclination towards the south, at an angle varying from nearly horizontal, to forty-five degrees. The course of the ravine is here nearly east and west. Towards the east the inclination is scarcely to be observed; but as we proceed towards the west it becomes more and more inclined, until having attained the the greatest dip, the strata become at once horizontal.

The junction between the level and the inclined strata is at the first falls, in the ravine, and does not exhibit the appearance of their having been broken, but they are here curved as if the cause that produced them operated during their deposition, or while they were in a yielding condition.

If they were thrown into their present inclination subsequent to their formation, the continuity observed would indicate an upheaval, rather than a subsidence of their strata. Local derangements of a very limited extent are found occasionally in this rock, which must have been produced when the rock was formed. One of these may be seen in the bed of the little stream which has been mentioned above, as forming a cascade south of the "chimney." It is a half cylindrical block about three feet in length and one and a half in diameter, which has fallen from the cliffs above; and whose section presents a series of concentric cresents.

The next rock in the series, occupying a large area of the south-western portion of Lewis county, and extending west into Oswego and south into Oneida counties, is the gray sandstone of Oswego.

No natural sections of this rock exist in Lewis county, and the only knowledge that is possessed of it is derived from observations made in the other counties above named. It forms the bed of Fish creek in Osceola, and the head waters of the larger tributaries of Black river from the west. Grind stones have been procured from this rock in West Turin, but its remoteness from the settlements has prevented it from being used to any extent for that purpose.

The agricultural character of the soil underlaid by the limestones and Utica slate in the county, does not vary materially, except where these are deeply covered by drift; being well adapted for the growth of the various kinds of grain, but more particularly for grass.

The dairy interests, the raising of cattle for market, and sheep husbandry, therefore occupy a prominent place in the agriculture of Lewis county, and must continue to do so from the nature of the soil and our inability to compete with the grain growing districts of the west. The soil underlaid by the Loraine shales is still less adapted to the growth of grain, but is yet productive in grass, and forms an excellent dairy land; while the soil of the gray sandstone is cold and unproductive, and as yet but little cultivated.

The region underlaid by this rock is yet almost entirely a wilderness; covered by swamps of tamarack and balsam fir, and by beaver meadows, with intervening districts susceptible of cultivation. The prevailing timber is spruce (Abies nigra,) and hemlock, (A. canadensis) intermixed with beech, birch, maple and ash. The balsam fir tree is abundant on the borders of swamps and beaver meadows; giving with its conical mass of evergreen foliage, a peculiar character to the scenery of the wilderness.

It is interesting to note the connection between the underlaying rock, and the state of cultivation of the soil above it. The primitive portion of Lewis county is still in a great measure covered with the primeval forest, into which civilization has everywhere forced its way several miles, exhibiting almost uniformly half cleared and half cultivated fields, with miserable roads, and poverty, dwelling in log cabins.

The limestone lands betray their extent by the improved cultivation of the farms, and the air of comfort and often of opulence around the dwellings of the inhabitants.

Every village in the county is underlaid by limestone, and probably four-fifths of the surplus products are derived from its soil.

As we ascend from the limestone to the slate, the change is slight until we approach the Loraine shales, which furnish a soil somewhat inferior to the Utica slate, and when we arrive at the gray sandstone, enterprise is checked, and but little encouragement exists for the expenditure of time and labor.

It would be possible to make out a tolerably accurate geological map, without once seeing the rock, from the agricultural aspect of a country.

Having enumerated and described the rocks of Lewis county, it remains but to notice the drift formation, recent deposites, and mineral springs.

Reference has been made, when speaking of the Trenton limestone, of the lateral valleys that come down obliquely into the main valley of Black river.

The first of these on the south, is south of Martinsburgh village, where the upper terrace of limerock crossing the State road makes a turn towards the west, and returning passes around just south of the village, forming the hill on which it is situated.

This valley and its western margin are deeply covered with drift, and a multitude of large boulders occur; more particularly on its eastern side. A similar excavation in the rock, and filled in like manner, occurs between the north town line and a point half way to the village. Lowville village is situated in a wide and irregular valley formed by the complete removal of the Trenton rock.

One mile south of Denmark village is another remarkable valley, formed in like manner, with a multitude of drift hills around it; while east of it the birdseye is covered for a long distance by a wide and deep deposite, constituting a low range of hills parallel with the river. Along the base of the range of highlands composed of slate, drift hills are of constant occurrence, particularly in Turin.

Along the base of the first terrace of limestone near the river there is observed a succession of drift deposites occurring with considerable regularity, and constituting as it were buttresses, resting against the terrace. The primitive region every where abounds with drift deposites, particularly in the neighborhood of the High falls, and in the south eastern corner of the county. These hills are often of considerable height, but no continuous range of them was observed. They continue south to the valley of the Mohawk, and those who have traveled across that part of Herkimer county which is known as the "Grant," may form a just idea of their appearance.

Minor accumulations of drift materials are of constant occurrence throughout the county, forming gentle swells and conical hills of small extent.

The surface of the rock is in numerous places worn smooth and scratched, by the materials of which these hills are composed being transported over them; and the direction of these rocks indicate the existence of a current from the north-west.

Usually a surface presents scratches in two or three directions, which uniformly coincide with the general direction of the valleys.

The transported materials form in some places a soil of clay, in others of sand, but usually its quality does not vary materially from that underlaid by the rock.

The erratic blocks of stone every where frequent, are composed of gneiss, hypersthene, chloritic slates, mica slate, primitive limestone, specular and magnetic iron ores,* coarse serpentine and epidote in disseminated grains.

The relative abundance of these rocks is in about the same order as enumerated. Besides these the lower transition rocks occur as boulders, being in certain localities extremely abundant. Local derangements of strata occur occasionally, which are to be ascribed to the drift period. About three miles south of Copenhagen on the Number Three road, the Utica slate is highly and irregularly inclined, with masses of erratic rock thrust under the strata. Large masses are occasionally found torn up and resting upon their edges, appearing to be on the site in which they were formed.†

The erratic rocks wherever observed, have very uniformly their angles rounded as if they had been rolled for a great distance, and

* An amusing illustration of the folly of some mining speculations occurred in Martinsburgh in 1837, about the time when the mania for mining was at its height. A portion of a large boulder of specular iron ore had been uncovered, being, as was supposed, the top of a mine of untold extent. A company with a large capital was to be organized, and nothing was thought of in the neighborhood but stocks, shares, dividends, and the prospective possession of fortunes, until a further examination dissipated the day dreams of the proprietors by revealing the true nature of the deposite. The ore was said to contain copper, and no small percentage of *Gold!*

† A very singular instance of these disturbanees exists in Jefferson county on the "Rutland Hollow" road, about half a mile from where it enters the State road towards Watertown. Here there occurs two or three isolated hills, thirty feet high, which are composed of Trenton rock, laying in every possible position, with their edges thrust up by boulders of gneiss, and with every appearance of having been exposed to the most violent torrents of water, or masses of moving ice. The strata beneath the disturbance are horizontal.

they are often found lying entirely upon the surface, as if they had been deposited there but yesterday.

The recent deposites of the county consist of calcareous tufa, bog iron ore, and black oxide of manganese.

Tufa occurs in limited quantities, petrifying moss and lichens below the falls on Roaring brook; below Lowville village on the south bank of the creek, and on the north branch of the same about one and a half miles north west of the village. Other localities of less note occur, but in no case does it exist in sufficient quantity to merit particular notice.

Bog iron ore occurs in the cedar swamps along Black river in Lowville and Watson, from which it has been procured in considerable quantities for the furnace at Carthage; but the quantity of pyrites that it contained being supposed to impair its quality, it is not now employed. The ore at this locality often replaced roots and sticks, preserving their form and structure with fidelity. The strata of this ore are often exposed along the alluvial banks of streams, which flow from the slate, mingled with logs of wood and gravel, but not in useful quantities.

In Diana, about two miles from the Louisburg furnace, a loamy ore is found, which is employed with the specular ore at the furnace. It also exists about one mile from Louisburg.

The ore of manganese occurs on the summit of Tug Hill, in the south western part of Martinsburgh, in a swamp, and forms a deposite about two feet in thickness, consisting of nodules disseminated through the soil.

When freshly broken, it has a glossy black color, like anthracite coal, for which it was at first mistaken, but it soon crumbles on exposure to the air into a coarse black powder.

Its extent has never been determined, but it probably does not occur in useful quantities; besides its impurity would render it unfit for the purposes for which this mineral is used. It would be difficult to procure it free from the clay with which it is mixed, even if it could be procured in quantities.

It has also been found in swamps in the town of Greig, but only in small quantities.

There are several sulphur springs in the county, which maintain a local celebrity as a cure for cutaneous diseases, the principal of which occur in Lowville, near the Number Three road, and about four and a half miles north of the village.

The water issues from the south bank of a stream, and is highly charged with sulphurated hydrogen. The rock at this place is the Trenton limestone. Numbers resort hither for the purpose of procuring the water, which is highly prized as a wash for old sores, scrofulous affections, and ill conditioned ulcers. Another sulphur spring occurs in the Loraine shales, on Whetstone creek, and at the head of the gulf. Several others of less note occur in the county. From the occurrence of these in rocks which are known to contain iron pyrites, we may infer that these mineral waters are derived from the decomposition of that mineral.

If to the recent products above enumerated, we add sulphate of iron and alum, which frequently occur in efflorescences on the edges of the strata of Utica slate, and which might possibly be turned to a profitable account, we shall have completed an account of the minerals of the county hitherto observed.

In conclusion, it might be added that there are few districts more worthy of study than this, as well on account of the full development of the lower rocks of the New York system, (with the exception of two or three members,) as the proximity of the different formations. The channel of Roaring brook, in the course of eight miles, furnishes sections of as many different rocks, from the primitive to the gray sandstone inclusive, being the entire Champlain division (with one exception,) as it is developed in this portion of the State.

Perhaps there is no line of equal length in the State that furnishes so fine an opportunity for studying so many formations as this, while the grandeur of the scenery along its course is well worthy of a visit even by those who derive no pleasure from the study of geological phenomena.

CULTURE OF SANFOIN.

BY W. H. SOTHAM.

I have long promised to write you an article on the culture of Sanfoin, but my head has been pressed by other matters that I have not been able to do so. I consider this plant amongst the most useful of grasses, more especially on light soils, such as stone brash, gravel, sand, or light loam. The land must be perfectly free from couch, (or what is generally termed *quack* in this country,) and in a good state of cultivation. It is generally sown with barley, as such soils are adapted for that kind of grain, and I think grass seeds of any sort will do better sown with it than any other.

Care must be taken to keep cattle and sheep off it, the season the barley is cut from it; probably it would be safer not to let any thing on it the first season. Mow it the following year, and then put sheep upon it until the frosty nights appear.

This plant reaches a long way into the ground, and brings the vegetable matter to the surface; the roots have been traced four feet below the surface, and the upper roots are much larger than those of clover. It is excellent horse hay. Sheep are very fond of the finer parts of it, but will leave the larger stalks, which should be fed to the horses, and they will eat such food with avidity. I have known working horses do exceedingly well on sheep orts of the sanfoin, but if it had been blown over and left by other horses, would not have touched it. It is good economy to feed the sheep orts of any kind of hay to working horses. I have known the sanfoin to have been mown nine and ten years in succession, and produced a good crop every year without any manure, and the aftermarth is very thriving feed for sheep, and produces excellent pasture. It will not do for milch cows; it gives the butter a very bitter flavor, and makes it very unsaleable.

It is pastured the last season, and then breast plowed, (or in other words pared and burnt.) The sod, which is very full of roots, is taken off with a breast plow, an instrument used by the hand, and forced through by the thighs of the operator. An acre per week is considered very good work for a man, if the sod is very stiff, but I have known experienced hands plow an acre in four days.

This sod is taken off about half an inch to an inch thick, turned over and left to dry. When sufficiently so as to burn, it is thrown together and burnt; the abundance of ashes it produces is almost incredible. They are plowed lightly in, (or what is termed in England *risbaulking*, a term well known there by *old fashioned farmers.*) This mode of plowing does not seem to be known in America. It is a part of a furrow plowed and turned over into the other part of the furrow, and laps the ashes up into it, for the purpose of keeping them on the surface. But latterly the most improved have thought it best to skin plow in preference to this mode, that is plow lightly as possible the first time, cross plow a little deeper the second time, well harrow and sow turneps on the surface broadcast. I never saw better crops of turneps than have been grown by this process, and the succeeding crops for four or five years have been abundant.

It will not do to sow sanfoin on the same soil again for twenty years hence, or it will not flourish; this has been proved in repeated instances.

I like to *risbaulk* land before winter comes on; it keeps it dry through the wet season, and it will work much earlier in the spring than land that is whole plowed, and it gives the frost a chance to slack and pulverize it, and the dry winds in March to penetrate it, which I think a very great advantage.

I shall be pleased to answer any inquiries that may be made through your paper at any time, if this article should be deemed worthy of its pages.

DUTY OF EDUCATED MEN.

I am highly pleased in the main with your papers, and have only met with one article that seems exceptionable: I refer to that in the Journal for March, on the " Duty of Educated Men," by Agricola. I shall venture some remarks in reply.

Asking an acquaintance of mine, to whom I had given the Journal for perusal, his opinion of it, he excepted from his expression of general liking, the idea of " farmers not knowing anything." He referred to that portion of your correspondent's article that speaks of " educating the sons of farmers at least, in all those sciences necessary to make this art (agriculture) take its highest place in the business of life"—that is, in geology, chemistry, natural philosophy, botany, &c." Agricola says, " all this is as impossible as the attempt of the frog in the fable, to puff himself up to the size of an ox." *Why*, if a farmer's son may ask so contraband a question; why is this impossible ? " Because there are few farmers who can afford to give their sons an education; three fourths of our population are to become tillers of the soil, and we cannot hope to procure schools or teachers to educate them. It is looking too far down the future, to anticipate any such Eutopian success in the present state of things." How many are there at present, the sons of farmers, who have not the opportunity of attending, for a portion of the year, the common district school ? Comparatively few. What effort, on the part of " educated men," would be necessary to introduce such works as "Johnston's Catechism of Agricultural Chemistry," and " Theodore Thinker's Botany" into our common schools, and even support practical illustration of their doctrines ? But little. And were the minds of children, from six to twelve years of age, instead of being disgusted with all thoughts of knowledge, by constant drilling in studies (as English grammar) far too abstruse for their ready comprehension; led into the fairy fields of nature, and entertained with her variety and simplicity, how would open and honest intelligence assume the place of ignorance and prejudice ! If we once enlist the human mind into the study of nature, the works of God will ever exert over it an irresistible spell, and though we may only countenance the catechisms and first principles, we shall find our student progressing by himself; and in a few years the primmers will be supplanted by octavos. I do not urge that the farmer shall possess manipulative skill to analyze his soil with scientific accuracy; but I do contend he may know the theoretical doctrines, the principles of science as applied to agriculture.

After a forcible repetition of the assertion " that all hopes of success in such an undertaking are utterly fallacious," Agricola ("which is, being interpreted," a *farmer*,) lays down the *fact* that such an education is *unnecessary*. "We," he says, "do not expect any physician to be so far an adept in practical chemistry as to manufacture his own medicines, though his business consists in the application of those medicines." True, *we* do not; but let us look to that country which yearly accomplishes more than any other, for the advancement of science—to Germany. The candidate for M. D. must there, work through a course of chemical analysis, and also spend a year with an apothecary preparing and compounding medicines. He must prepare an extensive herbarium, &c. (Prof. Horsford's letters from Germany, Alb. Cultivator, June, 1846.) Agricola, in carrying out *his* position, remarks; "They (farmers) are capable under proper direction, of preparing manures in the very most approved manner, though they may be ignorant of the reasons," &c. True, they *may;* but how shall proper methods find way to the ignorant ? How shall they burst the barriers of prejudice ? How shall the farmer know they are proper methods ? And if he does not know, how will he do ? And who is to stand by to give "proper directions," to "tell how ?" Did all the art of agriculture, like that of making horse-nails, consist of a few simple operations, to perform which an hour's instruction and a week's practice would suffice, then there might be no money profit in making the farmer more than a mere human automaton; but since the agriculturist's practice is so various, so extremely various, while so many substances are applied as fertilizers, so many kinds of plants are grown, so many different soils are worked, so many processes are employed, and so great a number of all these liable to be modified by adventitious circumstances; how great a capacity of mind, and what extensive acquirements are necessary to properly control them. Your correspondent tells "how easily, and with what a powerful influence educated men might be engaged every day, in breaking down those prejudices which are among our farming population the greatest hindrances to improvement. They might rapidly introduce the practice of reading agricultural papers and books, things which, unfortunately a vast number of our farmers are afraid of, and therefore need stimulating, in order to overcome their prejudice." But as it is easier to destroy the embryo than the great oak, so would it be easier to give the minds of the youth presentiments in favor of sound practice, by the early instillment of proper views, than when in after years their minds have received a lasting bias, to attempt the education of matured prejudices. And how shall uneducated farmers be won over to the reading of agricultural information, when on every page are introduced scientific terms and principles, to know which, is not only impossible, but unnecessary. "Knowledge is power," quotes your writer; and what but the want of it, was that weakness which "kept down and made to be regarded little better than bondmen and serfs, the tillers of the soil who have clothed and fed the whole human race." And what but education is "breaking the chains" and rendering "the dignity of their calling fully acknowledged and appreciated ?"

But were the increase of wealth the only object to be accomplished, I should not wish the farmer to "know anything." "The love of money is the root of all evil." The farmer as well as the clergymen has a mind and a heart. It is not only his privilege, but his duty, to improve and cultivate them. These he carries with him throughout all eternity; they constitute him and the circumstances in which he is placed, requiring labor, are only intended to make him, in the true sense of the word, a MAN, to draw out and expand his faculties.

Had I the secret which could throw unbounded luxuriance over the wide world, and obviate the necessity for toil, I would banish it from my memory and resist the impulse to unbosom it, as I would oppose the tide of inebriacy and licentiousness. Could not the labor that I would wish to be bestowed upon the educational interests of the farming community, react to enlarge the boundaries of knowledge, and make the world more sensible of the amazing superiority of mind over matter, and bring the current of human energy to bear upon intellectual salvation; rather than have it only minister to man's baser passions, I would wish the channels of thought forever dried up. All that constitutes the vast difference between the brute and human-kind is the mental being. It is destined for eternal endurance; and all our efforts should be directed to its enlargement and cultivation. We should toil to support our bodies, to preserve health, to beautify the earth, only as subservient to the mental and moral development of our fellow beings and ourselves. The grand object of our labors and experiments in agriculture, or any other art, should be making the mind industrious, energetic, strong, and healthful; the supplying of bodily necessities should be a secondary consideration. Says Linnæus, "That existence is surely contemptible, which regards only the gratification of instinctive wants and the preservation of a body made to perish."

Therefore, while we heartily respond to the sentiments of Agricola in relation to the "duty of educated men;" while we would remind them of their influence and their power, let us call up the farmers to behold and rightly estimate the blessings they may derive from education; and demonstrate to the world their ability and intention, if necessary, to stand independent of the clergyman and the physician, (in agricultural matters) trusting in their own *enlightened* practice and "*scientific* lore" as the elements of success, and possessing the mental tact to discriminate for *themselves* between "proper direction," and pedantic empiricism.

MRS. AND MR. JACKSON.

Mrs. Jackson was the daughter of Squire Thorn, who, in his day, was the great man of the village. Some expressed wonder that she married Mr. Jackson, since his body was not constructed according to any known rule of proportion, and his spirit was not calculated to endanger the river by combustion: in other words, he was an uncouth, awkward, good natured, easy, simple soul, that never did any harm. Some have insinuated that it was a hasty and ill considered match. But as she was at the age when the judgment has attained its full maturity, this insinuation must have been without foundation; there were doubtless good and sufficient reasons why she should marry Mr. Jackson. It was understood that she had the sole management of the affair, as she had of all other matters after the affair. Indeed she was commonly regarded and treated as the man of the house.

"Mrs. Jackson, I want to borrow your plow," was not an infrequent mode of address, even when Mr. Jackson was present. If she was disposed to grant the favor, the answer was direct—if not so disposed, there was an obedient reference to Mr. Jackson. For example: "Mrs. Jackson, I have called to see what you will give towards building a school-house." The answer would be, "I cannot tell what Mr. Jackson would give—he can speak for himself I reckon." Mr. Jackson on such occasions showed that his ideas of liberty of speech were analagous to the Dutch Justice's idea of liberty of thought. "Certainly, every man has a right to tink for himself, provided he tink wid de court."

Mrs. Jackson was an economical person, and like many of her country women, adroitly managed to reconcile her love of saying with her love of show. *Economy* said, "Set a frugal table," and its suggestion was obeyed. When company came, *Show* said, "Set a rich table," and it was obeyed. Now many persons in their simplicity, suppose that when food is placed on the table, it is placed there to be eaten. Mr. Jackson fell into this very common error, but was speedily better informed by his wife. Subsequently he was observed to take but one piece of cake, and that from the cheapest plate; and if at any time he appropriated some of better quality, an adroit shake of the head, and peculiar expression of the eye, on the part of Mrs. J., would lead him to drop it unharmed on the edge of his plate, to be returned unharmed to the original pile of display. So, (saith not Jeremy Taylor,) have I seen a dog drop a bone, when the cook has aimed a cleaver at his head.

Mrs. Jackson had furnished her parlor with considerable pretensions to style; but it was rarely entered. The company usually sat in "the other front room." On such occasions the door of the parlor would always be accidentally left open, so that the visitors in passing could catch a glimpse at the Turkey carpet and mantel mirror. The minister and Judge King have been known to sit down in the parlor, and little doubt was entertained but that the President would be invited into it, if he should favor the place with a visit. It is not known that Mr. Jackson ever trod upon the carpet, or saw his person reflected from the mantel mirror.

Mrs. Jackson had the idea of gentility fully developed. This was owing in part to her elevated birth, and in part to the native nobility of her mind. There were two young men in the village, contemporary with her younger years; it is a mystery she did not marry one or both of them. The one sat during the day for three years in Dr. Norton's office, with his feet on the table; then he was licensed to practice medicine, but ere long he came to the conclusion (*a priori*, for he had no trial,) that sick rooms and night rides must be unpleasant; accordingly he turned financier, and was rewarded for his contributions to the currency by a permanent birth in one of our state institutions. The other genteel young man was a clerk in Mr. Burford's store. His hands were the admiration of all the ladies, who made it a point to buy all their ribbons of him. He finally set up business for himself, failed and paid nothing on a dollar—entered into "the grocery line," became his own best customer and died, leaving his empty hogsheads to his creditors. Mrs. Jackson had lived to see the end of these specimens of gentility before she married Mr. Jackson. It was not known that she made any attempts to make *him* genteel.

Mrs. J. had a son, who in form and feature gave clear indications of his paternity. She determined to make him genteel, and labored assiduously to develop within him the idea of a gentleman, but without any very marked success. The first difficulty was the vagueness attached to the term gentleman in this country. The next was that there was no gentleman in Luneville—no examples to whom she could point her son; so that the idea of a gentleman that Frederic Fitzjames Jackson acquired, was one who did not work, whose hands were white, and who wore Sunday clothes every day. With all these characteristics, Frederic Fitzjames was peculiarly well pleased, especially the first named; he commenced a course of careful and successful practice, and was never known to do a single act of useful labor. His hands were not very white, and Sunday clothes were worn only on Sunday for the present.

This hopeful son Mrs. Jackson determined to bring up to college. This resolution was formed without cousulting with Mr. Jackson or dame Nature. The former was of no consequence, the latter is not accustomed to be slighted with impunity. Mrs. J. was aware that her son was not remarkably bright, but then she had understood that genteel young men in college were not remarkable for scholarship, and gentility was the sole object sought. He was placed in a neighboring select school which was taught by a Quaker. There the chief mental characteristic displayed by him, was a disposition to carve his desk. After vain attempts to correct the habit, the master concluded he had a gift for whittling, and furnished him with a quantity of soft pine each day. Frederic remained at school long after the milestones of his boyhood had been passed, and when Mrs. Jackson peremptorily inquired if he was not fit for college, the teacher warily answered, "he is ready to go to college." Accordingly homespun pants were cast off forever, and "boughten" ones procured. The farm was mortgaged, money raised, and Frederic Fitzjames was sent to a college in a city, that there might be a combination of influences to make him genteel. He was admitted without hesitation, the funds of the college superceding the necessity of a strict examination. He soon found companions who could teach him to spend money genteelly: this he was charged by his mother to do, with tears in her eyes.. The city tailors soon brought his form into a near approximation to the human shape, as those will readily believe who have witnessed the success of those artists, when they had very unpromising materials.

On his return home in vacation, his mother was delighted with his improvement, though h survey of his bills shot many a pang through her heart. Frederic Fitzjames had embraced a new element in his idea of a gentleman, viz.: ignorance in regard to all common, and especially agricultural matters. Accordingly he admitted this to his practice. Lisping was also added to his accomplishments. This genteel ignorance was manifested by a constant succession of annoying interrogatories. "Vhat's that?" "Vhat you call this?" was asked with reference to the most common implements of husbandry.

This troublesome habit was brought to an end by the father of his father's flock. One day Frederic walked with his gloves and cane to the field where his father and his hired men were at work. He began his interrogatories, when the *pater ovium*, whose horns were beautifully spiral, and who had known him from his boyhood, came up slyly in the rear, as if to listen. Apparently he was not well satisfied with what he heard, for his countenance assumed rather a stern expression, and he went backward about six paces, and then advanced vigorously, and came in contact with Frederic's rear, just as he was pointing to a hoe, and asking, "What's that?" The impulse sent him nearly a rod, and landed him on his face. "Why its the old ram," said the hired man, as if calmly answering the question. "It's the old ram, that's what it is, and he won't have this nonsense. He knows what you are up to, and if you don't stop, he'll knock the life out of you." Fitzjames discontinued his habit of questioning out of deference to the opinion of the ram. It was suggested that it would be well to send the said quadruped back with him as his private tutor, as he could beat more into him, or out of him, than any body else.

Frederic returned to the college and remained till no more money could be raised on the mortgage. This mortifying fact was made known to him by a letter from his mother, and her injunction to return home. He made known the state of affairs to his companions, whom he summoned to his privy council. They unanimously advised him, with great gravity and earnestness, to go south and marry a rich wife, assuring him that his genteel person and address, would enable him to accomplish it "in no time." Great secresy was of course enjoined. Accordingly he sold off his chattels, borrowed what money he could, his advisers lending him to carry on the joke, and away he went to Georgia. The secret instructions they gave him have not transpired, but certain it is, that in less than six months he was the master of a plantation and some hundred negroes, and a life interest in the body of a widow. The next summer he came on to the north, and visited Luneville in his splendid barouche, leaving his wife at the Springs. His mother had now a son who was a gentleman.

Mr. Jackson, the gentleman, was reminded of the mortgage given for his benefit, and of the improbability of its being cancelled without his aid. He very considerately proposed that the farm be sold, that his father be advanced to the post of negro-driver on his plantation, and his mother to that of housekeeper in his establishment. To the first of these propositions, Mrs. J. had no strong objection, but she utterly objected to residing among negroes herself, and occupying a second place in any house. She was greatly provoked to learn that the late widow had reserved to herself all control over money matters, though he assured her that he had submitted to it out of deference to her example. Frederic soon left the place and never returned.

The great object of Mrs. Jackson's life, the gentility of Fitzjames, being accomplished, her undivided energies could now be given to *saving*. The parlor was closed forever—company was at an end—Mr. Jackson was starved *ad libitum*—and the mortgage finally paid off.

EXTRACTS.

M. DUTROCHET'S VIEWS OF THE BREATHING OF VEGETABLES.

M. Dutrochet, who is already distinguished in the scientific world, for his able experiments on vegetable physiology, has recently laid some further information on the same subject before the French Academy of Sciences. Having observed that the pneumatic organs in different parts of the *Nymphæa lutea* contained an air in which there was less oxygen in proportion as these parts were distant from the leaves, it struck him, that the leaves were the sources whence these organs derived their oxygen, and that this oxygen was disposed of by the breathing of the plant, as in animals. After stating his observations at great length, he continues as follows:—The results of these experiments are, that the oxygen produced by the leaves under the influence of light, is first poured into the pneumatic cavities: into these it is pressed into continued accumulation, and escapes to the outer surface by means of the tracheæ, the orifices of which are situated in the air, and on the leaves. Most of the aquatic plants have these orifices so contrived, as not to be entirely closed when in contact with the water, but a few are without these mouths, and then the oxygen is crowded into the pneumatic canals of the footstalks, and from thence is pressed into the stem, which accounts for the enormous quantity of water contained in some of the aquatic plants. We may then conclude, that vegetables breathe like animals, that is, by assimilating the oxygen which they introduce into their respiratory organs; but instead of borrowing this from the surrounding air, they fabricate it, and that which they give out is, in reality, the overflowing of their respiratory organs. The leaves are the organs used in this fabrication, and when they have filled themselves, they send it on into the stem, and as the quantity exceeds the physiological wants of the plant, it is abundantly poured out. The pneumatic organs, which serve as a resoirvoir for breathing air, are generally placed on the under side of the leaves, and when leaves that are intended by nature to remain in a certain position are reversed, they will die, that is, they will cease to produce the respiratory oxygen, and will be suffocated; though it is not yet ascertained why leaves, in order to produce this oxygen in a healthy and durable manner, should necessarily have that side exposed to the light which is opposite to their resorvoirs of air. The direct and healthy manner of breathing in vegetables, consists of the production of oxygen under the influence of light; therefore darkness is unfavorable to vegetable life, and injures the durability of the plant. The life of the corollæ is ephemeral, because these parts do not manufacture respiratory oxygen, and consequently breathe by absorbing oxygen from the atmosphere. This mode of respiration is closely allied to that of insects which breathe by tracheæ, and even the orifices of these organs resemble each other in shape, being, in both instances, an elongated ellipse.

CRIMSON CLOVER.

The following notice of the *Trifolium incarnatum*, is taken from the Code of Agriculture, and as this grass is getting into favor, it will not be unacceptable to see it so highly spoken of abroad: "It is a subject of astonishment that this valuable plant, (*Trifolium incarnatum*,) should not have been long ago introduced into this country, and cultivated on an extensive scale. If sown in autumn, after a crop of potatoes or other roots, it produces next spring a crop fit to be cut for soiling cattle, eight days earlier than lucerne, and a fortnight before red clover. Care, however, must be taken to have good seed, and not to sow it too deep. It produces two excellent crops in one year, the first of which should be cut as soon as it comes into flower, and the second will produce a considerable quantity of seed. From its early growth in spring, when other articles for feeding stock with advantage are so difficult to be obtained, it is likely to become a valuable acquisition to British husbandry." If the clover—the seed of which is, we believe, to be had in considerable quantity of the seed merchants in this country—be sown in spring, it is considered that it will produce a full crop in Scotland in the months of July or August, and must be of no great value to those on whose lands the common red clover does not succeed, or where the crop may have partially failed. It is proper to remark that this is an annual plant, and therefore should only be employed in partial husbandry. —*Baltimore Farmer.*

NEW PUBLICATIONS.

A Practical Treatise on the Diseases of Children: By D. Francis Condie, m. d., Secretary of the College of Physicians, etc. Second edition: revised and augmented. Philadelphia: Lee & Blanchard. 1847; pp. 657.

It is pleasant to witness the progress of medicine, and to see a real advance of this branch of knowledge to that state when the mind will be more directed to the prevention, than the cure of disease. In infancy, there can be no doubt that diseases may, in nine cases out of ten, be prevented; and it seems that the profession are directing their minds steadily to this great end. But admitting that this is not true to the letter, still there can be no doubt that the means of curing disease have been increased, and the treatment of all the ordinary maladies are managed with better success now, than any former period.

The treatise of Dr. Condie bears evidence to the foregoing assertion. But evidence of still greater importance is furnished in the experience of all the active and enlightened physicians of the country. In calling the attention of our readers to this work, we can hardly expect that many of our readers will purchase it, or attempt to study the diseases of infants and children with a view to undertake their cure; still, those who may be disposed to give some time to the perusal of the work, will find the first 126 pages eminently calculated to promote sound views of the treatment of infants and children, both in health and sickness.

The first part of the work is devoted to the hygenic management of children, the peculiarities in the performance of the vital functions and the symptoms of diseased action.

The information in this part of the work will render it a valuable book to every parent, and to all who are interested in the physical and moral treatment of children.

We shall make a few extracts, for the purpose of illustrating the character of this part of the work. Page 25, treating of the cleanliness and bathing of children, Dr. Condie remarks. "The absurd notion so generally entertained, that the cold bath is adapted, in all cases to augment the strength and invigorate the powers of life, and which has induced so many to view it as an important agent in the physical education of infancy and childhood, has been fully exposed by the experiments of Dr. Edwards. By these it has been shown that the direct effect of cold water, when applied to the surface, is invariably to suppress the strength and vigor of the system; and that this depressing effect is always in a direct ratio of the feebleness or exhaustion of the individual subjected to its influence. When we add to this, that by the same experiments, it has been proved that the power of generating heat, and consequently the ability to support a diminution of temperature is at its minimum at birth, and goes on gradually augmenting as the child approaches maturity, we can readily understand the folly and danger of applying cold water to the skin of a young infant, as well as the necessity of the water in which it is washed, being sufficiently warm to prevent the production of the least degree of chilliness." Again; on clothing, the author says that the essentials in the clothing of children, are *lightness*, simplicity, and looseness. The texture, amount of clothing, during infancy and childhood, should be such as to preserve every portion of the body of a sufficient and equal warmth; neither allowing it, on the one hand, to experience the slightest sensation of chilliness, nor on the other unnecessarily augmenting its heat. The younger the infant the warmer should it be clothed, and the more care should be taken to protect every part of its surface by an appropriate covering.

Another important subject is treated of, viz: "the moral defects which render a female totally unfit to give nourishment to an infant, or to assume any charge of it whatever. Thus, an irritability of disposition, giving rise to frequent gusts of passion, has been known to produce so deleterious effect upon the milk, as to render the infant liable to convulsions, that partakes of it during or immediately after such exhibitions of ungovernable temper. Grief, envy, hatred, fear, jealousy, and peevishness, likewise, independently of their abstracting the mind from the duties necessary to be fulfilled towards the infant by their influence upon her health, tend to alter the quantities of the nurse's milk, so that the stomach of the infant becomes quickly disordered by it, while at the same time it is altogether unfitted for its proper nourishment."

A Voyage up the River Amazon, including a residence at Para, By William H. Edwards. D. Appleton & Co., 200 Broadway, N. Y., and G. S. Appleton, 143 Chesnut street, Philadelphia: 1847. pp. 256.

We certainly have read, and continue to read with increasing interest this journal of travels. Whether our partiality for the book is increased by the fact, that it is the production of an old and esteemed friend, we are unable to say. This is a matter of little consequence to our readers, as we can assure them that it abounds in interesting details and useful information. Mr. Edwards is a zealous naturalist, a good observer and gives his narrative in an easy, lively style, which never tires, but entices his reader along from chapter to chapter without surfeiting or fatigue. In general, Amazon travelers have been deficient in information relating to natural objects; and hence they have roamed over and through interesting fields, without the power and ability to instruct us in things of the highest interest. But we are happy to say that Mr. Edwards is free from this charge. One peculiarity of his work consists in giving the reader a picture of the journey itself. You at once feel that you are almost a fellow voyager, pushing up the mighty Amazon with the same objects in view. We obtain a vivid idea of what life is upon these waters; what the pursuits of men are in this distant part of our continent; how different their feelings, views and conditions are when compared with our own. This is no mean character in a journal; it is rather one which is of the highest excellence. We bespeak for our friend's work a wide circulation, and we cannot but hope that a very respectable harvest of fame will be gathered by his enterprise up the Amazon.

Report of the Commissioner of Patents for the year 1846.

We are indebted to our friend, Dr. L. D. Gale of the Patent Office, for a copy of this valuable report. We cannot but regret, however, that the government should have deemed it necessary to curtail the operations of the office so far as to exclude from its pages important statistical, and other information relating to agriculture. We earnestly recommend, that the former plan of the reports may be again approved of by the government. In no other way can our agriculturists be supplied with valuable information, in no other way can the interests of agriculture throughout the country be so well and so generally promoted. The document is very valuable, and it is scarcely necessary to add, indispensable to inventors.

BLACK HAWK, THE MORGAN HORSE.

We paid what we thought a deserved compliment to this fine animal, in our October number for last year. Another opportunity for examining him has fully satisfied us that our commendation fell rather short of the truth. We are aware that excessive praise often defeats its object; for truth is the only foundation upon which a matter can stand: and it is only upon this basis that we wish to place the merits and good qualities of Black Hawk. No one who has seen him, but is ready to speak in the highest terms of commendation. His usefulness must then rest upon his stock; and placing his claim to patronage upon this test, we are ready to say that enough is now known to place him first upon the list of stock horses in the New England States.

He is a distinct individual, having his own peculiar traits and characteristics; and hence the sure transmission of these traits and characteristics to his progeny. This will take place in a great measure, in a mode which will be independent of the iflu-ence of the female, unless indeed the female is equally individualized by high blood and distinctness of breed. Such horses are the only ones which can improve the stock of the country.

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OF

AGRICULTURE AND SCIENCE.

This work will be issued hereafter monthly, at two dollars per annum payable in advance. It will form two volumes at the close of the year of three hundred pages each, and will be illustrated by plates and wood engravings.

The object of this Journal is to disseminate useful knowledge relating to Science, the Arts, and Agriculture, and to promote sound views in education. It is in fine designed for a farmers' magazine, and no efforts will be wanting to make it a welcome visiter in his family.

Communications may be addressed as usual to the conductors at Albany or when more convenient, to the publishers, Huntington & Savage, at 216 Pearl st., New York.

E. EMMONS,
A. OSBORN.

Albany, January, 1847.

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CONDUCTED BY

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FRUITS.

In our previous article on fruits we confined ourselves to the simple facts of fertilization, or the conditions on which it takes place, and some modifying circumstances attending the phenomenon. We propose in the present article to consider more particularly some of the results of this operation.

Nothing can be more varied than these results are in some respects, or more constant than they are in others. The effect on the parts composing the seed vessel are as various as the plants themselves, and the production of a miniature plant or embryo is as constant as the phenomenon.

The most apparent and striking changes in regard to the parts of the fruit, are those in respect to its form, size and texture. To attempt an explanation of these changes, as to their cause, would be just as fruitless as to attempt to give a reason why an acorn produces an oak, or any seed a plant similar to the one that bore it. In the present state of our knowledge, it is simply the fact we have to deal with; of the cause we know nothing. When the act of fertilization is accomplished, a series of changes occur, which are characteristic of each species. In some the seed vessel seems to receive more than an equal share of the energies of the plant, increasing remarkably in size, and bearing no resemblance at maturity to the minute body of its earlier stage. In others the seed seems the special object of care, and while the seed vessel becomes a dry, thin membrane, the seeds become large, and are much the most conspicuous portions of the fruit. At other times they both increase together, and both seem the equal recipients of the energies of the plant. As examples of the first of these, we have the large, fleshy fruits, as the water-melon, gourd, &c.; of the second, the bean, wheat, pea, &c., afford examples, and we have exhibitions of the last in the cherry, persimmon, and many others. The *size* of the fruit is never indicated by the size of the plant. While the majestic oak and maple bear the small acorn and the light samara, the creeping, short-lived vine, of a few feet in length and scarcely an inch in diameter, bear fruits that would outweigh the whole plant besides.

The effect of cultivation on fruits is almost always to increase the seed vessel at the expense of the seed. Some plants are rendered entirely barren of seeds by cultivation, and in others the number of seeds is greatly diminished, as the size of the seed vessel is increased. The vine, quince, bananna, and pine apple afford examples of the increase of the seed vessels at the expense of the seed.

When the fruit has arrived at maturity, nature has in all cases devised means by which the seed shall become spontaneously disengaged from its confinement in the seed vessel. If the vessel is dry and membranous, and likely to resist decay, she arranges so that the very products of this state, which would render it impervious to the action of appropriate vital stimulus, shall in some manner rupture it and allow the seed to escape. If the vessel is fleshy, it never opens by any ordinary means but its entire decay; if left to natural agencies, it accomplishes, with little delay, the same end. On this account fruits are divided into dehiscent, or those which open spontaneously, and indehiscent, or those which do not open spontaneously, the former being usually dry, the latter fleshy. To the above there are exceptions, in which the seed vessel contains but a single seed, and so arranged that fluids easily pass to the embryo, so that there seems no need of the seed's being disengaged, as in the case of grasses, sunflower, caraway, &c., which, although generally regarded as seeds, are in reality composed not only of the seed proper, but also of the seed vessel.

The *seed vessel*, or *pericarp*, is made up of one or more leaves, (these leaves are called *carpels*,) folded with the upper surface inwards, and with the margins united. This is always the case where the seed vessel consists of one leaf, as in the *pea*, bean and peach, but when the seed vessel is composed of more than one leaf, the edge of one leaf is sometimes soldered to the edge of the one adjacent, as in the violet, but frequently each leaf is folded so that its own edges are united, as in the apple. The seeds are, in all cases, borne by the edges of the leaf, so that wherever we find seeds attached, we may be certain that that is the margin of a leaf. Hence, if we find seeds attached to the wall of the seed vessel, it is a sure indication that the different leaves are united by their edges, and if we find the seeds attached to the centre of the seed vessel, we may be assured that the leaves are folded so as to unite their own edges.

As we are writing for general readers, it will not be inappropriate to direct our attention to those parts which often enter into the constitution of the fruit, before we proceed to more particular considerations of its constitution. The organs of reproduction, as they are usually called, are four, and may all be seen in an apple or potato flower. Each of these organs is composed usually of several leaves in a whorl. The outer whorl is the *calyx*, each leaf of which is called a *sepal;* the next whorl is the *corolla*, and each leaf is called a *petal;* then interioraly come the stamens, and in the centre appears the seed vessel, which is composed of leaves, each of which is called a carpel.

All of these organs have their origin at the summit of the flower bearing branch, although they do not always appear to have their origin at this point. This arises from various degrees of union between the different parts. Sometimes the pistils and stamens contract a union, and the stamens appear to come from the top of the ovary, and are *epigynous*, or from the top of the pistil, *gynandrous.* At others they contract a union with the corolla or calyx, when in the latter case they are said to be *perigynous.* Sometimes all the organs are united as far as the top of the ovary, when the ovary is said to be inferior, and the calyx superior, as in the apple, haw, &c. When the organs appear in their true position, they all are said to be inferior, or *hypogynous*, except the seed vessel, which is said to be superior, as in the grape, cherry, peach, &c.

It is plain from the preceding remarks that in regarding fruits in respect to their constitution, we may divide them into two classes, viz., those that consist of the seed vessel proper, uncombined with any other organs, and those that are made up of all the organs of reproduction soldered together. This division corresponds to the division made by botanists into superior and inferior fruits, called superior because not contracting any cohesion with the adjacent organs, it seems to be above them, and inferior because contracting an adhesion with the surrounding organs; the organs seem to come from the top of the fruit, or the fruit seems to be below all the remaining parts.

This is an important practical distinction, as it is plain that those fruits that have not only their appropriate vessels for their nourishment, but all the vessels that supply the different organs of the flower, will stand much less in need of careful attention for their safety and ultimate perfection, than those that are wholly dependent on their own vessels for accomplishing the same end.

While the apple, pear, and quince, which are inferior fruits, usually need no attention in regard to their crop of fruit, the peach, plum, grape, &c., which are superior fruits, need special care that all causes that tend to produce the premature falling of the fruit should be carefully removed, and on the other hand excessive quantities should not be allowed to remain on to ripen.

It is well known to all that the position of the seeds differs remarkably in different species. In some they are arranged in regular order in a single cavity of the fruit; in others there are several cavities. Sometimes they are attached to the centre of the cavity, at others to the circumference, and again there seems to be but little or no regularity in their arrangement. Sometimes they are arranged on, apparently, a single line, and at others spread over a large surface. Now, however various this arrangement may be, the fact is universal, that they are always attached to the edge of the leaf, or some development of it. The seed bearing point, line or surface, as the case may be, is called the *placenta*, and to trace its modifications, we trace the modifications in the arrangement of the seeds.

In the pea we see the fruit made up of a single leaf folded and united by its edges, and bearing its seeds on two lines, at the line of junction, that is, on the two edges of the leaf. Were it not folded the seeds would appear attached in a regular series along the margin from the base on one side to the base on the other, exactly as the miniature plants appear on the margin of the Bryophyllum. There is a stage in the development of the fruit when this is the case, in some plants at least, when the leaves that compose the seed vessel are distinct and nearly flat, and the vesicles that are to become the embryo, may be seen as small elevations along their borders. As the parts increase, the leaves approach each other, and become usually in some one of various ways soldered together, and variously folded. The soldering commences at the base of the carpellary leaves and proceeds upwards, and in some plants the soldering does not reach completely the apex, in which case the seed vessel is lobed, as in the saxifragas and others.

It is plain from the constitution of the seed vessel, that if it is composed of but one carpel it can properly have but one cavity, as the pea, bean, peach, cherry, &c., and that the number of cavities never can exceed normally the number of carpels, and if the seeds are borne at the centre, there ought to be as many cells for seeds as there are carpels, and if the seeds are attached to the walls of the seed vessel, there ought to be no divisions into cells, in other words, the fruit should be one-celled. These principles are in conformity with facts, or if not, we can easily account for the departure. We find in some cases seeds attached to a central placenta, and the seed vessel one-celled. This has been produced by the breaking up the dissepiment, or partitions, by the unequal growth of the parts. In the early stage of the development, the partitions were perfect, but subsequent expansion of the outer walls ruptured the dividing membranes, and the vessel became one-celled. In the cabbage, for example, on the other hand, we find a two-celled pod, with the seeds attached to the wall, which is a departure from theoretical principles, but the dividing membrane we find not to be a part of the leaf, but an excessive development of the placenta, forming a spurious dissepiment, as botanists call it.

Sometimes, we said, that we found seeds spread over a surface. This is well exhibited in the pomegranate, and this fruit, by the way, affords a most interesting object of study, and of which we shall make special use in a future number. The placenta in the pomegranate is spread over a large space, and folded on the inflected portions of the carpellary leaves, and hence we have seeds apparently borne by all the interior surface of the seed vessel.

To enter on the principles of classification of fruits, or to discuss questions of vegetable physiology in regard to points we have assumed as true, which have nevertheless been subjects of discussion with botanists, would exceed the limits you would wish to afford to this department of scientific research, and we shall leave this topic after exhibiting the changes which the ovule undergoes from its earliest stage to that of its perfect development, which we will do by the aid of figures in our next.

BLIGHT IN APPLE AND PEAR TREES.

The search for causes in many of the phenomena of nature often results in casting more perplexity and doubt over a subject of enquiry than existed at the outset of examination. We commonly possess some vague notions of a cause, which is a support to the mind for the time being, and blunts in a measure those unpleasant sensations which are always experienced when we are compelled to feel that the cause is totally incomprehensible and beyond the reach of our grasp.

Many undoubtedly have felt a degree of complacency in their supposed knowlenge of the potato disease, previous to their investigations of the matter, but we feel certain that many have closed them with a feeling of great disquietude, and have been obliged to acknowledge, to themselves at least, that the cause is in total darkness; an acknowledgment which is never made without experiencing painful emotions. It forms no part of our object to account for this fact, or to show more than that our inability to comprehend many of the common phenomena of nature is attended with painful sensations. We have no doubt many persons, if they will but recur to past experience, will be satisfied of the fact. The disease of fruit trees, which is usually known as the blight, by no means stands in striking contrast with the potato disease. In fact many of the phenomena of each are quite similar, both in appearance and in their ultimate results.

The potato disease commences in the leaf and stem, beginning with a drying of the former upon its edges, and extending rapidly through the whole texture. The same effects follow with all the leaves in quick succession, and sometimes, when the cause acts intensely, the stems and leaves become perfectly brown and crisp in a few hours. The same changes take place in the blight of fruit trees; first a leaf becomes brown and crisp, or several of them are attacked simultaneously, and the first thing which attracts our notice is the perfect death of a small branch which hangs down in the midst of a perfectly healthy vegetation.

The disease may commence in the middle of a large limb and extend both ways, and it often happens that the termination of the branch, the newly formed wood, is the last to die. If a limb partially destroyed by the blight is closely inspected, the following phenomena may be usually observed. Patches of brownish bark on the sides of the limb. These do not extend entirely around it. These appear at irregular distances, and are separated from each other by living bark, but they soon coalesce and extend around the limb, as well as in the direction of the base and apex. But accompanying the death of the bark of the limb, there is also the death of the apex of the expanding leaf buds. If these are closely examined, they are frequently found softened and of a blackish brown color, and the attachment of the surrounding leaves will begin to be loosened, the whole circulation being cut off or destroyed.

If the whole limb is observed, then, in this disease, while it is progressing, a close inspection reveals patches of a brownish or leaden hue, and a slightly wrinkled state of the cuticle—the leaves brown in spots, others totally brown and dry, and ready to fall off. If now we make an incision so as merely to raise up the cuticle, the cellular tissue below is perfectly brown, or blackish brown; the junction of the bark with the wood is also discolored, and the wood beneath soon becomes dry and hard, and perfectly impervious to the fluids of the limb.

If the above description is true, our intelligent readers will scarcely fail to recognize in the symptoms and progress of the disease a true vegetable mortification, beginning with a death of the outside, which proceeds from a small surface upwards and downwards, and also inwards. The circulation in the centre of the limb proceeds languidly for some time, so far at least as to furnish nutriment to the extremity, while all below is dead and destroyed. So, too, as in mortification of the limbs of animals, a line of separation takes place between the dead and the living parts, beyond which the disease does not extend.

In accordance, then, with the above remarks, we have in many instances of post mortem examinations, pronounced a verdict of *death from mortification;* at the same time we have been constrained to add that in view of the primary cause we were in the dark.

There is nothing which conflicts, so far as we know, with the view that all living structures may be subject to death from mortification or gangrene. In animal structure gangrene results from a variety of causes, and is always to be set down as an effect. In aged persons the toes mortify, or the extreme parts which do not seem to be duly supported by the fluids. In cases of high inflammation the parts sometimes die or mortify, and are finally thrown off if the part is not a vital one. It can hardly be supposed, however, that vegetables are liable to attacks of inflammation; we may, it is true, suppose that under a hot sun the fluids and the solids may be acted upon in a manner analagous to that which results in inflammation in animals—still we can by no means feel satisfied that is truly the case.

The gangrene or mortification which occurs in trees, seems often to result from want of vigor or strength in the tissues, though by no means are we warranted in drawing the conclusion that it is always so. When, however, we see a tree with rather delicate leaves, and with long, straggling, pendant branches, losing its leaves and branches in succession, we may suspect that there is a want of ability to supply the amount of sap to preserve the vital principle, and especially where we find that heading in the branches results in stopping the progress of the decay, by giving more energy to the remaining parts.

The death of vegetables from mortification described above, differs materially from death by the girding of the larvæ of insects. In this case there is not that peculiar unhealthy appearance of the tissue of the parts beneath the cuticle, and generally the whole limb dies at once down to the place where the insect has formed its trench. The oak, and in truth many trees, are destroyed by the operations of a girdler. This is a cause which is easily ascertained, the whole effects of which resemble precisely the operations we often perform upon trees for the purpose of destroying them; and we may add that the phenomena attending the death of the tree or limb is precisely the same. The source of nutriment in both cases is cut off, and the limb or tree dies simply of starvation. There is in neither case an infused poison, but merely a destruction in the continuity of the parts which transmit the sap from the roots to the branches. In this case we are able to trace the death to a satisfactory cause, and our verdict on a post mortem examination must be, death from girdling.

The late Prof. Peck, as is well known, discovered the cause of one species of blight, in the insect called the Scolytus pyri, which eats around the branch beneath the bark.

This kind of blight must necessarily be distinguished from the blight which we have described, and which we consider a true vegetable gangrene. The remedy may be the same, viz., extirpation. In the one case extirpation is performed for the purpose of destroying the destroyer; in the other, it would seem for the purpose of preventing the mingling of tainted fluids with those which are healthy, and by which it is to be feared the disease may be extended to the whole system. In support of this view of the matter, it may be observed that it is an established fact that the contact of diseased parts with sound ones, or the mingling of diseased fluids with the healthy, is invariably injurious; and that under such circumstances the disease propagates itself in a manner which may be likened to the effects of leaven. This, it is true, is one of the oldest ideas of cause in accounting for diseased or unhealthy action, though of late it has been brought before the public in a dress somewhat new. As we are now speaking of the cause of blight, it is but right that we should refer to a cause which has been assigned by a distinguished writer upon horticulture. The writer referred to maintains that it is caused by sap which has frozen during the preceding winter.

There are many objections to this as a cause of the blight here described.

1. If the sap is frozen, and is thereby changed in its properties, it can hardly be maintained that it is capable of performing the part of a nutritious fluid, and possess the required properties which shall fit it for the development of leaves. It is but rational to infer that sap, when changed essentially by any cause, should act in the first period of its circulation in its usual way, and then subsequently, after having performed the exact purpose of healthy sap, at last can cause the death of a part which it had brought into life and existence. Besides, it is no where shown that frozen limbs always result in their destruction, or in the destruction of the sap. Repeated freezing and thawing will undoubtedly destroy the vegetable organs, but in these instances the effect is immediate, and the limb or tree never puts forth its leaves at all. In the county of St. Lawrence, and in other parts of the state, where frost destroys a tree or a part of it, there is an entire end of it. It never exhibits a vigorous life, it never puts forth strong and healthy leaves and blossoms, but it is actually a dead tree, or a dead part, when the cause has thus acted upon it.

2. It is agreeable to all that we know of the effects of freezing

that the new wood, or the latest growth, should suffer most. Thus the young of peach trees in some locations is often destroyed. The ends of limbs are dead. But not so in blight. The disease rarely begins with the extremity, but usually in the middle of a branch, as has been already described, and this not until after the limb has been covered with a vigorous growth of leaves and new wood, or an extension of its branches has taken place. In such a case it can hardly be supposed that it is really the same sap which has been supposed to have been frozen in the opening of spring, or during the winter. This sap has already been expended in the growth of new parts, and a new formed sap supplies the plant with this circulating fluid.

3. It seems more consonant with facts, to infer that when a vegetable is destroyed, immediately or ultimately, by frost, that death takes place by injury which the solids sustain, rather than by the injury of the fluids. The change in this case in the fluids is an effect, and not a cause—the solids themselves being the organs by which healthy fluids are generated, though it still remains true that when the fluids are imperfectly formed, or are changed in their essential properties, that death or injury to the structure must necessarily follow, notwithstanding the solids are in a healthy state. The foregoing considerations are sufficient with us for the rejection of the theory which maintains that frozen sap is proximately the cause of blight in fruit trees. To these we might still add other considerations which go to disprove it. So we dissent, also, from the views of the author of this theory in regard to the proposed remedy, viz., a coating of whitewash. This seems to have been proposed from a misapprehension of the nature of the coating itself; for, in fact, so far as the coating operates at all, it must promote rather than retard the freezing of the sap. An earthy material, of the nature of whitewash, is a better conductor of heat than the porous and partially dry cuticle itself. The remedy which has been proposed for the treatment of blight, is simple, but strikes not at the root of the evil. The limb, when found affected, may be removed; it is no longer a living part of the vegetable system. A close inspection of the bark, with incisions of the cuticle, will show the extent of the disease, and all that is diseased may be removed at once. It does not follow, however, that because a limb is not removed that the whole tree will certainly die, for instances do occur where the tree lives on with its dead branches remaining. The knife, however, had better be freely applied, for the limb is irreparably gone, and the fear that contaminated fluids may occur, by which the disease is extended, should rather stimulate us to the excision of the member.

The period when the blight begins is about the middle of June, after there has been a considerable part of the growth of wood for the year. It must often seem that temperature has something to do with the disease, and still the only fact which favors this view of the subject, is time, for it is not to be supposed that a certain degree of heat will cause the disease, and if it has any thing to do with it, it is only one of the conditions. Without recurring to theoretical grounds, or those which stand upon the known properties of matter, as it regards the conductibility of caloric, we believe experience has fully disproved the theory.

The blight is evidently making sad work in many parts of New York. Both apple and peach trees are injured by this destroyer. We have in one instance observed from fifteen to twenty recently dead limbs upon a single tree. What is quite remarkable and beyond comprehension, is the fact that a single tree is sadly effected, while those around and equally exposed to the operation of general causes, remained untouched.

It seems from these facts, that in the vegetable as in the animal kingdom, death strikes a blow where it is the least expected, and in a manner or by an instrumentality which has hitherto eluded our search. We deem it, in the present state of knowledge, to be entirely unknown, so far as cause is concerned. The fact of the death and the phenomena accompanying it are plain enough, but by what agency the blow is struck, is wholly enveloped in darkness.

A profound ignorance of the cause of the blight does not stand alone. If the cholera in the human species is still wrapped in as dark a mystery as ever, it is nothing strange that a disease should attack the vegetable whose cause also should hide itself in the profound. We know far less of vegetable than of the animal structure, and less of the mode by which the imponderables act. It is not strange, therefore, that we often inquire unsuccessfully after causes, and that we are so frequently obliged to stop our inquiries at negative results.

THE GRAPE. (Vitis Vinifera.)

We have often been surprised at the little attention which is bestowed upon the grape culture. As a fruit, it possesses in itself the highest recommendation for deliciousness; and being at the same time perfectly free from injurious action when eaten almost to satiety, it is quite unaccountable that so little care is bestowed upon it. What, however, makes the neglect of the grape still more surprising is the certain profit which will be secured by the crop. Its growth is quick, it attains a great age, and is but little subject to disease or the attacks of destructive insects. Besides, it may rapidly be extended, or the crop almost indefinitely increased by increased care in its culture. No fruit then can scarcely be said to compete successfully with it; whether we take the ease with which it may be raised, the amount of crop which may be secured, and the value of it; whether it is to be consumed at home for the increase of our own enjoyment, or to be sent to market for the profit which it will there bring us.

All countries have their native grapes; and hence it is quite difficult to trace the history of the vine, and of its culture, to a satisfactory origin.

In Britain it is supposed to have been introduced as early as the commencement of the Christian era. In the earliest times it was highly esteemed, and the sacred books abound in allusions to its fertility and value; and hence it has become the emblem of prosperity in all countries.

Climate limits the culture of the grape. The latitude of 50 or 54 north, in Europe, may be considered as the boundary, beyond which, in the open air, it will probably repay for its culture. Under glass, many varieties may be cultivated in the northern sections, or colder regions of the earth, which would necessarily fail in the open air upon walls. But culture under glass is too expensive for the world at large; it is only the out door culture which repays fully the husbandman for his labor.

There is still another inducement to the culture of the vine. It is this; that almost any space which is adjacent to a wall is a fit one for the occupation of the plant, and will most surely succeed. Hence, in towns, where walls for training exist to an unlimited extent, in connection with yards of greater or less extent, its culture becomes an object of the highest interest. Indeed, it is only in the very densest part of a city, where smoke and other obstructions occur, that it is at all likely to fail.

The circumstances which favor the production of fruit, both in the vine and in all other productions of this class, is the due production of wood and fruit; that is, if the vine is suffered to produce by unskilful management a large quantity of wood, it by no means follows that a large quantity of fruit will be formed and ripened; and hence the practice of suffering the vine to spread itself over a large surface of wall is detrimental to the object of culture. The tendency of the vine to spread itself and to form wood to a great extent arises from the constant growth of the vine from its extremities; and the consequence is, that the fruit is carried a long distance from the root. This rapid extension of vine has to be counteracted by proper pruning; inasmuch as the amount of wood produced in almost all cases is sufficient to develop more fruit than it is possible for it to mature.

Besides, it must be borne in mind that the same wood produces fruit for one season only. Another capital error arising from too great an extension of the vine is its smallness, and consequent feebleness; especially is this the case, if its fruit is suffered to mature when the vine is young, and before it has gained sufficient vigor to produce perfect fruit. In this case there is too great a proportion of foliage; the small and slender vines develop very generally a vast amount, and the vines, too, being greatly multiplied, an enormous extent for evaporation is created by which the root can by no means supply the waste; and the consequence is, that the energy of the vine is greatly crippled. To obviate, then, these difficulties, the vine has to be pruned to a far greater extent than we are accustomed to prune other plants. Pruning at the proper time and to a proper extent is necessary to impart vigor and strength to what remains, and which is destined to the office of bearing fruit. The energy and power must not be wasted by a wide diffusion through numerous and extended channels and wide, evaporating surface; but all must be concentrated upon a comparatively small area, if excellent and abundant fruit is wished for. There is a principle which governs, or ought to govern us in the use of the knife, viz., to preserve a due balance between the wood-producing power and the fruit-producing power; inasmuch as these two powers are not the same. In their native countries respectively these two powers are balanced, or may be. But in removing the plant from a warmer to a colder latitude, the wood-producing power predominates; and hence we see that the plant may live far beyond its true latitude and appear flourishing, but yields no fruit. Hence, the necessity for trimming foreign grapes, while the native grape, in its own latitude, with its powers duly balanced, will always require less reduction in the amount of wood. The same principle may be applied to the cultivation of other fruits, where foliage and wood is introduced at the expense of fruit; let it be restrained by the knife, or other means, as the case requires.

Another thing which calls for remark, and which points to a detrimental practice, is the suffering of the accumulation of old bark upon the main stem. The intention of nature is that the vine, like the button wood, should cast or exfoliate the whole of the bark of the preceding year; but this it may not be able to effect; and hence it should be removed, broken up and covered with earth near the base of the main stem, where it will decay and furnish thereby nourishment to plant. In the wilds of nature this is one of the methods by which the plant sustains itself. A great amount of bark is produced annually; and it contains a large percentage of lime and element necessary to the health and well being of the plant. What nature performs or attempts to perform spontaneously should be known and followed by us, if we would attain success in its cultivation.

For the same reason we should not suffer the adjacent ground or border to be occupied by weeds, or even by useful plants, for in the same proportion that we allow the grounds to be exhausted by other fruit trees or by weeds, so in a like proportion do we rob the vine of its food, and thereby cripple it in its power to produce either an abundant crop of grapes, or those of a fine flavor and quality. It therefore should not be attempted to raise every thing in the small yards of a town; the object should rather be to produce a valuable quantity of good fruit of one kind or another, and not a little of an imperfect kind of several. In this matter we all err by cluttering up the garden with little patches of a thousand things good in themselves, but worthless out of place and company. As the vine, therefore, is so well adapted to growth upon walls and in narrow bounds, in consequence of its peculiar mode of growth, if we would profit the most by the use of the yards attached to our dwelling houses, so we may most profitably use them for the grape almost exclusively. Certainly we ought to give them a reasonable chance by a perfect destruction of weeds. The grape vine produces a great extent of root—nearly as much root as vine. Now, in the cramped condition in which we are frequently obliged to grow it, we must resort to some method by which a great surface for roots may be made, without obliging it to send its roots too far, and in innutritious fields. This may often be effected by the use of stones in the superficial soil; and in support of this plan we find that we are sustained by observation as well as experience. Stony and rocky places frequently produce the best of fruit. The best material, however, is found in large bones of any kind mixed freely in the soil, and to any extent to which the material may be procured. They furnish the same extent of surface as stones, and at the same time supply the plant with nutriment.

The above are all of them important considerations; they are sufficient reasons why the grape should be more extensively cultivated in town and country, and they are important as measures to be put in practice in order to secure a fortunate and profitable result. No doubt many are deterred from the cultivation of the grape from the poor success which has followed from some unhappy attempts, or from failures. These failures have often arisen from the use of foreign kinds or varieties. In the United States we have a few excellent native kinds, which are far better adapted to the purposes sought to be attained, than any foreign kinds which have ever been planted; for it is well known that the most successful cultivators have tried them and have failed, and have afterwards taken into favor the Catawba and Isabella, and have been well rewarded by the change. The native grape, then, is the only one which will be worthy of general culture.

To prepare the ground for cultivation, let a trench be dug about 18 inches deep, and from 30 to 40 inches wide. If the soil is not rich, mix with it freely any organic material, bones, rich loam, and decomposing vegetables. In the trench plant the roots from 6 to 8 feet apart. Generally in a yard in the rear of a dwelling, a single vine by proper management will produce as much as two or three which are within 2 or 3 feet of each other. The first and great requisite of success is a plenty of nutriment; and it so happens that the vine bears high culture with great advantage. Hence manure from the cow stable, blood and offal of all kinds, may be used freely without danger of over stimulating the plant.

When the American grape is selected, as the Isabella, it is not necessary to resort to severe trimming as is advised by European culturists. There is far more vigor, and our climate is better, and ten feet of vine may stand where one is allowed in foreign cultivation.

The object of the above desultory remarks are intended merely as an inducement for the more general cultivation of the vine in town and country. We have not aimed at giving special rules of culture. Many excellent treatises have been written upon the subject, all of which are within the reach of most persons. To them we would refer for the minute and special directions for the proper management of a vineyard, or a single vine trained to a wall in the rear of a dwelling. We shall, however, notice a work in another place which we have before recommended to our readers, and which describes in detail a novel method of cultivation, which has been attended with signal success.

LOOK TO YOUR PEACH TREES.

About the 10th of July, the crysalis of the Ægeria and that of another insect, also a borer, will be found at the base of the tree, enveloped in a casing of saw dust, which it has thrown out in its progress of excavation. In some instances, the pupa appears as early as the first of July, and will then be found in its envelope or porele. The pupa are yellowish and quite beautiful, but they are of different size and markings. Leaving their description to another time and occasion, we have but little more to say than this, that every peach tree ought at this period (July) to be carefully examined by removing all the dirt from the base of the tree, provided signs exist of the presence of the insect. These may be known by the gummy exudations as well as by the dust from the excavations of the animal. The pupa becomes a fly about the first of August, or the last of July. If suffered to hatch, it of course escapes, and will inevitably deposit its eggs where its instincts will direct it to its proper place, when it will find its way into the tree. It requires only a few years to complete the destruction of a large and healthy tree. The eggs or larvæ are deposited the last of September or first of October, probably near the base of the tree, where they are hatched, and from that point begin their excavation beneath the bark and into its wood.

TRANSACTIONS OF THE NEW YORK STATE AGRICULTURAL SOCIETY, &c., for 1846. Vol. 6, pp. 716.

The volume of Transactions for 1846, contains a large amount of valuable matter, relating to the several departments of husbandry. In addition to the ordinary transactions of the parent or State society and the county societies, it embraces several important essays and reports upon subjects of the highest interest to the farmer. It will be impossible however, to notice all the matter which is now laid before the public in this volume; we shall therefore select for remark and comment, those reports and essays which contain the leading doctrinal matters for this year. First in order then of the reports which we propose to notice, is that of the Assembly's committee of Agriculture, upon the establishment of an Agricultural College near the city of New-York. The petitions for an institution of this character, originated with the members of the American Institute, and the committee to whom the petitions were referred, was composed of A. Beckwith, Samuel Lawrence, William Temple, John McGonegal. This committee reported against the petitioners, mainly on the ground of the location proposed, and the inability of the State to furnish funds. In addition to which, it is stated that it is expected that when the funds of the State are called for to support objects of this kind, the petitioners shall show that they themselves have contributed handsomely for the purposes proposed. It was deemed moreover by the committee, that the State, when it gives its aid to scientific and literary institutions, that the benefits which would be likely to accrue therefrom, should have in prospect a wide diffusion; that the many should reap benefits therefrom, and not merely the few. An exception might be taken to the latter consideration, inasmuch as it might be said that those educated under the auspices of such an institution would necessarily distribute their information wherever they were located, and that the discoveries which might be made, would soon become the property of the public; and hence the many would be actually benefitted, and that it could not be confined to the few.

In looking at the matter as it seemed to stand in the minds of the committee, we are inclined to believe they are right; for it appears that the committee had a different plan in view, provided it was clearly ascertained that the State could spare funds for an endowment of this kind. In dissenting from the views of the petitioners, the committee deemed it proper that they should bring forward a plan for the diffusion of Agricultural knowledge. This plan as brought forward by the committee, is as follows, and here we shall suffer the committee to speak for themselves.

"The plan alluded to is to encourage the study of agriculture in the Normal school, and in the academies and local institutions which are already established and endowed in all parts of the State; we would also encourage its study in our best common schools. It is here that the elements of agriculture might be laid; for its foundation may be regarded as being based upon a knowledge of the elements of bodies. Scholars, we believe, of the age of ten or twelve years may begin to learn with profit, the properties of things, or to study the essential characteristics of the common forms of matter, embracing as far as possible the varied forms which occur in the great field of nature. The advantages of beginning thus early are to create habits of observation and to strengthen the power of discrimination. It would serve to produce this general power or ability to distinguish things, to see their common characteristics, to learn what is essential and what is accidential. While this part of an education may be regarded as peculiarly necessary to the farmer, it is certainly no less so to the citizen as a member of society. These principles lie at the foundation of all correct experiments in agriculture, inasmuch as the correct knowledge of characters and phenomena enable the experimentalist to distinguish the true from the false, the accidental from the essential.

"Lads who have gone thus far may be said to have fairly commenced the study of agriculture, though they are still in the common school. With this knowledge they may go up to the academy in advance. It is to these institutions that most of our young men may resort; that is, they are not shut out for want of means; and we believe that many more would attend our academies were it known that agriculture with its collateral studies constituted a prominent course of education. This we are aware would be a new feature in them. We are about to make a remark which we presume will not be considered orthodox by those who stand in the ranks of the literati of our country, viz., that the study of Latin and Greek is a bar to the general education of farmers' sons; we allude to those who design to pursue farming for a living. If this is true, and we have no doubt of it, we may readily imagine what the result might be, if instead of the undue encouragement of the study of the dead languages, agriculture and its collateral branches were encouraged. We should, no doubt, see the academies filled with students; where one is educated, five, or perhaps ten, would be, under the new plan. And why should not such a change be made? The farmer's son may be educated with a good agricultural education, and all that is necessary as a citizen, without spending time to study the dead languages. If the mind is applied to the investigation of any subject it becomes disciplined. Close and intense reflection upon the phenomena of nature unshackled, would be much better than the study of these languages. We quote Professor Johnston; by his opinion we feel sustained. He thinks—"It is quite certain that the course of education pursued at most colleges and universities, is quite unsuited to qualify men for the common business and pursuits of life. Indeed, it would seem in many cases to operate as a positive disqualification; and men who have distinguished themselves at our universities for their classical and scholastic attainments, are often thrown upon society as helpless and incompetent to provide for themselves, or to serve the community, as children."

But again, our plan for educating farmers' sons is simple, and we believe feasible, and we think too, will prove effective. Let then, their education in agriculture begin in its elements in the common school. At the proper age let them go up to the academies, and there pursue, in conjunction with agriculture, algebra, mensuration, geometry, natural philosophy, physiology of vegetables and animals, geology and chemistry, and political economy. These may be pursued in several successive winters, depending much upon circumstances. The summers may be spent upon the farm at home, and under the care of the father or some experienced farmer, where the scholar may put in practice these principles of agricultural chemistry which he has been taught. If the mind has been properly awakened at the academy, these alternate periods of study and application of principles and of work, will go together, and will become the most effective way to the improvement of the individual. But the individual will not be benefitted only; the family and the neighboring families must also partake more or less of the benefits of the plan. The principles of agriculture must be spread widely, and so must its improve-

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ment and discoveries, which, beginning as it were at a point, will extend outwards like the radii of a circle.

"The school and the farm become by this plan mutual aids. The principles are acquired in the school, and the scholar becomes ambitious to test them in the field; from which it would follow, that the whole state, with its different soils and climate, becomes one great experimental farm, every intelligent farmer an intelligent experimentalist, every farm a model farm, and every farmers' son a teacher or at least an earnest learner. Such a state of things become in themselves *creative*; not merely sustaining such as would advance the outpost of our knowledge step by step into the present uncertain and unknown. The collision of minds, when put in working order invariably results in progress; possibly it would result in an overthrow of present doctrines; still it would be progress, and this is what we wish to effect, when the aid of the state is given for the promotion of a science, not merely to give a living to a few, but to give an impulse to the progress of knowledge in the many, and that a wide dissemination of truth be promoted; and it is for this reason that we propose rather the planting of many standards of education than a few, that many may be elevated and enlightened, rather than a single band whose influence would be confined to a limited sphere."

We propose then to encourage the study of agriculture. By the plans briefly detailed in the foregoing extracts, it appears that the committee hope to secure a wider and more speedy dissemination of the principles and practices of a productive agriculture, than by the slower and more limited process which must be incident to a single institution. The only question is, will the academies take hold of the subject with sufficient enthusiasm to secure the end contemplated by the committee. That there are many institutions already incorporated, which can engage in teaching agricultural chemistry, and in the institutions of experiments, there can be no doubt. It may be that the plan of the institution now followed, will have to be somewhat modified, is highly probable. The academies of New-York are of a high order, and many of the gentlemen who stand at their head, are competent to direct the principles of an agricultural education, as we can find in any other station. Ability is not wanting, and the institutions are already endowed and partly supplied with apparatus; and being located in fine agricultural regions, they seem to hold out the prospect of becoming highly important auxiliaries in the cause of scientific agriculture. The committee in concluding their report, remark:

"It may be said that the academies are not supplied with teachers capable to instruct in the departments proposed. But it is believed that the present teachers, finding what the sentiment is, in regard to this matter, will proceed to qualify themselves for the additional department. Interest will direct this course, for already the study of agriculture has been introduced into some of our best academies, and hence, others must follow the lead, if they would sustain themselves. This plan too, if favored, can scarcely fail to excite the honorable ambition of excelling, or of rivaling neighboring institutions in excellence; a sentiment which might well be encouraged by an award of medals, either by the State or county societies, in which such institution happened to be located.

"We look upon agriculture, as the most important interest to the people of the state, and regard every movement with pleasure, which is calculated to advance its interest; but we consider that to be educated a farmer, means something more than the mere ability to hoe corn, or to breed, buy and sell cattle. We hope the day is not far distant, when an uneducated farmer will be as rare a person as an uneducated lawyer, physician or minister. We mean, too, by an education something more than a knowledge of the mere routine of the farm, and farming operations; we mean by the term, a mental training, by which the man who works amid the complicated arrangements of the subtle and refined agencies of nature, will be able to understand those arrangements and give direction to the laws which control them."

It may be said the committee by no means assume an attitude of hostility to the project brought forward by the American Institute. With them it was a question of ability on the part of the state and of time. It appeared to them, that like the ordinary means which are designed to give a common school education to every child in the land, so ought every farmers' son be placed within the reach of an education that should fit him to fulfil its duties in a better manner, and more understandingly than they are at the present prepared and understood by the mass of farmers in the land; and though that high state of cultivation might not be attained, still the many who would thus be benefitted, would over balance in its power and influence, the few who might and would be educated at a single and well endowed institution. This comports with the genius of our institutions. In a word, shall we educate a few young men for a particular service and leave the mass in comparative ignorance? Or shall we educate even many in order to fit them, as in England and Ireland, to superintend for their lords the cultivation of large estates? The differences between the situation of laborers in New-York and England is so great, that the plan and objects of education must essentially differ. We proceed now to speak of an Essay by Dr. D. P. Gardner, on special manures.

The object of this essay, as announced in the introduction, is to show the "expensiveness of farm yard manure." Dr. G. first goes forward and speaks of the expense of farm yard manure, in which he seems to include the entire expense of raising and storing the food of the animals who furnish the manure, as well as the time and cost of feeding them. In the same connection, the Dr. defends his calculations of the cost of the manure on the plan which is said to be adopted in England, of buying steers or young cattle for the sole purpose of making manure; alluding at the same time to a practice common in Dutchess county, of purchasing western cattle in the spring and grazing them until fall when hey are sold in New-York. The cost is said to average $20, ınd then in the fall to average $30 per head.

We wish by no means to charge the Dr. with a misunderstanding of the whole matter; and yet we cannot assent to his propositions. We regard this part of the husbandry as merely incidental. The hills of Dutchess are well adapted to grazing, and here an extra number of young cattle can be supported during the grazing season, at the end of which, the growth and improvement of the stock for the time being, enables the farmer to realize an advance on the first cost, more or less, according to the state of the market. The assumption is, that the entire farm is devoted to the support of 100 head of young cattle, and that they exhaust it of its provender is not correct. It is also assumed that in order to take care of this 100 head of young cattle, two men and a boy are required, at an expense of 276 dollars. All the expenses of the system are supposed to amount to $1,046, and the sales to only $1,000. Now without further comment, it is well known that the farmers of Dutchess do not farm it in this way, and at an annual loss, as is here made to appear. Hence upon the face of the statement, it appears that there is some error in the supposition, that the Dr., in order to make out the original assumption that barn yard manure, *if used*, will run the farmer in debt, has not given a fair or correct statement. It is not true that the provender is exhausted, nor that it requires $276 to take care of 100 hundred head of young cattle in pastures as well fenced as those of Dutchess.

The question is not, whether the system referred to above is wholly right, but rather is it not such a system which, when well followed out, especially that part of it which concerns the use of barn yard manure, one which has been eminently profitable. That more money may be made than has been made, is no doubt true. That it is expensive to distribute barn yard manure over the farm there is no doubt; but is not the expense well incurred, and do not those farmers who do incur it get rich. Experience is certainly some test to which we can safely appeal.

Again, the nature of farm yard manure and the amount of vegetable matter it contains.

Under these two heads, Dr. Gardner makes an estimate of the value of barn yard manure; and guided by the investigations of M. Boussingault, it is considered that 1,500 pounds of barn yard manure is equivalent only to 50 pounds of bones, from 20 to 40 of guano, 28 pounds of nitre worth 2½ cents per pound, &c.

The solid matter of 1,500 pounds of barn yard manure amounts to only 300 pounds, 200 of which is vegetable matter analagous to straw. It is maintained that 1,200 of the 1,500 is useless water, and that the 210 is no better than chopped straw; and that the real value of the entire load which costs one dollar, is contained in the 90 pounds of mineral matter. We have ever been unwilling to dissent openly from the opinions of such men as Boussingault, and yet we never could regard the experiment by which 1,500 pounds of manure is reduced in value to the 300 pounds which is obtained by drying it at 230° of Fah. What is lost we have never believed to have been simple and pure water, inasmuch as exposure of manure to the ordinary temperature of the atmosphere in summer, is sufficient to dissipate most of the nitrogenous compounds. We do not obtain an expression of the value of the manure, but the amount of solid matters, which in order that they may be rendered useful must not only be combined with as much as they originally contained, but also with much more. The manure is still reduced in value by comparison with 40 pounds of nitrate of lime, which any farmer, it is asserted, can make for ten cents. The 40 pounds of nitrate of lime however is equivalent to the four pounds of nitrogen in the 1,500 pounds of manure.

A reference is also made to the practice of the Hindoos, who burn their manure and use the ashes only, and who also irrigate their lands with salt petre water. According to the estimation of the value of the equivalent here furnished us by Dr. Gardner, what is the worth of a load of barn yard manure? The nitrogen amounts to 4 pounds. Its value is represented by 28 pounds of nitre, worth 2½ cents per pound, which equals 70 cents. There is then 90 pounds of solid inorganic matter, consisting of phosphates and carbonates, which cannot be of less value, than half a cent per pound; this part is then worth 45 cents. The real value then of a load of barn yard manure must be reckoned at 115 cents. The inorganic matter of 1,500 pounds of barn yard manure must be worth as much as the same weight of inorganic matter of bones or guano. There is nothing but what is necessary and essential to the growth of vegetables and animals. A load of manure, if its value is estimated by equivalents, is worth the dollar the farmer pays for it, for it cannot be doubted for a moment that the nitrogen and the inorganic salts are in the best condition possible for becoming the food of plants. The objection seems to lie in the expense of carting out what is considered the useless water, if it is indeed useless; for without this it is of no value unless it is burned as is proposed. But again: suppose a farmer should burn his manure, would he not probably find it as expensive as carting it out upon his fields? In the hot climate of Hindostan, we may conceive that it will dry readily, and when fuel is scarce it may be substituted for it, and it is undoubtedly well to gather the ashes for fertilization; but does it follow, that because in the torrid zone where the dung is necessarily burned for fuel, that the farmer of Dutchess county can profitably burn it, singly for the ashes it contains? Neither will a farmer of old Dutchess neglect his manure heap and let it waste and spoil, and engage in the manufacture of nitre to supply its place. Now every practical farmer knows how the farm yard is managed; and he knows too that manure does not cost him a dollar a load, though in making an estimate of the cost of a crop it is sometimes put down at that rate; and yet we have often seen the value of a load of manure set down at one shilling per load, and that the hauling and spreading cost one shilling per load more, making twenty loads of manure to cost after it is spread five dollars. In regard to the mineral portion of the manure, it is proper that the essay should speak for itself; thus on page 216, under the head of the mineral portion of the manure, it is said:

" We now come to the consideration of the remaining 90 pounds of solid mineral matter obtained by burning 1,500 pounds of farm yard manure. The composition of this will depend upon the provender, therefore we will allow the animals to be fed on the finest hay. One hundred pounds of the ash of fine hay yield according to Sprengel,

Potash and soda,------------------------	24.0	pounds.
Lime and magnesia,----------------------	16.0	do
Sulphuric acid,-------------------------	5.5	do
Phosphoric acid,------------------------	0.5	do
Sand, carbonic acid and other unimportant bodies,-------------------------------	54.0	do
	100.0	

Therefore 54 per cent of the 90 pounds of animal matter in the load will be sand and substances in no way important or valuable. There will be 24 pounds of potash and soda, quantities accurately represented by 100 pounds of unleached ashes from the maple, hickory, oak or chestnut. Sixteen pounds of lime and magnesia are to be had by taking about double that weight of air slaked lime. The sulphuric acid, existing in the grass as sulphate of lime or gypsum, is accurately represented by 16 pounds of ground plaster. All the phosphoric acid found in the ash by Sprengel, is only equal to two pounds of bones. According to these valuations the ashes of a load of farm yard manure of 1,500 pounds are represented by

1 bushel of ashes,	worth,		12½ cents.
30 lbs. of air slaked lime	do	less than,	1¼ do
16 lbs. of plaster,	do	do	¼ do
2 lbs. of bones,	do	do	½ do
Worth less than,			14½ cents.

The value does not exceed 12½ cents in truth, for there are more of the above quantities in most kinds of wood ashes. None of these bodies can be shown to have more activity in the form of manure ashes, than in any other mixture, or in wood ashes. I do not undertake to advise any body to burn their manure for the ashes, and do not wish to be understood as hinting at any such practice, but only that the ash of farm yard dung is nothing more nor less than the ashes of the straw used for litter and of the provender. The effects are in no way dissimilar. However derived, the lime, potash, bone earth and gypsum are slowly dissolved in the rain water which falls on the soil, and enter plants, serving many important offices therein."

In this estimate of the value of the inorganic portion, more than one half is thrown away or useless under the denomination of sand. Ought it to be regarded in this light? Is not the matter here denominated useless sand, an element essential to the perfection of the vegetables upon which the animal is fed? Is it not the same as soluble silica? And if so of the highest value to the growth of cereals? We believe that every particle of the inorganic matter is valuable; that as voided by the animal it is in a condition to enter readily into the organism of plants again; but if burnt, the doctrine which we suppose is contended for, not only all the organic matter is lost, but the silica of the inorganic matter is in a less soluble state, and its value as a manure is diminished.

These remarks are not directed against the project of forming composts with ashes, lime, bones, &c., but we deny that a mixture of one bushel of ashes, 30 pounds of air slaked lime, 16 pounds of plaster and 2 pounds of bones, can be substituted in the long run for barn yard manures; and even at this estimate according to some farmers, it will be seen the mixture cost as much as a load of manure. But then the manure of the yard possesses other properties than those which have been alluded to; that of giving porosity to the soil, and increasing greatly its absorbing powers; both as it regards water and ammonia. And then the condition of barn yard manure as it regards its immediate and remote effects, is not to be overlooked in our estimates of its value. In the subsequent part of the essay, several pages are devoted to the consideration of fermentation, or to the notions which are by some entertained of the importance of the fermentation of manure in the ground. As this subject does not bear upon the question of the value of a load of manure, we shall pass it over without comment. Dr. Gardner very properly speaks of the value of special manures; those manures, which in their composition are fitted to supply the plant with its inorganic matter, and still we appeal to farmers whether in their experience, barn yard manures taking wet and dry seasons into consideration, and others which attend its accumulation, it is not the cheapest and best. Guano is powerful, it is valuable, provided you can control the season. Farm yard manure never fails in its effect upon vegetation, if properly put into the ground. It may be used in excess, and there are crops to which other matters are better adapted; and still for general use and for all seasons as they come upon us, where has a better material been found. The use of it does not preclude the use of others, of gypsum or of lime, all must be used sooner or later; but it must not be forgotten that organic matters must exist in the soil. Some talk of a total absence of it. The assertion is extravagant and false. No soil is destitute of it, but it is often deficient; and when that is the case your ashes and lime, and nitrogen are powerless.

The conclusion of Dr. Gardner's essay is in the following words:

"The basis upon which the doctrine of special manures rests, is unquestionably firm and perfect, but there are still some facts wanted to enable practical men to adopt it. That some crops require lime, others soda, others potash, sulphuric acid, phosphoric acid, &c., is beyond dispute. Equally apparent is the truth that to give every manure to such plants is inexpedient and wasteful. The difficulty rests in two points; the possibility of making proper special composts at a reasonable rate, and a want of experience with such mixtures. On the first point I can speak confidently. Manures exactly resembling the ashes of any vegetable can be obtained at a cheap rate, and composts made containing the same ingredients and in a more soluble and advantageous condition, for vegetation, at a trifling cost as compared with good yard manure. To do this it is necessary the farmer should make the necessary substances for himself, as many are not in the market, and all that are so, sell at exorbitant rates, as compared with the price at which they may be made. To attempt any detail of this art would be fruitless, the manufactures are sufficiently simple, requiring little or no fixtures and inexpensive, but they do require chemical knowledge, and I should utterly fail to explain them without using much technical language and far exceeding the space of an essay."

We have omitted the latter part of the paragraph as unimportant. The doctrine of special manures is undoubtedly advancing and making progress in the minds of intelligent agriculturists; still it is not probable that any particular element or any particular composition will be found generally useful. This we have no more reason to expect than that one kind of food is to be prepared which shall be applicable to the wants of all animals; or if we take the bark, leaves, seed, woody fibre, and all the part of a vegetable into consideration, we shall undoubtedly be satisfied that every special manure must consist of the alkalies, lime, phosphates and sulphates, and silicates; for there are but few plants whose ash does not contain them all, and how those elements must always be present, but in different proportions when intended for different crops; and it is for this reason that the excrements of the herbivorous are so valuable for manures; they contain all these elements in the proportion which is more generally applicable to the want of the cultivated plants, than any other known to farmers.

The Improvement of the Plow in the United States: By A. B. Allen.

This essay embraces a history of the improvements of the plow in the first part, and contains a description of several of the best plows now in use. The American farmer is under obligation to Mr. Allen for this paper, inasmuch as it embodies his own valuable opinions in regard to the different kinds of plows in use in this country.

Plank Roads: By Geo. Geddes.

This article is quite appropriate to the objects of the Transactions. Roads and their special improvements are matters of the highest importance to the farmer. Their produce must go to market, and as some sections of the country are more favored than others as regards facilities of reaching them, a community of farmers can never consistently with their interests throw obstacles in the way of the creation of roads of easy transportation.

On the construction of plank roads, Mr. Geddes gives the following important directions, p 249:

"In constructing plank roads, it is necessary to have the earth upon which the planks are to be laid, broken up and made fine, that they may touch the earth at every point. This is important, for if any space be left for air under the plank, or along side the sills, dry rot follows. The sills should not be large; four inches square is sufficient. They should be perfectly bedded into the earth, and there should be broken earth under them, care being taken that they should not rest firmly upon rocks or other hard substances, that will not allow them to settle.

All earth formations of this nature will settle some, and the sills must be permitted to go down as the rest of the structure settles, or a space for air would be left between the plank and the earth, and the sills would thus support the plank; whereas the plank should rest upon the earth at every point. Nothing is gained by wide or deep sills, and the whole support of the road is the earth that is covered by the plank, and the amount is in no wise increased by wide sills. The chief use of sills, is to grade by, and to keep the road in form until the earth has become settled.

There is in the vicinity of Toronto a short plank road that has no sills at all under it, and the grade is very nearly as exact as in those roads where sills are used.

The plank having been laid, the next thing is to grade a road some ten or twelve feet wide on one side, and two or three on the other, by taking earth from the ditches on each side, and bringing it by a dirt scraper just up to and even with the upper side of the plank, so that if a wheel runs off the track it passes upon a smooth surface of earth. The ends of the plank should not be laid even, but a part should project from two to four inches by the general line, to prevent a rut being cut just along the ends of a plank. If the ends of the plank are even, and a small rut is made, the wheel of a loaded wagon will scrape along the ends for some distance before it will rise up to the top of the plank, unless the wagon moves in a direction nearly across the road; but if the wheel cannot move two feet forward without coming square against the edge of a projecting plank, the difficulty of getting on the road is avoided. It is not necessary to pin or spike the plank to the sills.

Perfect drainage must be secured, and to that end the ditches must be deep and wide, and good sluices wherever water crosses the road. This is an important point—DRAIN PERFECTLY.

The thickness of the plank must be decided by the amount of travel. If it is sufficient to insure the *wearing* out, and not the *rotting* out of the timber, four inches is the thickness; if that thickness is not justified by the travel, then three inches should be used, but not less. The kind of timber is, too, a point that must be controlled by circumstances. Pine is used at Toronto. Hemlock on the Salina road. In some of the western states it is likely that oak might be procured at a reasonable price. The number of feet (board measure) of lumber required for two sills four inches square, for one mile, is 14,080 feet. Plank, three inches thick, for a single track eight feet wide, will measure 126,720 feet. The grading and laying a track, will vary in cost, according to circumstances. When an old road is used, and hills are not to be cut down, or valleys to be filled up, it will not vary much from fifty cents a rod for one track.

In those sections of the country where lumber is cheap, plank roads must go into very general use; and in some localities, it is the only road that can be made to endure the changes of the climate with any resonable outlay of money. Less power is required to draw loading over them, and they are superior in every respect to McAdam roads while they last."

Preparation of Sandy and Light Soils for Wheat: By the Hon. Elias Cost, Ontario county.

The new plan detailed quite briefly by Mr. Cost consists in plowing but once, and following with the cultivator for the purpose of exterminating weeds.

One great object which Mr. Cost wishes to secure is the consolidation of the soil. He deems it of no consequence how hard it is, provided sufficient earth is obtained to cover the seed. The principle is unquestionably correct, and is highly important to be remembered in cultivating for wheat all loose and porous soils.

Galloway Cattle : Their adaptation to this country. By Sanford Howard.

Mr. Howard, whose opinion and judgment is always worthy of reliance, recommends very strongly the Galloway cattle. We copy the following paragraph from pp. 284–5:

"This breed of cattle derive their name from that district of country in Scotland, called Galloway, which embraces portions of several counties. They are unquestionably an aboriginal breed, belonging rather to the mountains, than the lower country, and have probably been bred, down to the present time, in greater purity than most other breeds. Youatt observes, 'there is, perhaps, no breed of cattle which can more truly be said to be indigenous to the country, and incapable of improvement by any foreign cross, than the Galloways.'—(*British Cattle, p.* 163.) The same remark is made by Prof. Low. 'The breed of Galloway,' says he, 'is peculiarly confirmed in its characters, and thoroughly adapted to the condition of the country. * * * * It would be a retrogradation in improvement to attempt a mixture of blood with a race so long acclimated, and so excellent in itself, as that of Galloway. The great advantage of having a breed, possessing a uniformity of characters, is manifest in Galloway, as in every country where a fixed race with determined characters exists. The breeder has always in such a case, as was before observed, the assurance of being able to reproduce in the offspring, the character of the parents; whereas, in countries where no uniform breed has been established, he never can be so assured of the result of coupling animals together. The cattle of Galloway, though they have all the characters of resemblance which constitute a distinct breed, yet vary greatly in size and form, according to the fertility, natural or acquired, of the farms on which they are reared, showing the importance of providing an increase of food for the animals, when growing in bone and muscle.'—(*Low's Illustrations of Domestic Animals, p.* 16.")

SOILING: By R. L. PELL, Ulster county.

A man of wealth may do as he pleases. He may soil or pasture, as suits him. But soiling is regarded certainly with high favor by many intelligent farmers. Soiling has its peculiar advantages, and there are undoubtedly many whose location makes soiling the most productive mode of stock keeping. Mr. Pell says, p. 293:

"For the last four years it has been my constant practice to soil, not only cows, but hogs, oxen and horses. My yards are large, enclosed by stone walls, and so arranged as to collect all the manure in the centre. There is a pump and trough convenient to it, and open sheds where the animals may lie and ruminate at pleasure. Three times each day, at stated hours, green crops are cut and brought to them, such as clover and timothy grass, green oats, green corn stalks, green buckwheat in bloom, root tops, &c. Occasionally, by way of change, dry hay and straw are cut up and given to them, mixed with sufficient wheat bran to induce them to relish it. The stock are never permitted to waste anything; that left by the cows is given to the horses, as horses will eat after cows, and vice versa, cows after horses; but they will not eat after each other. The leavings of the horses is then fed to the hogs. The animals are enabled to consume their quantum in about thirty minutes, when they immediately lie down, rest, take on fat, and secrete milk. If pastured, they require many hours to obtain the requisite food, besides laboring diligently, which has a tendency to prevent the secretions, either of fat or milk. They have but little time to ruminate; and when driven to and from pasture, run wildly about the field; are whipped, stoned, and chased by dogs, which causes them to become feverish, and, as a result, contract their milk vessels.

THE HESSIAN FLY: By ASA FITCH, M. D.

This important contribution to one of the most important branches of agriculture, has already appeared in this journal, to which it was originally communicated. It is, as is well known, well illustrated by steel engravings.

On the Choice of Trees and Shrubs, for Cities and Rural Towns: By D. J. Brown.

The cultivation of trees and shrubs indicates a man of taste, and we think, too, an honest man. The cultivation of flowers indicates a lady of taste, and, we think, one of a pure mind. The contemplation of the work of one's hands, in planting trees and raising shrubs and flowers, leads the mind to entertain sentiments full of kindness and love. A rascal, a knave or a poltroon, never sets out a tree or cultivates a rose. It may be, it is true, that there are persons who cultivate trees and flowers whose ideas, all taken together, might be confined in a fair sized snuff box; yet it will always be found that their ideas will be commendable in kind. Mr. Brown gives a long list of trees and shrubs which are worthy of cultivation. We like them all, and dislike in all cases invidious distinctions. Every tree fills a place, and if our grounds are ample enough, the entire American sylva should be planted there.

Prize Essay on the Canada Thistle: By A. Stevens. (With a plate.)

Mr. Stevens takes a rational and common sense view of this prickly pest.

Mr. S. enters with much spirit and length into the history of this plant, which in itself is quite interesting. We cannot, however, find space to give more of Mr. Stevens' essay than what he terms deductions, p. 427:

"From a collation of what others have done, and from the experiments above detailed, the following conclusions may be deduced.

Whatever will effectually exclude the plant from the light and air will destroy it. This may be done by plowing, in some soils, and in others by a close grass sod. Plowing, if repeated frequently in soils, where the root does not descend beyond the reach of the plowing, will, in dry seasons, always destroy the thistle, and often in moist ones. In soils which are light, deep, rich, friable, and of course permeable to the air, and are in some measure always moist, plowing will always fail.

Wherever a dense sod can be formed, the thistle may be destroyed by seeding. The grasses, wherever they are adapted to the purpose, will be found the easiest means of destruction; although not so rapid as plowing, hoeing, salting or burning, where these latter are available.

In all uplands, where the soil is of a depth admitting the root to be reached and effected in its whole extent by the plow, hoe, fire or salt, the thistle may be destroyed by these means, and they will be found the most rapid ones.

In all bottom lands where the root descends deep, and the so permits access of air, neither the plow, hoe, fire or salt will destroy the thistle; here the grasses should be applied, and will be found the best destroyers.

Mowing will destroy those parts of the thistle which have thrown up flowering stalks; and will not in the least affect those which have not. Mowing should take place when the plant is in bloom.

Whatever limits the thorough application of the means of destruction, will proportionally diminish success. Hence it will be found difficult in very stony grounds ever to eradicate the thistle; the plow cannot effectually reach its roots, and such ground is rarely a good grass bearer. Salt and sheep, with the scythe, will be found best for stony grounds. In grounds filled with stumps, where the soil is rich and will grow a dense sod, the grasses will be best, and in such the plow should not be used, as it will not effectually reach all the roots. Fences that obstruct the application of the plow or hoe, should be removed.

If it is desirable to destroy the thistle by the grasses, it will be found best to make the land rich by manure. This will force the grass, and enable it more readily by vigorous growth, to kill the plant. And in the application of all remedies, care should be taken to reduce the soil by proper cultivation, to a fine tilth, that all the seeds of the thistle in the ground may germinate, and not lie dormant. The seed is very hardy, and escapes all the ordinary means of reaching the plant, except fire.

Precautionary Advice.—In regions infested with the Canada thistle, when new lands are to be cleared, let the under brush and rubbish be cleared out and the ground sown to grass. When the grass has well taken root and a sod is formed, the trees may be cleared off and the thistle will not appear.

When the thistle first appears, attack it at once; it may then be easily destroyed. If neglected it will become a formidable enemy, and time and patience and much labor will be required to subdue it.

Conclusion.—If this essay shall induce even one farmer to attempt the eradication of the thistle, a good will be done by it; if it direct attention to the subject and stimulate to action, the object of the writer will be attained."

In this connection we would by no means pass over the experiments of Mr. Sereno E. Todd, of Tompkins county. Mr. T. makes the following very judicious observations, which, though contrary to the views we have entertained, yet appear to be founded in reason and sustained by experiment, p. 431:

"Whenever Canada thistles have taken possession of land which I do not wish to plow at present, or on land which is filled with solid stumps, roots and stones, which cannot *all be plowed up deep,* I *mow* them close to the ground as soon in the season as they are high enough. I am fully satisfied that it is far better to mow them when they are about six inches high, than to suffer them to remain until they are nearly ready to blossom. My reason for this treatment is plausible, I think. If the stems are permitted to get a great growth, the stolens will increase in proportion. But if the stem is kept down, the roots will discontinue to spread; and, therefore, the thistles are kept on a smaller compass of land. But if they are cut just before they blossom, the effect upon the root *immediately connected* with the large stem, is more fatal; whereas, the stolens, on the border of the patch of thistles, will suffer little or no injury by the cutting of the parent stem; and will shoot up new stems, and push forward other stolens about as rapidly as if the old stems had not been cut. Now, by keeping the top or stem cut down *often*, the extension of the stolens is greatly retarded; and if the top is cut a few times close to the ground, the stolens cease *entirely* to grow. Experience has satisfied me, that once mowing in the former part of the season, checks its propagation by stolens more than *two* mowings afterwards."

Pigeon Weed or Red Root, Wheat Thief, Lithospermun, (stone seed.)

This is the last of the prize essays, and may be regarded as highly important to the wheat grower. Its mode of extirpation is by a rotation of crops, of which wheat forms the first and most important. After plowing in the fall, and the free use of a heavy cultivator, the ground is prepared and planted with corn. The next season, after the same treatment with the plow and cultivator, the ground may receive a crop of barley or peas. It is by the frequent use of the cultivator, and one hoed crop, that the wheat thief can be wholly extirpated.

DESCRIPTION OF A TOOTH OF THE ELEPHAS AMERICANUS.*

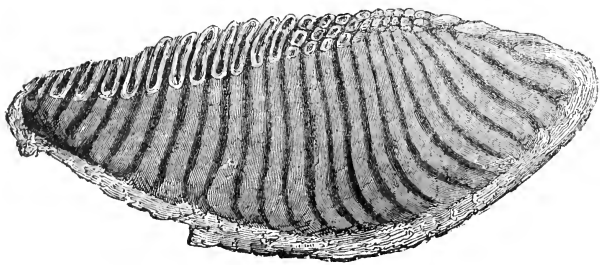
BY SAMUEL WOOLWORTH, PRINCIPAL OF HOMER ACADEMY.

A fossil tooth of this species has lately been found in the bank of a small stream, about two miles north-west of the village of Homer. The stream had washed away a portion of the bank,

* De Kay, N. Y. Fauna, p. 110.

and left a part of the tooth exposed, lying about twenty inches below the surface, in an alluvial formation, resting on a base of gravel. The stream has been making encroachments on this bank, as I have been informed many years; and its present bed is evidently removed several rods from that in which it formerly flowed. The tooth is in a very perfect state of preservation, exhibiting the laminæ undecayed, and the enamel on the grinding surface as highly polished as if it had just been removed from the mouth of the animal. The interstrictial substance, and the bony part of the laminæ, are removed about a quarter of an inch below the enamel, both on the grinding and lateral surfaces. The length of the tooth is twelve and a half inches—its depth five inches—and the greatest width of laminæ on the grinding surface is three and a half inches. The whole number of laminæ is twenty-three. Of these eleven occupy five and a half inches, measuring from the anterior part of the tooth, and are undivided on the surface. To these succeed five which are divided on the surface into three parts—the divisions apparently not extending down more than half an inch. The remaining laminæ are divided, two into five parts, two into four, one into three, one into two, and then follows a single one. The divisions on the surface have a compressed cylindrical form. The anterior part of the tooth, on the grinding surface, is much worn, apparently by use, the laminæ being only about an inch in depth, indicating the advanced age of the animal. The width of the laminæ varies from a quarter to three-eighths of an inch, and their distance from each other from a single line to a quarter of an inch. The laminæ are beautifully curved on the lateral surfaces. The weight of the tooth is eight and a quarter pounds. No other remains of the animal have been found. The water is at present too high to admit of a thorough examination, which I intend to make as soon as practicable. Of the result, if important, I will advise you.

Fig. 1, is the figure of the tooth described above, reduced to quarter of its size. It is evidently a perfect tooth, except that it is an old one, whose roots have been absorbed.



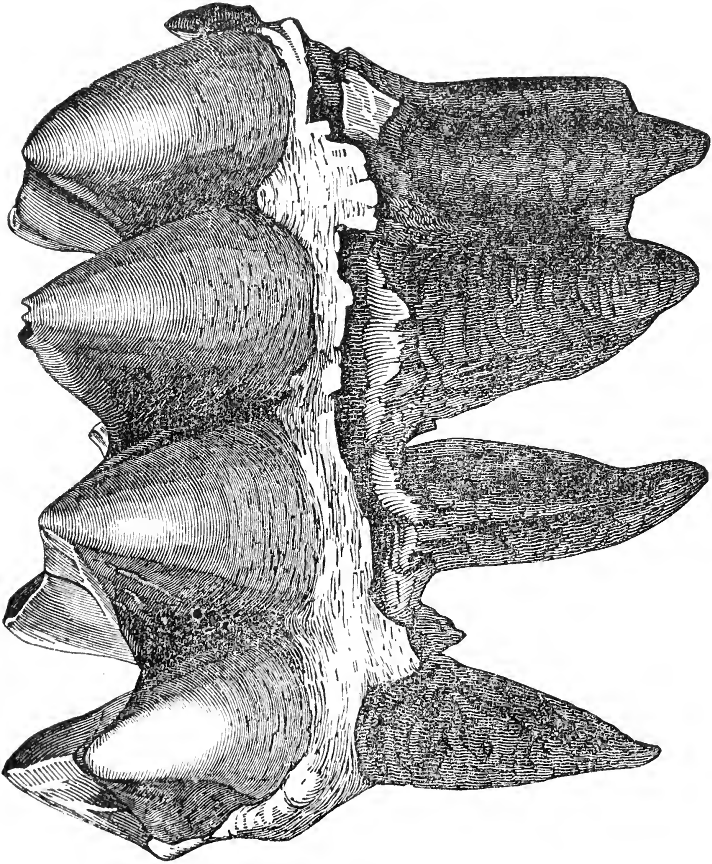


Fig. 2.

MASTODON TOOTH, (Natural Size.)

REMARKS.—The relics of this extinct species of elephant, possess the highest interest. They are among the last which have perished of the lost races. Their existence in America is extremely important as bearing upon the geological theory of the earth. That the whole and entire race of elephants and mastodons should have perished on this continent, while the elephant is still preserved in Asia, points to the operation of some cause which was limited in its influence. The period at which the elephant and mastodon appeared upon the earth, was, geologically speaking, recent. This is determined by the place or position their remains occupy among the formations. In New-York, this position is invariably above the drift of the country. At Scotchtown, in Orange county, the mastodon is found in fresh water marl beds, which contain also dead shells of the lymnea, but the same species is still living and very common in all parts of the country. The section illustrating the deposits here, are first, drift composed of coarse sand, gravel and rolled quartz pebbles. Second, fresh water marl, with abundance of dead shells of lymnea and planorbis, belonging always to the living species. Third, peat, which covers the land, embracing the remains of the mastodon. Fourth, ordinary soil. The marl, in addition to the animal remains, contains also large sticks of birch, about eighteen inches long, upon which the marks of the teeth of the beaver are still perfect. The wood is softened, but retains its original form perfectly, and all the specific characters of the wood itself. No one therefore, can doubt the recent extinction of the animal in question, when it is considered that the period is limited to the time that wood may be preserved in the earth near the surface. It is proper to remark however, that the wood is placed under favorable circumstances for preservation, being enveloped in a close calcareous deposit, overlaid with about eighteen inches of compact peat. The wood has not undergone a petrifying process, but is in the progress of slow decay; showing that it is subjected to those influences, which would in time destroy it completely. We possess a tooth or cast of a tooth of the elephant from Seneca lake near Geneva. So also the remains of the same species have been found near Rochester, New York, and in every instance above the drift. Fig. 2, is taken from the tooth of the mastodon. It is given for the purpose of exhibiting the differences in the form of the teeth of the elephant and mastodon, both of which were cotemporaries, and which perished in the same catastrophe, or by like and similar causes, at one and the same period.

That the food of the elephant and mastodon, leaving out of view the evidence which their teeth afford, that these extinct animals were vegetable feeders, there is also the direct evidence that the mastodon at least fed upon the twigs and branches of trees in the great mass of this matter, which was obtained with Dr. Prime's skeleton, which was discovered near Newburgh, in Orange county.

With this skeleton, occupying the region of the stomach, sticks partially broken and crushed, about two inches long, were found in a mass in the midst of the bones, and in a position and relation which clearly indicated the fact that this mass of sticks, was the undigested food of the animal itself. It is not at all remarkable that food of this coarse nature should have constituted the sustenance of the animal, when it is remembered that our moose of the northern forest subsists upon food in the same condition. The moose grinds and masticates limbs of the striped maple nearly as thick as the finger; so undoubtedly we should infer that the elephant and mastodon fed upon small limbs of trees and matters of that kind. The country must have been a forest with occasional openings forming natural meadows; but we cannot suppose for a moment that these huge animals could have resorted to marshes for food. The dry forests were undoubtedly the fields in which these animals roamed and fed.

There is no difficulty in admitting that the mastodon or elephant were fitted to a cold and variable climate like that of the present, because the elephant of Asia is hairless, or naked. It is generally known that an elephant thus provided with hair and fur was found in 1799 at the mouth of the river Lena. Then again animals adapt themselves to circumstances. The common wolf is clothed with very short hair in this latitude during summer. In the colder regions of the north they are provided with long thick fur and hair.

In attempting to account for the extinction of those remarkable animals, there is no evidence that they were destroyed by a sudden catastrophe. The contrary indeed appears in this case; and that in fact they died quietly and without the intervention of a violent cause. We are rather inclined to regard their conformation and bulk or massiveness, to have had some influence at least in bringing about their extirpation. This, taken in connection with the accidents to which such bulky creatures would be exposed might in time completely annihilate the race without the occurrence of a violent catastrophe, as a change in climate or the occurrence of a deluge. Although some geologists maintain that there is evidence of a change of climate about the period when the mastodons became extinct; we have never however been able to see the grounds upon which such an inference could be substantially based. That they lived after the diluvial period is evident, inasmuch as their remains are universally above the first drift, or that which is beneath the tertiary clay of the Hudson and Champlain valleys. The presence of this quiet deposit in which animal remains exist, which are rather peculiar to a climate more severe than the present in this latitude, may be accounted for on the ground that a cold current from the north from the direction of the St. Lawrence gulf, flowed at this period through these valleys into the bay of New York. But such a current, admitting its existence, would not materially alter the climate of the whole country. The effect would be quite local, and would be sufficient only to bring about a few slight changes in the distribution of the molusca, and perhaps to a certain extent of a few animals of a higher order.

We repeat then in conclusion, that it is unnecessary in accounting for the extinction of those peculiar races, to maintain that a change in climate destroyed them, or that they perished during some violent catastrophe.

RENEWAL OF BARK.

The destruction of the bark of trees does not necessarily result in their death. Mice and other gnawing animals devour the bark of fruit trees; but if the wood is not also badly injured the tree need not be considered as lost. The wood, if properly covered with a composition of wax, will give an opportunity for the injury to be healed, either by a renewal of bark over the whole surface, or else by a lateral closure by the extension of new wood and bark.

In order that the bark should be replaced at once, it is necessary that the outer layer or the newly formed wood should be uninjured. A proof that the entire bark of the body of a tree may be renewed or secreted, is furnished in facts and observations which we have recently made upon the white or paper birch, (*Betula populifera*). It is not uncommon for this birch to be stripped of its white and singularly laminated cuticle for five or six feet, along the lower part of the trunk. The consequence is, the whole of the tree's bark beneath is killed; when it cracks and splits off after a time. The tree itself, however, appears to suffer but little; for soon new bark is formed beneath the old. Even the restorative energies of the tree are sufficient, after a year or two, to form anew the white and peculiar cuticle; and we frequently have seen the old and dead bark remaining upon the outside, and the white cuticle beneath it presenting a curious instance of the presence of bark with the cuticle beneath the tree's bark of an anterior date.

AGENTS WHICH PRODUCE CHEMICAL CHANGES IN THE SOIL.

It is well known at the present day that the soil is made up of disintegrated rocks. This fact may be demonstrated by inspection of the finest soil by the microscope. By this instrument we may see that the soil is composed of quartz, feldspar, and in many instances, mica, hornblende, and various other stones and rocks in fine powder. Even the whole mass of soil may be seen to be thus constituted. But soil, if it were wholly composed of particles sufficiently coarse to be seen, would be almost barren; that is, it would not be fitted to supply in that condition the necessary inorganic matter. Hence it is necessary that it should be acted upon still farther; that its particles in fact should be brought into a soluble condition. The agents by which this is effected are water and carbonic acid, together with a few other agents which assist in the process. The substances to be dissolved seem to be among the bodies the least soluble, as quartz or flint, mica, feldspar and feldspar compounds, clay and clay slate, etc. It would farther seem that by the slow operation of nature, that the soluble materials necessary for the growth of plants would hardly be formed with sufficient rapidity to supply the wants of the vegetable kingdom.

Silex, sand or quartz, in its pure state, is insoluble either in water or water charged with carbonic acid. When silica or sand is boiled with soda, potash or lime, or ignited with either or all of these alkalies together, the silica is dissolved and forms glass.

Now silica exists in combination with these alkalies in the rocks, stones, and in the soil, in a comminated state. In this state, viz., in that which resembles artificial glass, and which is called by chemists a silicate, the solution of the silex is far less difficult. Even common window glass, or the common glass vessels, are somewhat soluble in water, especially when the water contains carbonic acid. Glass vessels in which water is distilled, although heated only to 212° Fah. contain a portion of their substance dissolved, and this may be proved by evaporating the water, and it may be found that the loss of weight sustained by the vessel is equalled by the solid residue obtained by evaporation.

So even window glass in certain situations after some considerable exposure, becomes opake and rather resembles ground glass, than the beautiful polished glass immediately from the manufactory. The solubility of the silicates will be found to be in proportion to the amount of alkalies present.

Feldspar, which is so common in the primary rocks and even in sedimentary ones, may be regarded as a natural glass, or in other words it is a silicate, and may be dissolved in water, though slowly, especially if carbonic acid has access to it. Hence a soil which is mixed with particles of feldspar, mica, or even clay slate, and many other bodies containing fine particles of the silicates, are actually dissolved in the common operations of nature which are going on in the soil. These operations furnish potash or a soluble silicate of potash, a substance required in all cereals and grasses for the perfection and strength of the straw or stalk. Another property of silicate which the farmer ought to be familiar with, is its insolubility after ignition or heating to redness, or even partially so, by thorough drying. As this substance exists in straw, and as straw is used as a fertilizer, it requires some consideration to determine whether it ought to be buried in its common state, for in reality the greater part of the useful material of the straw is a soluble silicate in this state and condition. Now if the straw is burned, this operation renders the silica insoluble, at least in a great degree; if on the contrary it is merely buried beneath the soil, where it will decompose, it will furnish its silica to the succeeding crop of plants in a soluble condition. We may, however, obviate the objection to burning by mixing with the ash of the straw lime, by which the silica will become soluble again and the potash of the straw set free, or be made available to the uses of vegetation.

The remarkable properties of silica or sand, or what in its pure state is called quartz crystal, renders it a fit material to form the basis upon which all our agricultural operations may be performed. Its insolubility in its common form or state makes it a substantial basis; and in its solubility in part when mixed or combined with an alkali makes suitable material for entering into the formation of the skeleton of the living plant. There are other properties which it possesses, which fit it also for the functions which it fulfils as a constituent of the soil, and as an element in the living organism of the vegetable.

We have many natural phenomena which prove and illustrate the power of water to dissolve silica, especially when aided by heat. The hot springs of Iceland deposit around them large masses of nearly pure silex which had been dissolved in the water. Even cold water, impregnated with carbonic acid, dissolves the silicates. This has been shown by Polstorf and Weigmann. So that by the quiet operation of water the silicates are dissolved. The water in such a case contains silica, potash and soda, lime and magnesia. From this experiment and from many observations which have been made, it is satisfactorily shown that we are greatly indebted to the influence of carbonic acid for the alkalies, and pure or soluble silica in the soil. Anything, therefore, which generates carbonic acid in the soil, favors vegetation by supplying plants with food by the decomposition of the comminated rocks.

But we may go still farther, and speak of the solubility of carbonate of lime and carbonate of magnesia in water holding in solution carbonic acid, substances which are difficult of solution in pure water The importance of all these substances to all vegetables without exception renders it a matter of considerable importance to furnish a supply of carbonic acid water for the sole purpose, were there no other, of effecting the solution of silica, lime and magnesia.

One of the means by which this important result may be brought about is by the use of almost any organic matter, as peat, and other manures of a similar kind. By decomposition they furnish as one of their products of change, carbonic acid, which is readily soluble in water, and which may in this state of solution be absorbed by plants, or may exert its solvent powers upon the various elements composing the soil. Supplying then the soil with decomposing organic matter, and several important results follow; the rocks are dissolved and the plants may be supplied with the necessary carbon, ammonia and other essential inorganic matter. In all these chemical changes there is much to admire, and much which is calculated to gratify an inquiring mind. See the beautiful as well as useful changes which are effected by the agency of iron, which in the soil is always in a state of oxydation. If it is in its highest state of oxydation, then the organic matter in the soil, in consequence of its affinity for oxygen, takes one atom of it and reduces it to its lowest state of oxydation, or to a protoxide. This change being effected, it is not possible for it to remain at rest in this state, but it must immediately seize upon the water of the soil and take an atom of oxygen from it, by which change hydrogen is freed or set at liberty, and which at the moment of its freedom takes to itself the nitrogen of the atmosphere of the soil and forms ammonia. If in nature there are wiser or better adaptations, we know not where they are to be found. The farmer, then, when he turns over the sod, or in any way breaks the soil, or when he commits the seed to the bosom of the earth, has before him not one lesson only replete with wisdom, but many, and to which the finger of Deity points. With what propriety may he stop, and as he withholds his hand from its accustomed work, inquire why is all this. Amidst the complicated arrangements of nature, it is his privilege to learn wisdom, and he who is in their midst and performs his labors, and is the daily witness of those results, and remains insensible to their teaching, proves himself a fit companion of the undevout astronomer.

The complex nature of the rocky strata increases the facility with which carbonic acid decomposes them, for in all cases the force of affinity diminishes in proportion to the multiplicity of the elements combined in the compound. Hence the basalts, the lavas, and all the aggregates analogous to feldspar, are comparatively easy of solution, and under the power of carbonic acid. These rocks, to which may be added mica and clay slate, contain silex, alumina, peroxide of iron, protoxide of iron, manganese, magnesia, lime, potash and soda, and water. From the foregoing remarks it is easy to see that carbonic acid plays an important part in the disintegration and decomposition of rocks, and becomes the great agent of solution by which the elements of soil are prepared for the vegetable kingdom. From which we have a highly practical problem to solve, viz., how and by what means can carbonic acid be added to the soil; how can the necessary supply be obtained? These questions have been partially answered, but will form a subject for hereafter.

ANALYSIS OF ARGILLACEOUS SLATE.

[From the farm of Hugh Magee, Howard, Steuben Co., N. Y.]

100 grs. gave of water of absorption,-----	4.50
Organic matter,---------------------	2.90
Silicates,---------------------------	66.22
Alumina and peroxide of iron, ---------	14.28
Phosphate of magnesium,--------------	4.20
Phosphate of lime, -------------- trace.	
Phosphate peroxide of iron, ------------	0.04
Carbonate of lime,--------------------	2.40
Magnesia,---------------------------	0.08
Sulphuric acid,----------------------	0.25
Chloride of sodium, or common salt,------	0.47
Soluble silica,-----------------------	0.48
Potash,-----------------------------	5.47
	100.87

This slate belongs to upper series in the New York system; and it may be considered as represented by the formation along the southern tier of counties. The important fact which is brought out by this analysis is the large amount of potash which the slate yields, and which it would furnish on decomposition to the soil.

This slate, provided it breaks up readily by frosts, and water, and other atmospheric agents, might be farther decomposed by the action of lime which frees potash from its combination with silica. At least, the use of lime will greatly facilitate this effect. In most soils where, on inspection, slate forms a part in small laminæ, it is important that the farmer should use lime, for the purpose specified above, inasmuch as most of the varieties of argillaceous slates contain alkalies.

We hope the numerous analyses which we have made and published in the Journal will serve to direct the attention of farmers to the character of the soils and rocks of their respective farms; and when the rocks decompose at the surface, the use of materials furnished ought to be tried as fertilizers in connection with lime.

BRAND OF THE CEREALS AND BLIGHT IN GRAIN.

We shall publish in the succeeding numbers the following work—a translation from the German. The following is a conspectus of its contents, from which it will be seen that it will constitute an important addition to our knowledge of the character of the blight in the different species of the cereals. It will contain the full engraved plates of the original on steel.

Contribution to the Knowledge of the Different Kinds of Brand of the Cereals and Blight of Corn: By A. C. Corda.

I. Of Wheat Brand. *Uredo Sitophila.* 6½ quarto pages. Plate I, Figs. 1 and 22.

II. Of the Oat Brand. *Uredo Avenae.* ½ quarto page. Plate I, Figs. 23 and 26.

III. Of the Barley Brand. *Uredo Segetum—Uredo Hordeæ.* 2 quarto pages. Plate II, Figs. 1 and 8.

IV. The Stalk Brand of the Grasses. *Puccinea graminis.* 1 quarto page. Plate II, Figs. 9 and 11.

V. Maize Brand. *Uredo Maydis—Uredo Zeae.* 2 quarto pages. Plate III, Figs. 1 and 2.

VI. The Millet Brand. *Uredo Destruens.* ½ quarto page. Plate III, Figs. 3 and 7.

VII. Rye Brand. *Cladosporium Herbarum.* ½ quarto page. Plate III, Figs. 8 and 13.

VIII. The Red Corn Brand, or Spindle Brand. *Septo Sporium Gramineum—Tusarium Heterosporium.* ½ quarto page. Plate III, Figs. 16 and 20.

IX. The Blight in Corn. *Hymenula Clavus—Ergot, Cockspur.* Black grain. Plate III, Figs. 21 and 30.

The whole is the result of close microscopic observations; and the various figures represent magnified views of the disease and its progress—also sectional views.

The plates are handsome steel plates, and will be well copied.

The whole might well be comprehended in from about 25 to 30 pages of the Quarterly Journal, and perhaps less; and perhaps 4 or 5 pages of plates.

Corda is the author of a work of repute on *Mycology.*

The following remarks by the author may be regarded as a brief explanation of the object of the work, etc., in which our subscribers may be interested.

The respected reader will pardon the freedom with which the author seeks to illustrate old long known facts in a way probably somewhat new to the husbandman—and he will find in these sketches simply plain matters of fact without any scientific pedantry. The author has no wish to search into the vast lore, or to reproduce the views of past observers, although he is well acquainted with all the works, even those only partially worthy of notice, from Theophrastus to Strauss, Bulliard, Meyen, Ungar, on this subject, among which the labors of Banks, Fries and Unger must be considered as the best guides. The author's aim is only to build on the foundations of facts depending on the internal structure and physiological connection, without desiring to admit or oppose the views, theories and so called experiments of others. In all pathological inquiries, besides Prof. *Dr. Unger*, none of the writers with whom I am acquainted have regarded the anatomical structure itself of plants. Usually, the so called experiments are presented which are opposed either by their own obscurity or by similar observation of the same or a succeeding investigator. These views the author of these pages has no wish to appropriate; and, therefore, he begs the respected reader to receive the following pages as the result of more than twenty years' observations, in which time the author has been especially occupied with the study of the parasitic fungi. At the same time, it should be recollected that this first cycle of pathological treatises regards the parasitic forms of disease as a *complete subject*, without any reference to their primitive origin, so far as this is possible; for *to the perfect physiological knowledge of an organic individual belongs previously the entire knowledge of its species and its anatomical structure;* as without these two foundations the author himself can only proceed on baseless views and superficial, wordy talk; and so much the more, if belonging to a certain school, he wishes to gloss over an upright, independent "*it ercio,*" with philosophic form. But to the subject;

Vegetable parasites, like the annual ones, form a great and very rich family; and the majority of them belong to the fungi. The same parasites which develop themselves in the texture of our cereals are also the more worthy of notice; and therefore I first of all examined them, and will afterwards also describe and represent the species which habitate in our other vegetables.

The collective specimens of brand belong to a humble family of fungi, to which the natural historian gives the family name of *Caeomaceæ*, and all the species of this great family are parasites. They distinguish themselves by the simple characteristics—"single-celled spores or seeds," from all the kindred families to which still by the development of the interior texture of their organism they belong. The most important for our object of these families are the wheat brand, the oat brand, the barley brand, the maize and millet brand. All these belong only to the families of the grasses; and of our cultivated grasses, the rye only is certainly marked as the particular species on which hitherto no species of brand has been discovered; an observation first made by Prof. Kunze of Leipsic, and which I have found confirmed in all parts of central Europe, although many authors also speak of the rye brand as one of the most common appearances. In the level country of Germany and Austria, besides the red stalk brand, (*Uredo rubigo,*) and the pedicel brand, (*Puccinia graminis,*) there is found no brand on rye; and only in cloudy, moist, mountainous regions is there any fungus of the family of the fibrous fungi, (*Tricho vel Hypbomycetes Auct*) found on the ears of rye to which fungus the people improperly give the name of "the rye brand," and which I shall consider specially below. I shall here exhibit besides many illustrations of the definitions of the particular organs and terms of expression; but all these illustrations must be only short here, and can be but imperfectly given; and the reader may obtain an intimate and detailed knowledge of the organs here spoken of in my "Guide to the Study of Mycology," p. 21 to 36. I will omit the same, and at once proceed to illustrate the form of structure of the various species of brand.

EMPIRE SPRING—SARATOGA.

This valuable water, analogous to the Congress water, has risen rapidly into favor. Its efficacy in cutaneous diseases and scrofula has been proved by trial. Its value depends upon the presence of the hydriodate of soda. It bottles remarkably well, and constitutes an excellent beverage in both summer and winter.

THE CROPS AND THE SEASON.

Thus far the crops of this vicinity, and to a great extent in the whole state, have been doing remarkably well. Hay is coming in as well as usual. Corn has nearly attained its forwardness for the season, and bids fair for a good yield. Rye and oats are equal to the crops of any former year, and of wheat there is not the least doubt but the produce will be fully an average one for the state.

Of potatoes it may be said that as yet there is only a slight probability that the disease will make its appearance to an injurious extent. Those kinds which are the most affected, or which show some signs of disease in the leaf, are those which were imported from Ireland. Indeed, what we regard as the concomitant signs of the presence of this malady, are to be observed only in a slight degree at the present time. Those signs, it may be well to state, are the curling and death of the leaves and branches of many of our forest trees, as the elm, button-wood, bass, and sometimes those of the maple. Still, August is the month when the tendency to disease is the most intense; and hence it is not possible at the present time to predict with certainty in regard to the crop. We have never entertained, however, but one idea of the disease, viz., that it is a temporary calamity, and that there is no more danger of the potato becoming extinct, or a crop which cannot be depended upon, than the apple, or any other kind of vegetable production. All the speculation in regard to the final loss of this vegetable, we have regarded as idle gossip, a waste of words. That the disease will continue, and effect the crop more or less in seasons to come, is highly probable; but the calamity, like all others which have occasionally visited us, will pass over, and the husbandman will reap, as formerly, the labor of his hands.

We cannot forbear, in this place, to make a few remarks upon the disposition of the times to speculate upon the probable scarcity of the crops of this country; and what we wish to effect by these remarks is, that farmers and others should take a rational view of the capabilities of our country, especially in regard to the amount of food which it is capable of producing.

The first point which we would call up to the mind of the reader is the extent of our country. This we need not speak of in detail, but look at the map and the wonderful extent of the grain producing region—rich in its soil, and rich in the enterprise of its inhabitants. In view, then, of this extent of country, we may well inquire if it is probable that any crop is likely to fail the country, if it is every where to be short, and present the spectacle of want and deficiency. This we believe to be almost in itself physically impossible. The law of the distribution of rain and other atmospheric agents, forbids such a result. When from a given cause a crop fails, it is not to be supposed that that cause will be general; and hence what is deficient in one part of our country, will be supplied by another.

Then again we are to look to the facility of transporting bread stuffs to market. And what does an examination of this matter result in? Why, that the sea-board is accessible from all of the interior of the country. Nature herself has been lavish on us in giving us those natural channels of communication through the great water courses, the main trunks of which penetrate in some instances 4000 miles into a rich and productive region. These send their arms upon the right and left, and as they channel the valleys far and wide, they waft upon their bosoms the breadstuffs which are garnered upon their shores, and bringing them to the great channels and trunks, they are brought finally to the great marts and store-houses of the nation. But this is not all. We are not content with what nature has done, but we chain and link together by bars of iron, durable as the flow of waters themselves, the west and the east, the north and the south. Our rivers, our inland seas, our rail roads and canals, are pushed through all the productive regions of our country, and wherever a bushel of wheat is sown its produce can find its way to the sea-board. If, then, our country is the most fertile in the world; if its means of communication equal its capacity to produce, why should a scarcity ever be feared. Why should the price of a bushel of wheat more than double in less than one sixth part of the time it is growing. The famines of the old world cannot drain us even though a partial failure should occur with us. Now the great antidote to the sufferings in community, and with individuals is to know what is produced in different parts of the country, how much has come to market, and how much probably remains in the hands of the producer, and whether this which is still held back can be brought speedily to the sea-board. And the only effectual way of counteracting the evils of speculation, is a general distribution of knowledge upon all these points. Now cotton never rises and falls like bread-stuffs; and why? because every fact in regard to the amount of cotton produced, where it is stored, and how much there is in the great marts of sale, is perfectly well known; and the same results would follow, could the public be as well informed in regard to bread-stuffs. We cannot, at this time, proceed with this trian of remarks. We only intended to bring our views in a general way before our readers. We wish to see a check put to speculation in grains, or that those who deal in them should be compelled, through the general spread of intelligence, to content themselves with a fair remuneration for their labor; that they should never be able through the press, to present false statements of the prospects of our grain crops; that they should never be able to winter-kill and blight all the prospects of farmers throughout the land, and diminish the crop at least one half through the instrumentality of the press, and by hired letter-writers from different quarters raise their prices. Since the fall of bread-stuffs in Europe, it is discovered that there is an abundant harvest in this country; but up to the time when it was possible to sustain speculation, the prospects of the grain crop were represented as likely to be a failure over all of our western states; but as soon as it is ascertained that there is a plenty abroad, then comes out the truth that there is also a plentiful harvest in prospect in this country.

Now we have already observed that because a crop may be diminished, or even destroyed in one part of the country, there is no probability that it will fail in others. Neither the rust, the fly, nor the winter-kill is ever a general calamity—hence there is always a rational ground of expectation that there will be a sufficiency of bread-stuffs. Another evil which a correct view of the subject will bring about is, to lead the producer to sell his grain when he has a fair opportunity, and not wait for the price to double its accustomed standard. With farmers, this is an evil—many have, and undoubtedly will, sustain losses by holding on to their grain. The true policy is to sell when the price is remunerating. In the long run this is the best policy, and will result in the greatest gain.

ACKNOWLEDGMENTS.

Received, the Proceedings of the Agricultural and Mechanics' Association of Louisiana, held January, 1847, with an oration by J. D. B. De Bow, Esq., and an essay by B. M. Norman, together with the reports of committees, &c. The document is highly interesting, and we are much obliged to Mr. Norman for it. We should be pleased had we space to make extracts from the oration and essay. We must at this time be content with the following curious extract from Mr. N's essay:

"During the year 1784, only sixty years since, and therefore within the memory of many now living, an American vessel having *eight bales* of cotton on board, was seized at Liverpool, on the plea that *so large* an amount of cotton could not have been produced in the United States. The shipment in 1785 amounted to 14 bales, in 1786 to 6, in 1787 to 109, 1788 to 389, in 1789 to 842 *bales.* An old Carolina planter, having gathered his crop of five acres, was so surprised and alarmed at the immense amount they yielded, which was fifteen bales, that he exclaimed "well, well, I have done with cotton; here is enough to make stockings for all the people in America! The cotton crop of the United States for 1844 was 2,300,000 *bales.*"

A Practical Treatise on the Cultivation of the Grape Vine on Open Walls &c.: By Clement Hoare; with an appendix, containing Remarks on the Culture of the Grape Vine in the United States.

The author of this treatise is distinguished for the success which has attended his mode of cultivation of this plant in England; a mode which, for foreign grapes, might without doubt be adopted for grapes from a wármer climate in the country. This part of the treatise, that relating to the peculiar mode as successfully carried into practice by the author, was fully described in one of the earliest numbers of this journal, and need not, therefore, detain the reader in this place.

We propose now to notice briefly some of the directions in the appendix for the cultivation of our native grapes, which has been furnished by Dr. Underhill, who is the most successful cultivator in this country.

Dr. Underhill cultivates the Catawba and Isabella grapes, which it is remarked have much improved, and are still farther susceptible of improvement; and the probability is, that hereafter we shall have no occasion to regret that vines from Europe have so generally failed us.

One of the difficulties which Dr. Underhill had to contend with was the rose bug, which infested the cluster of flowers, and which in the end nearly destroyed them. This difficulty had to be obviated by shaking them into a cup of water early in the morning; these on being disturbed in this way instantly fall from the leaf or flower, and when falling may be received into the cup of water or turpentine.

The following extract will suffice for the present for accounting for the previous failure in the cultivation of this fruit, and also for a description of the plan which had better be adopted to insure complete success hereafter.

"Another cause of failure has been a want of practical experience in the best mode of preparing the ground, planting the vines, pruning, &c., so as to insure a vigorous growth of bearing wood, and keep this from extending too far from the roots of the vines, when planted with the desire of forming a vineyard. The European method of pruning and cultivating the grape is not altogether correct. The natural vigor of our native vines is much greater than the foreign, and they require different treatment. The more variable nature of our climate, the greater heat experienced for three or four months in the year, and the comparative coolness of the nights during the same period, have a great influence upon the vines, as do also the severe drouths with which we are occasionally visited in the heat of summer. * * * * In selecting the ground for a vineyard, give that kind the preference which is free from clay within fifteen or eighteen inches of the surface, and is perfectly dry. Ground abounding in springs, after thorough draining, is sometimes used, but should not be selected if a preferable kind can be obtained. Sand, slate, limestone formation, will answer well. Side hills with a S., S. E., or E. aspect are generally preferred, leaving the N. (N. E. near the sea-coast) and W. winds broken off, by trees, hedge, stone or board fence.

In the latitude south of the Highlands of the Hudson, I find that the Isabella grapes ripen quite as well when planted in a level field, protected from the north and west winds by woods or hedges, as on declivities. Several of my vineyards are thus located; and as far as I can perceive, the fruit ripens at about the same time, and is of the same quality as when the vines are planted on steep side-hills. I think, however, that north of the Highlands side-hills would be preferable.

To prepare the ground for a vineyard, the best way is to turn under the whole of the surface soil from fifteen to eighteen inches in depth, early in the spring, after the frost is out of the ground, by plowing twice in the same furrow. This will place the richest part of the soil in a position where it will give the greatest supply of nourishment to the vines. Few vineyards in this country have been planted in this way; but the cost is so small, and the advantages so great, that it should be done, wherever there are no rocks or large stones to prevent it. Instead of adopting this method of preparing the ground, many persons have been content with digging large holes where they intended to plant the vines, and placing in the bottom of these, six or eight inches of good soil, previous to putting in the plants. A still greater number have not taken the trouble to resort to either plan, but have planted the vines with the same carelessness that they would a common animal, instead of giving the attention and care each plant should require—especially when it is expected to produce a fine crop of fruit every season after it has commenced bearing, for a hundred years.

The Isabella with me, adds Dr. U., is more certain to give a *ripe crop every year* than *any other fruit* with which I am acquainted. It ripens its fruit two or three weeks earlier than the Catawba, and is therefore more sure to produce a perfectly ripe crop in a short season."

SOUTH CAROLINA AGRICULTURAL SOCIETY.

By the politeness of Mr. R. N. Gibbes, M. D., we have received the Proceedings of the Agricultural Convention, and of the State Agricultural Society of South Carolina, from the supplement of which we extract the following important remarks on the manures for Sea Island cotton. They will be found to possess a high interest to the cotton planter.

Of manures, limited in quantity, that contain a large stock of fertilizing matter in a small compass, ashes, cotton seed, and corn stalks, are entitled to particular notice. A bushel of ashes, on the authority of Dr. Dana, is equal to a cask of lime. Where proper means are used, the amount of ashes that can be collected on a plantation in a year is very great. The hearths of the negro houses, under the supervision of the driver, should be swept once a week, and the contents deposited in *covered* barrels. Live cotton seed and salt mud together, (they should invariably be united, if possible,) in the proportion of only ten bushels of the first to the acre, and forty cart loads of the second, is a manure of extraordinary value for high or low grounds, especially the latter. Double the quantity of cotton seed would insure a large return. From the experiments of Sir H. Davy, the quantity of nutriment in corn stalks is very considerable—1,000 parts, giving 84 parts of ashes, and 1,000 parts of those ashes affording 72.56 of soluble matter. As immediately after harvest, which is the proper time to put them in the ground, in order to retain their saccharine and other enriching properties, is the season for gathering cotton, from which the labor of the grower cannot be diverted, the corn stalks, at a subsequent period, even after the cattle and atmosphere have deprived them of much of their power of doing good, if thrown into the cattle pen, would prove to be a judicious, and highly profitable expenditure of labor.

Without any attempt to enter into a scientific investigation of the principles that should regulate the planter in his plan of making composts, it may be necessary only to remark, that, whilst cotton requires well rotted manures, (to bring on a disposition in the woody fibre to decay and dissolve, with a view to this end, is the great aim of summer listings,) too great a degree of fermentation ought to be avoided, because the results, like those of combustion, would be the destruction of their most useful parts. Whenever the manure is perfectly cold, and so soft as to be easily cut with the spade, decomposition, which should have been completed in the soil is already finished; consequently, the chief elements of nourishment to plants—carbonic acid and ammonia—are entirely lost. To preserve the entire product of composts, as far as that object is attainable by human agency, and to prevent the dissipation of their ærial or gaseous particles, the use of retentive absorbents is indispensable. A stratum of clay sustaining the heap to receive the fluid parts, and a covering also of clay to hold fast the disengaged elastic matter, will, in part, accomplish these important designs. According to the statement of Dr. C. T. Jackson, in his Report on the Geological and Agricultural Survey of Rhode Island, a compost made of three parts of peat and one of stable manure, is equal in value to its bulk of clean stable dung, and is more permanent in its effects. By substituting salt clay mud, in which is a large portion of marsh roots, for the peat, a compound is furnished, of as great intrinsic worth to the grower of long cotton, as that so warmly recommended by Dr. Jackson, is to the New-England farmer. Into the cattle pen, a level though not a hollow or very low spot having been selected for that purpose, spread mud, of the kind just mentioned, about one foot thick, then add four or five barrels of lime. Upon these let the cattle trample for eighteen or twenty nights; then recommence and continue the same process until the requirements of the planter are satisfied. The lime, says Dr. Jackson, decomposes the peat (mud), neutralizes the acids, and disengages the ammonia. The peat absorbs the ammonia, becomes in part soluble in water. To the compost heap, pine straw and salt may be advantageously added. Independently of its utility as the destroyer of vermin,* salt in small quantities has a septic power; and as its capacity of attracting moisture is well known, it is strongly recommended for high land, especially where there is much vegetable matter. Pine straw has an acid principle which is corrected by the lime. As it is very slow of fermentation, its beneficial influence, although comparatively weak, endures for a longer period than any of the crude substances yet noticed. As a retentive absorbent it is highly prized.

The stock of putrescible substances annually collected on the island (Edisto), is perhaps large enough to secure a fair return of the products of the field; but from waste and a misapplication of efforts, much time and labor are uselessly consumed. To the desultory remarks on this head already offered, a few observations, with a view solely to excite reflection, will now be submitted. To augment, and not to diminish the supply of vegetable matter which nature or art might furnish, is too plain a proposition to be denied. Why then are potato vines so frequently used for cattle? This substance so abundant in quantity, and so rich in

* Salt in the proportion of one quart to the task-row on the list, or one pint below the list, and another above it, may be pronounced an effectual preventive to the attack of bugs at the roots of cotton.

nutritious properties, constitutes a cheap and effectual instrument of renovation. The practice, therefore, of not giving it back to the land, is attended with consequences than which, if the destruction of the capacities of the soil were designed, none other would be more speedy and certain in its hostile operation. The plan of passing the cattle pen over the land in the summer months is not unusual. Where the ground is not listed as soon as the pen is removed, the benefits of this mode of improvement must necessarily be very inconsiderable. The volatile parts of the dung, comprising nearly all that are of a fertilizing character, are certainly soon dissipated, as the nose, without the aid of science, assures us, and nothing remains but the salts, the amount of which is too meagre to exercise a decided influence on vegetation. All doubts on this subject will quickly disappear if the following experiment be tried on two adjoining acres:—let the one be partially listed, and the other remain without any part of the sward being removed. The growth of cotton on the former, and the display of fruit, will at once satisfy the most incredulous, that this is by far the preferable mode. Late in the fall when the power of the sun is weak, and complete listings can with impunity be effected, the disparity between the two methods will be much more striking. Akin to this practice, is that of using every means to bring about decomposition in vegetable matter by putting it in low spots, where excess of wetness first deprives it of a large portion of its treasures, and then gives it to the air; or of placing it in heaps on the edges of creeks, by which the liquid parts are daily washed away, instead of allowing the process of fermentation to begin and terminate under the soil. When the time arrives for removing the composted manure, the cartings of one day should be buried on the next. Wherever this is done, the enriching ingredients of ten loads will be found equal to about thirteen or fourteen loads that are suffered to lie exposed two weeks in the field. After the removal of the cattle from the pen, to protect the dung heap from the action of the sun, a covering of pine straw, or even a thick layer of bushes, is advisable, if not very necessary.

The importance of the subject about to be briefly noticed, must plead our apology for introducing it at the conclusion of our labors.

Within three years, other agents than that of human power have been resorted to in separating the seed from cotton. At this time a few planters still depend on the common treadle gin, but the propeller is steam; others use another machine, distinguishable from the foot gin chiefly in the length of the roller, to which steam or horse power is applied. The former produces only about twice the quantity of cotton as the treadle gin when the human foot is employed. Its advantages, therefore, when the outlay and incidental expenses are brought to view, are inconsiderable. The latter gives generally about 200 lbs. per day. On the debit side the items do not subtract materially from the interest of the capital employed. The objections to Farris's gin are, first, that it works irregularly; and that unless the adjustment of the parts of the whole be entirely true, no calculations as to its performance can be made: and secondly, that from the rapidity of the motion which, for a profitable daily yield, must be kept up, the staple of the cotton is injured. The first disadvantage is undeniably a strong one, but the last is at least problematical. Steam applied to Farris's gin has so far afforded more satisfaction than any other scheme of accomplishing the object of the planter yet tried. It is, however, certain that a machine for detaching the seed from Sea-Island cotton, without impairing some of its valuable properties, is still a desideratum; and as large expenditures of money and labor have been fruitlessly made in this and other countries to attain an end so desirable to the grower, the task may be pronounced embarrassing and full of difficulties. If, nevertheless, the labor of ginning cotton cannot be essentially abridged, mechanical aid could and ought to be made subservient to the preparing of it for the gin, for the bag, and for packing it. In reference to the last operation, why is not the screw used? This mechanical agent is equal to the power of about 20 men; in other words, with one boy and a mule, it can do in a day as much as twenty men can accomplish in the same time with the pestle. As the pressure of the screw is equal and regular, no damage whatever to the staple can ensue from its action; on the contrary, the repeated blows of the pestle, always of a wedge-like shape, must in some degree operate injuriously. As it is believed that the ship owners give a decided preference to the square over the round bale, if there be no weighty objections on the part of the manufacturer, which can easily be ascertained, the planter would consult his interest by substituting the screw for the present clumsy instrument for packing cotton.

From the tenor of this essay, it will readily be perceived that the resources for fertilizing the lands of the sea board are nearly as variant as they are abundant. If our planters would discard the ignoble principle that science is unnecessary to their success; if they understood the manner in which manures act; the best modes of applying them, and their relative value and durability; if they had but a slight acquaintance with the nature of soils, and the habits of plants, how infinitely more interesting, more worthy of their regard and high calling, and conducive to the individual prosperity and the public weal, would be their field labors, and all the duties inseparably identified with their profession! The spirit of inquiry, however, is abroad; and unless those whose exalted privilege it is to plead before the people the cause of the planter, and before him his duty to himself and his associates, do not relax in their honorable and patriotic labors, the period is not very remote when agriculture will be cultivated in South Carolina, not only because it is the instrument of wealth, but for the nobler reason that it elevates, refines and expands the intellect.

From the American Journal of Science and Arts.

FACTS IN PHYSIOLOGICAL CHEMISTRY.

[Communicated by J. Liebig to President Everett, of Harvard University.]

I ought several months since to have replied to your letter communicating the interesting intelligence in relation to the action of the vapor of ether. The result of your letter to me, you have doubtless seen in the European papers. The world is filled with the magnitude of this discovery, and we are looking for the most important applications of it in surgical practice. It is a benefaction to suffering humanity, when painful operations, through a medium so simple and safe, can be performed with diminished pain; and the world is most deeply indebted to the man who first employed ether for this purpose.

I have long intended to write in acknowledgment of your friendly letter; but I desired by way of return to incorporate in reply the results of an investigation, which has been brought to a conclusion only within the last few days. It is a chemical investigation of muscle-flesh; in which I have been led to some interesting results.

The fluid in the meat of recently slaughtered animals—the *flesh-fluid*—is *sour*, and contains two free acids, whose nature up to this time has been but imperfectly known. I have found that one of the acids is an *organic acid*, and is the same that appears in the process of the souring of milk. The other acid is phosphoric acid. Both acids are but partially free. A part is united to potash, magnesia and lime. They have been recognized in all muscle-flesh thus far examined, as well of carnivorous as of herbivorous animals.

A second ingredient, which I have found in all kinds of flesh, is a crystalline body, which was discovered in broth by Chevreul, eleven years ago, and described by him under the name *creatine*. It was supposed, inasmuch as Berzelius could find nothing in the fluid expressed from flesh, that this was an accidental ingredient. But this opinion rested upon an error. Creatine is found in the flesh of all healthy animals.

The composition of the body is such that creatine may be regarded as a compound of the body, *glycocoll*—so accurately studied by Mr. Horsford—and ammonia.*

A third ingredient which is never wanting in fresh meat is a positive organic base of constitution analogous to that of *chinin*, or perhaps more nearly to that of *codein*, which is found in opium. There are also in meat two nitrogenous acids;—altogether, a variety of bodies whose existence in the living body could have been scarcely suspected. I have described these bodies and their chemical relations in a paper which is now in press, and will detail only a few results that may be practically applied.

The presence of two fluids throughout the body of opposite chemical nature, one acid, (the flesh-fluid,) the other alkaline, (the blood and lymph,) separated from each other by membranes permeable to both, must satisfy any one that in this arrangement there is a source of electricity or of an electric current. I will not herewith say, that, by consequence, electrical effects must be recognizable in the body, for we know that these as such (electrical) disappear when through any result of motion, or chemical action (decomposition or composition) is produced, and I regard the latter as dependent upon an electrical stream.

Moreover, the occurrence in flesh of creatine,—of a substance whose properties are allied to those of the active ingredient of coffee (caffeine,) as also of another which has all the properties of an organic base, makes the action of medicines appear no longer so dark and mysterious. The most efficient of all medicines from the vegetable kingdom are organic bases.

If you leach finely chopped meat with cold water, you procure a red fluid and a white residue. The latter is the actual muscular fibre, and the solution contains, beside the above named bodies, a considerable quantity of albumen that may be separated as coagulum by heating the fluid to boiling.

I have found that the residue (the muscular fibre) either for it-

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* *Note from Prof. Horsford.*—One atom of creatine equals two atoms of glycocoll and one atom of ammonia.

$$C_8H_{11}N_3O_6 = 2(C_4H_4NO_3) + NH_3.$$

It contains also the elements of urea, glycocoll and wood-spirit.

$$C_8H_{11}N_3O_6 = C_2H_4N_2O_2 + C_4H_4NO_3 + C_2H_3O.$$

Liebig, by boiling creatine a length of time with baryta, separated the urea (doubtless as carbonic acid and ammonia;—$C_2H_4N_2O_2 + 2HO = 2CO_2 + 2NH_3$) and there remained the organic base, mentioned in the paragraph which follows above. Its constitution, as given in a letter to Gay Lussac, and published in the Comptes Rendus for Feb. 6, is $C_6H_7NO_4$—and contains the elements of the lactamide of Pelouze, a production of the action of dry ammonia gas upon lactic acid,—$C_6H_4O_4 + NH_2$. It contains also the elements of glycocoll and wood-spirit, as above intimated.

$$C_6H_7NO_4 = C_4H_4NO_3 + C_2H_3O.$$

self or boiled with water is tasteless, and that the water in which the fibre has been boiled derives no taste. The fibre, by boiling, becomes hard and altogether unpalatable.

All the ingredients having odor or taste, may of course be abstracted with cold water. They are contained in the flesh-fluid of slaughtered animals.

You will not wonder, my most respected sir, if I now turn to receipts for the kitchen.

It follows from the above, that one can make for himself, in a few minutes, the best and strongest broth, (Fleisch-brühe, Bouillon de viande:) if, e. g. a pound of finely chopped beef (mince) with a pound (pint) of *cold* water, be carefully mixed and then slowly heated to boiling, and the fluid separated from the solid parts by pressing through clean cloth. This broth, with the usual condiments (broiled onions, vegetables, salt, etc.) added, will furnish a dish beyond the criticism of the most fastidious gourmand.

Longer boiling will *not* necessarily make the extract stronger.

If the broth be slowly evaporated over a water bath, it will bebecome brown, and assume a fine taste like broiled meat. If evaporated (by exceedingly gentle heat,) to dryness, it yields a brown mass, of which, upon a journey, for example, half an ounce would convert a pound (pint) of water into the strongest broth.

By boiling a piece of meat in the water, a separation of the solution from the insoluble ingredients takes place. The soluble ingredients go into the extract—the broth—the soup. Among these besides those bodies mentioned above, are the alkaline phosphates. The thoroughly boiled meat contains no alkaline phosphates.

Now as these salts are necessary for the formation of the blood, it is clear that the fully boiled* meat, by the loss of them, loses its capacity to become either blood, or through blood to become flesh: *it loses its nutriment when eaten without the juices—the extract.*

In the extract the materials for the formation of albumen and fibrin, are both wanting. *Alone* also, it is not nourishing. Both must be eaten together. *The method of roasting is obviously the best to make flesh most nutritious.* But as the extract—the broth—contains *all the ingredients of the acid gastric juice*, it may perhaps be the best agent to aid the process of digestion in cases of dyspepsia.

Finally, I have found that the brine which forms in the salting of meat, contains all the ingredients of the flesh-fluid. The composition of salted meat is essentially different from that of fresh meat—inasmuch as phosphoric acid, lactic acid, and the salts of

* By this term it is intended to convey the idea of boiled till no further change occurs, or nothing more is extracted.

these acids—together with creatine and craetinine are abstracted by being packed down in salt. The salted meat becomes partly reduced by this process to a mere supporter of respiration.† This may be a source of scrofula, where, by eating salt meat, the replacement of the wasted organism is but imperfectly effected—where it loses its constitution without regaining it from food.

The temperature in the interior of a piece of meat to be boiled or roasted, rarely exceeds 100° C. (=212° F.) The meat is done and palatable when it has been exposed to a temperature of 62° C. (= 144° F.) but it is in this condition, red like blood. The blood-red places—the undone portions—were subjected at the highest to a temperature only of 60° C. (= 140° F.) At 70° to 72° C. (=158° to 162° F.) all these places disappear. At 100° C. (=212° F.) the fibre breaks up and becomes harder. The crustry property of the meat in chewing, depends upon the quantity of albumen, which, in a coagulated condition, permeates the fibre. The flesh of old animals is deficient in albumen.

If a piece of meat be put in *cold* water, and this heated to boiling, and boiled till it is "done," it will become harder and have less taste, than if the same piece had been thrown into water already boiling. In the first case the matters grateful to the smell and taste, go into the extract—the soup; in the second, the albumen of the meat coagulates from the surface inward, and envelopes the interior with a layer which is impermeable to water. In the latter case the soup will be indifferent, but the meat delicious.

Giessen, 24th March, 1847.

[From the Albany Argus.]

NEW YORK STATE AGRICULTURAL SOCIETY.

At a meeting of the Executive Committee, at the Agricultural Rooms, July 8th, 1847,—present, Geo. Vail, President; C. N. Bement, Vice President; A. D. McIntyre, Treasurer; B. P. Johnson, Secretary.

Letters were read from Hon. Edmund Burke, Com. Patents; P. L. Simmonds, London, Corresponding Member of the Society; J. B. Dill, Secretary Cayuga Agricultural Society; Aaron Clement, Secretary Philadelphia Agricultural Society; D. D. T. Moore, publisher Genesee Farmer; Hon. Adam Ferguson, Canada West; M. B. Bateham, editor Ohio Cultivator; James Rees, Secretary

† Liebig divides food into two kinds. One serves in the formation of tissues; the other burns to sustain animal heat—as sugar and fat. The latter supports respiration.

Oneida Agricultural Society; B. F. Angel, Secretary Livingston County Agricultural Society, with an interesting account of the annual plowing match, held on the twenty-ninth of May; J. Delafield, President Seneca Agricultural Society, with an account of the systematic effort making to arouse the farmers to a more thorough course of farming; and from several gentlemen who had been appointed as judges for the approaching fair.

The President exhibited some very large and fine specimens of quartz, taken from his farm near Troy, which were referred to Professor Hall, for examination.

Col. Sherwood, late president of the society, having become overstocked, offers for sale at his residence in Auburn, on the 8th of September next, his choice herd of Short Horns. The original cows of Col. S. were selected from the herds of the late Patroon, Francis Rotch, Esq., of Butternuts, and L. F. Allen, Esq., of Black Rock. An opportunity like the present to select choice animals, it is not probable will soon occur. The sale is to be without reserve. Pedigrees of the animals can be had on application to the Secretary, at the Agricultural Rooms, Albany.

The committee would specially invite the attention of breeders and farmers to this sale of valuable stock.

The committee appointed on the removal of the remains of the late Judge Buel, reported, That they had waited upon the family of the deceased, and presented the request of the Society; and were informed that they highly appreciated this testimony of respect to their esteemed relative, but declined at present to have the remains removed to the Cemetery.

The President reported that he had, with the Secretary, visited Saratoga Springs during the past week, and was happy to inform the committee that the citizens of Saratoga have organized their committees as requested by the Executive Committee at their last meeting; and that they are making arrangements for the erection of buildings and enclosing the grounds. Assurances were given that every thing required would be in readiness for the approaching Fair of the Society.

The Secretary reported that he had, in pursuance of the directions of the Executive Committee, corresponded with the officers of the rail road companies, and that the usual facilities would be furnished to the Society at the Fair. Articles and stock for exhibition to be transported free. Visitors in special trains, at half the usual fare. Officers of the Society to be carried to and from the Fair in any of the trains at the same rates.

Washington's Agricultural Correspondence, edited by Franklin Knight, was presented to the committee for examination, and they esteem it a very valuable work, and one desirable to be adopted as one of the works to be awarded as premiums. They could recommend it to the favorable notice of the officers of the County Agricultural Societies for premiums.

DONATIONS.

For the library of the Society have been received:

From the Philadelphia Society for the promotion of Agriculture, 5 volumes of their transactions.

From W. H. Starr, proprietor N. Y. Farmer and Mechanic, 4 bound volumes, and the volume of 1847, as far as published.

From the Hon. E. Burke, commissioner of patents, 4 copies of the Patent Office Reports, for 1846.

From S. H. Terry, Secretary of Rensselaer Agricultural Society, several copies of the transactions of the society for 1846.

From James Rees, Secretary Oneida Agricultural Society, pamphlet containing constitution, regulations, premiums and committees for 1847.

From Franklin Knight, New York, Washington's Agricultural Correspondence.

Thanks were tendered to the respective donors.

JUDGES FOR THE FAIR.

The vacancies in the list, which was made at the last meeting of the board, were supplied, and the secretary directed to prepare the same with directions, &c., in pamphlet form.

On Durham Cattle—Effingham Lawrence, Flushing, Long Island; Henry Holmes, Washington; Thomas Hollis, Otsego.

On Herefords, Devons and Ayreshires—Lemuel Hulbert, Winchester, Conn.; Frederick Ingersoll, Oneida; Thomas Bell, Westchester.

Cross-Improved and Native—Richard Griswold, Lyme, Conn.; Wm. Fuller, Skaneateles; John Budd, Greene county.

Worken Oxen—Sanford Howard, Albany; Joseph Bennett, Otsego; Hiram Clift, Onondaga.

Steers—John Boice, Homer; J. B. Dill, Auburn; Julius Curtis, Oneida.

Fat Cattle—Hiram Slocum, Troy; Thomas Devoe, New-York; Lester Barker, Oneida.

Milch Cows—Newbury Bronson, Wyoming; John Bathgate, Morrisania; Elias Cost, Ontario.

Horses, class 1 *and* 2—Hon. Adam Ferguson, Canada West; Theodore S. Faxton, Oneida; A. W. Clark, Jefferson.

Blood Horses—Charles Henry Hall, Harlem; John T. Cooper, Albany; Alexander O. Spencer, Wayne.

Matched Horses and Geldings—Silas K. Stow, Troy; W. S. Stoutenbergh, Coxsackie; Barent P. Staats, Albany.

Long Wooled Sheep—Edward Halleck, Ulster county; L. D. Clift, Putnam; Thomas Dunn, Albany.

Middle Wooled Sheep—Francis M. Rotch, Otsego county; S. Wait, Jr., Orange; Henry Mesier, Dutchess.

Merinos—Henry G. Tainter, Hampton, Conn.; Robert L. Rose, Ontario; J. L. Randall, Onondaga.

Saxons—James M. Ellis, Onondaga; S. C. Scoville, Salisbury, Conn.; M. Y. Tilden, Columbia.

Swine—Henry Rhodes, Oneida county; Martin Springer, Rensselaer; Wm. Howard, Cayuga.

Poultry—H. A. Field, New-York; F. C. Moses, Onondaga; Mr. Potter, New York.

Plows—John S. Gould, Columbia county; Edwin N. Hubbell, Greene; Morgan L. Brainerd, Oneida.

Wagons, Harrows, &c.—W. H. McCulloch, Greenbush; Matthias P. Coons, Rensselaer; Richard Van Dyke, Jr., Greene.

Farm Implements, &c.—T. A. Burrall, Ontario county; Benj. N. Huntington, Oneida; Hart Massey, Jefferson.

Plowing Match—John McDonald, Washington county; Isaac Tallmadge, Rensselaer; Joseph Ball, Otsego; Leonard Bronk, Greene; Hiram Mills, Lewis.

Butter—Israel Denio, Oneida County; Washington Putnam, Saratoga; John Bloom, Albany.

Cheese—Joseph Carey, Albany; Joel Woodworth, Jefferson; Joel Root, Saratoga.

Sugar—Robert McDonnell, Saratoga; George Tuckerman, Otsego; James M. Cook, Ballston, Spa.

Silk—Ebenezer Proudfit, Rensselaer; James Clark, Hudson; Henry Carpenter, Albany.

Domestic Manufactures—Orville Hungerford, Jefferson; Le Grand B. Cannon, Rensselaer; W. J. Gilchrist, Saratoga; Edward Wells, Montgomery; John Van Duzen, Jr., Columbia.

Needle-Work, &c.—Mrs. Lebbeus Booth, Ballston; Mrs. Miles Beach, Saratoga Springs; Mrs. M. Harvey, Salem; Mrs. Henry Holmes, Union Village; Mrs. Wm. A. Beach, Saratoga Springs; Mrs. Samuel Young, Ballston. John J. Viele, Esq., Troy, Secretary to committee.

Flowers—Dr. Herman Wendell, Albany; W. R. Randall, Cortlandt; J. W. Bissell, Monroe; James R. Westcott, Saratoga. *Ladies*—Mrs. E. C. Delavan, Balllston; Mrs. E. Huntington, Rome; Mrs. Huntsman, Flushing; Mrs. Dr. O'Toole, Washington, D. C.; Mrs. L. Tucker, Albany; Miss Margaret Conkling, Melrose, near Auburn.

Vegetables—Thomas Bridgman, New-York; R. Harper, Albany; David Gray, Utica.

Miscellaneous Articles—E. P. Prentice, Albany; Joshua Atwater, Greene; Ransom Cook, Saratoga.

Fruits—Lewis F. Allen, Erie; Samuel Young, Saratoga; Roswell Reed, Greene.

Paintings and Drawings—J. J. Thomas, Wayne; W. W. Forsyth, Albany; O. D. Grosvenor, Oneida.

Stoves, &c.—Pomeroy Jones, Oneida; Edward Fitch, Saratoga; Asa Fitch, M. D., Washington.

Discretionary—Orville Clarke, Washington; Joel Rathbone, Albany; W. L. F. Warren, Saratoga; A. L. Linn, Schenectady; George Griffing, Greene.

Foreign Stock—Horses—James D. Wasson, Albany; Ela Merriam, Lewis; Dr. Carrington, Farmington, Conn.

Cattle—Horatio Sargeant, Springfield, Mass.; Ira S. Hitchcock, Oneida; E. P. Beck, Wyoming.

Sheep—Stephen Batty, Washington county; John Murdock, Monroe; Samuel H. Church, Oneida.

COMMITTEE OF ARRANGEMENTS.

Geo. Vail, Troy; B. P. Johnson, Albany; T. J. Marvin, W. A. Beach, J. T. Blanchard, J. A. Corey, Saratoga Springs; Samuel Cheever, Bemis Heights.

COMMITTEE OF RECEPTION.

Hon. R. H. Walworth, Saratoga; Samuel Young, Ballston; John A. King, Jamaica; E. C. Delavan, Ballston; T. J. Marvin, J. H. Corey, G. M. Davidson, Saratoga.

B. P. JOHNSON, *Secretary.*

ALBANY AND RESSELAER HORTICULTURAL SOCIETY.

PREMIUMS AWARDED.

On Green House Plants and Flowers.

1. L. Menand, Watervliet, six best green house plants, $2.
2. James Wilson, Albany, $1.

James Wilson exhibited the greatest variety of green house plants.

Hardy Roses.

1. James Wilson, for best 25 varieties, $2.
2. Herman Wendell, Albany, $1.

Best and Greatest Variety of Hardy Roses.

James Wilson, $2.

J. Dingwall, Watervliet, for a beautiful variety of flowers, consisting of Verbenas, Picotees and Carnations, $2.

William Cooper, Albany, especially commended for a beautiful boquet of 16 varieties of wild flowers.

Also, Henry Vail, Troy, for a large and beautiful variety of flowers, consisting of Pæonies, Roses, and a large and beautiful variety of cut flowers.

A beautiful pyramid of flowers was exhibited by E. P. Prentice, Mt. Hope.

Joel Rathbone, Kenwood, exhibited one round and three other beautiful boquets of flowers, containing a large variety of choice flowers.

Alexander Walsh, Lansingburgh, exhibited a tremendous sized Scotch Thistle, together with many interesting specimens of flowering shrubs and plants.

The chairman of the committee, Wm. Newcomb, of Pittstown, presented a large and good assortment of annual, biennial and perennial flowers, together with Roses and Dahlias—and the committee report that Mr. Newcomb has exhibited the best and largest variety of annual and herbaceous biennial and perennial flowers.

James Wilson exhibited splendid Dahlias.

Floral Ornaments.

1. Nathan B. Warren, Troy, for the best round boquet for vase, $2.
2. E. P. Prentice, $1.

Hand Boquets.

1. James Wilson, Albany, best hand boquet, $2.
2. Herman Wendell, $1.

Fruits.

Cherries.—1. Herman Wendell, Albany, ten varieties, $2.

2. D. T. Vail, Troy, six varieties, $1.

Strawberries.—1. James Wilson, Albany, for Swainston seedling, $3.

2. J. W. Haydock, Greenbush, (near Troy,) Hovey seedling, $2.

In awarding this premium the committee decided on the flavor, not the size of the strawberry. The Hovey seedlings were the largest, but not of as fine flavor as the Swainston.

Vegetables.

Potatoes.—Alexander Walsh, Lansingburgh, for the best and earliest potatoes, ash leaf kidneys, (these potatoes said by the exhibitor to be fully ripe,) $2.

Mr. Walsh also exhibited fine specimens of sea-kald and windsor beans.

Peas.—Henry Vail, Troy, for best marrowfats, $2.

Same, for 12 best beets, $2.

Celery.—Peter Chapman, for best six heads celery, $2.

Frederick Keizel exhibited six heads of celery nearly if not quite equal to Mr. Chapman's, and a special premium is recommended of $2.

He is also entitled to commendation for very fine specimens of lettuce, red and white radishes—both of which are out of season for premiums.

V. P. Douw, Greenbush, is entitled to commendation for his fine long cucumbers, (about 20 inches long.)

James Wilson exhibited a peck of very fine Rosi early potatoes, scarcely if at all second to those exhibited by Mr. Walsh, quite equal in size, but not in maturity.

E. P. Prentice, premium, for best cauliflowers, cabbages, and rhubarb, all of which were very superior. The giant rhubarb remarkably large and fine.

Herman Wendell exhibited two fine specimens of early peas, and several very fine heads of lettuce.

FLOUR AND GRAIN.

The quantity of flour, wheat, corn and barley left at tide water during the first week in July, in the years 1846 and 1847, is as follows:—

	Flour, brls.	Wheat, bu.	Corn, bu.	Barley, bu.
1847, ----	218,106	262,089	451,219	28,847
1846, ----	88,202	64,342	112,928	7,100
Inc.----	129,904	197,747	338,391	21,747

The aggregate quantity of the same articles left at tide water from the commencement of navigation to the 7th of July, inclusive, is as follows:—

	Flour, brls.	Wheat, bu.	Corn, bu.	Barley, bu.
1847, ----	1,578,170	1,823,147	2,750,031	240,639
1846, ----	1,064,366	382,937	596,334	144,867
Inc.------	513,804	1,440,210	2,153,697	95,772

By reducing the wheat to flour, the quantity of the latter left at tide water this year, compared with the corresponding period of last year, shows an excess equal to 801,846 barrels of flour.

The receips of corn thus far exceed by 1,139,882 bushels the entire receipts for 1846.

The following table shows the quantity of some of the principal articles of produce left at tide water, from the commencement of navigation to the 7th of July, inclusive, during the years 1845, (84 days,) 1846, (83 days,) and 1847, (68 days,) :—

	1845.	1846.	1847.
Canal open,	April 15.	April 16.	May 1.
Flour,	728,335	1,064,366	1,578,170
Wheat,	174,988	382,937	1,823,147
Corn,	8,686	596,334	2,750,031
Barley,	26,120	144,867	240,639
Beef,	23,162	34,297	17,860
Pork,	28,935	50,282	37,950
Ashes,	40,618	30,919	15,670
Butter,	1,776,900	2,255,800	2,360,850
Lard,	1,666,000	2,658,300	3,209,200
Cheese,	2,214,100	2,754,000	3,272,500
Wool,	1,448,400	1,191,966	810,100
Bacon,	494,800	1,124,400	1,795,530

A SALE OF IMPROVED SHORT HORNED CATTLE AND MERINO SHEEP.

T. M. Sherwood, Esq., will sell at auction on the 8th of September, inst., a fine herd of Short Horned cattle and Merino sheep at his farm in Auburn. Those interested in stock will find this an excellent opportunity to supply themselves with pure breeds, of a high grade. Catalogues of animals can be obtained at this office by application, and at the rooms of the agricultural society.

CHICAGO.—In 1839, the first cargo of wheat was shipped from this port. The following shows the increase from that period:—

	Wheat.	Flour.	Beef & Pork.	Wool, lbs.
1842,	586,207	2,920	16,209	1,500
1843,	628,967	10,876	21,492	22,050
1844,	891,894	6,320	14,838	96,635
1845,	956,850	13,752	13,269	216,616
1846,	1,459,590	23,045	31,269	281,222

AMERICAN INSTITUTE.—Notice of the twentieth annual fair of this association is already given. It will be held, as last year, at Castle Garden. It will commence on Tuesday, October 5th, and be kept open upwards of a fortnight.

AMERICAN JOURNAL

OF

AGRICULTURE AND SCIENCE.

This work will be issued hereafter monthly, at two dollars per annum payable in advance. It will form two volumes at the close of the year of three hundred pages each, and will be illustrated by plates and wood engravings.

The object of this Journal is to disseminate useful knowledge relating to Science, the Arts, and Agriculture, and to promote sound views in education. It is in fine designed for a Farmers' Magazine, and no efforts will be wanting to make it a welcome visiter in his family.

Communications may be addressed as usual to the conductors at Albany, or when more convenient, to the publishers, Huntington & Savage, at 216 Pearl st., New York.

E. EMMONS,
A. OSBORN.

Albany, January, 1847.

AMERICAN JOURNAL

OF

AGRICULTURE AND SCIENCE.

CONDUCTED BY

DR. E. EMMONS, AND A. OSBORN ESQ.

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No. XVI. AUGUST, 1847.

UNITED STATES COINAGE.

CHARACTER OF THE METALLIC CURRENCY OF THE UNITED STATES—SPURIOUS AND COUNTERFEIT COIN—GOLD AND SILVER COINAGE—COUNTERFEIT COIN—HOW IT MAY BE DETECTED, ETC.

It is not irrational to suppose that the speedy and certain detection of a felony will operate as a surer preventive of a crime, than its severe punishment. If our knowledge was sufficiently exact to detect at a glance a piece of spurious coin, we believe that such coins and attempts to pass them would be extremely rare. Indeed we believe we may lay down this proposition, that this kind of offence against our laws will always bear a certain ratio to the facility with which the offence may be discovered.

So it must be evident that if the coin or any kind of circulating medium could be fabricated in a manner, and at the same time of those materials which resemble the true so closely that they would escape detection generally, then a community would be flooded with it, and the perpetrator of the crime would of course escape detection. In passing counterfeit coin, as in poisoning, if the means of a speedy and certain detection were generally known, those attempts to defraud and destroy will be proportionally diminished in frequency. It is the great uncertainty of detection which makes it so prevalent. A more general knowledge, then, of our coins, and the means which may be instituted for their determination, we deem a subject of sufficient importance to merit a place in this journal.

The subject, it may not be improper to state, excited our attention in consequence of being present at a trial for passing counterfeit money; in the course of which, the evidence against the defendant was stated in a form and manner which it seemed to us was quite inconclusive; particularly that part of it which related to the method which was frequently pursued in the determination of the character of the coin itself. An important witness, for example, stated that on trial with nitric acid, a green solution was produced. This fact, though an important one when thus stated, yet without its proper explanation, leaves the question as it regards the character of the coin, in an unsettled state; for it is well known that the true coin also gives a green solution with nitric acid.

Now, there is no principle better settled in this country, than this, that the rights of the accused should be protected, however dark his character may appear, and that his conviction should be established on grounds which upon the whole evidence, scarcely admit of doubt. Hence it should be proved that the coin is in the first place a counterfeit, and as this fact may be freed from all doubt, if proper measures are taken, the guilt of the accused should never be declared so long as the experiments only of an uncertain kind may have been employed.

The subject may be considered under two heads. 1. The character of the legal coin as it is manufactured under the authority of Congress.* 2. The character of spurious coin, and the means by which it may be detected.

1. The metals which are suitable for a currency, and fit to become the money of any country, are gold, silver and copper. The two first only claim our attention in this article.

Gold and silver, of all the metals known, are the only ones which in all respects fulfil the requirements demanded in a circulating medium. These requirements are, that they shall remain unaffected by the ordinary chemical agents; that they shall be malleable, and that in themselves they shall possess a high intrinsic value. Beauty is not an indifferent character; and in this respect gold and silver are of higher esteem than all the other metals.

Gold as found in the earth or in mines.—Gold is found in the sandy rivers in the form of grains, and in small masses. These grains are probably derived from a decomposing rock, which contains sulphuret of iron, in which it is mechanically mixed, and which, when it falls to pieces, the gold becomes disseminated with the earth. So also, gold is found in fine grains and irregular masses in quartz belonging to the talcose slates of the primary system. The particles are often so fine as to be invisible. Gold is found in several of the southern states in both conditions. It is called *native gold*, and is often nearly pure, or free from mixture with

* We have derived much valuable information upon the subject under consideration, from a work entitled "A manual of gold and silver coins of all nations," etc., by Jacob R. Eckfelt and Wm. E. DuBois. 1843.

other metals; usually, however, it is alloyed with silver, sometimes tin and copper.

One of the most remarkable characteristics of gold is its great weight, or its high specific gravity. This is clearly perceptible to the senses, but is more correctly determined by weighing. Thus it is found that gold, when compared with water, is 19.3 times heavier. If a cubic inch of water weighed one ounce, gold would weigh 19.3 ounces. Notwithstanding the great density of gold, it is still translucent. It suffers light to pass through it. When gold leaf is held before the eye in sunlight, a beautiful green light is transmitted.

Gold, as is well known, is yellow. It is the only yellow metal known. When pure, the color is constant, but when alloyed, it changes perceptibly by use. Silver makes it paler, and copper gives it a reddish hue.

Pure gold is never used for coin. The object gained by alloying it with other metals, is to increase its hardness.

When pure it may be cut easily with a knife, and hence is subjected to a loss by use, and hence, too, it is quite essential that it should be alloyed with other metals. This is the less objectionable when it is considered that those metals may be easily and perfectly separated from the gold again, whenever an occasion requires it.

By an act of Congress, in January, 1837, the quantity of alloy admissable into our gold coins was settled upon the following basis: The eagle was made 900 thousandths fine, and to weigh 258 grains, and the half and quarter in proportion; thus making the standard nine-tenths fine. There is an allowed deviation in fineness from this standard, for gold, of from 898 to 902. Under this act and regulation, our gold coins have passed concurrently without premium in any of our exchanges. The relative value of gold to silver, as established by this act, is as 16 to 1; but it may be considered that circumstances may so influence the relative value of these metals, that there may be a fluctuation varying from 15 or 16 to 1.

The proportion of gold to silver has not been, however, always of this standard. When the mint was established, in 1792, the eagle of the denomination of ten dollars weighed 270 grains, and the half and quarter in proportion; and their fineness was 917 thousandths, or as otherwise expressed, 22 carats fine. This coinage gave the proportional value of gold to silver as 15 to 1; at a rate too low, and hence gold coinage was necessarily restrained. At this value it was constantly exported, and was employed for the manufacture of articles for domestic use.

Silver, in an almost equal degree, possesses those characteristics which qualify it for performing the functions of a circulating medium. Compared with other metals, it is rare. It is malleable and ductile, and also is unaffected by most of the common agents around us. So it answers all the purposes required in money.* It has a clear white color. Its specific gravity is 10.5; $15\frac{1}{2}$ or 16 ounces equal in value 1 ounce of gold.

Silver is found in rocks in a state of purity. The region of Lake Superior furnishes it in this condition, where it is found in plates, threads and masses of considerable size, in igneous rocks. It is also alloyed with the native copper which is so abundant here. A large supply of silver, however, is derived from the sulphuret intermixed with the sulphuret of lead—other ores of lead contain silver.

By the improved methods of working the ores of lead, it is found that when a ton of lead ore contains 3 ounces, it will pay the expense of extraction. This proportion is only about one part in ten thousand. Cornwall, in England, in 1835, furnished 36,000 ounces of silver from its ores. Silver requires to be alloyed, also, in order to increase its hardness. The law of Congress regulates this matter. The metal for the alloy is always copper. The dollar and its legalized parts must be 900 thousandths fine, and must weigh $412\frac{1}{2}$ grains, and it is allowed to deviate from this standard from 897 to 903. This standard, then, makes it nine-tenths fine, in which particular it conforms to the standard previously adopted by France. This is a convenient proportion, as it is easily remembered, and answers the purposes for which the alloy is made.

Both gold and silver are extensively used in the arts and for domestic purposes. In the latter case it is called *plate.* The English plate possesses the same degree of fineness as its coin. Hence the wrought silver or plate is 925 thousandths fine. All those articles of English manufacture which are of sufficient size and thickness, are stamped with a lion and the initials of the maker's name. Gold and silver, when cast, or put in the form of large bars, is called *bullion.* When in small bars, they are called *ingots.*

For personal ornaments and trinkets, Great Britain has a prescribed standard. Thus it is necessary that such articles should be 22 and 18 carats fine; or 916-7 and 750 thousandths. Eighteen carats fine is the usual standard for French articles. But there is a great variation from the above. The amount of alloy which may be admitted into use is not determined. For ornamental articles which are not to be handled much, 14 carats will answer; but for jewelry, which is exposed to wear, it is considered that gold ought to be 18 carats fine, certainly not less than 16.

* By money is generally understood that medium of exchange which measures the value of all other commodities, and which also regulates their price or value.

Jewelry undergoes a great loss on melting. This is owing to the collection of dirt in cavities, or in the outside work. The inside is also filled with solder, and in melting all this matter is consumed. There is usually a loss of from 4 to 16 per cent.

It is proper to notice the fact that platinum has been coined by the Emperor Nicholas in pieces of the value of three, six and twelve roubles. This coinage, however, has been discontinued, although platinum possesses most of the properties of a precious metal. Still, it requires so much heat to fuse it, even that of a furnace is not sufficient, that it renders it an inconvenient coin to the maker. It is a metal extremely valuable in the arts, and is found in Brazil, Colombia, St. Domingo, and Russia. The latter country furnishes by far the greatest quantity.

The specific gravity of platinum is 21. The price of platinum is fluctuating, and at the present time is very high. In 1830 the equivalent value of platinum in gold and silver was established as follows: A gold rouble weighed 18.5 grains, a platinum rouble 53.16 grains, and a silver rouble 277.4 grains; consequently platinum is worth $5\frac{1}{4}$ times more than silver, and gold is worth 3 times as much as platinum. These relative values have, however, changed in consequence of the great demand for platinum in the arts, and especially in the construction of batteries for telegraphic lines.

Russia has not been followed in coining platinum by any of the nations. In fact, the uses for platinum in the arts and its scarcity will ever prevent this metal from being used in coinage. Its price must fluctuate considerably, and hence the difficulty of preserving it in a constant and steady circulation. In one or two respects it possesses advantages over gold; it is hard and requires no alloy; it is heavy, and therefore would be counterfeited rarely. For a coin of a small denomination, it might perhaps be employed to advantage.

The processes pursued in coining at the mint of the United States are somewhat numerous and complicated. This arises in part from the condition in which the metals come to the mint. In many instances it is amalgamated or dissolved in quicksilver, all the superfluous mercury being pressed out. In most instances it is an alloy, varying greatly in fineness and quality. Whatever form or condition it may be in, it is the duty of an assayer to determine both the nature of the alloy and the proportions in which the combination exists. When the metals are refined and brought to the proper standard, it is cast into ingots of a suitable form, a process which will depend upon the size of the coin to be made. These must be approved and annealed by heating to redness and

Note.—The Russian pound is nearly equivalent to 6319.4 Troy grains, or according to Baron Humboldt, 6312.6 Troy grains.

then slowly cooled, when by the aid of steam power it is rolled into long, thin strips. This process is completed by drawing the plate in a sort of graduated steel machine which fixes the exact thickness of the plate to the coin which it is intended should be struck. The pieces, or as they are called, planchets, are then cut out in discs of the size of the coin. The circular punch which performs this work cuts at the rate of one hundred and sixty per minute. The planchets are then milled, a process which consists in raising an edge, the use of which is to protect the faces of the coin from wear. This process, too, is performed with great rapidity, five hundred and sixty half dimes being milled in one minute. After this, the gold pieces are adjusted in their weight, cleaned and whitened, piece by piece. Stamping the pieces with their proper devices is the next step. They are placed in a tube from which the planchets slide one by one to a steel collar and between the coining dies, where they are powerfully compressed, when they receive the design in relief upon their discs. This completes the process of coining, from which brief description it will be seen that the processes themselves, being systematic, perfect and rapid, through the aid of machinery, are a great hindrance to the designs of counterfeiters, inasmuch as they cannot afford a workmanship as perfect in any of its parts, but must necessarily produce an inferior article. It is true, however, that in some instances base coins exhibit a tolerable degree of perfection; yet in general it is not difficult to see by comparison that they are rather poor imitations of genuine coin.

2. *Character of spurious or counterfeit coins, and the means by which they may be detected.*—A counterfeit coin is an imitation of one which is genuine, and which has been issued according to law. As the object in making counterfeit coins is gain, it is necessary that they should be composed of materials of an inferior value. So, too, it is probable that their workmanship will be such as will give them a currency; though it can hardly be expected that it will equal that of genuine coin, as the hopes of great gain would thereby be greatly diminished. It has happened, however, that our inferior coins, both in composition and workmanship, have been put in circulation under the sanction of law. Thus the smaller pieces of money which usually remain in the country, and are designed as the circulating medium of trade and traffic in the common affairs of life, have been made of inferior metal by government itself. This attempt to defraud the people under the authority and sanction of law, has generally defeated itself; for the base coin will be easily imitated by rogues in the adjacent districts; and the profits, which were designed only for the government, have been divided, and soon the speculation has come to an end by the reduction of the coin to its true value.

Counterfeiting coin has always been regarded as a felony, and has been usually punished with great severity. The ancient Egyptians cut off both hands; and under the civil law of ancient Rome, counterfeiters were thrown to wild beasts. Constantine ordered it treason; and in Great Britain it is a felony, punishable with death, though usually commuted by transportation for life. In the United States, it may be punished by a fine not exceeding five thousand dollars, and imprisonment at hard labor for a term not exceeding ten years.

The crime is shown by the statistics of Great Britain to be a prevalent one; as it appears from examination that the number of convictions in England and Wales for four years only, ending with 1847, amounted to eleven hundred and thirty.

A coin falls under suspicion when its color, its workmanship, size and ring varies from its ordinary standard. The kinds which are the most common are the American half dollar. The gold coins, too, are counterfeited; but there is greater difficulty to be overcome, and hence fewer counterfeits are attempted.

The determination of a good or a spurious coin is based upon the fixed and unchangeable laws of nature. In the case of the metals, and indeed with all other bodies, there are certain essential properties which do not vary, and which may always be used to identify them. Indeed, their existence is no more certain than their properties. Silver can never be red or yellow. Neither can copper be white or yellow. So, too, their relations to other bodies are fixed and constant; and thereby furnish absolute proof of their identity. They melt at a certain temperature; each having its own degree at which it softens and fuses; each has its own color, hardness, specific gravity; and each, too, respectively, is either malleable, ductile or brittle. The bodies termed acids act also in certain ways; some are soluble in them, some not; and each gives a solution whose color is the same, or passes through certain definite changes which are the same under similar circumstances.

Many preliminary tests are resorted to for determining the character of a coin. These are usually indecisive, though not without value, inasmuch as they may be used on the spur of the occasion, and are at least sufficiently important either to excite or allay suspicion; but yet, are incompetent to establish that amount of certainty which ought always to be required for conviction.

The most obvious characters are those sensible ones which are recognized by *sight, feel, smell and hearing.*

1. Sight. By sight we are able to test the color of the coin, and its execution and size. A piece of pure gold exhibits that rich, golden yellow which is so well known. When alloyed,

however, with copper it imparts a reddish tint; and when with silver, it becomes paler than natural; and these changes are slightly increased by wear. When, however, the alloy is both silver and copper, as is the case with the United States' coin, the color remains constant. In consequence, then, of the alloy, there may be a slight variation in the color of the true coin. The French coin is slightly verging to the reddish tinge; and some of the private coinages at the south are pale and slightly brassy. Nevertheless, both are fine standard gold.

But a source of deception may arise from gilding. This is more likely to be a source of deception in a new counterfeit. Half dollars have been gilded and passed for eagles; but now there is too great a diversity in size to permit this fraud. A gilded coin will, of course, be brighter; and though its color may be right, other characters will be sufficient to raise suspicion of its genuineness. Gold coins have been debased by cutting out the interior and filling it with base metals, or discs, and soldering them to another disc of platina. Here color would be of no avail; but still, close inspection might detect the imposition. This kind of counterfeit is not likely to happen frequently, as it requires considerable skill, ingenuity and patience, and cannot be very profitable. Platina must be used for the interior; and as this is also expensive, is not likely to be much resorted to; and the baser metals would make the coin too light, unless it was increased in thickness. But there is still another way which is followed in counterfeiting gold coin: it is by an alloy of gold, copper or silver, which must amount to from one fourth to two thirds gold, in order to be passable In order, however, to obtain the golden surface in as great perfection as possible, the piece is immersed in nitric acid; by which means a thin layer of the base metal is removed, leaving a surface of gold. This surface, however, becomes tarnished by exposure; and the points of adulteration become evident, especially if inspected by a microscope. Gilding will be detected by removing a slice with a knife; and an alloy, which has been immersed in acid, or *pickled* as termed, may also be detected by the knife, and by careful inspection with a magnifying glass; it will not appear in that perfectly smooth and even surface as the highly compressed eagle and half eagle.

Silver coin, when counterfeited, may be an alloy, plated or galvanized. The alloy may contain silver, or it may not. Often the composition is that of German silver. This may be suspected when the piece assumes a yellowish tint; which, to discover, need be placed by the side of a true coin. A piece which is plated must be cut into, and the copper will be seen. A galvanized piece has the true silver white color; but close inspection will frequently, if not always, exhibit a crystalline surface in small areas. The silver crystalizes as it is deposited upon the planchet; and afterwards, when it is struck with the die, some of the crystalline surface will remain, which may be distinctly seen by aid of the microscope. This is the fact with the Palmyra emission, or the Williams counterfeit; which, in other respects, are quite good imitations of Mexican dollars.

Inspection of the workmanship is also important. Straggling letters, an eagle with an open mouth, or some defect in this particular, is so common that inspection alone will lead to suspicion. So perfect are our coins at present, that it has become an important safeguard to the metallic currency.

Dimensions.—Comparison with a true piece may often detect an impostor. It is, however, more likely to be too thick than too large; as it is more difficult to adjust the latter than the former.

2. Smell. Copper and its alloy with silver and German silver, when warmed by friction, gives off an odor; whereas, genuine silver coin does not. It is a test of limited application.

3. Hearing, or sound. This test is the one which is too much relied upon, though it is not without its value. German silver has a sharper ring than the true coin. Sometimes a counterfeit, especially the older counterfeit dollars, which were usually a plated pewter, gave a very dull, flat sound. The test is performed by balancing the suspected piece upon the finger and gently striking it with another. But a genuine coin may, for certain reasons, give a suspicious sound; and hence, it is valuable only for raising suspicions, which shall lead to a more perfect test.

4. Feeling. The touch is often tried upon coin as a test of genuineness. Thus, it is well known that German silver, pewter and tin feel smooth and greasy; and that real well washed silver does not. Practice, undoubtedly, will so far improve the perceptibility of this sense that it may be useful. Still, this and the foregoing, except the first, are comparatively unimportant.

Mechanical tests.—Among these, we may enumerate *filing, cutting and weighing.* Both filing and cutting have two objects in view; the determination of the metal beneath the surface, and the hardness of the piece. As we have before stated, hardness is an important quality; and it is the same for all simple bodies: that is, each substance has its own hardness; and this is determined by the resistance which is overcome in the mechanical process which may be resorted to to impress or remove a part of it. It requires experience, and at the same time a comparison of it with the hardness of the genuine coin. In filing, a deep, narrow cut is made, sufficiently deep and wide to disclose the interior of the metal.

The most important of the mechanical tests, however, is weighing, or counterpoising it with a piece of the same denomination.

It will be observed that the counterfeit must be very nearly, if not exactly, the size of the genuine coin: and it is very difficult to harmonize weight and size when the metals are different in gravity or weight.

The gold eagle of the act of 1837 weighs 258 grains. The silver dollar 412.5 grains. If, then, there is a variation in weight in the gold piece of 3 grains it would make it suspicious; and if more, would condemn it. In silver, only about the same latitude could be admitted in new pieces.

A Mexican dollar, if forged, and having the fineness of 970, if of the perfect size, would weigh only 402 grains instead of 416, which is its true weight. This composition would be quite liberal; and none but quite an honest rogue would be disposed to employ so much silver in his coin. There is, however, too much irregularity in the weight of the South American dollars to condemn a piece solely upon a few grains deficiency in weight, or a few grains excess. One counterfeit Mexican dollar weighed 418 grains; but others weigh from 30 to 50 grains less. A counterfeit half dollar weighed 213 grains, but others varied from 20 to 30 grains.

Specific gravity is an equally important character with weight, and perhaps more so. As has been already stated, the specific gravity of a body is its weight compared with an equal bulk of water, taken as a standard for comparison. It may always be teken as a sure test for the genuineness of coin, and ought always to be resorted to. The process is this: weigh the piece or a part of it in the air; weigh it suspended by a hair in pure, or rain water, near the temperature of 60 Fah.; take the difference of the two weights, and divide the weight in air by this difference, and it is the specific gravity sought. Now the specific gravity of gold coin is 17.3, and of silver 10.3. If a spurious gold piece, having one half gold, and one quarter silver, and one quarter copper in it, its specific gravity would be only 12.8 instead of 17.3, as it ought to be; a difference which is detectable by the ordinary apothecary's scale, supplied with true weights. Its weight would be too light by 34 grains; and even if it contained three fourths gold and the rest silver and copper, it would still be too light by 14 grains. A forged Mexican dollar, with a fineness of 770 instead of 900, would have a specific gravity of 9.94 instead of 10.3, as it ought to have.

It is clear, then, with the ordinary scales and weights used by apothecaries, that a genuine coin can always be distinguished from a spurious one. There is not the least danger of falling into error in the matter when proper care is observed in the weighing. If the size of the counterfeit is the same as the true, it must always be too light; and if its size is increased to bring up the weight of the piece to the true standard, it will be too large, and may be discovered by measurement, and its spuriousness determined by its specific gravity, which will of course be too low. These measures, too, have the advantage of not injuring or defacing a piece; and none are superior to these in determining the fact of spuriousness or genuineness, though they do not determine composition. For, however they might be suspicious in sound, feel or workmanship, if the size, weight and specific gravity are right, then the coin must be genuine. We might, perhaps, except an alloy of gold and platina; but we have little to fear, as platina is too rare and expensive to be employed in counterfeiting when profit is an object.

The American eagle counterfeited with a gold surface upon silver, will weigh about 179 grains, and have a specific gravity of 10.3 to 10.7. The workmanship of such a piece will, of course, be genuine, and its value will be 50 cents.

The doubloon of Colombia is counterfeited by gilding in the same way as the old half American dollar piece. The workmanship will be genuine, but its specific gravity be only 10.3, as above; and the same may be stated of all the spurious gold coin upon a foundation of silver.

The German silver half dollar pieces of the Watertown emission have a specific gravity of 8.19. They contain no silver, and have no value. They are all too light; their actual weight, as well as specific gravity, being uniformly too low.

Chemical character.—The relation which bodies sustain to each other are always the same. Thus, the action of acids upon metals is uniformly one action under the same circumstances. The colors of the solutions produced also are the same for a given metal. Hence, if a coin is subjected to the action of nitric acid it will behave uniformly with it; and its solution, if soluble, will be of a uniform color. For the determination of the fact of genuineness, then, we may rely upon the results of the action of an acid upon it. Gold is unaffected in any one acid; but mix nitric and muriatic together and it dissolves. Silver is soluble in nitric acid alone; and the solution, when the silver is pure, is colorless: but it stains the fingers or skin a blackish brown and cannot be removed by washing. If muriatic acid is added to such a solution it precipitates a gray powder, which becomes purple in sun light or if organic matter is present. Silver coin contains copper; and in consequence of the presence of copper the nitric acid solution will be green or greenish. The presence of silver is very well determined by the dark stain upon the skin. The counterfeit coin, if galvanized or plated with silver, will give for an instant the same phenomena as the true, especially if new. A darkish stain is first produced, which is formed by the action of organic matter and nitrate of silver, already spoken of; but soon the deep green color of the salts of copper or nickel will be manifest.

These facts are sufficient to form a basis for the settlement of the question respecting the genuineness of any coin. Silver or gold may be present, but its presence may not be equal to the standard coin; the amount requires the aid of a practical chemist: and it is only when from twenty to sixty per cent of silver is present that doubts will arise. We are not, however, treating of the modes of analysis, but merely of those tests which are qualitative, and go so far only as to settle a preliminary point.

Color, sound, feel and smell, though not unimportant, are yet not sufficient in themselves to settle the preliminary question; but if we add to these weight, size and specific gravity, together with the action and results of the action of nitric acid, these will in all cases be sufficient, not only for strong suspicion of guilt but also for a verdict of guilty or not guilty.

LIME FROM GAS WORKS.

Lime in the form of what is called milk of lime, is used extensively for purifying coal gas. This lime afterwards becomes a refuse matter and useless to gas makers, and hence is often sold, or has been, in this vicinity, to farmers for agricultural purposes.

We have stated to several individuals who were about to use this material, that it would probably exert an injurious influence upon vegetation. The experience of this season confirms this statement. It has been found that plants around which it has been put soon become white, and unless very vigorous die in a short time after its application. This effect seems to arise from the offensive gas which escapes, and which acts immediately upon the leaves, which are speedily bleached. The lime of the gas works may therefore be regarded as not only worthless but poisonous, and ought not to be used in the state in which it is obtained.

This lime however, might be ignited at a comparatively cheap rate, when the matter so injurious to plants would be wholly expelled. This operation would be attended with less expense than burning oyster or clam shells. Or if a kill is in the neighborhood of cities where these shells accumulate, both the gas lime and the shells might be ignited together, and lime for agricultural purposes obtained at a cheap rate.

POTATO DISEASE.

Notwithstanding the theme has been long a standing one, still it may yet be regarded as a topic of great interest to the agriculturist and physiologist. To the first it is interesting practically, and to the latter theoretically. To the first preventions are important, as it forms a necessary and essential part of his resources.

At this late day we have no occasion to describe in full the progress of the disease. In general it involves in destruction the stalks and tubers; though it is not always the case that the former perish. In its most malignant form, they are speedily killed. But potatoes, during the first years of its attacks, rotted after they were housed. There were, however, indications of disease upon them when raised from their hills.

Our own observations, in conjunction with Mr. Salisbury, prove conclusively that the disease begins with the lowest part of the stem. It appears first softened just beneath the cuticle, at the points where the fibres start out just above the attachment of the old or seed potato. From this point it proceeds upward, involving the cellular tissue of the stem. The circulation gradually diminishes, and the leaves soon dry upon their edges. This is succeeded by the death of the edge of the leaf first, and then the whole stalk; the terminal part, with its leaf, being the last which dies.

Our object in calling up this subject again to the notice of farmers and others who feel interested in it, is to request them to observe one fact, viz., the temperature of the hills or ground in which the potatoes are growing. There is no cause, perhaps, more influential in producing the decay of organic substances, than heat. This is especially the case when the thing is buried, or charged with water. It is easy to see that potatoes, or any immature or over-ripe fruit, when subjected to a certain temperature, would necessarily undergo changes which in the end must result in its total decomposition. This temperature comes within the range of that which may be produced by the sun. In many instances the evaporation or exhalation of the water is so rapid that the plant is unable to obtain a supply of water through the roots; the consequence of which is, that it withers, and in some instances dies. In a potato field where the tops have been destroyed and the hills are exposed to the direct rays of the sun, the temperature of the ground is elevated higher than is consistent with the health of the growing crop. A continuance of such a state for days in succession could scarcely occur without leaving a predisposition at least to decay, if it did not at once make a visible impression upon it. Without resorting, then, to a cause which is far removed from the ordinary course of nature, we may consider it highly probable that potatoes may be destroyed by atmospheric influences, and by influences which do not suppose or require the agency of a particular miasma. In all those instances where we have examined the hills of decaying potatoes, we have found a remarkable elevation of temperature. Not that the diseased potatoes have produced this, but the direct rays of the sun beating for twelve hours upon a field, the whole ground has become too warm for the health of the tubers; and hence their decay. This of course does not occur without a succession of hot, sultry days, during which it is usual to see the vines perishing, the effect of which is to expose still more the immature tubers and the roots which give them nourishment. It may not be possible to reconcile all the phenomena of the disease to this view. Still we think that it is in itself a rational explanation of many of the phenomena, and that it accords well with what is already known of the agency of heat in effecting changes in organic compounds.

If this view of the disease is admitted, does it furnish a hope that any thing can be devised to prevent its recurrence? It is evident that atmospheric causes are beyond control; the weather is ordered by Deity. Still, observation shows that some varieties and kinds are far more liable to disease than others; a fact which is by no means new in the history of organized beings. Another fact too, which is equally well known, is that by modes of cultivation, we can modify the growth and stability of the plant. With these two facts to start from, it by no means appears beyond the power of man to stay the potato disease, although the cause itself is wholly beyond our control. This, too, is an old fact, and it has been acted upon from time immemorial. It is not essential that we should be able to control causes in order to combat successfully their influence. We prevent intermittent fever by the administration of quinine, even though we are daily exposed to a miasma which produces it. We may prevent the lead cholic by using as a drink a little lemonade with sulphuric acid; thus we inhale the metal, and we may especially eradicate the tendency to disease by giving vigor and firmness to the system by a course of treatment which invigorates the body. A person is subject to pulmonary disease, to a cough, on exposure to certain atmospheric changes; let him sponge the body with cold water at bed time, and in many instances this predisposition will be removed.

It is not our purpose at this time to recommend specific remedies for the prevention or cure of this disease. We merely wish to hint at certain principles which are established, and which are generally known. They furnish the ground for a rational belief that something may be done to mitigate, at least, the malady. It is undoubtedly true that a fair success must turn upon a proper selection of varieties. Among these, we have never known the long red or merino to be affected. Indeed it would seem that red potatoes have not been so much effected as the white.

In conclusion, we wish to repeat our request that our readers will take the trouble to inquire whether the cause of the potato disease may not be owing to the high temperature of the medium in which they are necessarily confined while growing. When the ground is well defended by vines, is there not less disease, and is it not a very material point to protect the earth from excessive heat by the preservation of the vines by a mode of cultivation which is calculated to give strength and ability to resist the cause of disease we have referred to. And is it not also true that in cool seasons, those particularly which are not visited with days of sharp, sultry heat, have not been entirely free from disease. It is, we believe, agreeable to observation, that cool and rather wet seasons have been favorable for large and healthy crops; those, for example, which are not favorable for corn. If this is true, then it will be admitted probably, that there is some show of reason in the hypothesis put forth in the foregoing remarks. It is evident, too, that the cause, whatever it may be, must be one which is connected with the general phenomena of nature. On other grounds it is quite difficult to reconcile its general prevalence with local or partial causes. Heat is a general cause, and though it is not necessary that it should be oppressively hot in Ireland and New England at the same time, it is clearly within the bounds of possibility. These remarks, however, partake too much of the character of conjecture, and are not, therefore, at all important, except they may call forth the thoughts and reflections of careful observers.

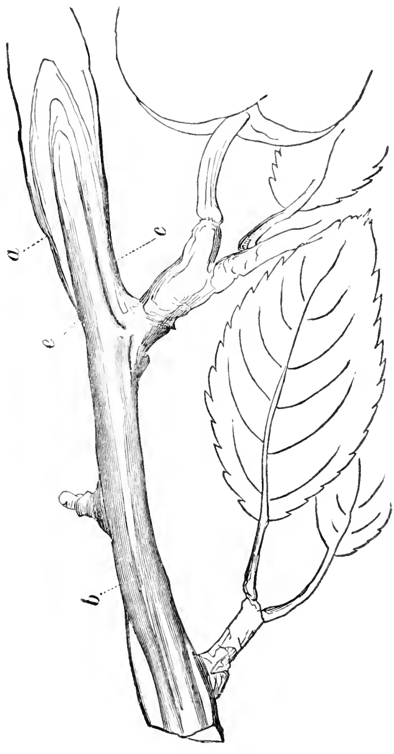
BLIGHT IN FRUIT TREES.

This is a theme which may be made as prolific in opinion and theories as the potato disease. Its cause is just as inscrutable. So in regard to remedies; we know of no course of treatment which can prevent its occurrence, or stay its progress. Observation and experience, however, have determined one thing: that it is better to leave the dead branch upon the tree, than to attempt to arrest its progress by a free removal of its branches. Experience proves, too, that no evil is to be apprehended from a poisoned sap by which the disease may be extended. We take great pleasure in alluding to the experience of E. P. Prentice, Esq., whose fine garden and orchard has suffered excessively by the blight. Last year his gardener, as we are informed, was directed to make a regular business of removing every limb which was attacked, below all appearance of disease. This was persevered in. This year, 1847, while the disease has been equally severe, the dead limbs have been suffered to remain, and it is extremely interesting to observe some of the results. So far from proving the death of the individual from what are usually called poisoned branches, there is an unusual vigor in the parts of the branches which remain. The effect is much like that which follows from shortening the branches by the knife. The limbs grow rapidly, and the leaves are of deep green; and they continue growing to a period in the season when it is unusual for wood to be formed. What, however, is the most remarkable result or phenomenon, is the vigor of the end of a limb beyond the apparently dead and dry portion of it. The limb is constricted, and is nearly one quarter smaller than the adjacent parts above or below. This constricted portion appears so perfectly dead and dry that it seems impossible for the sap to pass through it and reach the vigorous and living portion beyond; which is not only bearing large leaves but also fruit, which is also equally as large and promising as that upon any of the unaffected limbs.

The effect of the disease as exhibited in very numerous instances, is much the same as that which follows from ringing a branch; a process by which the circulation, as is maintained, is interrupted. Its descent to the root is at least partially prevented, by which there is an accumulation at all times of nutritious fluids in the limb above the removed or injured bark and wood The constriction where the disease is seated is mechanically arrested, however, with the ascent and descent of the sap; for here it is evident, by the dry state of this portion of the limb, that its vessels are nearly impervious; and after a short time they become entirely so—the disease passing from outside to inside, and not in the opposite direction. The circulation, therefore, is sustained by the interior. It would seem from an inspection of the dying branches that it is almost impossible, in many instances, for the sap to pass along the limb; still, there is no doubt that this it does so long as a green leaf appears.

The following cuts exhibit the fact we have stated; and it may, if followed out, throw new light upon the circulation of sap, and of the nutrition of vegetables.

Fig. 1.—Part of a blighted branch of an apple tree, which was taken from the garden of E. P. Prentice, Esq., of Albany.



(Fig. 1.)

a, dead bark and wood.

b, living bark and newly formed wood.

c, constricted portion of the stem, and dead upon the outside.

e, interior of the stem, showing signs of life.

f, living and luxuriant growth of part of the branch.

In this example there is quite a thickened state of the branch at *a*, which, in the specimen, is strongly contrasted with the part beyond the dead portion; as it is about $\frac{1}{4}$ thicker by the formation of new wood since it was attacked by the blight. Most of the new growth has taken place since the time when a branch usually acquires the length of stem for the season. In the bark, or immediately beneath it, there is often an accumulation of sap in the swollen vessels in a quantity sufficient to flow out in a rapid stream for a moment after it is wounded. This blighted part bears large and healthy fruit, as represented in the cut.

Fig. 2.—A stem two years old, from an apple tree in Mr. Prentice's garden.

a, dead band; forming a constriction of the branch.

b, a layer of new bark formed beneath the old bark.

c, living interior the wood of last year, through which the life of the stem beyond the constricted portion is preserved.

Fig. 3.—A short piece of a branch; showing an area of dead or blighted portion, in the centre of which stands a dead stem.

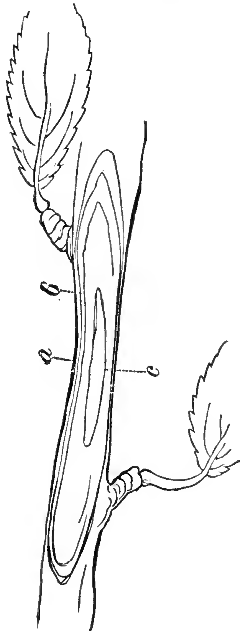
a, dead stem, dry and brittle.

b, living interior, with a projecting point extending up to the centre of the dead stem.

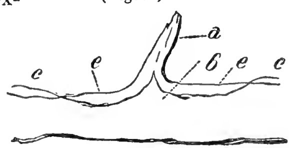
c c, dead bark extending around the dead stem.

e e, living bark.

This dead portion is a patch about an inch and a half in diameter, measured along the stem. It does not, however, embrace the whole of it or extend entirely around it; and it is not unusual for the blight to affect an area in which there is a small branch in its centre, or nearly so.



(Fig. 2.)



(Fig. 3.)

Close observation upon the state of the weather, the character of the winds, etc., seem to be highly important. We ought to remark that the disease had appeared to have ceased its ravages for three or four weeks preceding the 1st of August. Our heaviest rain for the season occurred on the 30th of July. The heat of the three days after this heavy rain had been rather oppressive; and now, the fourth day, the leaves of the branches which are remarkably vigorous begin to curl and lose their bright green, as if another attack had commenced. A few days will determine the fact. We may remark, too, that the beautiful and vigorous pines of Mount Hope, the residence of Mr. Prentice, exhibit the same phenomena as the fruit trees. The terminal branches in these pines is the seat of the disease. It does not seem to extend to the large branches. One fact in regard to Mr. Prentice's garden and orchard ought not to be forgotten; viz., that he uses much stimulating, azotized manure from his establishments. It is not stated, however, as proving that high living in the case of vegetables predisposes to the blight; and yet, it appears that some of the worst cases of the potato disease have happened when they have been highly manured. The effect of rich manures, especially those abounding in organic matter, deserves consideration. Comparative observations are wanted to make out the case for us; but certainly there is some proof derived from the analogy of things, that vegetables may be so far over-stimulated by certain manures as to render them more susceptible to the causes of disease. Analogy, however, must not lead us astray. A vegetable has but few, if any, of the properties of the animal; and we may not certainly conclude, that because a good liver becomes fat and subject to gout and dropsy, that a tree from an abundance of food will become corpulent and liable to perish from a surplus of food.

Another important rule of practice which seems to be established, is that it is better to wait until the termination of the disease before the dead parts are removed. The rule will enable us to save much of the tree which would be sacrificed if the limbs are removed at random; and since experience proves that there is no danger of an extension of disease from their remaining, the propriety of this course need not be urged.

There is still another species of blight which attacks fruit trees. It might be called the leaf blight, inasmuch as it first begins in the leaf. The branch does not necessarily perish,—frequently it does. Most of the leaves curl, dry up and fall off; if they all fall off the limb necessarily dies. This affection differs from the pear blight in this: the limb maintains its color, except that it is dry. There is no appearance of gangrene; and if one or two leaves are saved the limb will not die. In the pear blight, which affects the limb so remarkably, gangrenous patches are common and the leaf seems to die from an obstruction of the flow of sap. In the leaf blight, on the contrary, the death of the leaf is the cause of the death of the branch, by checking the flow of the sap into the branch. The elm is more subject to this disease than any of our forest trees, except the buttonwood. The disease is confined to those which we believe are cultivated; at least, they seem to suffer more than those which have not been transplanted.

METEOROLOGICAL OBSERVATIONS AT MARTINSBURGH, N. Y.

There is, perhaps, no method of representing the relative forwardness of different seasons, or the prevailing character of the climate of any district, better than the following, which, although it wants the precision of scientific observations, has the advantage of being fully comprehended by all, being made up from the record of those little events which diversify life in rural districts, and serve as popular indicators of the relatively advanced state of different seasons. Were such tables more generally kept, we might, from their comparison, deduce, perhaps, some important laws which govern climates and seasons, and arrive at important results of interest to mankind in general, as well, if not better, than from monthly averages of temperature and barometric pressure.

During four years a record of the failure or fulfilment of the weather-table, (usually ascribed to Dr. Clarke,) was kept with the following results, viz.:

RESULTS.	1842.	1843	1844.	1845.	Total.
Fulfilled,	13	27	30	21	91
Failed,	16	27	19	27	89

From which we are led to infer that the moon's changes have little to do with the changes in our atmosphere. Only such cases were recorded as were decidedly in accordance or disagreement with the table.

The following observations were made at Martinsburgh, N. Y., during the following years:

PHENOMENA.	1838.	1 39.	1840.	1841.	1842.	1843.	1844.	1845	1846.	1847.
Sugar season commenced,................	Mar. 28	Mar. 20	Mar. 26	April 12	Mar. 6	April 7	April 3	Mar. 21	Mar. 20	April 4
Thunder first heard,............		Mar 21	April 22	May 2	April 22	May 1	April 23	Mar 7	April 10	April 21
Claytonia virginica in bloom,...........	May 1	April 13	April 10	May 8	April 18	April 20	April 16	April 18	April 12	April 25
Hepatica triloba in bloom,...............	May 1	April 18	April 14	May 7	April 20	April 22	April 14	April 16	April 10	April 25
Currants in leaf and blossom,............	May 20	April 25	April 17	May 16	April 30	May 4	April 24	April 22	April 20	May 12
Strawberries in bloom,..................	May 20	May 10	April 25	May 18	April 30	May 6	May 1	May 5	May 5	May 15
Garden cherries in bloom,................	May 25	May 12	May 8	May 21	May 15	May 10	May 4	May 7	May 7	May 19
Strawberries ripe.......................	June 20	June 23	June 11	June 15	June 14	June 20	June 10	June 11	June 9	June 13
Wheat heading out,......................	June 30	June 20	June 11	June 15	June 18	July 5	June 25	June 27	June 20	June 28
Haying commenced,......................	July 10	July 1	June 30	July 4	July 10	July 22	July 2	July 7	July 1	July 10
Raspberries ripe........................	July 15	July 23	July 11	July 10	July 14	July 18	July 15	July 14	July 2	July 14
Corn in blossom,........................	Aug 1	July 14	July 12	July 14	July 17	July 21	July 13	July 10	July 4	July 15
Blackberries ripe,.......................	Aug. 10	Aug. 16	Aug. 1	Aug. 12	Aug. 15	Aug. 20	Aug. 15	Aug. 19	Aug. 11	
Plums ripe,..........................	Sept. 10	Sept. 3	Aug. 17	Aug. 25	Sept 8.	Sept. 12	Sept 5	Sept. 4	Sept. 1	
Corn, &c , nipped by frost,...............	Sept. 11	Sept. 12	Sept. 20	Sept. 24	Sept. 14	Sept. 17	Sept. 28	Sept. 20	Sept. 27	
Early apples ripe,......................	Sept 15	Sept. 20	Aug. 30	Aug 28	Sept 2	Sept 5	Sept. 7	Sept. 14	Sept. 2	
Trees discolored by frost................	Sept 25	Sept 20	Sept. 20	Sept. 24	Sept 29	Sept. 17	Sept. 28	Sept. 22	Sept. 27	
First snow of autumn,...................	Oct 13	Sept. 27	Oct 26	Oct. 20	Nov. 10	Oct. 18	Oct. 20	Oct. 23	Oct. 17	
Indian summer began,...................	Nov. 4	Oct. 16	Nov. 3	Oct 27	Nov. 7	None			Nov. 6	
Sleighing began,.......................	Nov. 30	Nov. 29	Dec. 1	Dec. 12	Nov. 20	Nov. 5	Nov. 28		Dec. 30	

During the nine years included in the preceding tables, several very singular haloes, with and without parhelia, were observed, among which the accompanying are worthy of record.

Fig. 1. Seen April 17, 1843, at 3½ o'clock, P. M. The circle was white, the arc brightly irised.

Fig. 2. May 2, 1843, about 4 o'clock, P. M. Lasted one hour. The parhelion on the north was partly obscured by a cloud.

Fig. 3. A double halo observed May 25, 1843. The inner circle faint; outer one irised. The parhelia on the sides were a little lower than the sun. 5 o'clock, P. M. Lasted about one hour.

Fig. 4. September 6, 1843, at 7 o'clock, A. M., was seen the detatched arc A, with its convex side towards the sun, and brilliantly irised. By 8 o'clock a prolongation on the eastern side made the whole appear as in Fig. 5. The prolongation seemed to be the arc of an ellipse. About 10 o'clock the phenomenon presented the combination represented in Fig. 6. E B C F was the arc of a circle having the zenith as its centre, of a faintly white light. The circle G K H was white and distinct. The ellipse G D L H was irised and brighter on the eastern side. At the intersection of the horizontal circle with the circle and ellipse two parhelia were formed on each side, B A C D.

Fig. 7. Was an irregular halo composed in part of a circle and in part of an ellipse, seen from near sunrise till 10 o'clock, on the 2nd of January, 1844. At A, in the elliptical arc C F, was a parhelion, and another at B, to the east of the other, and exterior to the halo.

Fig. 8. A halo with an ellipse exterior to it, like Fig. 6, with parhelia on the eastern side. Seen April 11, 1844. On several occasions the halo, with an arc of an ellipse above and below, have been observed.

Fig. 9. Seen April 29, 1844, soon after noon, and for an hour. The smaller halo was by far the brighter, and very beautifully irised, but more brilliant above and below than on the sides. The larger having the zenith as its centre, was white and narrow, but very distinct. The sky during the time that this phenomenon lasted was very pure and serene. No parhelia were observed at the points of intersection.

Fig. 10. Seen January 6, 1846, at 8½ o'clock, A. M. B H A a common halo, very faint, having indistinct parhelia, each with a conical tail on the side opposite the sun. C a very bright arc of smaller radius. D E, F G, arcs of larger haloes, irised but faint. Preceded by a succession of frosty nights, and followed by rain.

Fig. 11. A halo seen February 24, 1846. The external parhelion irised.

Fig. 12. Seen March, 6, 1847, about 4 o'clock, P. M., preceded

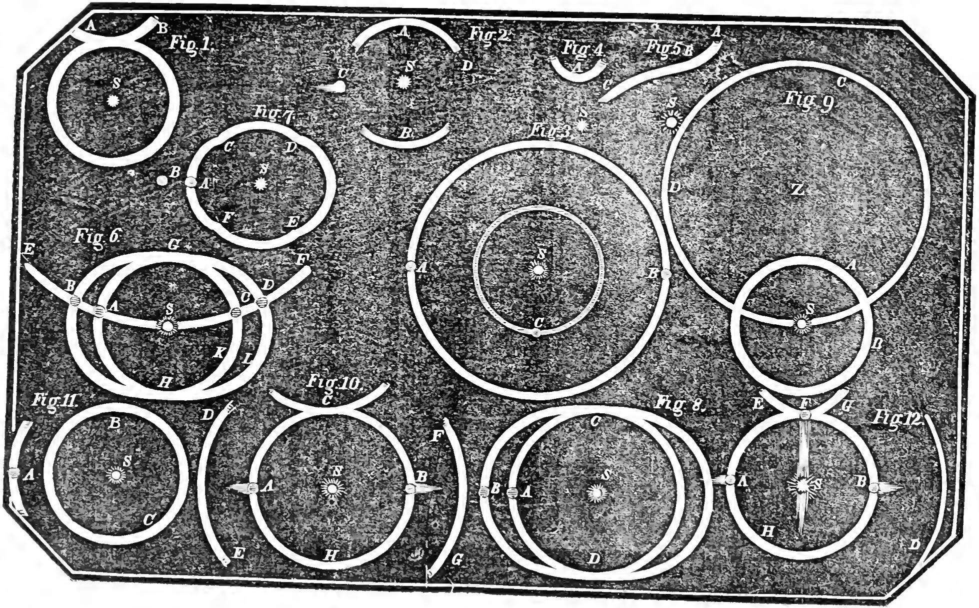


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.

by a warm and hazy day. The two parhelia on the sides were first observed, which slowly extending formed nearly the entire arc of the central halo. The parhelion on the north side was by far the brightest, and both were brilliantly colored. Soon after these were formed, there appeared above the halo an arc apparently of a parabola, also brightly irised. Finally and faintly there was seen on the north side the arc of a large halo distinctly irised, and the order of the colors were observed to be the *same* as those in the smaller halo. The red of this, as of the smaller one, was towards the sun, but the *violet* was its most conspicuous color. During the whole continuance of this phenomenon, there was seen by indirect vision a column of light extending upwards from the sun and to a short distance below it. The irised colors of the two parhelia were so bright as to attract general notice. The day following was stormy, with a strong wind and driving sleet from the west.

The following is a condensed table of certain meteorological phenomena, &c., observed at Martinsburgh, N. Y., during eight years:

PHENOMENA.	1839.	1840	1841.	1842.	1843.	1844.	1845	1846.
Solar haloes,	49	60	47	74	53	67	61	55
Lunar haloes,	11	15	18	17	21	19	16	14
Parhelia,	8	14	19	17	22	20	18	13
Aurora Borealis,	8	7		5	6	9	7	5
Shooting stars,	71	39	54	67	74	43	52	47
Days more than ½ cloudy,	250	261	210	274	245	231	221	237
Days less than ½ cloudy,	115	105	155	91	120	135	144	128
Starlight evenings,	204	197	169	210	189	182	177	168
Days—rain,	81	78	68	71	54	63	82	66
Days—snow,	64	53	71	68	57	78	63	58

The following table exhibits a comparison of the prevailing winds during the several years from 1840 to 1846, both inclusive:

WINDS.	1840.	1841.	1842.	1843	1844.	1845	1846.
Days—North wind,	68	71	60	54	68	79	58
Northeast,	7	6	4	3	6	9	5
East,	1	3	0	2	4	1	3
Southeast,	25	34	39	29	34	29	25
South,	84	91	85	94	78	81	73
Southwest,	23	27	34	44	30	40	51
West,	122	113	97	107	118	99	119
Northwest,	36	20	46	32	28	29	31

Comparative table of mean monthly temperatures during five years, compiled from observations made thrice daily, viz., at 9 o'clock, A. M., 12 M., and 5 P. M.

MONTHS.	1842.	1843.	1844.	1845.	1 46.
January,	21.3	25.2	13.1	14.9	23.8
February,	22.3	19.9	21.4	18.6	20.0
March,	32.3	31.1	29.9	24.7	30.3
April,	48.3	50.9	50.1	49.2	51.4
May,	56.7	55.8	55.3	58.3	54.4
June,	66.9	63.9	64.7	66.3	70.1
July,	72.1	68.7	69.1	68.8	71.8
August,	72.4	70.7	71.3	72.3	76.7
September,	69 8	64.4	68.8	63.9	65.3
October,	59.9	61.3	60.3	58.9	59.1
November,	50.1	49.8	51.0	48.2	49.9
December,	31.1	27.3	28.4	27.3	29.0
Mean,	50.2	49.1	48.6	47.6	50.1

The average temperatures here given are doubtless too high, as none of the observations were taken during the cool part of the day. The results of a long series of observations made at the Lowville Academy, (five miles north of the station where these were taken,) in conformity to the instructions of the regents, gives a mean annual temperature of about 42 degrees.

Snow usually falls during November, and continues on till April, having an average depth of about three feet during the winter. The amount of rain and melted snow that fell at Lowville during fourteen years, averaged 34.95 inches.

It will be observed that the prevailing winds are from the westward; a direction at right angles with the range of our hills and valleys, and indicating the action of distant and general causes. This prevalence of westwardly winds is sufficiently proved by the general inclination of pine trees in the forests, and elm trees growing in the open fields, which have almost invariably their tops swayed over towards the east. But one occasion is remembered during twenty years, in which a rain storm has come from the east.

Snow and sleet not unfrequently come from that quarter in the spring and fall, but rarely or never at other seasons of the year. As a general rule, our rain storms are from the west and south; snow from the north-west, and fair weather from the north. Rain in summer is almost invariably from the west.

Whether the deep snows which prevail in Lewis county, are to be ascribed to its situation between two extensive forests, or its relation to Lake Ontario being such as to receive the west winds which sweep over it, cannot be determined until the forests are cleared. Probably both of these causes influence the climate. It has been noticed that less rain falls of late years than formerly, as shown by the diminished size of the streams in summer, a fact that has been regarded with anxiety by mill owners, and which indicates the approach of a time when much trouble may be occasioned from this source. This is to be ascribed to the gradual destruction of the forests, and conversion of the swamps into meadows; by which means, not only less evaporation takes place from the general surface and consequently less rain produced, but the rills are exposed to the sun and dried up.

In the spring season, and in the early part of summer, it is common to observe those radiating beams of yellow and blue after sunset, which have been so often observed and admired in western New York. These belts of sunlight and clear sky, doubtless caused by the interception of a portion of the sun's rays by distant clouds, were on one occasion noticed extending across the entire heavens, and disappearing in the east. These parallel belts of light, by the known laws of perspective, seemed to diminish in breadth and converge in the opposite points as if another luminary was about to rise in the east.

There almost invariably occurs, during the year, two well marked seasons of smoky weather, in June and in November. The latter period is the well known American peculiarity, the Indian summer, which seldom fails to beautify with its bland air and dusky tints, the gloom of autumn, and usher in the winter. Is it not probable that this period corresponds to the halcyon days of the ancients? although that event occurred later than our Indian summer, it being the seven days that precede and follow the winter solstice.

Not having met with a satisfactory theory to explain this phenomenon, I have been induced to frame a theory of my own by which to account for it. Two facts are to be noticed; the lull of the atmosphere, and the smoky hue of the air. From the occurrence of this calm period on both continents, and at the transition between winter and summer, we may infer that it is dependent upon a cause as general as that which causes the change of seasons. The prevailing direction of winds in summer being from some point south of west, while in winter the winds are from a northwardly direction, is a fact so general as to accord with the experience of all, aside from meteorological observations. The change in the prevailing course of the winds, must be attended by a period of rest in the same manner as it would be, if the gentle current of a river was reversed, by a slight change of level in its two extremities.

The cause of the prevalence of southerly winds in summer, and the opposite in winter, is doubtless related to the revolution of the earth round the sun, in the same manner as the seasons, and due to the general flow of air from the cold hemisphere of the globe to the warmer, and its return upon the approach of the opposite season of the year. There would necessarily be two changes, and such we have; at the approach of summer and on the verge of winter, when the air would be calm and with little wind.

The gradual transition of solar heat from the northern to the southern hemisphere, would be insufficient to cause an immediate change in the prevailing direction of the winds, which would by the momentum they had acquired, preserve their prevailing direction till long after the astronomical seasons had changed; otherwise the change from south to north, would be so gradual as to be insensible. Thus are the summer and the winter prolonged beyond their fixed limits, and each is made to encroach upon the other. Local and modifying causes may hasten or retard this change in certain seasons and in certain localities; while particular districts may be so influenced by these causes, that the transition may be quite insensible.

It is further to be observed, that the change would begin in the equatorial regions and progress gradually towards the poles, commencing at about the time of the equinox, and causing those destructive storms that desolate the tropics at those periods of the year. The change progressing slowly towards the polar regions, would at length cease to be perceptible in high latitudes. Various causes might delay the progress of the change, so that at the same localities it might occur at an earlier or a later period, or not perceptibly, according to circumstances.

This cause is, in the opinion of the writer, sufficient to account for the calm weather which usually precedes the commencement of winter; the smoky and thick atmosphere of the Indian summer, must be accounted for on another theory.

Its occurrence after the destruction of the herbage and foliage by the frosts of autumn, (and in this region usually after our early snows,) seems to indicate that it has some connection with the annual destruction of vegetation, and that it is caused by the fermentation and decay of vegetable matter. A fact in support of this hypothesis is well known, viz: that the annual return of this period, of late years, since the clearing up of the forests, has been less decidedly characterized by a thick smoky atmosphere, than in the early settlements of the country when a large amount of vegetation was annually destroyed by frosts.

In cultivated districts there is but a small amount of organic matter thus destroyed, as most crops are removed before the occurrence of frosts; while the grass lands do not have their vegetation thus cut down. The halcyon days of antiquity, (which of course continue down to the present time,) were spoken of as a serene and sunny season when all nature was at rest, and the stormy elements were lulled to repose. The air was of a delightful serenity, and the sea fanned by gentle breezes, seemed peculiarly inviting to the mariner and tempted him to the treacherous main. But nothing was known of the thick smoky aspect so peculiar to our Indian summer. The location of the region where this phenomenon occurred, in a climate not subject to destructive frosts, and in the midst of a vast extent of cultivated land, sufficiently explains the reason of the serenity of the atmosphere. Many causes conspire to render this bland, dusky season peculiar to America.

The vast extent of timbered lands, and the nearly simultaneous destruction of foliage over its northern portions by autumnal frosts, and the remarkable difference between the temperatures of winter and summer, with the rapid change from one to the other, all conspire to produce, when considered *à priori*, such a season as we realize in our Indian summer.

That the smoky aspect of this period is caused by extensive fires at the far west, or in other quarters, cannot be believed, as such a cause does not annually exist to an extent sufficient to account for it. That smoke and opake particles from fire can be wafted to a great distance, is sufficiently proved by the fact, that in the summer of 1783 all Europe was overshadowed by a gloom from the eruption of a volcano in Ireland. That such an event, or even a common fire should occur periodically, and that too just at the time when the elements are at rest, is too absurd to be entertained. These hypotheses would not have been noticed, had not arguments to sustain them been published in journals of reputable standing. That the atmosphere at this season contains organic matter in more than ordinary quantities, cannot be proved without a delicate analysis; yet it seems extremely probable that foreign matter should exist more then than at other times, and at least so modify it that it should reflect more of the blue ray of the solar spectrum than the other tints.

THE ORGANIC MATTER OF SOIL.

An allusion is made to the use of organic matter of the soil, on page 40 of the July number. It is as follows: "Supplying, then, the soil with decomposing organic matter, and several important results follow; the rocks are dissolved and the plants may be supplied with the necessary carbon, ammonia, and other essential inorganic matter." The doctrine contained in this extract is important, and may be drawn out more in detail. The opinion has generally prevailed that mould, or the black matter of soil, was eminently useful. Many, and perhaps all, at one time entertained the idea that it was the principal food of plants. The idea, it is true, was crude, and it will not offend any one at the present time to say that the early notions of farmers and chemists, who had turned their attention to the subject, were crude, and probably, if we insist upon it, were really erroneous. Still, even error, in toto, is rare, and some truth at least is usually mixed with it; that it was a valuable composition in the soil, and performed some function serviceable to vegetation, was a common belief. The error consisted in the misapprehension of the truth, and was not so broad or fatal as that which maintains that it is of no use at all. It is by no means a fatal error to maintain that a substance is important, and yet mistake its function or office. It is one of those errors which belong to theory, and does not necessarily exist in practice. A farmer, for instance, believes that barn yard manure is useful. His belief will lead him to save it, and employ it upon his corn, and this he may do notwithstanding his theory of its action is misapprehended, or may be totally false. The main thing is to be right as to the fact. Still, a correct view of the whole subject, how the organic matter acts, in what way it is beneficial, and how it is related to the inorganic matter, will undoubtedly increase our power over the products of the earth. This is by no means an irrational view of the subject. If we apply it to some of the most common processes of farming, as plowing, it is evident that the farmer who best understands the object and use of plowing, will derive the most benefit from it. All agree that it is useful, and hence all will plow; still, those will plow the best, and adapt the work better to the end in view, who best understands its use, than the farmer who has only this naked truth at his elbow, that it is useful, but knows not why or wherefore. Theory, then, to continue the line of remark, is useful; and correct theory eminently useful. At the same time, the *fact* may, and usually is, more important practically; for the fact leads to the right action, but it may fall short of the benefit it is calculated to give, when fact and correct theory are conjoined, and go to the work together. Theory and book learning are often ridiculed by the *matter of fact man*, and yet observation often bears us out in the opinion that in most instances there is not only a great want of facts, but that also when found they are often greatly perverted. But we turn now to the subject more immediately before us. What are the functions which the organic matter performs in vegetation? Our belief is, that all terrestrial plants, if they do not absolutely require it, are at least benefited by it. That it is not taken into the plant in the condition of mould or humus, is proved from the fact that it is not in this condition sufficiently soluble. If then it is useful, it is necessary to maintain that it undergoes certain changes before it becomes the food of plants. It may minister to the wants of vegetation in several ways, without its becoming the food itself. It ministers to the vegetable by its presence, procuring thereby an open state of the soil, by which air is more freely conveyed to the roots. It ministers, also, to the wants of vegetation by its absorbent and retentive powers. Indeed, in this respect it is almost indispensable to vegetation. These, then, though not all the uses which mould exercises in vegetation, still are sufficiently important to merit the attention of the agriculturist. In neither, do we find that the brown or black matter of soil becomes the nutriment of vegetables, and yet its service is immense. To understand the nature of the changes which take place in the organic matter of the soil, it is necessary to know what agents exist there. A mixture of carbonate of lime and magnesia, silex and alumine, and orgainic matter, would remain without change forever, were there no other bodies of a more active kind, whose affinities become a present and efficient cause for action. These powers or forces exist in the atmosphere and in the water diffused through the soll, and it is proper to make a distinction of the atmosphere within the soil, from that above or without it. The atmosphere is composed of two elements, oxygen and nitrogen, in the proportion of 79 nitrogen to 21 oxygen. The latter is free and uncombined with the nitrogen, or is merely dissolved in it, just as sugar or salt is dissolved in water. The consequences which follow from this condition or state of the elements, is, that both are free to unite with other bodies, that is, so far as attraction for each other is concerned there is no hindrance or force to be overcome to bring about a separation. Hence, in the respiration of animals, the oxygen of the atmosphere which is inhaled combines readily with the carbon suspended in the return or venous blood. So in the soil, there is the same independence; the oxygen or nitrogen is not hindered from uniting with other bodies by any affinity existing between themselves. The final end or cause of this is, the ultimate union of the oxygen with certain bodies in the soil, especially with the organic part. The other agent, water, undergoes chemical changes of a different kind. In this the elements are chemically combined, and hence they are not so readily separated from each other, and hence, too, its action is constant, and that which is proper to it in its state of integrity—it is the solvent power so necessary to bring all particles to a state of fineness that they may pass into the organism of vegetables; for solution is merely that separation of particles to that degree of minuteness that they are capable of being suspended in the medium. They are merely farther apart, and they are brought thereby into a condition to undergo farther and more thorough changes than they were previous to their solution or suspension in the medium itself. But certain bodies can and do decompose it, the final end or cause of which is to supply ammonia or rather nitrogen to the growing plants. Air and water, then, contain the elements which make it possible for the organic matter of the soil to return once more to that vital state in which it exists in living vegetables, or in other words, to become the food of plants.

If we now trace the changes which decaying wood undergoes from the time when it first ceases to be a living body to that last change by which it is fitted for the function of nutrition, we shall be able to see its use in this part of the economy of nature. Wood, when it has lost its vitality, goes to decay, but the progressive changes which it passes through are not analagous to putrefaction. Rotten wood, as it exists in decayed trees, is a neutral substance; neither acid nor alkaline at first. But in progress of time, several definite substances are formed from it, which possess activity and belong mainly to the class of acids, and are capable of combining with the alkalies and alkaline earths which are soluble salts, and in this state minister to the growth of plants. Of the substances which are formed by decaying wood, and by peat or muck, ulmine is one, which is also a neutral body, and is quite insoluble, and hence is not useful as a nutriment. This substance is called ulmine from the fact that it was first prepared from the wood of the elm; but it is found in all other kinds of vegetable matters which are undergoing the changes already alluded to. Ulmine is formed from wood, or fibrous, vegetable matter of any kind, as leaves, twigs, &c., by the absorption of oxygen from the air, or contained in the moist earth. By a simultaneous action carbonic acid is liberated. The substance formed may be represented by C_{33}, H_{27}, O_{24}; 33 equivalents of carbon, 27 of hydrogen, and 24 of oxygen. The substance represented by this formula is a white, friable substance, found in the interior of hollow, decaying trees, and is produced by the oxidation of the woody fibre. Lignine also produces other bodies by combining with oxygen. Thus, 4 atoms of lignine,* C_{48}, H_{32}, O_{32}, with 14 of oxygen, produce 8C. O_2 with 18H. O.; and an atom of ulmine, C_{40}, H_{14}, O_{12}. Other products of an analogous kind are formed from wood by union with oxygen. Of these, humus and humic acids are among the most remarkable. The first is represented by the formula C_{40}, H_{14}, O_{12}; the latter by C_{40}, H_{15}, O_{15}. These two acids, which are spontaneously formed, and are common in peat and other earths, differ from each other in their relations to ammonia; the first having no affinity for it, while in the latter it is so strong that it is difficult to separate them. In consequence of this affinity, it no doubt forms an important element in productive soils.

* Kane's Chemistry, edited by Draper, p. 638.

Another class of vegetable acids, which are also produced by the action of oxygen on organic matter, is called the azotized, from the fact that they contain nitrogen. These acids are the *crenic* and *apocrenic* of Berzelius. Both are soluble in water and alcohol; the apocrenic less so than the crenic. They form with alkalies and alkaline earths soluble and insoluble salts; some of which are essential constituents of a rich and productive soil.

By the continued absorption of oxygen from the atmosphere, wood and other organic matters are converted into a nutriment for vegetables. The crenic and apocrenic acids are products of bodies which are nitrogenous themselves; the nitrogen of which is retained through all the changes which the organic matters pass.

It seems to be established, then, that organic matter may be useful to plants, and may promote their growth in various ways. This conclusion might be made almost *à priori*, subsequent to the determination of the nature of the bodies under consideration; for it is well known that many bodies require nitrogen; and it is ascertained that some of the organic bodies contain, and others absorb and retain ammonia obstinately. And each of these classes of bodies are soluble, and in a condition to be received into the vegetable system.

If the foregoing considerations are true, why should farmers be taught that the organic matter of decaying leaves and of their barn yards is useless? that it is a bad economy to spread it upon their fields, or plow it into their soil? We have sometimes wondered why it is that many intelligent farmers hold book farming in such low repute. We, however, have been satisfied as to the cause; when, for instance, doctrines are taught so contrary to their experience; and when they are told that they had better burn their barn yard manure rather than carry it out to their meadows, we are not at all surprised that they lose confidence in books, and hence often refuse to receive many things which are really sound and valuable; and this, on account of the erroneous doctrines which come apparently from a responsible source.

But to return to the consideration of ammonia in the soil. Chemists are not agreed as to the processes by which ammonia is supplied to the soil. That it exists there, and that it is provided for by certain chemical changes is admitted. We have stated in a former article in this journal, that one of the means by which it is restored to the soil is through the mutual influence of water and the protoxide of iron; the latter substance having the power of decomposing the former and taking to itself its oxygen; the hydrogen being liberated instantly combines with the nitrogen of the air in the soil, and forms with it ammonia. Humic acid, too, by its strong affinity for ammonia, rapidly absorbs it whenever it is freed from its combinations. Other modes undoubtedly exist by which the nitrogenous compounds are supplied with this essential element. Ammonia, too, has been proved to be present at all times in the atmosphere, though only in small proportions.

One of the forms in which ammonia is found in the soil is that of apocrenate of ammonia; a compound which is formed from humic acid by its continued oxidation; the apocrenic acid being merely a higher state of oxidation of the same substance. In the chain of causes by which apocrenic acid is formed, nitric acid is also generated, according to Mulder—this acid acts with great vehemence upon humic acid. Admitting the fact of the formation of nitric acid, and its subsequent action on humic acid follows necessarily; and furthermore, we can understand how the humic acid is oxidated and changed into apocrenic acid. Mulder says, p. 166, in his Chemistry of Vegetable and Animal Physiology, when apocrenic acid is found in the soil it is accompanied with the production of carbonic acid; the ammonia of the soil produced in it from the atmospheric air it has absorbed, may, by the influence of decaying, organic substances and water, be converted into nitric acid; and no doubt is so when the bases required for nitrification are present. Saltpetre was long extracted from the soil exclusively, as in many places in Egypt, India, &c. By the oxygen of the atmospheric air contained in the soil, the hydrogen and nitrogen of ammonia produced from the constituents of the air are oxidized; water and nitric acid as soon as it is formed, meets with a substance in the soil, humic acid and humin, which by its influence is converted into apocrenate of ammonia, and at the same time produces carbonic acid. This change of humic acid into apocrenic acid takes place in minute quantities; as is the case with the formation of ammonia which precedes it. Thus, to form one equivalent of apocrenic acid, there are required two equivalents of humic acid and one equivalent of ammonia and seventy-six equivalents of oxygen. In this production of apocrenic acid, the ammonia from the humate of ammonia is not only transferred to the apocrenic acid, but it performs an intermediate part, namely, the fixing of oxygen. Through the tendency of ammonia to form nitric acid, the oxygen of the atmospheric air contained in the soil is combined with the constituents of the humic acid; the ammonia itself remaining unchanged; neither leaving the soil, nor being oxidized into nitric acid. If there be not an abundance of organic matter, and if the air be moist, and lime, magnesia or potash be present, ammonia is first produced, and afterwards nitric acid. If, on the contrary, instead of these leaves, organic substances are in excess, humic acid is formed by their decay; at the same time, ammonia is produced from the nitrogen of the atmosphere; and, finally, apocrenate of ammonia, carbonic acid and water."

This long extract seemed to be required in order to put the reader in possession of the views of Mulder on this important subject; from which it is well established that organic matter in soil is of the highest moment; and that it not only ministers indirectly to the growth of plants, as stated in the early part of this article, but also becomes food itself in the form of apocrenate of ammonia. So, also, that important substance, carbonic acid, is liberated and furnished to the roots; a substance which many suppose is taken up by the leaves only. The apocrenates are continually forming; not only the apocrenate of ammonia but also those of potash, lime and magnesia.

Through, then, the action of the organic acids the inorganic bodies are received also into the circulation of vegetables; and this gives us an idea of its importance, namely, as a medium by which lime, magnesia and potash are supplied to the vegetable kingdom. The carbonates of lime and magnesia are rather insoluble bodies, though the carbonates of soda and potash are, as is well known, highly soluble.

We should take an unsafe course in practice, then, in rejecting the organic part of manures; and how truly important lime, potash, soda, magnesia, &c., they are; still, soil cannot and is not fertile if they contain only these; and the highest and most valuable soils are those in which a due balance is preserved between the organic and the inorganic part.

WOOD'S CLASS BOOK OF BOTANY.

The second edition of this popular and interesting work has just been published. The character of the first edition was early announced in this journal. It contained one of the greatest improvements in the study of modern botany. Adopting the *natural system*, it employed the Linnæan method as a mere index to lead to the natural orders, or genera of plants. It was the happiest application of the artificial method that had ever been made, and comported exactly with the great end designed by the immortal Linnæus himself. He failed to perfect the natural method he had begun, because he could not attain the requisite knowledge of plants, and because the structure of vegetables had been so little examined. Owing to the splendor of his attainments and the admirable simplicity of his artificial system, as well as the devoted attachment to him as the great master in botany, the *natural method* made slow progress. There were two intrinsic difficulties in the way, which could be removed only by long continued exertion of a host of the finest minds. These difficulties are not indeed all removed. The ignorance which nearly overwhelmed the powers of the great Linnæus is not yet wholly dispelled, and so oppresses the great lights of botanical science, that they are obliged still to retain not a few artificial characters. *How* they are to be removed no eye has yet discovered, though the rapid improvement made in the last twenty years gives rich promise of a brighter day.

Mr. Wood, taking the natural system in its most improved state, has given to the student a very clear exhibition of its principles, as well as a brief view of the Linnæan classification. In the second edition he has added a chapter on the "principles of agricultural chemistry," which supplies to the learner an important part in the practical application of the science. Among the elements of plants is *carbon*, which he correctly states "is derived from the carbonic acid which the atmosphere contains, and from the decaying vegetable matter of the soil;" thus, making the sources of carbon to be the "air, earth and water." The use and benefit of manures is thus fully implied, and on no other principles can be maintained.

In the study of the natural system no learner knows how to begin. Though he may readily discover the great natural divisions, and see that his plant is, for example, an *exogen* with a polypetalous corol, as there are before him *seventy orders* with polypetalous corols, how shall he refer his plant to the proper order? In the second edition this is done by an *analytical table;* a table for the analysis of plants, preceded by a clear exposition of the course to be pursued, in which the Linnæan system is not employed, and by which the student is led by a simple process to the order in which his plant is contained. This process of analysis "consists of a simple series of *dilemmas* or *alternatives;* the decision being, in almost all cases, to be made merely between *two opposite* or *obviously distinct characters.*" This mode of analysis avoids all the irregularities found in the Linnæan classification, shortens and simplifies the analysis, and conducts the pupil by obvious and distinct particulars to the natural family now sought after. If the mode of this general analysis is as complete as it appears to be, it is one of the greatest improvements found in any class book, or other book, on this modern science. It realises the declaration once made, that ere long the dependence on stamens and pistils, so complete for fructification, will be unknown in the study of botany. Rendering useless as it does the *artificial* system, it will not however detract from the glory which must ever rest on the head of Linnæus for his developments in botanical knowledge. It is not easy to see what improvement can supersede the use of the analysis given by Mr. Wood in this Class Book, as it is modestly named by the author—a Class Book, so rich in this science.

This edition is enriched by some new genera and species. A tour of the author the last year through a considerable portion of the western states afforded him many treasures which the work contains.

The work is made far more valuable, too, by the introduction of many foreign species which are now of common occurrence in shrubberies, or in the richer gardens and green-houses. The student will be glad to find the additional species of the Buck Eye and Horse Chesnut family; of the Elæagnaceæ, as the beautiful Shepherdia argentea, so easily cultivated; the species of Daphne, Clarkia, Fuchsia, Lonicera Tartarica, Viscum, Platea and Ailanthus; or, as Loudon gives the last, Ailantus, from Ailanto, the name of an eastern species.

Many, who will use this class book, will not be disappointed in finding several species of Pæonia; many of the Rosa, the new Sullivantia, the Itea, the beautiful and odoriferous Calycanthus, and many others. A few more introduced plants may find a place in subsequent editions.

The edition is the more valuable from the authority of the works whose nomenclature and names are generally adopted; as of Drs. Torrey and Gray, our distinguished botanists and standard writers on our botany.

The great divisions of the vegetable world are fully and clearly expounded.

1. The Phænogamia, or Flowering Plants.
2. The Cryptogamia, or Flowerless Plants.

The Phænogamia, from their manner of growth, are distinguished into—first, Exogens; and second, Endogens.

The Exogens form two classes, as they have *covered* or *naked* seeds, called

I. Angiosperms; and
II. Gymnosperms.

The Endogens form two classes, as they have *glumes* or *not*, called

III. Aglumaceous; and
IV. Glumaceous.

The *Cryptogamia* also form two classes. "The mutual relations of the six classes with the higher divisions" are shown in the Class Book in the following manner:

Vegetable kingdom.	Phænogamia,	Exogens,	Class I. Angiosperms,
			Class II. Gymnosperms.
		Endogens,	Class III. Aglumaceous,
			Class IV. Glumaceous.
	Cryptogamia,		Class V. Acrogens,
			Class VI. Thallogens.

This edition contains a great amount of the most important and desirable knowledge in theoretical and practical botany, and forms a beautiful book of 645 pages.

The teachers of botany in our higher schools should make themselves familiar at once with the Class Book of Botany, and teach no other than the natural system. Even the imperfect knowledge, too commonly obtained by classes in botany, should be taught on correct principles and from the more perfect system. The books on English grammar, or arithmetic, fifty years old, are not so far behind the times as the works on botany which have been in use till recently. A teacher cannot too soon come up to the improvements of the age.

The first edition was extensively adopted in the important seminaries of the northern states. The adaptation of the work to a more southern latitude was eagerly desired. This has now been effected. The second edition is certain of a more wide and general use. It will go wherever the other has come to be used, and be hailed as a great improvement. It deserves a place in every library, which is used by those who have any knowledge and taste in this science.

SHADE TREES NOT INJURED BY GAS.

It has been supposed that many of the shade trees which are dying and dead in this city, have been injured and killed by the gas which escapes from the conducting pipes. However plausible this view of the subject may appear at first sight, it will nevertheless be found on examination that the trees are injured by other causes. It is true that trees near any establishment where sulphurous acid and other compounds of sulphur escape, vegetation is either destroyed or injured more or less. Even the lime from the gas works through which the gas has passed for purification is injurious to plants, especially those which belong to the herbaceous kind; but this lime may be put around the body of fruit and forest trees without perceptibly injuring them. The trees which are dead and dying in Chapel street, are destroyed by other causes.

If, for instance, the bark is removed, it will be found that several of them at least, are infested with the larvæ of insects. These larvæ burrow between the bark and wood, and thereby destroy perfectly the communication between the branches and root, or in other words, the circulation of sap is entirely interrupted in the worst cases, and hence, the tree perishes. The insects which infest these trees, belong to several species. One of them belongs to the genus SCOLYTUS, and though very small, is yet capable of effecting the entire destruction of an individual tree in the course of two or three years.

These facts it seemed proper to state, for it is not right that the cause of the ruin of our beautiful shade trees should be laid to the charge of persons who are entirely free from blame. As it is now ascertained that the trees in question have been injured, and in some instances totally destroyed by insects, many no doubt will be anxious to learn if there is any remedy against these depredations. And here we are extremely sorry to say, that we fear we are left without adequate guards to their ravages. Especially is this the case within the limits of the city and its neighborhood. The reason is this; the birds, which are naturally our defenders against insects, are not suffered to live. Every grown up boy is permitted to destroy them with his gun, out of mere sport and pastime. A sparrow or robin which strays from its shelter, the woods, is sure to be shot; and a wood-pecker, whose special business it is to look after grubs beneath the bark of trees and in its hollows, is considered as lawful game, and a meritorious act to pop him over. So many other species who happen to be fond of cherries in their season, but who subsist mainly on worms, are sacrificed by persons who mean to be humane and to act generally upon Christian principles. If the robin or cedar bird, however, for the sake of a little change of diet, and after a long season of feeding upon meat, ventures to take a few cherries, he will most certainly have to pay a heavy penalty for his temerity, a forfeit of his life. That shade and ornamental trees are mainly destroyed by insects which have increased in consequence of driving away the birds from the open fields and hedges, seems to be true from the fact, that in forests and their vicinity where birds are numerous, they are not killed. The wood-pecker and creepers and other birds feed upon this larvæ continually, and thus so far diminish the number of destructive insects, that the trees mainly escape. But near villages and towns the trees are left without their natural protectors, and hence fall a victim to the ravages.

Something may be done, by great diligence, in ridding ourselves of the enemies of our fruit and shade trees. But in order to effect much, it is necessary that the habits of insects should be well understood; the time for depositing their eggs found out, together with many other facts in their history, before we can successfully attempt to guard either a shade or fruit tree. Those persons who raise fruit for market or for their own luxury, had better be content with sharing their products with the birds than to have their trees totally destroyed by insects; and so important is the feathered race in view of the defence which they afford against insects, that it would be well to protect them by the enactment of a law, the force of which should prevent their extirpation at the hazard of a proper fine on conviction.

STRAMONIUM.

Children sometimes eat the seeds of this plant, which speedily induces a train of alarming symptoms. The first effect is dryness of the throat, and a hoarseness of the voice, the intellectual functions soon become obtuse, the limbs are weak and trembling, and there is but little disposition to sleep, though it produces, like opium, agreeable dreams in small doses. But unlike opium in small doses, it does not affect the appetite; in large doses it diminishes it, but the salivary and urinary secretions are increased, in which respect it resembles in its operation, digitalis. As a sedative it is slower in its operation than digitalis, and more certain; when taken in large doses it disposes to hemorhage, and if ceath follows, to a speedy dissolution of the body; hence it extinguishes rapidly the vital powers. Stramonium, digitalis and prussic acid diminish the oxygenation of the blood.

PROGRESS OF DISCOVERY.

The history of all great discoveries forms an interesting subject for reflection; and it will afford us that kind of information, which will dispose us to set a due value upon the labors of our predecessors, as well as upon our cotemporaries. The discovery for example, of the action of plants upon carbonic acid, illustrates the usual progress of the discovery of all great ones which have hitherto been made by experimental researches. Thus Bonnet first observed the evolution of a gas from leaves immersed in water; Priestly discovered that the gas was oxygen; Ingenhouse demonstrated the necessity of solar light for its disengagement, and finally to complete the range of discovery Leuwestein has the honor of showing that the oxygen gas is derived from carbonic acid. It is in this way that discoveries advance in a certain line step by step towards some ultimate fact, which is required to give perfection to the advancing series.

CAPACITY OF A SOIL TO ENDURE CONSTANT CULTIVATION.

The capacity of a soil to support for a series of years, the cultivated crops, depends mainly upon the following conditions:

1. Upon the quantity of water it can imbibe or retain, during the seasons which would be considered dry.
2. On the amount of nutritious matter which may be introduced without waste.

A supply of water must ever be regarded as one of the most essential things in the cultivation of all crops. This water must be retained long enough to act upon the nutriment in the soil; it must not escape immediately from the superior part of the soil, or that part through which it usually ramifies. The quantity of nutriment which may be condensed in a soil, depends too upon its retentiveness for water; if it is too porous, it is speedily washed out and lost, if too close, it is not received into it but is lost by exhalation from the surface. In cultivation then, we seek to modify both extremes; the object in all cases being to secure that texture, which shall give it certain relations to water, which experience and reason have determined to be the best.

PRACTICE AND THEORY.

The practice of agriculture has advanced with far greater rapidity than its theory. Indeed, so far in the back ground is the theory, and so imperfect in its development, that it may be regarded as existing in expectation rather than in fact. The advancement of agriculture then, cannot be ascribed to theory, neither can it be said to be under its guidance or direction. There have been, no doubt, many suggestions which have sprung up from doctrines to a certain extent, which are theoretical, still the practice of agriculture is rarely governed by them.

The fact, however, must still be maintained, that its perfection can be attained only by the aid of a sound theory. This will do for agriculture, what it has already done for astronomy, geology and chemistry. That the practice of agriculture has advanced far towards perfection without the aid of theory is not very surprising, when it is considered that its operations are very simple and that the results flow from them with great certainty. This fact has prevented that special consideration of phenomena, which would have come to pass in more complicated arrangements. Besides the phenomena with which agriculturists are most familiar, are enveloped in a kind of mystery, and hence beyond his reach. He can, however, bring out the phenomena of vegetation in its season; the grass and grain springs up when he sows the seed; it grows up under his eye, though not in obedience to his will; he still stands, however, in the place of its proximate cause. He has learned by ample experience that its growth may be promoted or retarded by certain agents; yet the why and the wherefore he has not satisfactorily determined.

HESSIAN FLY.

Dr. Emmons—Since my return from my very delightful excursion through your state, I have renewed my researches in the wheat fields, and have been partially successful, though not equal to my expectation. From some cause, which I cannot explain, the larvæ of the Cecidomyia which I have found feeding in the centre of the straw, have been so retarded in their growth that they have not attained more than half their usual size. While the wheat is ready for the harvest, of course there are none on the outside of the straw, and no injury appears to have been done in the grain, though the worm is to be found in great abundance through the field that I have been in the habit of visiting. What will be the result I am unable to conjecture, but intend to bring a sheaf of the wheat, when cut, into the library, and thus have it under daily inspection. Perhaps the larvæ may not perish, but go through their changes inside the straw, though I fear they will, as they usually pass through their different changes in time for the flies to deposit their eggs on the grain while in the soft or milky state.

I have gathered some of the straws with the larvæ in them, for you, and leave them in the care of Prof. W. R. Johnson, who will, I have no doubt, forward them to you. Together with these, I send another insect, the larvæ of which I found feeding in the earth of a flower-pot in my window. Desirous of ascertaining its true history, I put some of the earth containing larvæ and pupæ under a bell glass, in which I planted a bunch of growing wheat, suspecting it to be a wheat fly of some kind. In two days a number of flies made their appearance, and on the third, I saw six flies depositing their eggs on the lowest leaves and sheath of the growing wheat. At first these eggs were of a pale straw color and nearly transparent, but subsequently became black; they are firmly glued to the straw, and have undergone no change since then, from which I infer that the earth is their feeding place, and their food the decaying straw. If so, they must be useful in hastening the decomposition of the straw, and rendering it sooner available for manure.

In vial No. 3, I send you some of the earth in which will be found fine particles of straw and chaff. No. 2, contains larva, pupa and perfect fly; and in box No. 4, you will find dried specimens of the fly between the layers of cotton. Vial No. 1, contains wheat-straws with the larvæ of the Cecidomyia feeding in them.

After a careful reading of all the numbers of Dr. Fitch's communication, in the American Journal, I have found no description that would lead me to believe that either of these insects have fallen under his observation. Certainly the larva feeding in the centre of the straw bears no affinity to the tritici, as that feeds in the blossom, and undergoes its change either in the earth or in the husks of the wheat; while this, as you will see, feeds in the stalk, and the fly does not make its appearance until after the grain is formed, and undergoes its change either inside or on the outside of the stalk, as shown by the specimens now in the Academy of Natural Sciences, Philadelphia.

The names of both of these insects I shall therefore leave to those more learned in the law than myself; but I think I have shown clearly that I have not been observing the C. tritici, and that for at least half my journey I have been led by Say and Le Sueur. Of the destructive powers of the insect, I think no one can doubt, feeding as it does in the centre of the straw near the joint, and thus draining the grain of its nourishment at a time when the whole vigor of the plant is required to bring the seed to maturity. In 1838, '40 and '41, many fields in this neighborhood were so impoverished by it, that they did not yield a crop sufficient to remunerate the farmers for the expense of harvesting.

I have deposited specimens of both these insects in the Academy in Philadelphia, and suppose they will be published there; should they not, I will be gratified if you will take them under your care. I remain yours, very sincerely,

W. H. MORRIS.

Germantown, July 16, 1847.

IMPROVEMENT IN SMELTING COPPER ORES BY ELECTRICITY.

Although we have before acquainted our readers with one or two methods of the application of electricity in the smelting of copper ores, we learn from the American Mining Journal that a patent has recently been obtained in France for another improvement in electrical smelting by M. M. Dechaud and M. Gaultier de Clanbury. These gentlemen had long been engaged on the effect of weak electrical currents on copper ores; and the following is an account of the results at which they had arrived before taking out their patent. The process consists of two operations, viz: roasting the ore, and the precipitation of the copper. The roasting is effected in a reverberatory furnace, either by conversion of the sulphuret into sulphate by the action of the air, or in the transformation of the oxide of copper into sulphate, by calcining it with sulphate of iron, at a dull red heat in a current of air, the iron being left in a state of peroxide. Washing, then, extracts the sulphate of copper, so that the most impure minerals will afford copper equally pure with the carbonate or oxides. In the precipitation by galvanism, batteries would be far too costly; and they have obtained the same results without the use of exterior batteries. The principle is as follows: If two solutions are placed one over the other, one of sulphate of copper, very dense, and the other sulphate of iron less dense, and in the first is placed a plate of metal, and in the second, a fragment of cast iron, and then unite these two metals by a conductor, the precipitation of copper commences at once, and is completed in a long or short period, according to the temperature, the concentration of the liquids, and the extent of metallic surfaces, the state of the copper becomes greatly changed as the liquor becomes weaker. To obviate this, they take advantage of the following phenomena; after some minutes' action, there exists four strata in the liquids; at the bottom is a dense solution of sulphate of copper, then a less dense solution of the same salt; next, a sulphate of iron, and on the surface a less dense solution of the same. If, therefore, we arrange at the level of each of these liquids suitable apertures for the addition or the removal of the liquid, they can be kept at a uniform state of density, and thus the copper is always pure, and in the same physical condition.

For convenience, the liquids are now arranged in vertical, instead of horizontal layers; they are now to be separated by a diaphragm very permeable to electricity, but not to liquids, pasteboard answers perfectly well for this, and lasts for months. The apparatus is then arranged as follows: a chest of wood, lined with lead or some suitable mastic, contains the solution of sulphate of iron; into this chest a number of cases are plunged, made of a frame having its ends and bottoms formed of iron plates coated with lead, the sides being of pasteboard. The strong solution of sulphate of copper enters through a pipe near the bottom, and escapes in its weak state through an opening at the top; in each case is placed a sheet of leaded iron, and between each are plates of cast iron; separate rods connect each plate with the common conductor, which is supported over the apparatus, and the copper is precipitated on both sides of the sheet of metal, the pasteboard preventing the immediate contact of the two liquids; the sulphate of iron thus floats above the sulphate of copper, and the apparatus fulfils all that is required. At a temperature of 60° Fah. 1073 feet of surface will receive 14,444 grs. of copper in 24 hours perfectly pure, and immediately fit for hammering or passing through the rolling mill. This manufacture of copper presents no difficulties, requires no refining, and gives no scoria. The patentees consider that as a metallurgical result, 50 per cent of the copper is obtained in sheets; 25 per cent in fragments which require fusion; and 25 per cent in powder requiring subsequent refining. The application of galvanism to smelting appears to be reduced to the simplest form, and electrotypes on the largest scale can be obtained.

EXTRACTS—DOMESTIC AND FOREIGN.

The following article extracted from the Journal of Agriculture, and the Transactions of the Highland Agricultural Society of Scotland, may not be precisely adapted to the system of farming in this country; yet it contains much which may be profitable to every thinking farmer, and may lead also to improved modes of culture.

Cropping Fallows. By the late *Mr. Main*, Chelsea.—Fallowing arable land for the purpose of ameliorating or clearing off weeds, or resting it for a few years after a course of severe cropping, are two of the oldest practices incident to field husbandry. In the early history of the Jewish nation, we learn that resting the arable land at stated periods was enjoined by their legislature; and ever since, the same customs have been followed in every modern system of agriculture, except in such populous countries as China, where no weeds are suffered to grow at any time, or as in certain districts of high-rented land in this country, where continual hand-weeding of every crop checks the increase of weeds, and renders summer fallows unnecessary, as is exemplified in the large market garden farms in the neighborhood of London, where every plow and harrow are followed by a troop of women and children, who pick up every root weed they can find. Weeds naturally arise in every crop, and if not destroyed, increase in number in every following one, till at last they gain possession of the whole surface; in which case a fallow is the only remedy. On the other hand, if land has been exhausted by long and repeated annual cropping, it is recruited by being laid down to pasture for a few years, in order to be again broken up at a suitable time. On this practice of having land alternately under the plow and pasture, the system of convertible husbandry is founded; and is unluckily less practised than it deserves to be.

Fallowing, therefore, though in most cases absolutely necessary, is always regretted, because the process is expensive without immediate profit; and when a fallow on light soil is extended for wheat to be sown at Michaelmas, the purpose of the fallow is completed; that is, the soil is sufficiently reduced, the weeds destroyed, burnt, or got off by the first of June, after which the land must lie naked till wheat seed time. It was this circumstance, in all probability, which first suggested the idea of raising an immediate crop on the naked fallow. Any plant which would arrive at an useful degree of perfection in the space of four months, would be of great importance to the live stock farmer, and at the same time prevent the naked soil from being parched and impoverished by the heat of the midsummer sun. The clovers and their alliances were recommended, as well as several of the grasses; but the turnip and its congeries were found the most eligible, whether to be eaten or drawn on before wheat sowing, or to stand over the winter to be eaten off in the spring. The introduction of the turnip upon the fallows, formed quite an era in British farming; so satisfactory was every trial of raising turnips on the fallow, that hardly any other kind of plant was thought of as a substitute.

This predilection for the turnip, in a very short time produced a very material change in the general system of farming. It introduced the *four course* rotation of cropping over all the lighter descriptions of land in the kingdom; and of course the general practice became much more uniform and successful. But this uniformity of culture, and constantly recurring crops of the same kinds upon the same fields, began to show, that there was not a sufficient variety of plants in the rotation. Some of them exhibited unusual weakness. Broad clover was one of the first that gave signs of being tired of land where it had often been grown before; wheat appears to be less abundant than formerly; and even the turnip itself presents signs of decrepitude.

These failures can only be attributed to the too frequent repetition of the same crops on the same fields; the attention of farmers has been awakened to the subject, and it is matter of serious consideration with every thinking man, how far our present management of free soils, as respects the rotation of the crops, may be improved by the introduction of new plants, and to which the land would be a congenial bed; that is, not already tired.

Such additions can only be pasture or fodder plants, either of which would be a valuable boon to the live stock farmer, or to any one wishing to increase his live stock. Because, according to the number of the flocks and herds that can be well kept throughout the year on any farm, in like proportion will be the amount of profits arising therefrom. Any crop, therefore, that can be raised upon a fallow, between the first of June and wheat seed time, say before the middle of October, will be so much clear gain; and, what is of equal importance, the land itself will be less exhausted by bearing a green shady crop, than it would be lying idle for two or three months, exposed to the parching sun.

On some of the light gravelly soils in the south of England, and where the fallowing is soon completed, the farmers have a custom of sowing brank to shade the land, and as a preparation for wheat. This plant is so rapid in growth, and so quickly arrives at perfection, that though a native of India, it may be successfully cultivated in Siberia, where the summer continues only three months; if sown, therefore, in the beginning of June in this country, the crop is usually in the barn or rick-yard some time in October. The straw is of no use as fodder, and makes but poor litter, the whole plant being so succulent, that it is quickly decomposed, whether in the earth or air. The plant is most impatient of frost, the least degree being fatal to it during growth. In favorable seasons, however, it yields three or four-quarters of grain per acree, the price varying with that of barley, and is eagerly purchased by distillers.

But there is another much more useful fodder plant, which may be raised on a wheat fallow, and within the same period as is required for brank, namely, three or four months; and to recommend which to the notice of live stock farmers, is the principal object of this communication.

This plant is no other than the common trefoil, which when the fallow is completed early, say beginning of June, let a liberal quantity (8 or 10 lbs. per acre), be sown on a well pulverised surface, tined in, and rolled down smooth. If the soil be somewhat moist, or soon afterward refreshed with showers, the plants will quickly appear and cover the ground, and be ready to fold off in good time.

A friend of mine, a most intelligent and successful farmer and grazier in Essex, has this last summer tried for the first time the trefoil at my instigation. A few days ago, I requested to know how it turned out; his answer now before me is in the following words:—"The weather was so very dry, I did not sow till the third week in June, and I think we had no rain till quite the latter end of that month. Soon afterwards, the plants came up and flourished quite equal to my expectation, and afforded abundant keep both for beasts and sheep; and, moreover, formed a firm and wholesome seed-bed for the wheat, in a field which was always before too light for wheat after a fallow."

Here, then, we have proof, that when light land requires a fallow for wheat, a kindly preparation may be made for it by taking an immediately previous crop of trefoil, which is so much gain by saving other provender, advancing the condition of the stock, and as already observed, improving the staple for the reception of the wheat seed. I know of no other plant that would equally answer the purpose of the farmer as trefoil. Tankard turnips, indeed, might be tried before wheat; but they are a more expensive and more casualty crop than trefoil.

The introduction of the greatest variety of useful plants into our rotations of crops is a positive advantage. It is well known that plants of different genera succeed each other on the same spot much more prosperously than if they were nearly allied; and, therefore, whenever a useful green crop can be taken from between two white ones, all three will be benefitted. This, indeed, is a general rule among cultivators, and it is a practice which can hardly be carried too far. The foregoing account of the success of trefoil, is one instance of how any rotation may be occasionally varied with advantage; and it is a practical point of cultivation which should engage atttention much more than it has hitherto done.

Every addition that can possibly be made to the amount of fodder upon a farm, is in the present state of British agriculture, of most material consequence to the farmer. Less plowing, except for green crops, and more feeding, should be a guiding principle. The butcher and cattle-dealer would be better customers than the miller and corn-merchant. With the former we have few or no rivals; but with the latter both Europe and America are in league against us, or at least their threatened rivalry should not be disregarded.

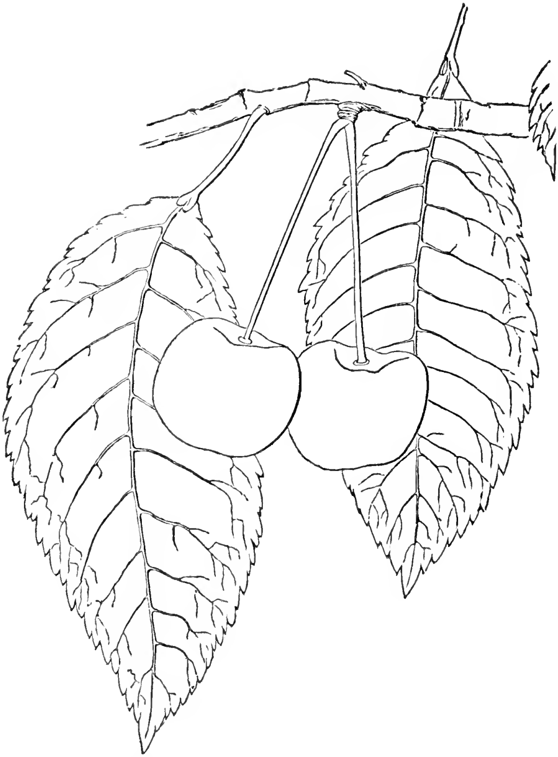
WENDELL'S MOTTLED BIGAREAU.

This new seedling forms a fine addition to our fruits. It is a large and handsome, and is certainly a very good bearer for its age. It is a strong, robust tree, of good shape, and with large luxuriant leaves upon a stout thick branch.

The fruit is deep red, and before it is fully ripened, distinctly mottled, but when it is perfected, this characteristic is not so strongly marked. The flesh is rather a dark red, firm, though not tough, but is juicy, and may be masticated for some time during which it yields a high flavored and rich taste, without the unpleasant raw and acid taste of the common cherry.

We annex an outline cut, which exhibits its shape, size and length of stem.

As we design giving a rich steel engraving of this seedling, in our September number, we deem it superfluous to enlarge our



description at this time. The name we have given this production of our most enlightened and enthusiastic horticulturist's, we hope will prove acceptable to our readers. They will bear in mind that this name will be received by horticulturists, as the common name by which it is hereafter to be known.

There is a great evil in multiplying synonyms, especially for fruits; it must lead continually to the commission of mistakes and disappointments, and hence that name which is given with the first description, especially if it is accompanied with a figure, never ought to be rejected without very urgent reasons.

MR. G. S. JOHNSON, AND MR. T. BROCHALBACK,

Are the authorized Agents for this Journal.

LIST OF NEW SUBSCRIBERS THIS MONTH.

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Jabin Armstrong, Camillus.
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Daniel Sands, "
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" " " 2, Camillus.
" " " 11, "
" " " 4, Onondaga.
" " " 3, Camillus.
" " " 18, "
" " " 12, "
" " " 11, Van Buren.
" " " 7, Elbridge.
" " " 2, "
" " " 10, "
" " " 6, Elbridge and Brutus.
" " " 11, "
" " " 38, "
" " " 17, "
" " " 15, "
" " " 6, Van Buren.
" " " 8, Clay.

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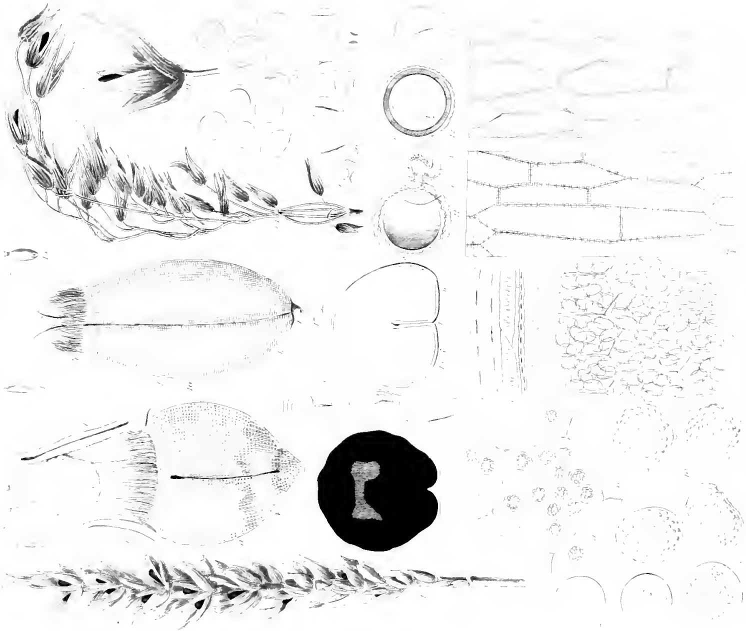

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BRAND IN THE CEREALS.

Essay towards a more thorough knowledge of the various kinds of Brand in the Cereals and Blight in Corn, translated from the German of A. C. Corda, for this Journal,

BY E. GOODRICH SMITH, OF THE PATENT OFFICE.*

The respected reader of this essay, will pardon the freedom with which the author illustrates an old long known subject, in a manner probably somewhat strange to farmers, or if he should find set down in these sketches only real matters of fact without any display of scientific learning. The author likewise proffers no copious literature or reproduction of the views of past observers, although nearly all the writers on the subject are known to him from *Theophrastus* to *Tessier*, *Strauss*, *Bulliard*, *Meyen* and *Unger;* among whom he would notice the works of *Banks*, *Fries* and *Unger* as the best guides. The author's object is to prepare a foundation of facts derived from the internal structure and physiological texture, without aiming to admit or oppose the views, theories and so-termed knowledge of others. In all pathological inquiries, no one of the authors, so far as I am acquainted, has regarded the anatomical structure of the plants themselves. Usually the so-termed observations are set forth, which are contradicted either by their own obscurity or by similar observations of the author himself, or those of others who succeed him. Such a course does not consist with the views of the author of these pages, and therefore he begs the respected reader to receive the following remarks as the result of more than twenty years' observations, during which period he has been occupied with the particular study of the parasitic fungi. At the same time he wishes this first epitome of pathological investigations into the parasitic forms of disease, to be regarded as a *complete whole*, without any reference to their primitive origin, so far as this is possible; since *to the perfect physiological knowledge of an organised subject must belong previously the entire knowledge of its nature and anatomical structure;* as without these two foundations the writer can only deal in unfounded suppositions and superficial discourse, full of empty words. This is especially the case if, belonging to a certain school, he is desirous of glossing over a bold, upright admission of his ignorance with philosophical forms. But to our subject.

The vegetable parasites, like the animal, form a large and extremely numerous family of plants, and the greatest portion of them belong to the class of the fungi. Those parasites, which develope themselves in the texture of our grain plants, are by far the most worthy of notice, and therefore I have examined them first of all, and will afterwards describe and delineate the kinds which habitate in our other cultivated plants.

The various kinds of brand collectively belong to a family of fungi of humble rank, which natural historians call by the family name of the *Caeomaceæ*, and all the species of this great family are parasites. They are distinguished from all the kindred families to which they are allied, in their internal organic texture, by the single characteristic that they have solely one-celled spores or seeds. The species of this family, most important for our consideration, are the *Wheat Brand*, the *Oat Brand*, the *Barley Brand*, the *Maize* and *Millet Brands.* All these species habitate only in the family of the grasses, and of our cultivated grasses rye is only to be distinguished as that species on which, up to this time, there has with certainty been found no true species of brand, an observation which was first made by *Prof. Kunze* of Leipsic, and which I have thus far found confirmed in almost all parts of Central Europe, although many writers speak of the rye brand as one of the most common appearances. In the level country of Germany and Austria, besides the red stalk rust (*Uredo rubigo*) and the stalk brand, (*Puccinia graminis*) no brand is found on rye; and it is only in the mountainous regions which are cloudy and moist, that there is a fungus of the family of the fibrous fungi, (*Tricho vel Hypbomycetes Auct.*) which lodges in the ears of rye, and which fungus the common people very incorrectly call the rye brand or smoke brand, and which I shall consider particularly hereafter.

I shall likewise take for granted many explanations of the definitions of particular organs and phraseology; for, as such explanations could only be very short in a periodical journal, they must hence be also imperfect, and the reader may acquire accurate and minute knowledge of the terms here applied to the crgans, in my Guide to the Study of Mycology, pages 21–36. I will therefore omit the same, and proceed at once to the description of the structure of the various species of brand.

I. Of the Wheat or Smut Brand, (*Uredo Sitophila Dittmar.*)

Plate I. Fig. 1—22.

Among all the species of brand which infest our grain crops, this is by far the most worthy of notice. It lodges only in the ears of wheat, and is found in no other kind of grain or grass. It migrates with wheat in all climates of the earth, without being subject to local influences, as is almost ever the case with the other cultivated plants. The farmer dreads it most, and justly, for being lodged in the ears when they are brought to be threshed, it is there dispersed by the flail or threshing machine, and thus directly infects the sound grain, while the barley and oat brands are for the most part out on the field, and hence the largest portion of the seed of these latter kinds of brand necessarily falls on meadow, forest, or other kinds of soil, which are not applied to the cultivation of grain, and so, for the want of plants adapted to the infection, are not further spread. But the consideration of the infection and transmission of the various species of brand by means of threshing and the sowing of their seeds, I reserve for a more comprehensive subsequent treatise.

Those halms of wheat which afterwards bear ears affected with brand, may be early distinguished, before their bloom, by their luxuriant growth and their dark green color, as well as by their large, broad, stiff leaves. They apparently bloom much earlier; but very often (yet not always) their anthers contain no grains of pollen (powder of fructification), and the first act of fructification, the shedding of their pollen on the cup of the pistil, is very imperfect, and should the ears affected by the brand and already diseased be dusted with sound pollen, the little balls of pollen, usually form no aggregation of pollen on the pistil, or such as are formed do not press into the pistil and down to the ovary. The fructification of the blossoms of wheat affected by brand is therefore imperfect, and in case the grains of pollen form no cluster in the cup, then there is indeed no fructification. But the careful observer finds on almost all the ears ripe for receiving the grains of brand, on the side of every seed corn affected with brand, one or two anthers (Plate I, Fig. 3, 4, b, b), which on the buds which are well fructified and bear seed, the anthers with their stamens have long since fallen off. The anthers which remain standing on the grains affected with brand, are usually destitute of pollen, and sometimes we find that the same, in consequence of efforts at imperfect fructification, are stuck, as it were, (Fig. 4, b, right side), to the pistils which remain standing (Fig. 4, c). The two pistils which remain standing, of the seed affected with brand, are usually covered and joined together, by delicate white threads interwoven like mould in a sort of network (Plate I, Fig. 4, c). This mould formation belongs essentially to the wheat brand, and forms as it were a part of the root texture of the fungus constituting the brand. It always exists, only frequently more or less developed, and therefore more or less easily found. It wholly covers the head of the seed, and lies between the chaff-hairs (Fig. 16, h), while the sound seed exhibits not a trace of such an interwoven fibrous formation among the chaff-hairs on its head. The same is also the case in respect to the pistils of the sound seed (Fig. 16, i). With the development of this outer fibrous mould begins likewise the transformation of the seed, as well in respect to its external form as to its internal structure.

If the transformation which the seed of wheat undergoes by the formation of brand, be examined, we find that the particles have undergone either an entire or partial transformation in respect to internal structure, and without here entering on the technological signification of the several parts of the seed, I shall describe the same, in a way generally intelligible, and simply, as should always be done, and so pass over the head as well as the pistil, since they suffer no visible change by the formation of the brand. The same is true of the glumes and petals, the anthers and the spike of the ears themselves.

The fruit or seed of the wheat viewed on the outside, consists of an elongated irregularly egg-shaped body (Fig. 16, f), having on the front surface a streak or furrow lengthwise, (Fig. 16, k), which bears on the point the pistil (Fig. 16, i), and the head (Fig. 16, h).

At the bottom we see on the back, the little shield (Fig. 15), containing the germ, and the front side the little opening (*Feusterchen*, (Fig. 16, g). If the seed is cut across through the middle (Fig. 18), we find that it has an outer skin (Fig. 18, l), which by bending inward forms the furrow lengthwise (k). Inside of this skin are found white hard transparent bodies containing starch-meal which natural historians call the albuminous bodies, "the albumen" of the seed (Fig. 18, m). If now we cut off as thin as possible, a slice perfectly transparent in the direction already mentioned, and examine the same microscopically, we find that,

1. The skin of the seed (Fig. 18, l), consists of three layers, to wit:

a. The outer layer, (Fig. 19, n);

b. The middle layer, (Fig 19, o); and

c. The inner layer, (Fig. 19, p), on which layer immediately lies a large soft cellular strata, which contains the grains of gluten

(Fig. 19, q), nearest the inside lie the amylum cells, containing the starch-meal, (Fig. 19, r. s).

a. The outer layer of the seed-skin, (Fig. 19, n), consists of two layers of thick-walled porous cells, which stand with their longest diameter parallel to the axis of the seed, and the walls of which contain slight hollows or little canals, which in a section cut lengthwise and very strongly magnified (Fig. 20, w), give to the cellular walls a form as if they were formed of oblong figures.

b. The second layer (Fig. 19, o) of the seed-skin, consists of similar cells to those of the first layer, only the walls of the cells are not so thick, and the pores, which these walls contain are much more distinctly (Fig. 19, o) to be seen, than is the case in the cellular walls of the first layer of the skin. But the cells of this layer stand with axis of length horizontally to the axis of the first cellular layer and of the seed, and therefore run as it were parallel to outer surface of the seed. In a section lengthwise they resemble even to the direction of the cells of the first layer of cells, and are nearly as large as they are (Fig. 20. x, x).

c. The third layer is extremely soft and somewhat confused. Its cells are so small, that we can discern their hollows only indistinctly and in the form of mere streaks (Fig. 19, p).

2. Directly under this cellular strata or of the seed-skin in general, we find situated the already mentioned cells of gluten, (Fig. 19, q). They are large bag-formed cells, with extremely thin scarcely visible cellular walls, which are filled exclusively with the gluten, a small-grained, greasy, smutty-gray substance, approaching to yellow. Under these cells of gluten lie, first

3. The albuminous bodies of the seed, which consists of large six-sided prismatic cells (Fig. 19, r), the walls of which are soft, clear as glass, and perfectly transparent, and the hollow space in the ripe seed is filled with little grains of starch-meal, (Fig. 19, s; Fig. 22). These latter are round or irregularly egg-shaped, transparent and white, and consist of concentric layers or peels (Fig. 22), the outer of which often bursts or springs open. Between the grains of amylum or starch-meal are found still smaller grains which consist almost wholly of starch, and must be regarded as little grains of amylum.

At the base of the seed below the little shield lies the embryo plant or germ; but as the same is scarcely ever found in the bud of wheat which is affected with brand, the consideration of this here does not belong to the province of this essay, since no immediate transforming influence can be referred to it.

If now after the minute examination of the sound seed, we compare with it the the structure of that which is affected by brand, we find that the diseased seed (Fig. 4), is wholly changed as well in respect to its form as to its structure. It has become shorter and thicker, and not as in the sound seed tapering toward the top (Fig. 16), but increased in thickness (Fig. 4). On its base or on the head, the anthers remain hanging or standing, while in the sound seed they have long since fallen off. The head with the pistil (Fig. 4, c), is broader, and the outer skin (a) of the seed corn affected by brand is rougher and fine punctured.

Let a seed corn thus affected by brand be cut through horizontally, and it be examined under a magnifying glass (Fig. 5), we find outwardly a simple outer skin, and internally a dark black substance often approaching to violet, which is extremely fine grained and greasy, gives out a foul penetrating ammoniacal smell, and on being dried falls to powder. In the middle of the grain affected by brand we generally see a clearer colored square gray spot, which on close examination is found to consist of the remains of the former cellular texture. If now we examine more closely the particular organs of such a kernel affected with brand, we find that the outer skin of the seed thus affected consists of a single stiff layer of cells (Fig. 21), the cells of which in respect to their form and size, resemble much the outer cellular layer of the seed-skin of the sound seed (Fig. 20, w); but their walls are no longer porous, but paper-like, stiff and folded lengthwise; they are not so finely colored, as in the sound seed, but are of a smutty earth color. The second and third cellular layer (Fig. 19, o, p) of the sound seed, has wholly disappeared in the diseased one; the same is true of the cells of gluten, of which not a single trace remains.

On examining still more minutely the black smutty mass, which fills the space designed for the albuminous bodies, we find that here and there it contains some particles of cellular tissue, like the cellular tissue of the albuminous bodies, but the cells themselves are much widened (Fig. 6, d) and folded. But the hollow spaces, are filled with grains of brand (Fig. 6, e). Should the brand not be fully ripe or developed, we find the cellular tissue still entirely preserved and connected together, but without any traces of amylum. This latter is scarcely ever developed in diseased seed, but in place of it are formed clear globular cells of the same size (Fig. 7), which we instantly distinguish as the young grains of brand. These by form are oily-grained contents (Fig. 7), which increases with the advancing growth of the same (Fig. 8), and their cellular skin previously clear as glass and white, becomes brownish colored. In the later growth we find the entire cells of brand (Fig. 9) filled with little oil-drops, and the cellular wall is of pale violet color, but it is still smooth. These cells, natural historians call the spores or seeds of the fungi which constitute the brand, and in the advancing growth the cellular skin, which is the seed skin of the spore, gradually becomes dark colored and covered with fine warts, while at the same time the little oil-drops visibly increase in the space of the spore-skin, and finally flow into a compact yet scarcely discernible body, (Fig. 10).

But if we thoroughly examine the ripe spores of brand, and we happen to obtain good sections of the same — a problem extremely difficult on account of the minuteness of the body to be cut, and only to be secured by chance — then we see that the spore-skin (Figs. 11, 12, t, t), of the brand-spore forms a dark colored single membrane uneven on the outer surface, which encloses in its hollow space a second transparent cell (Figs. 11, 12, 13, u, u, u), which forms the second or inner spore-skin. But in the space of the second spore skin we find a waxy, curved body (Figs. 11, 13, v, v), which is called the kernel of the spore, and which in spores not yet fully ripe, appears to be surrounded with little drops of oil. The spores compared to other of the different kinds of brand are large and their linear diameter is from 0.000700 to 0.000730 ($\frac{1}{1429}$) of a Paris inch. The spores distinguish this species of brand from all others which habitate wheat, and their specific gravity is greater than that of water; they sink therefore in water, and hence the seed which is affected by brand may be cleaned with running water, as it is thus also clear that well washed seed suffers less from the brand. But the seed must be thoroughly washed before sowing, in order that the spores of the brand, which may still be in the furrow of the seed and among the chaff-hairs of the head, may be removed.

Here is not the place to quote all the various opinions of the husbandmen and natural historians respecting the existence and propagation of the brand in the various kinds of grain generally. The conviction and view of every individual is so peculiar a matter which rests on such different grounds of representation and positive induction, that opposition to even the crudest ideas (and so called experience), according to my multifarious observation, is only injurious.

Yet I may be allowed to maintain here as preliminary, that the view which regards the brand merely as a stage of disease, or a disease analogous to the organic diseases of the animals, must indeed be false. I can only compare the parasitic formations which belong to the class of fungi or mushrooms, to the phticiases or the louse disease, and in this case *no spontaneous generation* is supposed. We have one of the most decisive proofs in the case of a majority of exotic plants which are evidently produced from seed and no parasites (especially eutophytes) have been imported from their native country, while in our glass house all the plants known to me as having been brought alive from the tropic have introduced certain eutophytes peculiar each to its species of plants, and not belonging to this country. The great idea of *De Candolle* "the spreading of the species of brand depends on the sowing of the spores," since the beautiful observations which *Gleichen* published more than sixty years ago, can no more be doubted. This great German natural historian found indeed that the wheat crop strewn and sown with brand dust gave over 50 per ct. of ears affected by brand, while the dry and thoroughly washed seed exhibited scarcely any ears affected by brand.

Besides many eutophytes may be transported, and in the kinds of brand of grain we are by no means justified in denying the transmission by spores, and especially as no husbandman can maintain, "that he has cultivated wholly clean seed containing not a single brand-spore;" for in practice the extraordinary minuteness of the brand-spores lays an insurmountable obstacle in the way of all observations. The parasites which have their abode in the dead parts of plants may easily be propagated by the sowing of their spores, and a careful observer may in this latter case readily follow the germ of the spores sown, and the gradual development of the parasite through all the stages of its formation, as I have already many times shown in other places. But a multitude of eutophytes besides the sowing by spores also require peculiar conditions of soil and a moist atmosphere for their development; since otherwise the mother plant is not capable of furnishing the nutrition indispensable for its development, or to perform the secretion of the same from its own fluids.

These organic processes necessary to such formations, are yet partially mysteries to natural historians, which may not be laid open by logical phrases, or such as belong to natural philosophy. Only direct observations can here determine, and all views, opinions, belief and so-called experience are positively injurious, while they are almost ever wanting in any strong induction, and under critical examination sink into their original nothingness. It is therefore the wiser openly to admit that we have not yet observed the direct propagation of the kinds of brand by spores, as we must allow on a critical investigation of all circumstances, "*that the conditions of soil, the influence of cultivation, weather, situation and manure which is required for the spreading of the various species of brand*, are not fully known." Such conclusions are more salutary for the advancement of human knowledge, than all the so-called learned or purely empirical talk.

But since *Ehrenberg* has practically demonstrated the propagation of the infusoria by eggs and division, and I have also the sowing of fungi and mushrooms by spores, we may too hope for a similar proof of the propagation of eutophytes by spores, and until then set aside all speculations on their spontaneous generation as injurious and unnecessary, and the more so as nearly every kind of plant has parasites exclusively having their abode in it, and likewise the soil equally necessary to its development.

Explanation of the Illustrations.

Plate I, fig. 1; an ear affected with brand of the natural size. Figs. 2 and 3, seed kernels affected with brand, with and without anthers, of the natural size. Fig. 4, a seed kernel affected by the brand, greatly magnified; a, the seed kernel with the fold lengthwise; bb, anthers, which stick to the head of the same, and on the pistils, c, interwoven by fungous fibres. Fig. 5, a horizontal section of same greatly magnified. Fig. 6, a cell of this section, with brand-spores, e, greatly magnified. Fig. 7, an entire young brand-spore. Figs. 8, 9, older brand-spores, before the formation of the kernel and spore-skin. Fig. 10, four ripe brand-spores strongly magnified. Fig. 11, section of a spore very greatly magnified; t, spore-skin; u, inner spore-skin; v, kernel of the spore surrounded with little drops of oil. Fig. 12, a single spore of this kind where the kernel of the spore v, with the inner spore-skin u yet lies in the hollow space of the outer spore-skin t. Fig. 13, a kernel of the spore v, represented alone with the inner spore-skin u, greatly magnified. Fig. 14, a sound, ripe wheat kernel, front view. Fig. 15, the same, back view, with the little shield, natural size. Fig. 16, the same, greatly magnified; f, the seed-kernel, with the seed-skin; k, the fold lengthwise; g, the little opening; h, the head; i, the pistils. Fig. 17, horizontal section of the same through the centre, and Fig. 18, slightly magnified.; l, the seed skin; k, the fold; m, the albuminous bodies Fig. 19 a thinner section of the wheat kernel strongly magnified; n, the cellular layers of the first seed skin; o, the second; p, the third or innermost seed skin; g, the cells of gluten; r, the cellular tissue of the albumen with grains of starch-meal, s. Fig. 20, external view of a very delicate vertical section of the seed-skin of a sound kernel of wheat strongly magnified; w, outer cellular layer; xx, inner cellular layer of the same greatly magnified. Fig. 21, the outer skin of a wheat kernel affected with brand of the same ear strongly magnified. Fig. 22, little grains of amylum very strongly magnified.

II. The Oat Brand. (*Uredo Avenæ Corda.*)

Plate I. Figs 23–26.

Almost all naturalists have confounded this species of brand with the brand (*flug brand*) which lives on barley (*Uredo Segetum*, *Pers.*); since in common with this latter it is characterized by scattering the spores, the destruction of the buds, and a certain stunting of the ears. It has its abode almost ever originally in the fruit buds of oats, and afterwards more or less wholly attacks the other parts of the bloom. The outer skin of the fruit buds is destroyed extremely quick, and soon is entirely gone, and before the ears are fully developed the blossom and fruit organs are destroyed even to the outer and inner leaves of the bud (Fig. 24), and the shedding of the pollen of the brand-spores has then commenced. The diseased ears of oats show them at a distance by their stunted spikes and little branches. The fungous brand itself in a ripe state forms a brownish black extremely soft powder, which very rapidly sheds out, and examined by the microscope, consists of very small transparent roundish little grains, which viewed under the water (Fig. 25) are globular or elongated, very often for a time double, and of unequal form and size. Viewed dry or without water (Fig. 26) they still appear in similar forms, but then they are folded over or with curved hollows. They consist of a very delicate single spore-skin, and a spore-kernel almost slimy, filling the whole spore-skin. The spores themselves are very minute; their diameter in the round spores are 0.000270 ($\frac{1}{3703}$) Paris inch, and the longest diameter of the elongated ones only 0.000310 ($\frac{1}{3226}$) Paris inch. They are twice or three times less than the little grains of the wheat brand, and much smaller than the spores of the barley brand which are represented in the plate, and from the latter of which they are distinguished sufficiently in the structure of the spore-kernel. This species of brand resembles the millet brand as little as it does the barley, as the general structure and spores of that brand are both perfectly distinguishable, only the oat brand, the barley brand, and the millet brand have smooth spores, though indeed with difficulty to be confounded and compared; the other kinds of brand which have their abode in the buds of our grasses have spores with grained spore-skin, and on this account can neither be confounded nor compared. The oat brand scatters itself early in the field, and it is highly probable, that the spores of all the kinds of brand already shedding their dust on the field remain for years in the soil, retaining their germinating power until their mother plants again come under cultivation there, or that they sow themselves in the yet tender and first ripening seeds of plants in their neighborhood, and thus already lay the germ for the development of their progeny.

Explanation of the Illustrations.

Plate I, Fig. 23, an ear of oats affected with brand, natural size. Fig. 24, a single fruit bud of the same diseased. Fig. 25, spores of the oat brand represented under water and strongly magnified. Fig. 26, the same examined dry and powerfully magnified.

CHESS.—Bromus Secalinus.

Few subjects of practical agriculture have a greater interest than this. Substituted for wheat, not a more miserable crop exists. Its appearance in a field of wheat is like the *plague spot* on the human frame. To avoid it the farmer is obliged to see that his seed wheat is pure, and utterly destitute of that seed. It is the remark of many thorough farmers, that they never raise *chess*. This would be adequate preof in any other case of the origin of the plant.

But the remark is often made that the fields in which the wheat is *winter-killed*, abound in chess. The proof is palpable. Numerous such fields have been seen this year. Is this adequate reason for the opinion that *wheat is converted into chess* by the frosts of winter? I think not, for the following reasons.

1. All the wheat fields in which the wheat has been killed by the winter, do not abound in it, and some of them are free from it. It is curious that the chess is not the uniform result of the killing of wheat, if the supposed change is effected by the operation of winter.

2. Wheat and chess are not found growing on the same root. The contrary has been alleged, but an examination of the cases has ever proved that this is not the fact. If wheat is converted into chess, all the plants on the same root are the subjects of the transformation.

3. The distinctness and difference of the two. Wheat has a long head, or *spike*, of sessile flowers, and does not send out branches; chess has a diffusely divided stem or *panicle*, in several places towards the summit, in form like oats, and bearing short, and rather close, short *spikes* or collections of flowers. The supposed change, therefore, affects the whole form and appearance of the plant. The embryo plant is formed in the seed of wheat, and the change must affect the very form of the embryo, and cause a great modification of the whole plant. The fruit or seed, too, is changed in its form, manner of growth, and character of the matter which it contains. No similar change occurs in other plants, and there is no proof of the said change in this. In all their characters, wheat and chess are more diverse than rye and wheat, barley and wheat, oats and rye, barley and rye, apple and pear, cherry and plum, and the like. Chess is not like a *hybrid* of other plants. It is not the *pollen* which effects the change in chess, but the form and peculiarities of chess exist before the flowering and the evolution of the pollen take place.

It has been said that *rye* has been changed into *oats*, but there is needed any satisfactory proof of the fact; as there is that the brain of man is at one time that of a fish; at another, of a crow; and at another, of an ape. Such puerilities must have been maintained to ascertain how far credulity can extend, and how large a part of men can believe themselves to be *improved tadpoles*.

4. There are adequate sources of the seeds of chess. They may have been sowed with the wheat, and developed with greater fertility as the wheat was absent from the well-cultivated earth. Such a fact is often noticed in the growth of other plants.

The seeds may have been already in the ground, and buried too deep for germination, till cultivation placed them in a situation to grow. This is a well-known fact in respect to a multitude of plants, whose seeds are long preserved in the ground, and germinate on the proper exposure.

The wheat of new lands, if the seed is usually pure, is remarkably free from chess. The seed is probably always carried with the wheat, and this begins the chess, which is afterwards developed in the circumstances favorable to its growth. One of these is the absence of wheat by being winter-killed. *Let it be shown* that the seed of chess is not in the ground, before the influence of winter is made the cause of its appearance.

5. Chess propagates itself by seeds like other grains. Thus it is like any other plant, as the "herb yielding seed after its kind, and the tree yielding fruit, whose seed is in itself after its kind," a principle fundamental in human belief. If cold and frost may change wheat to chess, why does not heat change chess to wheat? If the farmer intends his wheat shall be free from the seeds of useless, or injurious, or noxious plants, he must remove the seeds from his seed-wheat, and weed out the plants from the growing grain.

It is of no avail to say, may not the transformation of wheat to chess take place? It is inconsistent with all the known laws of vegetation, and the violation of fixed laws, by natural causes, is impossibility. What miraculous power might effect is not to the purpose, when the laws of matter, organized or unorganized, are under consideration.

A writer has, indeed, called chess a hybrid; but of what is it a hybrid? Where are the two plants which are thus assimilated? A hybrid is formed by means of two closely related species, the pollen of one being transferred to the flower of the other. If the two plants are closely related, the modification can sometimes be effected. Its infrequency, when the number and proximity of plants* is considered, is proof enough of the difficulty. Besides,

* A dozen or more plants of different kinds, and several of them in flower at the same time, may be found on a square foot of grass lands.

if it was an easy process, hybrids would be common over the fields. Wheat and rye are nearly related species; but they are grown together often by the farmer, and yet both preserved distinct—not a hybrid of them appears. But chess has generic characters, which separate it far from those of wheat. Wonderful indeed would be the modification of the one into the other. A hybrid of it must be, not chess, but some yet unknown vegetable.

Fields of wheat sometimes abound in *cockle*, Lychnis *githago*, whose seeds are so ruinous to good flour. Why has not this plant been considered some modified wheat? Because it is so different? What is the limit to differences, when wheat and chess may be said to have the same origin?

The correct knowledge of chess leads directly to safe agricultural practice. The remedy is as palpable as the difficulty. Let the soil be freed from the seeds of chess.

NO COAL IN THE NEW YORK ROCKS.

An impression was common, and seems to have pervaded community at one time, that coal would be found in the New York rocks. The origin of this expectation probably arose from a mistake in regard to the character of a single member of the New York series of rocks. Thus, the Medina sandstone was regarded as a rock equivalent to, or identical with, the new red sandstone of Europe; a rock which is superior to the coal formation, and beneath which it is known to exist. Two facts seemed to have led to this error; first, the great similarity of the Medina sandstone to the new red sandstone of Europe in its lithological characters: second, the existence of salt or brine springs in each. These two facts were certainly very strong arguments in favor of the assumption that coal would be found in this state. Subsequent examination however, has fully proved the falsity of this assumption; for it is now established on the most substantial basis, that the Medina sandstone is older, not only than the new red sandstone of Europe, but far below and older than the old red sandstone also.

Two inferences may be safely drawn from the above error; 1. That lithological characters are insufficient of themselves to determine the age of any rock. 2. That the mineral contents, even when taken in conjunction with those characters, are also insufficient and cannot form a basis upon which the age of a rock can be determined.

Notwithstanding, however, that the above inferences are admitted by most persons who have examined the subject, there are many still, who are unwilling to be convinced that coal is not a product of the rock of New York, or of the Silurian system. Those persons are stumbled by the fact, that coal is found in Rhode Island and Massachusetts, in a formation which rests upon the primary, or the Taconic system, which is older than the Silurian. This seems to be, at least on the first impression, a fact which must overthrow what has been asserted in regard to the absence of coal in the New York rocks; for if rocks which rest immediately upon the primary contain coal, may not the still newer ones of the New York system contain coal also. At least it would appear that there is nothing incompatible with the expectations of coal, provided it is found in rocks as old as those of Rhode Island and Massachusetts. But notwithstanding the plausibility of this view, it is nevertheless erroneous; for, though the coal rocks of Rhode Island may rest upon the primary, still it by no means proves that they immediately succeed the primary.

It is not true as some suppose, that there is an uninterrupted succession of strata. The fact is, that many interruptions have occurred in the deposition of rocks. Those interruptions have been occasioned by the oscillations of the earth's surface. Only a part of the earth's surface is, or ever has been submerged at one time. No deposites take place except during a submergence. Hence a given section of country may be dry land during several geological epochs, and when a new submergence actually occurs, the character of the deposits which will then take place, will be those which are peculiar to, and belong to the era.

Thus it was with Rhode Island, for a long period, even during the whole of the Silurian, when the New York rocks were being deposited, it was entirely above water, or dry land; but at the era of the coal deposites, it was submerged; and hence the deposites themselves partook of the character of those which were in progress in Pennsylvania, Ohio, England and Wales. The organic beings are identical with those found in the deposites respectively, although they are widely separated from each other. We are then to determine first of all, the age of a formation, and we cannot determine this from the age of the inferior rocks, neither can we by the lithological characters or mineral contents; at least these may all be fallacious. When we see however, that the plants of the small coal basin of Rhode Island, are identical with those of the coal formation of Pennsylvania, and other coal bearing regions, we may then safely conclude that the formation itself is of the same period notwithstanding it rests on the oldest rocks of the globe.

This leads us to say that the indications of coal are those which are found in organic beings, inclosed in the rocks themselves, and not on the mineral character of the rock. We can place no reliance upon the presence of black slate, gray sandstone, or upon the presence of iron or lime. Black slates are found abundantly in the coal series, and so are gray sandstones, but throughout the world wherever coal is found, there also are peculiar plants, as lepidodra, calamites and other vegetable remains.

No exception is known to the rule. Hence it is a safe inference, that where these plants are not found no coal will be found. We except of course some varieties of carbonaceous matters, such as those of the calciferous sandstone, the bituminous matters of the slate of the Hudson river, &c. These matters may or may not have been derived from vegetables, and though the fact of their presence is interesting, still, it is no evidence of the existence of a coal formation; neither is the presence of a thin seam of coaly matter sufficient evidence that a coal formation exists in the rocks which contain it.

The basis of our present knowledge in regard to the position of coal have been laid in careful observation. Observations have been made in almost every country, and the fact has been established therefrom that the earliest appearance of coal in the rocky strata was one period the world over; and as we have already remarked, that period is characterised by the presence of certain vegetable forms which are never absent. This is therefore no theory, hypothesis or conjecture in the matter; it all rests on well conducted examinations of the rocks, and hence it is, that geologists speak so confidently upon this question, and pronounce so unhesitatingly upon the absence of coal in the state of New York. Under these circumstances then, it seems to us that public opinion ought to be settled; that full confidence ought to be placed upon what is now known in regard to the presence or absence of this substance. But again, if observations were confined solely to New York, the presence or absence of coal might be determined by direct observation, inasmuch as the whole series of rocks are cut through by rivers and streams from the top of the Catskill mountains, to the primary itself. This we regard as a curious and interesting fact, independent of the practical bearing which it has. It lays open to inspection the entire series, and whatever valuable productions may be contained in the rocks can be discovered.

We append to the preceding observations the earliest classification of the New York rocks, and in a parallel column the present arrangement, as has been determined by the State geologists.

PROF. EATON'S CLASSES.	PRESENT CLASSES OR SYSTEMS.
1. *Primitive Class.*	1. *Primary Rocks.*
Granite	Same as opposite column, except those numerated in the Taconic system.
Gneiss	
Horneblende rock	
Mica slate	
Talcose rock	
Granular quartz	
Granular limestone	
Sparry limerock	
Primitive argillite	
2. *Transitive Class.*	2. *Taconic System.*
Transitive argillite	Granular quartz
Calciferous sandrock	Magnesian slate
Metalliferous limerock	Granular limestone alternating with Magnesian slate
Graywacke	Sparry limestone
Old red sandstone	Taconic slate, and subordinate beds of impure limestone
3. *Secondary Class.*	3. *New York System.*
Millstone grit	Potsdam sandstone
Saliferous rock	Calciferous sandstone
Gray band ferriferous slate	Chazy limestone, and Birds-eye Trenton limestone
Ferriferous sandrock	Utica slate
Calciferous slate	Lorraine shales
Geodiferous limerock	Gray sandstone
Cornitiferous limerock	Medina sandstone
Pyritiferous rock	Onondaga salt and plaster rocks
	Manlius water lime
	Pentamerus limestone
	Delthyris shabby limestone.
	Encrinal limestone
REMARK.—The pyritiferous rock embraced the whole series from the Onondaga limestone to the base of the old red sandstone of the Catskill mountain.	Oriskany sandstone
	Caudagalli grit
	Onondaga limestone, and
	Corniferous limestone
	Marcellus slate
	Hamilton slates and shales
	Tully limestone
	Genesee slate
	Portage and Chemung sandstones and shales
	Old red sandstone
	Conglomerate of the coal formation

The foregoing is merely a catalogue of rocks arranged on the one side by the late Professor Eaton, and on the other as they have been determined by the late surveys. The existence of the old red sandstone in this state was pointed out by Dr. James Eights in one of the early numbers of the Zodiac.

As it regards the order of the rocks, all that is necessary seems to be determined. Many rocks are named in this list, which are really only subordinate masses, and yet it was proper they should be described.

In Mr. Eaton's arrangement, it will be observed that all the rocks denominated secondary class, are placed above the old red sandstone, the rock which forms the Catskill mountains, and was correctly called old red sandstone. This great error arose from the error already referred to; that of regarding the saliferous rock as the new red sand stone of Europe, which, in the old classification belonged to that class. It led to the strange result, that of blinding the eyes to the actual superposition of rocks, which to present observers is perfectly clear.

BLIGHT.

This disease, the description of which has occupied several pages of the present number of this Journal, is not usually well defined. As commonly applied, it designates any kind of disease which affects fruit trees, and terminates in the curling up, or destroying their leaves and blossoms. It is also applied to those changes in leaves which amount only to a sickly appearance, as well as to another affection peculiar to the black plum; the black warty excresence of the branches. It is plain enough, that there is much error in the application of the term, inasmuch as it embraces several diseases which are quite different from each other,—even the attacks of insects as the leaf rollers, and the different species of Aphis, produce what some regarded as the blight, though without reason.

The term *Blight* in our opinion ought to be confined to that peculiar disease which is produced by atmospheric influences. We do not mean by this expression that there are certain flying vapors in the atmosphere which are concentrated upon certain parts of a plant, and which operate like a burning glass. To effect a blight in plants it seems only necessary that their parts should be in a juicy suculent state, and growing rapidly. This state is common to pear and apple trees planted in rich and highly manured fields. If then, a period of rapid growth has existed and the plant is surcharged with its natural juice, and there succeeds a dry scorching sun and winds which carry off the juices more rapidly than they can be supplied by the roots, then the tissues dry; first, the leaf withers and becomes black, followed by the same changes in the limb or a portion of the limb, and it usually takes e ect around the basis of a flourishing twig or branch, as we represented in a former number of this Journal. The parts themselves which are thus destroyed while in full sap, become, as we should expect, black, and exhibit all the appearances of a gangrene or mortification; these parts are never restored.

It is to this peculiar disease we would restrict the term *blight*, and although our theory of blight may not be correct; still our description of the disease is sufficiently definite to enable any one to think and speak understandingly of its effects and characters. If our views are correct as it regards the cause, it may probably be checked more by culture than by other means. We cannot, however, well obviate the evils arising from too much water which the root receives, and yet, if highly stimulating manures predispose the plant to blight, it will be proper to give the less. Facts, however, are wanting to enable us to reach a correct conclusion. And we leave it as it now stands for future investigation. We cannot even say whether deep drainage will be of any avail, or drainage which shall carry off all the superfluous water, and lay a field as dry as possible. A tree very rarely dies from drought, though fruit is often affected by it—and it would be only in extraordinary seasons, that fruit trees would suffer by diminishing the amount of water in the soil by deep drainage. This evil would be only an inconsiderable one compared with that of the blight, and we hope that thorough drainage may be tried.

MILDEW.

Unlike blight, mildew is caused by parasitical fungi; fogs, or dews are not the immediate cause of the malady, although we think that certain states of the weather favor the developement of fungi, and so may cultivation, or the want of cultivation; that is, if a plant is not supplied with certain elements essential to a healthy state, it is probable that mildew will attack it. Writers describe several kinds of fungi which are parents of mildew; and each plant seems to be infested with a specific kind; and not liable to injury from those which affect other plants, although they may be nearly related to each other. There are two classes of these fungi, one class occupying the interior organization of a vegetable, and the other the exterior. The former are seen to break through the outer coverings of the plant, as the epidermis, for the purpose of ripening and dispersing their spores. Of the Uredo fœtida, the Erineum griseum, Æcidium cancellatum and various species of Puccinia are the most common. The first is often called the pepper brand, and attacks wheat. It fills the young grain with a jelly like substance, and its odor is fœted. Its spores are brown.

The Puccinia affects the straw of wheat, and is generated or produced in the cellular tissue, and breaks forth through the epidermis to ripen and sow its spores. The organs bearing the spores are club-form and simple. The mildew of the gooseberry is another parasitical plant appearing upon the cuticle in the form of a brown nap, or fur. When it is rubbed off, the cuticle often seems to be perfectly sound. The peach is subject to mildew. It is the Erysiphe pannosa. It appears from what is known upon the subject, that the internal parasites attack the most vigorous plants; while the external attack only the feeble and sickly.

These curious facts are accounted for on the ground that in the former case the spores are taken up by the roots from the soil in which they preëxisted. In the latter case it is agreeable to what is known of the analogy of things. It is well known that only the sickly and feeble in animals are subject to the attacks of parasites, as intestinal worms, &c. A practical rule which it is highly necessary to observe in the first instance, viz: to burn or destroy those plants which are infested with the kind of mildew, as thereby the spores are destroyed, and are prevented from infecting the soil of gardens. So in the latter case as the existence of mildew upon the outside affects the feeble principally, so, a more invigorating diet is called for. In the case of gooseberry blight, the use of lime and alkalies is highly important, as giving strength and vigor to the growing fruit. If the functions of the organs are carried on vigorously, the plant resists the attacks of mildew or fungi.

CURE FOR MILDEW.

Put some sulphur vivum in a bag and boil it well in water. When cold, if too strong dilute it with clear water, and then syringe your mildewed heaths with the mixture. This mode of curing the evil is equally effectual with that of dusting with sulphur, and has the advantage that it does not disfigure the plants.

AGRICULTURE OF NEW YORK.

Our volume upon the agriculture of New York has been before the public about six months. The volume embraces an account of the composition of the soils, their classification, distribution and relations to the rock upon which they repose. It also gives the composition of most of the natural waters of the state. A highly valuable chapter on the climate of New York was drawn up by Prof. James Coffin of La Fayette college. The first part of the work is devoted to the consideration of the rocks of the state. It forms an epitome of its geology, which seemed to be required in connection with soils which in New York are derived from the underlying strata. This, though not always the case, is so common, that the relations of the rock to the soil are more important than in the New England states. Many additional facts are given in regard to the rocks, particularly as it regards their thickness, composition, showing what kind of waters issue from them, etc.

The origin of the phosphates and alkalies have been ascertained in many instances, and the probable value of the shaly rocks as fertilizers has been attempted to be shown. Many of these researches are original in this country, or even in England; particularly the attempt to ascertain the character of the principal natural waters; which was undertaken mainly for the purpose of determining their value for irrigation. The same subject has since been taken up in England by Prof. Johnson, some details of which are given in the July number of the Journal of Agriculture, and Transactions of the Highland and Agricultural Society.

In the geological part many details are furnished of the Taconic rocks, which are not intimately related to agriculture. This subject came under discussion from the consideration that the state expected all facts in regard to the rocks to be fully given. Their relation, age, position, lithological characters, etc., could not be passed over lightly without good reason; and as strong indications existed on the very face of the rocks of their belonging to another period than those denominated the New York system, it was deemed proper that the question should be placed before the public on its own merits. These views of the subject have been sustained by the public, and many have adopted them, and it now seems highly probable that in a short time they will generally prevail. It is true they have met with some counter-statements of minor importance; the statements however are many of them mere assertions without sufficient foundations for support, and must give way to a dispassionate examination in due time.

The state is divided into six agricultural districts. Each of these is supposed to possess some character, which serves to distinguish it from the others. These districts are designed for New York only, and it is by no means attempted to furnish therefrom a classification of soils for other parts of the country. There are reasons for not attempting a classification of soils now. The wheat soils of New York differ from those of the western states. The same remark too may be made of the maize soils. The wheat soils in particular, stands by itself. It is based essentially upon the slate and shales of the Clinton, Niagara and Onondaga salt groups, or rather we should say upon red and plaster shales, the best of which furnish a stiffish chocolate-colored clay. These clays form a durable foundation, and are probably more lasting and sustain cropping longer than any other wheat soils in the Union. Besides it is well known that the quality of the wheat is remarkably fine, and bears the highest price in market.

The analysis of soils has been made with reference to these districts. Reasons were not wanting for the adoption of this course. It was found that in the first place the physical properties of the soils of these sections differed, and in the second place, that the chemical characters or composition differed from each other sufficiently to warrant the arrangement. The difference in composition however, is not equally great for all the districts. The two which stand strongly in contrast are the Taconic and wheat districts, the former being rather famous for the production of Indian corn, the latter for wheat. It is evident too, that the system of husbandry varies considerably in the two districts, even when their relations to a market is considered.

When the agricultural survey was commenced, it was a serious question for determination, whether it was expedient to analyze soils at all. The discussion of this question turned mainly upon the fact that large tracts existed which were covered with a homogeneous soil, whose origin could be determined upon a comparatively few analyses, in at least so far as the existence of some of the most important elements were concerned, as lime, magnesia, the phosphates, free silica and alumina. These facts were of sufficient importance it was thought, to take up the work of analysis, and it is now thought, that the determination was well taken, since it was found that in many parts of each of the districts lime is wanting, and that there is a deficiency of other important elements in districts which have long been under culture. We are fully aware, however, that much more remains to be done in the same field, and we believe that the progress of agriculture in New York depends much upon the prosecution of the subject in the same line of research. To effect safe generalizations it will require extended details. If chemistry is to do as much for agriculture as some predict it will, it is certain that the soils must be thoroughly analyzed. Indeed we may go farther, and say that all those productions which spring spontaneously from the soil under certain conditions must be analyzed also. If certain conditions bring forth certain products, it is interesting to know what those conditions are, that they may be turned to the best account. There is another subject which requires farther examination. It is the physical condition required for certain results. These undoubtedly exercise as much influence upon the perfection of an organic being as the chemical, leaving out of view the fact that the presence of certain elements are essential to a result. Take the lime out of the soil, and certain vegetables would not be grown at all, it is essential to the perfection of a larger number than has been suspected.

The illustrations which accompany the volume are designed to furnish pictorial representations of the geological, and in some instances the agricultural features of the state.

Two maps accompany the volume. The first is an enlargement of the geological map, which appeared necessary to give a view of the extent of the most important rocks, by which the relations of the soils to the rocks would be more clearly given. The smaller map gives the agricultural districts. Their area and extent is thus seen at once. Both of these maps furnish a great range of means for the study of agricultural geology, and of agriculture in its simple form. The means of studying agriculture in this mode, that is by the aid of maps, has not before existed in this state. No attempt has been made in either of these maps to represent clayey, sandy, or calcareous districts, or to distinguish those soils which lithologically belong to the classes. It was impossible to do this, though it seemed desirable. The amount of sandy and clayey soil in different parts of the state, must be left to be solved by local societies, where many observers can be engaged in this special work, and who by their ordinary travels and intercourse can work it out without much sacrifice of time.

In studying the soils of a particular section, it is highly important to be well acquainted with the law of their distribution. For this reason, a chapter is devoted to the distribution of the soils. That a rock is not covered with its own debris, except in a few instances, is well known. It therefore is important to know in what direction the former debris of a rock has been moved. Observation establishes the fact that they have been moved from north to south, and never from east to west. In one district, the removal of soil has scarcely changed the relations of the soil to the rock, inasmuch as the strike is in the direction in which the soil has been moved. This is the case with the Taconic district. In the counties situated upon the west side of the Hudson, however, this relation does not exist. Here the rocks strike to the west or northwest, and hence the soil has been transferred from one rock to another. This movement has extended the boundaries of the wheat region many miles to the south, especially in the direction of the valleys. We will venture to copy what is said of the final cause of this movement, or as it is expressed in the text, the *the final cause of diluvial action.*

"What was the cause of this transaction? It may be irrelevant to the purposes of this essay to discuss the bearing of a question of this nature; still we hope it will not be found unprofitable to offer one or two remarks upon it. As in numberless instances of less magnitude than this, we are impressed with the idea that some special design was manifested by the accomplishment of an event, some general good secured by it, and that this good had reference to the benefits of man; so we are now to seek what beneficent design is manifested, what great and general good has been secured, and what benefits have enured to the human race, through the change wrought upon the surface of our planet by the mighty upheavals, and subsidences, and currents, which have converted sea into land, and land into sea. Among these benefits, no inconsiderable one appears to come from the mechanical effect of the drift upon the strata. Fractures and uplifts had rendered the earth's surface rough and rugged, broken and uneven; so much so, indeed, that it would have been but a sorry field for cultivation, and for the habitation of man. Hence we regard the drift period as having been designed for the purpose of polishing down the broken strata, and for removing their roughness and their asperities; while at the same time a vast amount of new soil was produced by the same operation, and mixed and spread widely over the surface, serving thereby to increase the depth of the soil, and fill up many irregularities which then existed. Such we regard as an epitome of the final cause of diluvial action.

"Inspection of strata, and an inspection of the matters resting upon them, especially if we look to their condition, prove that rocks have been deeply worn, their angles obliterated, and smoothed, the joint effects of which have been to remove asperities and make the earth's surface smooth, and less rugged, and hence far better adapted to the habitation of intelligent beings than if it had been left in its early broken condition.

"This view is favored too by the fact that the movement of the soils, or diluvial action, was one of the last great geological changes which has modified and given form to the earth's surface. We therefore enjoy and partake more fully of its benefits, than if the same changes had occurred at an earlier period of the earth's history."

The analysis of several of the rocks has given interesting results. Those rocks particularly which contain the alkalies and phosphates, especially where those rocks were extensive. We have ascertained that both alkalies and phosphates pervade the Taconic slates. The following analyses we extract as instances showing the results we have obtained.

Analysis of 100 *grs. Hoosick Roofing Slate.*

Water, - - - - - - -	3.79
Silicates, - - - - - -	70.55
Alumina and peroxide of iron, -	20.35
Carbonate of lime, - - - -	0.99
Potash, - - - - - - -	3.52
Carb. magnesia, - - - - - -	0.49
Soluble silica, - - - - - -	trace
Phosphates, - - - - - -	trace

Analysis of a Crystallized Slate from Salem, Wash. Co.

Water, - - - - - - -	2.62
Silicates, - - - - - -	84.65
Alumina and peroxide of iron, - -	11.53
Carbonate of lime, - - - -	0.60
Potash, - - - - - - -	0.60
Soluble silica, - - - - -	trace
Phosphates, - - - - - -	trace

Analysis of a Slate similar to the above, and belonging to the same System, from Waterville, Me.

Water, - - - - - - -	3.42
Silica, - - - - - - -	71.62
Alumina and peroxide of iron, - -	23.25
Carbonate of lime, - - - -	0.10
Potash, - - - - - - -	1r52
Carb. magnesia, - - - - - -	0.05
Soluble silica, - - - - -	trace
Phosphates, - - - - - -	0.90

The foregoing slates are distributed over a wide area, and from their composition we can see how it happens that their debris supplies both phosphates and potash to the soil. These lands usually produce excellent corn or maize.

The marls in many instances will be found valuable fertilizers, as may be inferred from their composition. One from Christian Hollow, Onondaga county, gave the following results.

Analysis of Onondaga County Marl.

Grganic matter, - - - -	3.01
Water (dried at 212°) - - - -	5.68

One hundred grains when deprived of water and organic matter, gave

Silica, - - - - - - -	11.88
Alumina and peroxide of iron, - -	0.43
Carb. lime, - - - - - -	76.84
Magnesia, - - - - - - -	0.64
Potash and soda, - - - - -	0.48

Fresh water marls of this description are very common, and hence it is important to know the composition. In all the districts marl has been found, though it is much more abundant and of far greater extent in the middle and western counties than elsewhere.

Peat is also quite abundant, and is justly considered a valuable acquisition to the farmer's means of enriching his soil.

The clays received also a share of our attention, and the composition of several was ascertained.

Analysis of Albany Clay.

Water of absorption, - - - -	4.25
Organic matter, - - - - - -	1.17
Sulphate of lime, - - - - -	1.00
Silicates, - - - - - - -	69.02
Free alumina and peroxide of iron,	17.24
Potash, - - - - - - -	0.14
Carb. lime, - - - - - -	4.00
Magnesia, - - - - - - -	3.00
Total, - - - - - - -	99.82

The lime varies in amount from 4 to 8 per cent, and probably some localities may from 16 to 20.

Clay from the Mohawk valley contains, however, less lime than the preceding.

Analysis of Clay from Mohawk Valley.

Water, - - - - - - -	9.75
Silicates, - - - - - - -	71.92
Free alumina and peroxide of iron, -	14.98
Carb. lime, - - - - - -	1.75
Magnesia, - - - - - -	0.70
Total, - - - - - - -	99.10

Claystones, as they are often called, and which are obtained from these clays, gave a large amount of lime.

Analysis of Claystones.

Water,	6.28
Organic matter,	1.70
Silicates,	30.88
Free alumina and peroxyde of iron,	9.42
Carb. lime,	53.98
Magnesia,	0.22
	99.42

The limestones, which occupy a large area in the state of New York, are important as fertilizers, and deserve a very careful examination. The following analyses were made with a view of determining their value in agriculture.

Analysis of Tully and Onondaga Limestones.

	Tully.	Onondaga.
Insoluble matter,	27.61	3.74
Alumina, phosphates and per oxide of iron,	10.34	0.18
Carb. lime,	54.10	89.00
Magnesia,	0.34	trace
Phosphate of lime,	0.88	0.03
Potash,	1.80	0
Soda,	trace	0
Magnesia,	4.93	0
Water and loss,	0	3.02
Soluble silica,	trace	0

Analysis of the Primary and Stockbridge Limestones.

	Primary.	Stockbridge.
Insoluble,	0.88	0.29
Alumina, etc.,	0.88	0
Carb. lime,	98.24	99.51
Magnesia,	trace	trace*
†Phosphate of lime,	0	0
Potash,	0	0
Soda,	0	0
Water,	0.20	0

The lower limestones, as the Chazy and Trenton, contain frequently a large but variable amount of magnesia, as well as insoluble matters in the form of slate or silica. The calciferous sandstone contains several drab-colored beds, which form a very good cement. These layers are magnesian.

* These limestones are often dolomites, and contain from 20 to 40 per cent of magnesia.

† Often disseminated through the rock, and sometimes in masses weighing twenty pounds.

The following remarks are given in the work, on the power which soils possess for absorbing and retaining water.

"Our account of the New York soils would be incomplete, if we passed over in silence these important qualities, which all soils possess in a greater or less degree. The determination of this power can be satisfactorily ascertained only by an extensive series of experiments carefully conducted, during the summer months, or during that period of the year when vegetation is affected by atmospheric changes. At any rate, experiments performed during the winter, the early spring, or late in autumn, would not be so satisfactory as during some portion of the period when vegetation is active and energetic. Experiments were commenced and pursued for a week or more, but they were suspended partly for want of time at command, and partly from the fact, that all the experiments and observations appeared to lead to and establish the result, that the powers in question were in the direct ratio to the quantity of organic matter in the soil, though modified by its state of subdivision; for it appeared, that when the subdivision was excessive, it absorbed and retained water in its maximum degree; and when coarse, or but imperfectly divided, its power of absorption and retention were proportionally diminished: still it was evident, that even when the organic matter was coarse, those powers were much greater than when the soil was deprived of matter from the vegetable kingdom. The facts being established, that the power of absorption and retention are in the ratio of the quantity of organic matter, modified by its state or condition, it shows that soils may differ in those powers, even when by analysis the amount of organic matter is nearly the same. It becomes important, then, in a practical point of view, to secure a proper degree of fineness in the vegetable and animal matters which are added to soils, inasmuch as they will be much more effective as fertilizers in a given period than if they were coarse; for it is during the dry season, that vegetables require a soil which is both absorptive and retentive; that soil which is capable of seizing atmospheric water, and holding it when the atmosphere is heated, is one of the best constituted soils."

The preceding observations, we believe, may be easily confirmed by other observers, if they will but turn their attention to the varieties of loam, or any of the mixtures of sand and organic matter, or organic matter and clay.

Another fact, which is equally important with the foregoing, and which was determined while engaged in these experiments, is the order in which the different materials composing the soils stand to each other, or the relations which they severally hold to each other in their separate capacity. For example, it w served that marls, or the finely divided calcareous compounds, are quite powerful absorbers and retainers of water, being even superior to clay and the argillaceous compounds, or to alumina in a state of great purity. This result was quite unexpected; as the common and prevailing opinion is, and has been, that clays are the most active and energetic in their powers of absorbing and retaining moisture.

In accordance, then, with these observations, we found that the materials which are most influential in soils, may be arranged in the following order, when their relations to water or moisture are considered: 1. Peat, or pure organic matter; 2. Marl, or, to be explicit and definite, freshwater or shell marl; 3. Clay, and argillaceous compounds, in which this element is in excess; 4. Loam, or the common soils as they usually occur; 5. Sandy loam; 6. Sand. Each of these kinds of earth is influenced, and its power of absorption depends upon the presence of vegetable or animal matter. This statement seems to receive support from the fact that when the organic matter is burned off, or the soil fully ignited, the different varieties agree in both their retentive and absorbing powers. Even the marl which was so retentive is reduced to almost the same power as that of ignited clay.

Carbonate of lime when obtained from rocks by the ordinary process of abrasion differs but little from sand in its absorptive and retentive powers.

In conclusion, we copy substantially, a summary of the leading facts which have been ascertained respecting the soils of New York.

"1. The soils of New York are often modified by the rock upon which they rest. Their composition, however, always differs from the rock, even when it is apparent that they were derived directly from the strata upon which they repose, or are in immediate contact. The differences are found to consist principally in the presence of those matters which are soluble in water when aided by carbonic acid, as carbonate of lime and magnesia. The soluble organic matters exist in a proportion greater in the soils than in the rocks; though all sedimentary rocks contain soluble organic matters, especially the decomposable shales and slates. The hard limestones exert but little effect or influence upon the composition of the soils: the most important office which they perform is mechanical, and the soil upon them is usually drier than upon the compact sandstones and shales.

2. The composition of the soils of the eastern or Taconic district differs from that of Central and Western New York, or those which belong to the wheat district. The first contain a greater amount of the phosphates of lime, alumina, iron and magnesia; the last, a greater amount of nitrogenous matters. The derivation of the first may be traced to the rock upon which they rest; the same

fact has been shown in respect to the last; and it is the peculiar constitution of the rock which makes them wheat soils, or gives them a fitness to sustain and perfect the wheat crop for a succession of years.

3. It has been shown that the soils of the eastern district are closely allied to the southern, or to those which rest upon the shales situated above the Onondaga limestone, particularly in the northern part of the southern district. We find, in this range, soils which contain the phosphates, and which are fitted for the culture of maize. The amount of this crop is greater than upon the wheat soils below; and although wheat was formerly grown in the early settlement of the country, and may have been an important crop upon this higher shelf of land, still experience proves that it is not a durable crop; that it is more liable to shrink; and that now only spring wheat is attempted to be raised upon the lands, after they have been cultivated for a few years.

4. The soil of the southern district is shown, by analysis, to be deficient in lime and magnesia. The lime which exists in it is mostly in combination with the organic acids, and is more abundant in the surface soil, than in the subsoil. The valleys, those especially which are watered by the Susquehannah, Allegany and their tributaries, are better supplied with lime than the soils of the hill-sides.

5. The geological formations which are most favorable to the production of the greatest number of important crops, are those of the western and central part of the state; inasmuch as their peculiar composition, and the speedy disintegration of the rocks upon which they rest, furnish new and fresh matter to supply the loss occasioned by the removal of inorganic matter in the crops themselves.

6. The supply of phosphates has been shown, by analysis, to be derived in the main from the rocks themselves; parts of the two systems supplying them in about equal proportions, namely, the Taconic slates, and the Hamilton and Chemung groups. The Tully limestone also furnishes the phosphates in about the same proportion; but, this rock being quite limited, its influence is not extensive.

7. The character of the soils which are now cultivated in New York, has not been materially changed by diluvial action. This assertion will receive essential support, when it is recollected that the rocks upon the east side of the Hudson extend very far north; and that the force or power which transported the soil, moved it in the direction of the strike of the rocks themselves. In the middle and western counties, a very large proportion of the underlying rock crumbles down into a tillable soil in a short time after exposure. The transportation of the debris of those rocks,

however, has extended the wheat-growing soil as far as the out-cropping of the Hamilton and Chemung rocks in many places. The higher grounds, or the elevated parts of the district, covered by the Hamilton and Chemung groups, have not received the debris of the Onondaga salt group; they are furnished with soil which is derived principally from the groups themselves. It is always deficient in the alkalies and alkaline earths.

8. The iron in the wheat soils, and in the green shales, is in the state of a protoxide: indeed this statement holds good when applied to the Taconic slates. The soils, too, of the wheat district, contain the protoxide principally; while in the maize-growing district, it is usually in a state of a peroxide. It is improbable that iron enters into the organs of vegetables without first becoming a peroxide.

9. There are no soils in New York, which are entitled to the appellation of calcareous soils. In the common language of the journalists of the day, they are either sandy or argillaceous loams. The peaty soils belong mostly to swamps or marshes, or which were so before they were reclaimed.

10. The means which are usually at hand for maintaining an uninterrupted fertility, are plaster, limestone, marl, tufa, peat, and decomposable shales. The distribution of the limestones is well delineated on the geological map. The peat and marl beds are generally distributed over the entire state, but they occupy only small basins in each of the geological formations. Lime is used too seldom; though its influences and effects are invariably decided, when there is a sufficiency of vegetable or organic matter. Hence one of the most important desiderata for the agriculturist, will be hereafter to secure a sufficient amount of organic matter, which may be used most efficaciously in the form of compost with narl and lime. Sulphate of lime is quite a constant ingredient in the soils of the eastern, central and western counties; and less common in the southern, northern, Highland and Atlantic districts.

11. The means for increasing the fertility of soil are much greater in all places than may be supposed; for example, all manufacturing establishments have various kinds of wastes, such as hair, wool, bones and animal matter, wood and horn shavings, coal dust and cinders, ashes, waste lime, coal ashes, apple pumice, in which, during decomposition, much ammonia and the phosphates exist; carcases of dead animals, weeds of the yards of houses and barns, all of which ought to go into the compost heap; turf by the road side, and the wash of roads, which ought always to be turned upon meadows or pastures.

12. It is evident from the composition of the numerous beds of slate and shale which exist in all the sedimentary formations that

heaps of the fragments of these rocks might be turned to good account as fertilizers, provided a disintegration could be affected. In many instances, there is not the slightest difficulty in bringing them to a pulverulent mass. Where they resist decomposition, piles of the debris, if heated, would crumble more speedily to powder. If they were coarsely pulverized, the mechanical effects in many cases would be important, especially on the argillaceous soils; and they would slowly yield up their potash, phosphates, magnesia and lime, to supply the annual waste to which the soil is subjected by cropping. Rocks which contain sulphuret of iron undergo a rapid disintegration, and afterwards a thorough decomposition. In these rocks are contained, in all cases, valuable fertilizers, which are available by the aid of quicklime. From them a large amount of gypsum may be obtained by means of the lime, in addition to the other soluble matters which the rock may contain.

13. In conclusion, I feel justified in saying that the available means within the reach of the farmers of New York are much greater than has been supposed. The gypsum, marls, limestones, peat, and broken down shales, either gypseous or calcareous, may be employed at a reasonable expense, not only to sustain the soil in its present state of fertility, but to increase considerably its productiveness."

THE EFFECT OF PLANTS ON THE DISTRIBUTION OF NUTRIMENT IN SOILS.

The ultimate effects of plants on the nutriment in soil, depends upon circumstances. The immediate effects in all cases of growing plants, is the same. The latter is to bring from below the food, and convert it into organized matter. When this is done in the case of weeds, it operates beneficially, provided they are saved and allowed to rot in heaps, and afterwards redistributed over the surface; or which amounts to the same thing, either lie in the position where they grew, and there decay. By this operation they have brought a quantity of food to the surface, which is not taken away. Weeds do not then impoverish soil, though they divide the food of the store-house, the earth, with more valuable plants, as grains. Trees, which survive for centuries, operate somewhat differently. They take up the food and store it up for their use, or rather convert it into wood, and this matter may be considered as being lost to the soil, inasmuch as they are finally removed from the fields. It is true a large portion is restored annually by leaves and bark, which fall off, decay, and give back the phosphates, alkalies and lime. This is a beautiful provision, inasmuch as the least abundant and most valuable matters are by law determined to the outside. Still no plant can reach perfection within the area which the roots of a vigorous tree occupies. Shade and the action of the roots of such a tree in monopolizing the magazine of food, are the reasons why corn, the cereals, or tuberous plants are starved under such circumstances. Weeds, then, which are suffered to die upon the ground, and there undergo eremacausis, do not impoverish the soils, but bring up nutriment to the surface; they counteract the influence of water, which, percolating through the soil, carries down the nutriment from the reach of the roots, and bears it away to other areas, where it is lost so far as the immediate uses to man are concerned. Trees restore partially to the surface the nutriment they bring up, but operate injuriously to growing crops; not by any poisonous influence, but by excluding light and monopolizing the store-house of food in the soil. The cultivated plants exhaust under every system of husbandry which can be devised, whether it be a rotation, or a perennial cropping by the same species; exhaustion goes on, whether you use clover or any other crop for manure. When nothing is added, but something removed yearly, exhaustion must occur in process of time. Hence a rule may be laid down, that where a pound of matter is removed from a field, organic or inorganic, a pound should be restored in some other form. We include organic matter, for we believe it to be essential to fertility, and until the matter is regarded in this light, the husbandry of any country will be conducted with a final loss to its interests; inasmuch as the activity and usefulness of inorganic matter depends upon the presence of organic matter in the soil.

DISEASED POTATOES USED FOR SEED.

Healthy potatoes are produced from those which are diseased, and it has been found that the crop is equal to that which has grown from perfectly healthy tubers.

PREPARED GUM FOR PASTING.

Take two parts of gum Arabic, one part of powdered tragacanth, one part of coarse brown sugar, thoroughly dissolved and applied of the thickness of cream. This is suitable for a great variety of purposes in a cabinet of plants or minerals, for sticking small broken specimens, or for labels, etc.

LIST OF NOXIOUS INSECTS.

BY A. FITCH.

I. Infesting Grain.

Wheat.

At the root and lower joints of the stalks, (Hessian fly) *Cecidomyia destructor.*

In the centre of the stalk, *Cephus pygmæus.* } European—
Chlorops pumilionis }
some American species has the same habits.

On or in the heads, (Clear-winged Wheat fly) *Cecidomyia tritici.*
(Spotted-winged Wheat fly) *Cecidomyia cerealis.*
Thrips cerealium of Europe
Psocus tritici (nondescript).
Gaylord's Wheat caterpillar, Trans. State Ag. Soc. 1843, p. 147.

In the ripe grain, (Grain weevil) *Calandria granaria.*
Calandra remotepunctata.
(Grain moth) *Tinea granella.*
(Angoumois moth) *Anacampsis? cerealella.*

In flour, *Pyralis farinalis,*
Silvanus surinamensis.

Barley.

At the upper joints, (Barley midge) *Tipula cerealis.*
In the heads, *Oscinis frit* of Europe.
(Also, *Cecidomyia destructor, C. tritici, Tinea granella.*

Rye.

(*Cecidomyia destructor, C. tritici, Chlorops pumilionis.*)

Oats.

(*Tinea granella.*)

Indian Corn.

Destroying the planted seed, (Wire worms).
Cutting off the young plants, (Cut worms) *Agrotis telifera,*
A. inermis, etc.
Eating the young plants, *Arctia virginica.*
Arctia arge.
In the base of the stalk, *Gortyna zeæ.*
On the stalk, *Cetonia inda.*
In the shelled grain, *Calandria oryzæ.*

II.—Infesting Meadows and Pastures.

Grass.

At the roots, (Cockchafers of Europe).
Phyllophaga quercina, P. fraterna, P. hirticula, etc.
Melolontha variolosa.
Elater appressifrons, E. obesus, etc.
Gryllotalpa brevipennis.

On the leaves, sucking their juices, (some nondescript leaf-hoppers).

On the leaves, eating them, (Crickets) *Acheta abbreviata, A. nigra, A. vittata.*
Raphidophora maculata.
(Catydid) *Platyphyllum concavum.*
Orchelinum vulgare, O. gracile.
Conocephalus ensiger.
(Grass-hoppers) *Acrydium flavo-vittatum, A. femur-rubrum.*
(Grass-hoppers) *Gryllus carolinus, G. corallinus, etc.*
(Grouse locusts) *Tetrix ornata, F. dorsalis, etc.*
Arctia Acreæ.

Clover.

Eating the green leaves, *Arctia Isabella.*
Infesting the newly-gathered hay, (vide Harris's Treatise, 447).

III.—Infesting Garden Vegetables.

Potatoes.

At the root, (one or more species of *Centipede*).
Eating holes in the leaves, *Crioceris trilineata.*
Eating the leaves, *Cantharis vittata, C. marginata, C. atrata, etc.*
(Potatoe worm) *Sphinx quinquemaculatus.*
Sucking the juices of the leaves, *Phytocoris lineolaris.*

Tomato.

Eating the leaves, (Potato worm) *Sphinx quinquemaculatus.*

Turnip.

Eating holes in the leaves, *Haltica pubescens, H. striolata.*
Pontia oleracea.
Eating the leaves, *Deilephila lineata.*
In the roots, *Anthomyia canicularis.*

Radish.

Boring the growing roots, *Anthomyia raphani.*

Horseradish.

Eating holes in the leaves, *Haltica striolata.*

Mustard.

Eating holes in the leaves, *Haltica striolata.*

Cabbage.

Cutting off the young plants, *Agrotis devastator.*
Eating holes in the leaves, *Pontia oleracea.*
Eating the leaves, *Mamestra picta.*
Sucking the juices of the leaves, *Aphis brassicæ.*

Carrot, Parsnip, Parsley.

Eating the leaves, *Papilia asterias.*

Onion.

In the young roots, *Anthomyia ceparum.*

Peas.

In the fruit, (Pea bug) *Bruchus pisi.*

Beans.

Eating the leaves, *Cantharis cinerea.*
Sucking the juices, *Tettigonia faba.*

Cucumber, Squash, Melon, Pumpkin.

In the stalks, *Ligeria cucurbitæ.*
Sucking the juices of the leaves, *Coreus tristis.*
Eating the leaves and flowers, *Galeruca vittata.*
Haltica pubescens.

Hop.

Destroying the root, *Hepiolus humuli.*
Eating the heads, *Thecla humuli.*
Eating the leaves, *Vanessa interrogationis, V. comma.*
Hypæna humuli.

Currant.

In the stem, *Ligeria tipuliformis.*
Eating the leaves, *Attacus cecropia.*
(a nondescript *Geometer*).
Sucking the juices of the leaves and distorting them, (Currant louse) *Aphis ribis.*

Blackberry, Raspberry.

Eating the pith of the stalk, *Saperda tripunctata.*
Agrilus ruficollis.

IV.—Infesting Flowers.

V.—Infesting Orchards, Fruit Trees, Vineyards.

VI.—Infesting Forest Trees.

1. *Evergreens.* 2. *Deciduous Trees.*

VII.—Infesting Domestic Animals.

(Lice, Ticks, Bot flies, etc.).

VIII.—Infesting Dwellings, Clothing, Furniture, etc.

(House flies, Meat flies, Cheese maggots, Ants, Clothes moths, Feather moths, Grease moths, etc.)

IX.—Attacking Man.

(Lice, Fleas, Bed bugs, Wasps, Mosquitoes, etc.).

Infesting Old Books, Herbariums, Cases of Insects, Old Furniture, etc.

An active whitish louse with a yellow head.

The Book Louse.

I am not aware that this species has hitherto been noticed by any of our naturalists, although it is quite as common here as in Europe, where it has long been well known. There are few persons but what have seen it. On opening some old and neglected book, what is regarded as a mote or small particle of dust, is often perceived on some part of the page, lying perfectly still and quiescent. Suddenly, with a brisk movement, it glides towards some cleft or covert, and the eye being now fixed upon it, it is seen to be a minute insect, closely resembling a louse in its appearance, but much more active in all its motions; yet so fragile in its structure, that a slight brush with the finger annihilates it, and "leaves not a wreck behind." It not only infests old books, but abounds also in great numbers in neglected collections of dried plants and of insects. Indeed the utmost care can scarcely keep it from cabinets of these departments of natural history, to which it is very injurious, devouring the more delicate and minute parts of the specimens. It also congregates among old and little-used furniture, old wood, &c.; and in brushing off the articles and sweeping up the dust of an unfrequented apartment, the contents of the dust-pan are sometimes all alive with these mites, and hence many of our housewives familiarly designate them by the name of *dust lice.*

If one of these lice be dropped into a phial or box impregnated with the vapor of camphor, it is in most cases paralysed instantly, so that it seldom moves from the spot on which it falls. An atmosphere of choke-damp scarcely produces a more sudden asphyxia in man, than does a camphorated atmosphere in this insect. Its limbs are rapidly convulsed with violent spasms, which subside only in death, even though it be removed from the noxious vapor. Camphor operates in the same way, though less suddenly, upon many other insects. The symptoms which it produces seem to be identical with those caused in the higher orders of animals by an excessive dose of the same substance. This is therefore a most efficient remedy against the depredations of this insect. Its powder should occasionally be sprinkled between the leaves of herbariums, and every collector of insects is aware that the drawers of his cabinet must never be without it. The vapor of oil of pine, the common spirits of turpentine, is perhaps equally as efficient as camphor for destroying this insect. Phials containing this oil, and loosely stopped, to allow it to slowly evaporate, may also be placed in situations where injury from this depredator is feared.

This species derives its technical name from the habit which it was deemed to possess, of occasionally making a slight tapping noise, analogous to the ticking of a watch; on which account it has sometimes been called the *death-watch*, a name which is more frequently bestowed upon some coleopterous insects of the genus Anobium, which are well known to possess this faculty. Writers of the present day are not agreed whether the habit alluded to does belong to the present species, or not. It is difficult to conceive it possible for so minute, so soft, and weak an insect, to produce any audible sound. A box, purposely allowed to be much infested with these lice, has stood upon the table beside me, and often less than two feet from my ear, during the past season;

yet no sound has ever been observed to issue from it. The species is the

Atropos pulsatorius (Linn.), Leach. The largest individuals (females?) are of a dull white color, the head honey-yellow, and the eyes red. The abdomen is broad, oval, conspicuously broader than the head, its sides convex, and its tip approaching to an acute point. Length about 0.08. This is the form which has commonly been described by authors.

Smaller specimens (males?) are of a pale brownish hue, the head light fulvous, and the eyes black. In these the abdomen is scarcely broader than the head, with its opposite sides nearly parallel, and its apex rounded and obtuse. Length about 0.05. This would seem to be what the old writers described as a distinct species, under the name of *Termes divinatorium.*

Specimens but half grown (larvæ) are of a shining milk-white color, the eyes black, and the labrum of a fulvous tinge.

ON WHEAT HEADS, STRAW, GRAIN, AND FLOUR, IN THE FIELD, BARN, AND MILL.

An active, minute, dark-brown louse, commonly having wings.

THE WHEAT LOUSE.

This minute insect has occurred to my notice in the following situations; at the time of wheat harvest, upon the straw and heads of wheat; in the wheat mow and upon the threshing floor in autumn; in bins of wheat and upon the exposed surface of newly ground flour standing in barrels, in mills, so late in the season as the latter part of November, though more abundant earlier. In all of these situations it has been met with, at times, in immense numbers. What is its particular nourishment, is not known. From the dexterity with which a live specimen, gummed to a slip of paper, essayed to gnaw and tear away with its tiny jaws the surface on which it was confined, it was apparent that it was well accustomed to the use of these instruments. Some authors suppose the insects of this genus to subsist upon decaying vegetable matter; others that they live upon minute animalculæ. Neither of these opinions would seem to be correct as regards this species, from the fact that it is attracted in numbers to the surface of flour when exposed—a situation where it is not probable that either animalculæ or decaying vegetable matters abound. Being so abundant upon wheat, both in the field, in the barn, and at the mill, it merits a notice here, although we know not as yet that it is in any wise injurious to the grain or flour. I suspect it to be this insect which Dr. Harris, from Mrs. Gage's account, inferred to be the *Thrips cerealium*, (Treatise, p. 444). The species would seem to be scarcely different from the European *P. bipunctatus*, except that the stigma has no black spot. It may be named and characterized as follows:

Psocus tritici. Dark-brown or black, shining; wings hyaline, upper pair with a black dot on the middle of the anterior and another on the middle of the posterior margin; abdomen dull pale-yellow, commonly annulated with black. Wings expand 0.10. Variety *a*. Abdomen white, without bands, with a fulvous dorsal line.

In Forests, on the Surface of Melting Snow, Buckets of Maple Sap, and Pools of Water.

A minute, dull, blue-black flea.

The Snow Flea.

This is an abundant species in our forests in the winter and fore part of spring, breeding, it is supposed, at the very period when nearly all the rest of the animal and vegetable creation is reposing in torpidity, under the influence of hyemal frosts and snows. It probably subsists upon decaying vegetable substances. When ever a few days of mild weather occur at any time in the winter, the surface of the snow, often, over whole acres of woodland, may be found sprinkled more or less thickly with these minute fleas, looking, at first sight, as though gun-powder had been there scattered. They advance with slight leaps, which are produced by means of their tails. This member is forked at its tip, is flexible and elastic, and lodged, when at rest, in a groove under the abdomen. The tail moves as if with a spring, and striking the surface on which the insect is placed, throws it a short distance. It commonly falls upon its back with the tail extended. Hollows and holes in the snow, out of which the insects are unable to throw themselves readily, are often black with the multitudes which here become imprisoned. Their bodies are coated with a fine meal-like powder, of a blue-black color, analogous to that on the surface of cabbage leaves; this enables them to float buoyantly upon the surface of water, without becoming wet. When the snow is melting, so as to produce small rivulets coursing along the tracks of the lumberman's sleigh, these snow fleas are often observed, floating passively in its current, in such numbers as to form continuous strings; whilst the eddies and still pools gather them in such myriads as to wholly hide the element beneath them. In the early spring, the buckets and troughs employed to receive the sap from the maple tree, are often similarly thronged with them; rendering it necessary to carefully skim or strain the fluid, before pouring it into the kettles for boiling, wherever a due regard is had to the purity and cleanliness of the syrup and sugar.

From the habits of this species, we should infer that it might be abundant in all the snow clad regions of the northern parts of this continent. It may therefore prove to be identical with the *Podura humicola* of Otho Fabricius, (Fauna Gröenlandica,) of which we are unable to refer to any but short and unsatisfactory descriptions, which do not coincide well with our insect. Recent specimens exhibit the following characters.

Podura nivicola. Blue-black; legs beneath, and tail dull brown. Length 0.08. Body cylindric, somewhat broader towards the tail; black, covered with a slightly adherent blue-black powder, and sparingly clothed with minute hairs. *Antennæ* short and thick, longer than the head. *Legs* above blackish, beneath dull brown, much paler than the body. *Tail* of the same color with the venter, its fork brownish, glabrous on its inner or anterior surface, with minute hairs on the opposite side.

On the Leaves of the Grape Vine, Sucking their Juices.

A slim cream-colored fly, nearly half an inch long, with a light vermilion stripe on each side of its head and upper wings.

Coquebert's Otiocerus.

This common and pretty species may be met with in July and August, on the leaves of the wild grape vine, and doubtless also on those of the cultivated grape. It likewise occurs on beech, walnut and oak trees; in short any shrub or tree clothed with a very dense growth of foliage, appears to afford it a favorite resort. I have met with it more commonly on grape vines which ascend young saplings ten or twelve feet high, and having no support for mounting higher or shooting off laterally, twine around the several limbs of the sapling, completely enveloping and smothering it under a tangled matting of vines and leaves. Hence, keeping the cultivated grape well pruned, so that the air and sunlight will have a free circulation among its leaves, is without doubt one of the best measures for preventing it from becoming infested with these insects. The species is the

Otiocerus coquebertii of Kirby. It measures 0.35 to the tip of the abdomen, and its wings expand about 0.72. It is of a yellowish-white color throughout, the wings being milk-white and diaphanous; &c., &c.

ADVANTAGES OF IRRIGATION.

The advantages of irrigation do not arise simply from the quantity of water which they receive. The amount of saline matter in the water, is an important consideration, and give some waters an advantage over others. As an illustration of this statement, which is confirmed, we copy the following analysis of water with the remarks subjoined. The waters of New York have already received that attention which the importance of the subject demanded.

The following are analyses of water from a well in the Boulevard St. Martin, and from the Seine, at Paris; by M. Lassaigne:

Well, in Boulevard St. Martins.

	In a Litre.	In an Imperial Gallon.
Sulphate of lime,	1 560 grammes.	109 450 grains.
Carbonate of lime,	0.401 "	28.138 "
Nitrate of magnesia, and chloride of magnesium,	0 22 "	15.437 "
Air.	0 020 litre.	5 544 cub. in.
Carbonic acid.	0.027 "	7.485 "

Water of the Seine.

	In a Litre.	In an Imperial Gallon
Sulphate of lime.	0 017 grammes	1 193 grains.
Carbonate of lime.	0.099 "	6.946 "
Nitrate of magnesia, and chloride of magnesium,	0 012 "	0 842 "
Air,	0.024 litre.	6 653 cub. in.
Carbonic acid.	0 006 "	1.663 "

Supposing a bed of soil were watered from the well above mentioned, in quantity equal to the amount of rain which falls on an average in the climate of London, that is about two inches deep per month, or 12,465 gallons for each square foot in a year; the bed in the course of the year would receive, with the water, at the rate of 3 tons, 15 cwt., 79 lbs., of sulphate of lime, per acre; of carbonate of lime, 19 cwt., 53 lbs.; and of nitrate of magnesia, and chloride of magnesium, 10 cwt., 74 lbs. The editors of the Revue Horticole state, with reference to the preceding analysis, that the water of a well in the Jardin des Plantes, contains still greater proportions of sulphate, and carbonate of lime, than that of the one in the Boulevard St. Martin.

ON THE CULTURE OF POTATOES.

It is well occasionally to recur to the past, and learn the views of others, and what results their investigation taught them. We may compare them with our own experience, or with what we know to be the experience of our neighbors. We therefore publish the following letter of Noah Webster, written more than half a century ago, and published in the first volume of the Transactions of the old New York Agricultural Society. Noah Webster was an eminent man in his day. He was devoted to literature, and yet found time to experiment on the raising of potatoes. We leave it to farmers to say whether his conclusions are not measurably good, and may we not inquire how much has the business of raising potatoes advanced since Noah Webster wrote out the results of his experiments? We consider that the letter itself is no dishonor to his name.

Dear Sir:—You know my love of the first and best occupation of man, *agriculture*, and how anxious I am to see this most useful business improved among my fellow-citizens. In my present situation, I have not an opportunity to make experiments on a large scale; but some observations made the last year, on the growth of potatoes, may possibly be worth the notice of the agricultural society. From a single experiment, I am led to the following results:

1. The seed-potatoes should be those of full growth. If small potatoes are planted, they will produce perhaps nearly the same weight, but the new potatoes will be mostly small. I judge that full grown potatoes will produce double the number of those which are large and fit for use.

2. Cuttings produce more than whole potatoes. This has been fully demonstrated by others.

3. The English whites grow to perfection, in a *shorter time*, and in a *poorer soil*, than the red. The difference is essential. They are therefore best for early potatoes.

4. Potatoes will not come to perfection without the sun. Therefore nothing is so prejudicial as to plant them too thick, especially on a rich soil. The white potatoes will answer tolerably well, on light, thin soil, with hills or drills at three feet distance. But if the soil is rich, the stalks of the potatoes will have a luxuriant growth, and cover the whole surface with shade. This will in-

evitably mar the crop. The hills should be not less than four feet asunder; and in a very rich soil, a greater distance may be better. The same of drills.

5. The cuttings in drills, where the land is light, will answer well at nine inches distance. This indeed seems to be a good distance for the whites. But in rich land, and especially if the potatoes are of the red kind, the stalk of which grows to a larger size than that of the whites, the distance should be not less than twelve or fifteen inches. The red require richer land than the white.

If these observations contain any thing not generally known, you are at liberty to lay them before the society. If not, the communication you will please to suppress.

LOSS OF INORGANIC MATTER IN DRAINAGE WATER.

The following extract as it appears in the Gardiners' Chronicle, furnishes matter for reflection. The loss of nutriment which is sustained by deep drainage is probably large, at the same time we believe the practice of thorough drainage will be sustained:

In the autumn of 1844, being a resident in East Lothian, where the system of thorough drainage is very extensively carried out, it occurred to me that the drainage-water during its percolation of the soil must necessarily dissolve out and carry away a great portion of the soluble constituents of it, which by the practice as at present followed, are carried off the land and entirely lost to the farmer. I therefore took advantage of the first fall of rain sufficient to set the drains running after the dry weather of the autumn, and collected some of the drainage-water, which I subjected to a partial analysis, the particulars of which are described in a paper read by Dr. W. Gregory, at a meeting of the Royal Society, Edinburgh, in the early part of last year. The results I then obtained, though very incomplete, were quite sufficient to show me that they had a very important bearing on agriculture, and to induce me to go on with their further investigation. About the usual quantity of rain had fallen during the time between November, when I collected the first sample, and April 29th, when I obtained the second, and during the whole of that period the land had laid ploughed as a winter fallow. Immediately after the second sample was taken, the field was prepared for seed and sown with guano and barley. In a few days after (May 16th), I was enabled to collect a third sample (of course from the same drains), and having submitted them to analysis, the following are the results:

Second Sample.—18 lbs. of drainage-water on evaporation gave 15·2 grs. of solid residue, or about ·844 grs. to the lb.

Organic matter and water in combination,	3·4
Silica, - - - - - -	0·9
Silicate of alumina, - - - -	0·4
Chloride of magnesium, - - -	1·12
Chloride of sodium, - - - -	1·8
Chloride of calcium, - - - -	3·0
Sulphate of alumina, - - -	0·85
Peroxide of iron, - - - -	2·1
Phosphate of lime, - - - -	0·3
	13·87

Third Sample.—18 lbs. of drainage-water on evaporation gave 27·5 grs. of solid residue, or about 1·525 grs. to the pound.

Organic matter, &c., - - -	7·8
Silica, - - - - - -	0·7
Silicate of alumina, - - - -	0·2
Peroxide of iron, - - - -	2·25
Phosphate of magnesia, - - -	1·8
Magnesia, - - - - -	1·69
Chloride of sodium, - - - -	2·615
Chloride of calcium, - - - -	2·107
Carbonate of lime, - - - -	2·7
Phosphate of lime, - - - -	3·1
Phosphate of alumina, - - -	0·45
	25·412

I should here observe that the first sample, collected in November, after the drains had been dry for many weeks previous, contained 2·25 grs. of solid residue to the pound; whereas that collected in the following April, (No. 2,) after the land had been continually drenched by the winter rains, only gave ·844 grs. to the pound. On adding a quantity of easily soluble manure (gunao) to the soil, the first waters (No. 3) that passed through not only brought with them an increased quantity (1·525 grs. to the pound), but they contained many of the very ingredients that constituted the value of the manure itself. At the time the paper referred to was read at the Royal Society, Edinburgh, it was suggested that possibly the turbid portion first discharged from the drains after heavy rains might contain matter also very valuable to the soil; but on comparing the subjoined analysis with that of the drained soil, it appears to be composed of the same ingredients, with a decrease in the proportion of silica and an increase in the lime, both of which may be readily accounted for.

Analysis of Soil deposited from Turbid Drain-water.

Silica,	60·0
Silicate of alumina,	17·5
Protoxide of iron,	6·5
Sulphate of lime,	9·4
Sulphate of magnesia,	0·75
Phosphate of lime,	0·6
Alumina,	4·0
Water, &c.,	1·25
	100·00

I do not for a moment wish to question the value of the principle of thorough draining; that is now, I believe, universally admitted; but if its results are deemed so beneficial to the farmer under the present practice, how much more so would they not become, if some remedy were devised either to prevent as much as possible this great abstraction, or else to render the enriched drainage-water again available to the soil. This subject has not, I find, escaped the observant mind of Liebig, and in fact forms the basis of the Patent Manure, according to his specification in October last. He has argued theoretically to the same end, and proffered a remedy in the shape of a manure, by his patent process rendered much less soluble than before, which of course would not be acted upon so readily by the percolating rain-water, and would consequently remain longer in the soil for the purposes of vegetation. Mr. Smith, of Deanston, a man to whom practical agriculture is deeply indebted, has suggested the application of all manures whatsoever in a largely diluted liquid state, and which I am informed has been most successfully applied on the western coast of Scotland. Now both of these plans will most assuredly tend to lessen the loss at present sustained; the one by diminishing the solubility of the manures employed, and the other by rendering the drainage-water again available. But should the farmer object to take advantage of either plan, it would appear expedient to avoid using as much as possible the very soluble manures, and instead of giving his land the usual good dose of manure that is expected to suffice for two or three seasons, to divide the quantity, and to apply it in as small a proportion and as frequently as the nature of his crops will permit him to do. In such cases his crops will get more and his ditches less than by the present practice.

MANAGEMENT OF PEAR TREES.

We deem it unnecessary to apologize to our readers for copying the following article entire, from the Gardeners' Chronicle. This mode of management of pears seem highly and well worth knowing, and though our climate is better adapted for the perfecting of most fiuits than England, still the principles which are applicable to the management of the pear in that humid climate, will undoubtedly be in a measure applicable here.

I feel that it is a duty I owe to your correspondents and the gardening world generally, to notice the letter of a "Constant Reader," in No. 21. It will, perhaps, be the better mode to take his questions and remarks *seriatim:* he says, "I have been for years much interested in the proper stock for fruit trees; my impression is that the pear cannot be produced in its highest state of perfection (whatever the mode of treatment or the stock used) on any other stock save the pear stock." To this I can answer most positively that the very finest pears I have ever seen or tasted, have been produced on pear trees grafted on the quince. I use no stocks but the pear and the quince; the former for orchard trees, or for those who prefer the pear stock; the latter solely for garden trees, principally to form prolific pyramidal trees, for which they are unrivalled both in beauty and fertility. I fear "Constant Reader" has also been constant to his home; has he never seen or tasted the magnificent pears in some of the fruit gardens near Paris? has he never seen the pear trees in the Potagerie at Versailles, or tasted the fruit from them? (Mind, trees there, are nearly all grafted on the quince.) If he has not done this he has yet something to see and taste. I repeat that I use only the pear and the quince as stocks, and I find the pear stock submit as kindly to root pruning (or even more so) as the quince. I can illustrate the good effects of root pruning very forcibly in my specimen orchard, and at any time your correspondent may see and believe; however, I must tell my tale, and then proceed.

About 30 years ago my father planted some rows of pear trees in a portion of the nursery, then a recent purchase; these were all common sorts of pears, standards, grafted as usual on the pear stock. They grew must luxuriantly for some eight or ten years, when their leaves began to change from their usually vivid green to a light yellow; in a year or two this yellow tint increased till their foliage was really of a bright straw color; the trees soon after all died, so that at the end of fifteen years not a tree was left on this portion of the nursery, the subsoil of which, I must add, is hard white clay full of chalk stones; this peculiar soil occupies a very small space, not more than a quarter of an acre, as the neighboring soil is a tender sandy loam.

When I came to years of thinking, the untimely fate of these pear trees was often present to my mind, for I remembered so vividly with what pleasure I had filled my pockets from them; I at that time also found that to be able to know anything about pears I must have a specimen tree of every kind that I cultivated. No other but this "pestilent spot" of earth happened to be just the place most eligible as a site for my specimen ground. What could I do? I did not then think of root pruning, but I thought that I should find some way or other to avert the untimely fate of my trees; I therefore planted them in the usual way, digging the holes about two feet in depth, and mixing some manure and compost with the earth taken from the holes, but leaving the hard clayey subsoil below to the depth of two feet untouched. I watched my trees narrowly after four or five years, as I then expected to see traces of the effects of the clay soil upon them. I think some eight years must have passed and gone before their foliage turned yellow. My first thought said, remove them to a different site and soil; second thought, take them up and give them some fresh compost, they will last a few years, and you can then find a good place for them; third thought, if you can renovate them for a few years by taking them up and replanting, why not do this periodically, so as to keep your trees healthy; the site is good, make the soil equally so; fourth thought, what occasion is there to remove the tree? cut its principal roots, leave those that are fibrous; and so I became a pruner of roots. Now for effects, and a "Constant Reader" must recollect that any day the Eastern Counties rail will carry him either to Harlow or Sawbridgeworth, each equally convenient for a few shillings, to see with his own eyes all that I state.

In my specimen ground are several standard pear trees from eight to ten years old; these terminate long rows of standards, left to grow as nature dictates, both root and branch, except occasional thinning of their heads. These, it must be recollected are among my root-pruned specimen trees, a great number of which are from twelve to fifteen years old. They have had their roots pruned three times within these eight years, the last time in December 1844. They are now full of health and foliage and fruit, in fact all that I can wish them to be. The standard trees, with roots unpruned, have their leaves yellow, and are, I fear, hastening to death. I now proceed to give a list of such sorts of pears that on my soil are decidedly higher in flavor when grafted on the quince, and not as your correspondent almost ludicrously says, "partaking of the flavor of the quince." Pray, have you or Mr. Thompson ever ate a quince-flavored pear? that is, a pear having such a flavor from being grafted on the quince (as I well know there are many pears with a very odd flavor). Does the Ribstone Pippin taste of the Crab because it is grafted upon it? Does the Peach acquire the flavor of the Mussel Plum because it is budded upon it? Does the Greengage ever taste sour and austere? and yet it is almost invariably grafted upon the common Wild Plum, which is uneatable, from its peculiar astringent acidity. I do hope, for the credit of your paper, that your correspondent is not your "Constant Reader." To return to my list, I must first premise that every sort of pear is, as far as my experience at present goes, improved by being worked on the quince; but the following in list I, are remarkable for growing freely on the quince in most soils, without being double worked, bearing large fruit of the highest flavor:

LIST I.

1 Beurré d' Amanlis*	18 Forelle or Trout pear
2 " Ananas	19 Fortunée (Parmentier)
3 " d'Aremberg	20 Franc Real, Summer
4 " de Capiaumont	21 Glout Morceau
5 " Diel	22 Gratioli of Jersey
6 " Easter	23 Jargonelle
7 Bon Chretien, Williams	24 King Edward's
8 Chaumontalle	25 Louise Bonne of Jersey
9 Citron des Carmes	26 Napoleon
10 Colmar	27 Passe Colmar
11 Colmar d'Aremberg	28 Poire Chenille
12 Comte de Lamy	29 Princess Royal (Groom)
13 Crassane	30 Saint Denis
14 Doyenné Gris	31 St. German
15 Doyennê, white	32 Van Mons. Leon le Clerc
16 Duchesse d'Angouleme	33 Vicar of Winkfield
17 Duchesse d'Orleans	34 Wilhelmina

There are many other sorts that I feel almost assured will do equally well on the quince stock as the above. I forbear to add them till I am fully convinced by proving them. No. 3: Of this I ate my best specimens about the middle of last April; they were vinous, juicy, and delicious, from plants on the quince. Specimens from plants on the pear stock, kept only till the end of February.

No. 5. This pear seldom ripens well from trees on the pear

* D'Amanlis according to most French authors; D'Amalis, according to Horticultural Catalogue of Fruits.

stock; on the quince the fruit are larger, more handsome, of perfect flavor, and they invariably ripen well.

No. 6. On the pear stock here (it must be borne in mind that I am always referring to trees in the open quarters—not wall trees); this is a most crab-like pear, bearing not very seldom, and never ripening; on the quince it bears well, is of high flavor, and always ripens in April and May; it is, however, inclined to be gritty at the core, and this at present is the only pear I have found to be so from the quince stock.

No. 19. This is a perfect crab from trees on the pear stock; from the quince it is very melting and juicy, and really a good small late pear. I ate my last and only specimen this day, May 26.

No. 21. Grows freely here on the pear stock, and blooms freely, yet seldom bears any clear fruit; they are generally full of spots, and often do not ripen at all kindly. On the quince stock it bears clear handsome fruit, which invariably ripen, and are very highly flavored.

No. 23. On my finest soil here, a tender loam, six feet in depth, subsoil sand, this sort always cankers, and very seldom produces any good fruit; in short, it is a very shy bearer when on the pear stock; on the quince it grows freely, and bears most abundantly; fruit, fine and clear, and of high flavor.

No. 25. This, of all the pears I know, is most benefitted by working on the quince. My specimen tree, on a pear stock, now twelve years old, has scarcely borne a dozen good clear fruit, and some standards of nearly twenty years' growth canker at the tips of their shoots, and their fruit is in most seasons spotted and misshapen. On the quince how different! I have trees from three to five years old full of fruit, and these have hitherto every season been large, remarkably high-colored, beautiful, and of the highest flavor. "Constant Reader" will, I think, see that I have some confidence in the quince stock, when I state that I have a young plantation of this variety on the quince of 1500 trees, which I hope to make up in the autumn to 3000; these are to bear to supply the London market. At the expense of being thought a little egotistical, I must tell him that I am not only a pear tree grower, but also a pear grower; Providence has kindly blessed me with fifty acres of good land, on which roses and pears, and I know not what, seem to be "very happy;" this is a favorite phrase with one of our best gardeners, who, when he sees a tree in fine order, or one the contrary, designates them "happy and unhappy trees."

No. 27 bears here on the pear stock, a tremendous quantity of fruit; these are often inclined to speck, and they seldom ripen well in the fruit room. On the quince stock the fruit are clear, always ripen well, and are of the highest flavor. I have, as above given my remarks on a few well-known and preferable sorts; they may be applied, with slight modifications, to all the varieties in list I.

LIST II.

Pears that require double working before they will succeed on the quince; this is merely grafting or budding some free-growing sort of pear on the quince, and then regrafting the graft the following season with the "refractory sort," to use the expression of your friend Docman.

1 Bergamot Autumn	12 Jean de Witte
2 " Gansell's	13 Marie Louise
3 Beurré Bosc	14 Monarch, Knight's
4 " Rance	15 Nelis, Winter
5 Broom Park	16 Ne Plus Meuris
6 Brougham	17 Saint Marc
7 Crassane, Althorp	18 Seckel
8 " Winter	19 Suffolk Thorn
9 Dunmore	20 Thompson's
10 Hacon's Incomparable	21 Urbaniste
11 Inconnue, Van Mons, 175	

No. 3 is exceedingly "refractory," and I am not quite sure that it will live and flourish for any lengthened period, although double worked on very thrifty stocks. In some soils this fine pear does not ripen well on standards, it is therefore very desirable to get it to do well on the quince, as it will, I have no doubt, bear when the tree is young; at present it is, while young, a shy bearer.

No. 4. My standards of this sort on the pear stock too often bear misshapen fruit, inclined to speck and crack, and in some seasons not ripening well on the quince. Its fruit is clear, fine, and remarkably high flavored.

No. 11. I notice this pear, as I remarked a short time since one of your correspondents inquired of you its origin, which you could not give. I received it with several other sorts from M. Van Mons, I think about 18 years ago; I understood him at the time that they were seedlings, not then named; this is a very hardy and excellent late pear, about the size of Beurré d' Aremberg, but larger, first rate in quality as a melting pear, and fit for the table from February to April; the sorts then received were placed in the nursery catalogue as "Inconnue Van Mons," and numbered. They all stand under the same name, with different numbers attached.

The sorts I use to form a stock on the quince for regrafting are Buerré d' Amanlis, Jargonelle d' Automne, Fondante de Brest. These all form the most luxuriant stocks. Grafting on the quince often fails. I have known 18 out of 20 to succeed in some seasons, and the same number to fail in others. It is an uncertain mode; budding is preferable. For double working, you may always graft, that is, if you prefer it, or if your buds fail. Grafts succeed perfectly on the shoot of the pear produced from the quince stock the preceding season. I earth up my trees, to encourage them to root close up to the junction of the graft with the stock, but not with the view of making the graft root. I wish to avoid this, as the effect of the quince stock is then lost. If you wish for cultivated pears on their own roots, there is much time and labor lost by this mode; for any variety of pear may be layered, and good plants obtained in about two seasons. And now for the last paragraph of your "constant" friend. Can we always find "soil and locality in every respect suitable" to the growth of foreign varieties of pears? Is not our method of placing them against walls and espalier rails, &c., "unnatural?" The peach tree, which in the United States, in a natural state, bears such enormous crops, bears here at least equally fine fruit, but in most "unnatural" places. My root-pruned pear trees, many of them, I have purposely made to contend against nature; in a soil that is naturally death to them I make them flourish. To use the oft-quoted sentence, "A man that can make a blade of grass to grow," &c., is a benefactor to his race, and if I can, by precept and example, enable the numerous occupiers of small gardens to grow pears and apples for their dessert nine months in the year, and plums and cherries during the summer, shall I not also be a benefactor in a humble way? I hope so.

Allow me to advise your correspondent to visit the Horticultural Gardens at Chiswick; he may there see pear trees of some twenty five years' growth on the quince stock, with roots protruding from the stock close to its junction with the graft. Pictures of health and fertility, they have borne many bushels of fruit, and yet I have never heard the Fellows of the Horticultural Society complain that they tasted like quinces. Some fine trees of about the same age on the quince are also in the border. These were all removed about two years since, and of course their roots were pruned; on them therefore may be seen the effects of root-pruning.

I will conclude with the words of Dodman: "a very little care and judicious selection of sorts would insure them pears daily, from the end of July till May. I may add that any garden ten yards square, or even less, will, with the quince stock for pears, the paradise stock for apples, the Cerasus Mahaleb as a stock for cherries, judicious root pruning and surface culture, supply a very ample dessert of delicious fruits.—*Thomas Rivers.*

INFLUENCE OF THE MODE OF CHURNING ON THE HARDNESS OR SOFTNESS OF BUTTER.

BY PROF. JOHNSTON.

Two facts are observed by the dairy maid in the preparation of her butter, which are not without interest, either in a chemical or in an economical point of view.

First, the butter obtained on the same farm, and by the same process, or method of churning, is almost every where observed to be harder at one season of the year than at another.

Second, the same milk under different management, or modes of churning, yields butter of different degrees of hardness.

The hardness of butter is a quality much prized; so much so, that in some districts it is said to be artificially obtained by an admixture of mutton or beef fat. Upon what, therefore, does it depend? Why is it greater at one season of the year than another? Is there any thing in peculiar modes of churning which can be supposed to diminish or increase it.

Before we can answer these questions we must understand the structure, so to speak, of milk, and the exact chemical composition of butter.

Cows' milk consists of water to the extent of about 87 or 88 pounds in every hundred. This water holds in solution about 5 pounds of sugar and a little soda. In the saccharine solution there are also dissolved 4 or 5 pounds of curd, which impart to it the bluish-white opacity of skimmed milk. In this mixed solution, again, there float a vast number of minute globules of semi-fluid fat, each covered with a thin shell of a peculiar substance resembling curd, but, so far as our present knowledge goes, slightly differing from it in composition. The curd, for instance, when heated on polished silver, with a drop or two of a solution of caustic potash, causes a brownish black stain of sulphur upon the silver; the substance which is supposed to form the envelope of the globules gives no such stain.

When milk is set aside for a time, and left undisturbed, these globules of fat, with their coatings, rise to the surface of the milk, and collect in the form of cream.

When this cream is agitated for a length of time, in a churn or otherwise, at a proper temperature, the thin coatings burst, or are torn asunder, and the particles of half-liquid fat unite together and form butter. This butter includes some of the thin envelopes of the fat globules, with a little curd and sugar, and a considerable proportion of water. When churned, and well pressed, it consists of

	per cent	
Curd and envelopes, - - - - -	$\frac{1}{3}$ to	1
Water, - - - - - - -	10 to	14
Fat, - - - - - - - -	$89\frac{2}{3}$ to	85
	100	100

When butter is salted, a portion of the water separates, and the butter becomes harder, closer, and more rich in fat.

The fat of butter consists of a solid and a liquid portion. The former is called margarine, and the latter elaine. When butter is put into a linen bag, and submitted to the action of a press, the elaine flows out. The larger the proportion of margarine, the more solid is the butter; the larger the quantity of elaine, the softer it is.

At this latter fact the chemical interest of our practical question begins: If the hardness of butter depends upon the proportion of margarine, and if the hardness is found to vary, the proportion of margarine must vary also. And this, upon careful chemical investigation, is really found to be the case.*

What, then, is the chemical relation between the solid and liquid fats of butter? Are they capable of being changed, the one into the other? Are the circumstances under which butter is churned such as naturally to give rise to such a change? Are they such as to cause this change to take place to a greater extent at one time, or at one season than at another?

1. *The Chemical Relation of the two Fats.*—For the sake of clearness it may be proper first to state, that both margarine and elaine, when treated in a particular way, yield a sweet sugary substance, to which the name of oil sugar, or glycerine, has been given. When this sweet substance is separated, the former has become changed into margaric acid, and the latter into elaic acid. It is the composition of these two acids, therefore, that we have to compare with each other. When combined with the same substance, glycerine, they form respectively the natural fats, margarine and elaine.

Now, margaric and elaic acids are represented respectively†—

	Carbon.	Hydrogen.	Oxygen.
Margaric Acid, by - -	34	33	3
Elaic Acid, by - - -	36	33	3

These numbers show that elaic differs from margaric acid only in containing two equivalents more of carbon. By the action of

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* See my Lectures on Agricultural Chemistry and Geology, 2d ed., p. 964.

† The pure chemist will observe that I have, for the sake of simplicity, omitted an equivalent of water, in respect of which the two acids also differ from each other.

oxygen alone, therefore, the elaic may be changed into the margaric acid. Thus—

	Carbon.	Hydrogen.	Oxygen.
To one of elaic acid - -	36	33	3
Add four of oxygen, - -			4
And we have - -	36	33	7
From this take two of carbonic acid, - - -	2		4
And margaric acid remains,	34	33	3

That is to say—if one of liquid elaic acid absorb from the air, or from any other source, four of oxygen, it will, in favorable circumstances, give off two of carbonic acid, and become transferred into margaric acid.

We do not know any probable way by which the converse change of the margaric into the elaic acid can be effected in so simple a manner. The natural process of change, therefore, of the fats of butter, seems to be from the more fluid into the more solid fat.

It is confirmatory of this view, that the liquid elaic acid is with difficulty obtained in a pure state. Its tendency to absorb oxygen is so great, that by simple exposure to the air it undergoes a rapid alteration. The tendency being thus rapidly to absorb oxygen, the probability is very great that in favorable conditions the more fluid fat of the milk, as it comes from the cow, will be in a greater or less degree changed into the more solid fat—in other words, that from the same milk under varying circumstances, a butter of greater or less hardness may be obtained, in consequence of such a purely chemical change.

It is a further confirmation of the view that I have advanced, that gas has occasionally been observed to be given off during the operation of churning, and that this gas has been supposed to be carbonic acid.*

2. *Circumstances under which Butter is churned.*—In what way do the circumstances under which butter is churned vary? Can such usual variations affect the greater or less absorption of oxygen by the more fluid fat of the milk?

The churning of milk involves two operations—a violent agitation of the particles of the milk among themselves, and an alternate exposure of the same particles to the action of the air. The former tends to break the thin coverings of the fat globules, the latter exposes these globules to the oxygen of the atmospheric

* See Thomson's Animal Chemistry.

air, which is continually renewed in the churn, and thus puts the more fluid fat in conditions which are favorable to its change into the more solid fat. And as the time of churning and the temperature of the air and of the milk are rarely the same in any two operations, even in the same season and in the same dairy, there must necessarily be minute differences in the chemical conditions, and therefore in the chemical results, though often unnoticed, of almost every churning.

The above observations refer to the common churn worked either by the hand or by other power, but many new forms of churns have been lately introduced and recommended as capable of producing the more speedy or more favorable results.

Among these there are two ingenious and interesting forms well spoken of by many, which may be supposed to owe a part of the qualities ascribed to them to the peculiar chemical influence of the air which I have above described.

The one is *Weston's Air Churn*, which consists of a hollow cylinder of zinc into which the milk or cream is put, and through the bottom of which a current of air is driven by a small air pump. This air throws the milk into violent agitation, and causes the butter rapidly to separate. By this process the oxygen of the air is more fully and with more frequent renewals brought into contact with the milk, and thus a harder butter may be expected to be in general produced.

The other is a kind of churn, half-boxed in, invented and made by Mr. Robinson of Lisburn, in which the cream is set in motion, as in the barrel-churn, by a revolving wheel or beater—but in passing from one side of the wheel to the other, the milk or cream is made to traverse an uncovered part of the box, where it is freely exposed to the air. In this part also, the butter, when it begins to separate is arrested by a kind of grating, and is thus prevented from again entering into the churn and becoming exposed to the action of the beaters. If, therefore, the air really has any influence in giving greater firmness to the butter in consequence of a chemical change, such as I have described, this form of churn, like that of Mr. Weston, seems well fitted to allow it to have its full effect.

The questions proposed at the commencement of this article, seem therefore to be satisfactorily answered. It is granted that chemical changes of various kinds take place in the digestive organs, and perhaps even in the very udder of the cow. The fats of the food are changed if necessary, into the two fats of the milk, and these may no doubt exist in very different proportions in the milk of different animals, and in that of the same animal at different times. The food, the temperature, the circumstances in which the animal is placed may cause such differences—and in these we have a natural and intelligible source of differences also in the quality and consistence of the butter.

But from the same milk, by the absorption of oxygen in greater or less abundance, a harder or softer butter may also be produced, and in this fact satisfactorily and chemically explained, we have the key to many practical anomalies. It may also enable us hereafter to arrive at a modification of the usual mode of churning, by which butter of the firmest consistence may more frequently be obtained.

The chemical influence of the air in the process of churning has often been suspected, but the precise way in which it might actually influence the quality of the butter has not previously been pointed out.

Influence of the air on the process of churning by ordinary methods.

In connection with the subject of the preceding article, and to make the whole circumstances more clear, I shall here consider also what series of changes usually take place in the process of churning by the ordinary methods.

It is conceded that the presence of air and oxygen, or their renewal, are not necessary to the churning of milk or butter. It can be completely effected by prolonged agitation in close vessels. When this is the case therefore, the quality of the butter formed, and the changes which the milk undergoes, are entirely independent of any chemical influence from without.

But in ordinary churning the air is, I believe never excluded. If, therefore, a probable chemical influence of the air in churning, or upon the results of the churning, can be pointed out, it is reasonable to suppose, in the absence of proof to the contrary, that such an influence is really exercised. Let us therefore consider the chemical changes which take place during this operation, and the influence which the presence or absence of the air may have upon the result.

1. *Sensible changes which always accompany the churning of milk.*—When sweet milk, or cream, is churned, two changes are obvious to every one; the milk becomes sour, and the butter is separated in a solid form. The first of these—the souring—is due to the change of the sugar of milk into lactic acid. This is a chemical change, but it requires neither the addition nor substraction of any new matter. The constituents of the milk sugar, by a mere new arrangement among themselves form the acid of milk. The second change—the separation of the butter in a solid form, is owing to the breaking up of the envelopes of the globules of fat, and the mutual adhesion of these globules when they come in contact with each other. This change may be regarded as en-

tirely mechanical, and as due solely to the mechanical action in churning. It may, however, and more reasonably, I think, be regarded as including also a chemical action, which I shall presently explain.

2. *Chemical changes produced during churning in close vessels.*—The first change observed is the souring of the milk. If pure sugar of milk be dissolved in water, it is not transformed into lactic acid by any length of agitation in close vessels. In the churning, therefore, it is not the mere mechanical action which turns the milk sour. But if, with this solution of sugar of milk, a little fresh curd be mixed, and the mixture be then exposed to the air for a length of time with occasional stirring, the sugar is gradually changed into lactic acid. The presence of a little chalk in the mixture facilitates and ensures the change, lactate of lime being produced. The curd of milk, therefore, in favorable circumstances, can persuade or induce the sugar of milk to become transformed into lactic acid. In milk itself, the curd without doubt possesses a similar power, and agitation, with a slightly elevated temperature, may facilitate the exercise of it.

Milk contains curd or casein, in two states. The greater part is in a state of solution, but a small part of it is in the coagulated or undissolved state, according to the latest observers. Milk in its natural condition, as it comes from a cow in good health and in a state of repose, is alkaline. It loses this character, however, almost immediately, and becomes acid, though not sufficiently so to be perceived by the taste, after a very brief exposure to the air. The process of souring — of converting the sugar into the acid of milk — has already begun.

I have said, *perhaps*, because in an alkaline state of the milk, it does not appear likely that any of the common curd or casein should be in a coagulated state, since it is by the soda of the milk that the whole is supposed to be held in solution.

The course of the changes, therefore, which take place when sweet milk or cream is churned in a close vessel, is most probably as follows:

The action, perhaps of the coagulated portion of the curd, aided by the free alkali of the milk, causes the production of acid to begin; this acid combines with the free alkali, and with a portion of that by which the curd is held in solution. An additional small quantity of curd is thus coagulated, and this is repeated upon every fresh production of acid. The agitation and constant intermixture of the particles of the milk brings the acid, the alkali the curd, and the sugar, into frequent and close contact with each other, and thus promotes their mutual action, while the slightly elevated temperature at which churning succeeds best, assists and promotes this action.

As the milk becomes decidedly sour, another change commences. The envelopes of the fat globules are attacked by the acid, and are gradually dissolved. As they thin off they begin to burst, the particles of fat are liberated and gradually unite into the visible particles of solid butter. It has been found by experiment that the envelopes are dissolved by acetic acid. I think it quite as likely, therefore, that they are soluble in the acid of milk.

3. *Chemical changes produced during churning, with access of air.*—The only change of circumstances here is, that the oxygen of the atmosphere may exercise an influence upon the several ingredients which the milk contains.

Supposing other matters to proceed as in the close vessel, there are three ways in which the presence of oxygen may affect the process of churning, or the results obtained from it.

a. When fresh moist curd is exposed for a time to the air, it undergoes upon its surface a series of chemical alterations or successive decompositions, which it is unnecessary here to describe. When these take place in the milk itself, they so alter the curd as to promote its action upon the sugar, and to hasten the production of lactic acid.

b. By exposure to the air, under a variety of circumstances, the protein compounds, of which both the curd and the envelopes of the globules consist, absorb oxygen, and are more or less completely changed into *soluble* oxides of protein. It is probable, therefore, that churning with access of air may cause the envelopes to absorb oxygen, to become partially soluble, to thin off, and finally to burst, and thus to liberate the fatty matter they contain.

c. The constantly renewed and intimate contact between the air and the particles of fat, as they are liberated, may enable the latter to become partially oxidised also, to give off carbonic acid, the evolution of which is said to have been actually observed, and thus to produce the solid or margaric acid of butter in larger proportion than that in which it existed naturally in the milk. The theory of this operation or change has been explained in the preceding article.

In all chemical transformations which it is in our power to produce by art, the aid of a specific temperature is necessary to ensure the speediest, purest and most certain results. It can scarcely be doubted that the temperature found in practice to be most favorable to the churning of milk and cream, and to the production of butter of good quality, is so favorable, because it promotes the more rapid and effectual performance of the changes which I have above indicated and explained.

While, therefore, it is conceded that milk and cream may be completely churned in close vessels, and that the oxygen of the air is not necessary to the changes which attend it; yet, in ordinary churning, it is probable that the presence of air does exercise a real influence upon the process, modifying its rapidity and the quality of the butter obtained. It is probable, also, that those forms of churn which admit the air to the most intimate and renewed contact with the milk, may also facilitate the changes by which churning is attended, and, as I have explained in the preceding article, may cause the same milk to yield a harder butter than would otherwise have been obtained from it.

In the foregoing observations I have assumed as correct, the statement usually received, that the fat globules in milk are all actually surrounded by envelopes. That some are so surrounded has been clearly seen by Henle, Simons, and others of our latest microscopical observers. Dumas long ago stated his belief that they are all so enveloped, and he mentioned as a proof of it, that pure ether extracted no fat from new milk when mixed with it, which it could not fail to do were the fatty globules naked, and simply in a state of suspension. This latter statement having been called in question by Voelcker, I caused new milk to be forced directly from the teat of a cow, into a bottle half filled with ether, and after a gentle agitation set the whole aside. Three layers formed. The upper one was clear and colorless, and by spontaneous evaporation left a considerable residue of solid crystalline fat, evidently mixed with a fluid oil. The middle layer was semi-transparent, and gelatinous, and consisted of ether, fat and curd. The third or undermost layer was milk-white, and besides water and a portion of curd, contained the sugar and salts of the milk. It is a matter of after inquiry, whether by this method it can be proved that the curd of milk exists in it in two separate states.

Ether, therefore, according to this experiment, does directly extract fatty matter from milk. It does not follow, however, from this, that in the milk the fat globules are not really surrounded by envelopes. The ether may act upon these envelopes, may corrugate, shrivel, and cause them to burst, and may thus set free and dissolve the fatty matter they contain.

Natural emulsions, such as the substance of the nerves and brain are considered by Mulder to contain a species of chemical compound of the fatty matter with albumen, which has the property of mixing with water. In the nerves of a dead animal, this compound begins immediately to decompose, the fat retreating inwards and forming a transparent axis, the albumen gathering itself towards the exterior of the fibre.

Is milk, then, a natural emulsion, which, while in the udder of the cow, is under the secret influence of the vital power, and which, when drawn from it, begins immediately to decompose, like the substance of the nerves and brain, because the influence of life is no longer exercised upon it?

Of the preparation of rennet, and the use of the curd in the calf's stomach.

Curious differences in opinion and practice prevail in diary districts, in regard to the preparation of rennet. These differences are all interesting, because they are almost in every case connected with minute chemical operations, and because a critical examination of them gives rise to theoretical suggestions, which may lead to improvements in practice.

Of this kind is the difference which prevails as to the use or usefulness of the curd in the stomach of the calf, when employed for the preparation of rennet.

Three different practices are followed in different districts in preparing the stomach of the suckling or milk-fed calf for salting. Some carefully wash every thing out of the stomach, some salt the stomach and its milky contents together, or take out the curd and salt it separately; and some give the calf before it is killed a large draught of milk, that the quantity of curd in the stomach may be greater at the time when it is taken from the animal, and put into the salting-tub.*

Which of these three practices is the best? Is the curd of any use at all in the preparation of rennet?

An answer to these questions is supplied by a knowledge of the way in which rennet acts in curdling milk, and of the nature of the substances which, like rennet, possess this remarkable property.

In my published Lectures on Agricultural Chemisty and Geology, second edition, p. 985, I have endeavored to show, that the action of rennet consists simply in the rapid conversion of a portion of the milk sugar into lactic acid, which acid has, like vinegar, the property of curdling milk. I have stated also that a similar property is possessed by animal membranes of various kinds, after they have been for some time exposed to the air, and even by the curd of milk itself.

From these facts, it appears that the curd in the calf's stomach naturally posseses the same power of curdling milk which the membrane of the stomach itself is valued for, and therefore ought not to be rejected.

And yet the discordant practices to which I have alluded are all justifiable and perfectly concordant.

In Gloucester and Cheshire, the curd and slimy matters are usu-

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* See my Lectures on Agricultural Chemistry and Geology, 2d ed., p. 980.

ally removed from the stomach by a gentle washing, because they are believed to impart a strong taste to the cheese. In some parts of Cheshire this evil is avoided by taking out the curd and salting it separately; while the Ayrshire practice of giving the calf a large draught of milk before it is killed, dilutes the strong flavoring quality, and thus by a different means brings about the same result.

While, therefore, reason and judgment are displayed in all these methods, economy is clearly on the side of those who preserve the curd, and more clearly still of those who increase its quantity by giving a copious feed of milk to the young calf, as is done in the diary districts of Ayshire and Limburg.

Several practical suggestions arise from the above brief discussion, of which I may mention the following:

1. May curd alone not be salted and cured, as the calf's stomach is, for after-use in the preparation of rennet?

2. May some varieties of agreeable old cheese not be employed as a substitute for the dried stomach, without any further preparation? May not the use of such cheese even prove a means of imparting to the new made cheese a portion of the desirable flavor of the old?

3. The natural fluids of the stomach cannot be necessary to the production of rennet, since a dried stomach, which has been steeped for the manufacture of rennet, may be salted and dried over again with advantage. A piece of dried pig's bladder, also, may be substituted for the dried stomach. May not lean meat, therefore, or other similar animal substances, where it is more convenient, be also substituted for it? Is the brine of long salted meat and such things as long-kept Bologna sausages, yield, on steeping a serviceable rennet?

4. The first extract of malt, exposed to the air at a moderate temperature till it begins to decompose and emit an unpleasant smell, possesses the property of changing milk sugar into lactic acid. May a useful rennet not be prepared in this way from malt or from the extract of peas or beans, or even from oatmeal or Indian corn, without the necessity of employing any animal substance at all?

5. Sour leaven contains altered gluten, and owes its sourness to the change of a portion of the starch of the flour into lactic acid. This change is produced by the action of the partially decomposed gluten upon the starch. May it not produce this change more rapidly upon the sugar of milk? In other words, may not old leaven, upon occasions, supply the place of rennet?

Such suggestions as these, however small their value may appear in the eyes of some, especially in long-cultivated countries, or districts where everything of which old custom has sanctioned the use, can be obtained in abundance, may nevertheless lead to useful economical results, when generally understood and appreciated.

I particularly recommend trials to be made with the pure prepared curd. If we are able to rescue the manufacture of rennet out of the mysterious and empirical hands of the skilled dairy-maid, and by the use of a simple, abundant, easily prepared and pure rennet, can command at once a ready coagulation of the milk, and a curd, either naturally sweet or of a flavor which we had foreseen and commended, we shall have made a considerable step towards the perfection of the art of cheese making.

ANALYSIS OF THE ASH OF THE FIBRE OF THE FLAX.

The idea that any part of a vegetable is destitute of matter derived from the soil, is not supported by facts: that some bodies are more rich in inorganic matters than others, is true, but none which spring from the soil, but that take up matters from it, and if removed from the field thus far exhausts the soil of certain elements.

Report on the Analysis of the Fibre of the Flax Plant, by John F. Hodges, M. D.—The council of the society are aware that I have, on several occasions, considered it my duty to direct their attention to the propriety of requesting the Royal Society for the Improvement of the Growth of Flax, to coöperate with them, so as to procure a complete examination of the flax plant. I was induced to recommend that such inquiries as I have described in a paper, submitted to their consideration, should be instituted, from the persuasion which I derived from some analytical examinations of the plant, that its chemical composition, and the circumstances affecting its cultivation, were, as yet, but imperfectly known, and because I conceived that the farmers of this country, who are urged to extend the cultivation of flax, might reasonably expect that the Royal Flax Society, which has already done so much to extend our knowledge respecting the proper management of that most valuable crop, should give us their assistance in carrying out the proposed investigations; for, though the subject is one of immense importance to the country, and particularly to the manufacturing industry of this province, but little has, as yet, been done to advance our knowledge respecting it. We are not in possession of any information which can enable us to state the precise effect which the growth of the flax plant is capable of producing upon the soils of Ireland, or which would assist the agriculturist in studying the chemical conditions requisite for its production, in the state in which it is best adapted for the purposes of the manufacturer. I believe that chemistry is capable of giving us valuable information on these subjects.

As a proof that we require a complete examination of the flax plant, I would direct the attention of the council to the results of an analysis of the fibre of the plant with which I have been engaged. These results, it will be perceived, are in opposition to the opinion at present commonly entertained respecting the composition of that substance. The opinion which commonly prevails on this subject, the council are aware, is that which supposes that the flax fibre, in the state in which it is brought to market, after it has undergone the various operations required to fit it for the spinner, contains merely the elements, oxygen, hydrogen, and carbon, united, nearly in the proportions in which these substances exist in starch, and that it contains no trace of the ingredients of the soil. It has, therefore, been represented, and the statement has been widely circulated, that it is possible for the flax grower to maintain the fertility of his field unimpaired, and to obviate the admitted exhausting effects of the crop, by applying, as manure, the steep water and the refuse of the dressed flax; the fibre, after steeping and dressing, being supposed to consist solely of the condensed gases of the air. Being anxious to test the accuracy of a statement which, if correct, was of such immense importance to the flax grower, I procured several months ago, by the kindness of the Secretary of the Royal Flax Society, a specimen of remarkably fine flax fibre, from a sample which had obtained the first prize at the exhibitions of the Flax Society, at Ballinasloe and Belfast. That sample, I presumed, might safely be taken as representing the fibre in the purest form in which it is presented to the manufacturer.

As the details of the analysis would interest only the chemist, it is unnecessary to describe them. The method which I followed is that taught by my esteemed friend, Dr. H. Will, Extraordinarius Professor of Chemistry, in the University of Geissen. It may, however, be useful for the information of those who are not familiar with the processes of the laboratory, to mention that every plant, when exposed to a strong heat, in the crucible of the chemist, is found to consist of two parts; a part which is combustible and flies away, being composed of the elements which the plant, during its growth, had derived from the air, and a fixed incombustible ash, containing the materials supplied by the soil. The pure flax fibre, if possessing the composition usually assigned to it, should, when burned in the open crucible, totally disappear, without leaving any solid residuum. The first step in my experiment was, therefore, to ascertain whether that substance, when heated, as I have described, left any incombustible earthy matter. A portion of the fibre, dried at 212°, was burned in a clean platinum crucible, and ignited, until all organic matter had burned away, when there remained in the crucible a quantity of a very light bulky ash, which possessed the same slightly yellowish white tinge which the fibre exhibited. A qualitative examination of this ash, showed that it contained the following ingredients of the soil, iron, lime, magnesia, soda, chlorine, sulphuric acid, phosphoric acid. One hundred parts of the dry flax fibre I found to contain 0.54 parts of ash, so that 2½ cwt. of dressed flax would contain more than 1½ lbs. of the ingredients of the soil.

A quantity of ash was prepared from the same sample, and was found to possess the following composition in the 100 parts:

Carbonate of lime, - - - - -	62.00
Sulphate of lime, gypsum, - -	7.15
Phosphate of lime, - - - - -	13.66
Oxide of Iron, - - - - -	3.99
Carbonate of magnesia, with traces of chloride of sodium, (common salt,) -	2.00
Silica, - - - - - - -	11.20
	100.00

It is evident, therefore, from the above analysis, that the fibre of the flax plant, even after steeping and dressing, contrary to what is commonly supposed, does not consist merely of the condensed gases of the air, but robs the soil of a considerable amount of its most valuable ingredients. These consist, as we might naturally suppose from the treatment which the fibre has undergone, chiefly of the most insoluble ingredients of the inorganic matter of the plant, the carbonate of lime, and the phosphate of lime and silica; but it appears that the steep water does not abstract all the soluble salts of the fibre, as the sample examined contained considerable traces of the chloride of sodium, (common salt).

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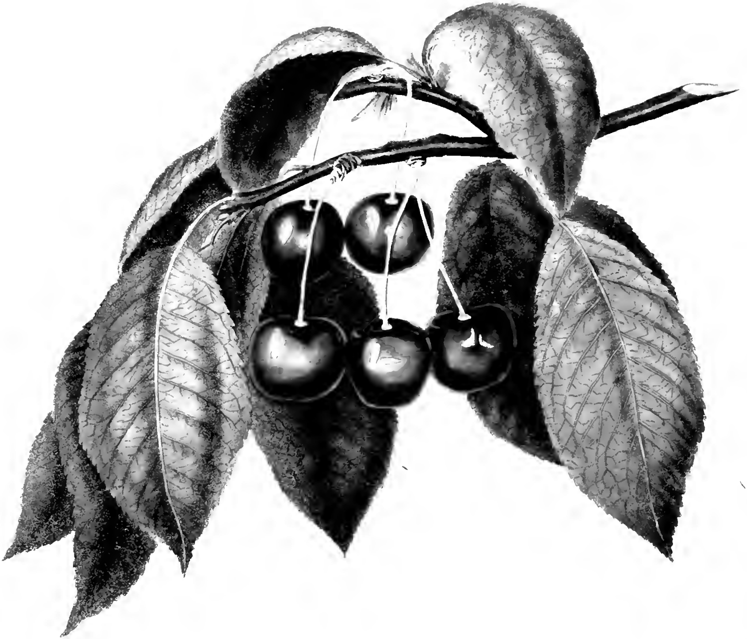

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GOV. WRIGHT'S ADDRESS.*

At the Exhibition of the New-York State Ag. Society Sept. 16, 1847.

Mr. President, and Gentlemen of the State Agricultural Society:—Had it been my purpose to entertain you with a eulogium upon the great interest confided to your care, the Agriculture of the State, I should find myself forestalled by the exhibition which surrounds us, and which has pronounced that eulogy to the eye, much more forcibly, impressively, eloquently, than I could command language to pronounce it to the ear of this assembly.

Had I mistakenly proposed to address to you a discourse upon agricultural production, this exhibition would have driven me from my purpose, by the conviction that I am a backward and scarcely initiated scholar, standing in the presence of masters, with the least instructed and experienced of whom, it would be my duty to change places.

The agriculture of our state, far as it yet is from maturity and perfection, has already become an art, a science, a profession, in which he who would instruct must be first himself instructed far beyond the advancement of him who now addresses you.

The pervading character of this great and vital interest, however; its intimate connection with the wants, comforts, and interests of every man in every employment and calling in life; and its controlling relations to the commerce, manufactures, substantial independence, and general health and prosperity of our whole people, present abundant subjects for contemplation upon occasions

* Most of our readers are already apprized of the sudden demise of Gov. WRIGHT, at his residence in Canton, on the 27th of August. The address was completed the evening before his death, and was read at the Exhibition, by the Hon. JOHN A. DIX.

like this, without attempting to explore the depths, or to define the principles of a science so profound, and, to the uninitiated, so difficult as that of agriculture.

Agricultural production is the sub-stratum of the whole superstructure; the great element which spreads the sail and impels the car of commerce, and moves the hands and turns the machinery of manufacture. The earth is the common mother of all, in whatever employment engaged, and the fruits gathered from its bosom, are alike the indispensable nutriment and support of all. The productions of its surface and the treasures of its mines, are the material upon which the labor of the agriculturist, the merchant, and the manufacturer, are alike bestowed, and are the prize for which all alike toil.

The active stimulus which urges all forward, excites industry, awakens ingenuity, and brings out invention, is the prospect or the hope of a market for the productions of their labor. The farmer produces to sell; the merchant purchases to sell; and the manufacturer fabricates to sell. Self-consumption of their respective goods, although an indispensable necessity of life, is a mere incident in the mind impelled to acquisition. To gain that which is not produced or acquired, by the sale of that which is possessed, is the great struggle of laboring man.

Agricultural production is the first in order, the strongest in necessity, and the highest in usefulness, in this whole system of acquisition. The other branches stand upon it, are sustained by it, and without it could not exist. Still it has been almost uniformly, as the whole history of our state and country will show, the most neglected. Apprenticeship, education, a specific course of systematic instruction, has been, time out mind, considered an indispensable pre-requisite to a creditable or successful engagement in commercial or mechanical pursuits; while to know how to wield the axe, to hold the plow, and to swing the scythe, has been deemed sufficient to entitle the possessor of that knowledge to the first place, and the highest place in agricultural employment.

A simple principle of production and of trade, always practically applied to manufactures and commerce, that the best and cheapest article will command the market, and prove the most profitable to the producer and the seller, because most beneficial to the buyer and consumer, is but beginning to receive its application to agriculture. The merchant, who, from a more extensive acquaintance with his occupation, a more attentive observation of the markets, better adapted means, and a more careful application of sound judgment, untiring energy, and prudent industry, can buy the best and sell the cheapest, has always been seen to be the earliest and surest to accomplish the great object of his class, an independence for himself. So the mechanic, who, from a more thorough instruction in the principles and handicraft of his trade, or a more intense application of mind and judgment with labor, can improve the articles he fabricates, or the machinery and modes of their manufacture, and can thus produce the best and sell the cheapest, has always been seen to reach the same advantage over his competitors, with equal readiness and certainty; and that these results should follow these means and efforts, has been considered natural and unavoidable.

Still the agriculturist has been content to follow in the beaten track, to pursue the course his fathers have ever pursued, and to depend on the earth, the seasons, good fortune, and providence, for a crop, indulging the hope that high prices may compensate for diminished quantity or inferior quality. It has scarcely occurred to him that the study of the principles of his profession had anything to do with his success as a farmer, or that what he had demanded from his soils should be considered in connection with what he is to do for them, and what he is about to ask them to perform. He has almost overlooked the fact that his lands, like his patient teams, require to be fed to enable them to perform well, and especially has he neglected to consider that there is a like connection between the quantity and quality of the food they are to receive, and the service to be required from them. Ready, almost always, to the extent of their ability, to make advances for the purchase of more lands, how few of our farmers, in the comparison, are willing to make the necessary outlays for the profitable improvement of the land they have?

These and kindred subjects, are beginning to occupy the minds of our farmers, and the debt they owe to this society for its efforts to awaken their attention to these important facts, and to supply useful and practical information in regard to them, is gradually receiving a just appreciation, as the assemblage which surrounds us, and the exhibitions upon this ground, most gratifyingly prove.

Many of our agriculturists are now vigorously commencing the study of their soils, the adaptation of their manures to the soil and the crop, the natures of the plants they cultivate, the food they require, and the best methods of administering that food to produce health and vigor and fruit; and they are becoming convinced that to understand how to plow and sow and reap, is not the whole education of a farmer; but that it is quite as important to know what land is prepared for the plow, and what seed it will bring to a harvest worthy of the labors of the sickle. Experience is steadily proving that, by a due attention to these considerations, a better article, double in quantity, may be produced from the same acre of ground, with a small proportionate increase of labor and expense, and that the farmer who pursues this improved system of agriculture, can, like the merchant and mechanic referred to, enter the market with a better production, at a cheaper price, than his less enterprising competitor.

This change in the agriculture of our state and country, opens to the mind reflections of the most cheering character. If carried out to its legitimate results, it promises a competition among our farmers, not to obtain the highest prices for inferior productions, but to produce the most, the best, and the cheapest of the necessaries of human life. It promises agricultural prosperity, with cheap and good bread, furnished in abundance to all who will eat within the rule prescribed by fallen man, in the sacred volume of the Divine law.

Steady resolution and persevering energy, are requisite to carry forward these improvements to that degree of perfection dictated alike by interest and by duty; and the stimulus of a steady and remunerating market will rouse that resolution and nerve that energy. Without this encouragement in prospect, few will persevere in making improvements which require close and constant mental application, as well as severe physical laqor. Agriculture will never be healthfully or profitably prosecuted by him whose controlling object is his own consumption. The hope of gain is the motive power to human industry, and is as necessary to the farmer as to the merchant or manufacturer. All who labor are equally stimulated by the prospect of a market which is to remunerate them for their toil, and without this hope neither mental activity, nor physical energy, will characterize their exertions. True it is that the farmers of our country, as a class, calculate less closely the profits of their labor and captital, than men engaged in most other pursuits, and are content with lower rates of gain. The most of them own their farms, their stocks and farming implements, unencumbered by debt. Their business gives but an annual return. They live frugally, labor patiently and faithfully, and at the close of the year, its expenses are paid from its proceeds, the balance remaining being accounted the profits of the year. Although a moderate sum, it produces contentment, without a computation of the rate per cent. upon the capital invested, or the wages it will pay to the proprietor and the members of his family. The result is an advance in the great object of human labor, and, if not rapid, it is safe and certain. It is a surplus beyond the expenses of living, to be added to the estate, and may be repeated in each revolving year.

If, however, this surplus is left upon the hands of the farmer, in his own products, for which there is no market, his energies are paralyzed, his spirits sink, and he scarcely feels that the year has added to his gains. He sees little encouragement in toiling on, to cultivate beyond his wants, productions which will not sell; and the chances are, that his farm is neglected, his husbandry becomes bad, and his gains in fact cease.

To continue a progressive state of improvement in agriculture, then, and to give energy and prosperity to this great and vital branch of human industry, a healthful and stable market becomes indispensable, and no object should more carefully occupy the attention of the farmers of the United States.

Deeply impressed with the conviction of this truth, benevolent minds have cherished the idea that a domestic market, to be influenced only by our own national policy, would be so far preferable, in stability and certainty, to the open market of the commercial world, as to have persuaded themselves that a sufficient market for our agricultural products is thus attainable. It is not designed to discuss the soundness of this theory, where it can be reduced to practice; but only to inquire whether the state of this country, the condition of its society, and the tendency and inclination of its population, as to their industrial pursuits, are such, at the present time, or can be expected to be such for generations yet to come, as to render it possible to consume within the country the surplus of the productions of our agriculture. The theory of an exclusively domestic market for this great domestic interest, is certainly a very beautiful one, as a theory, and can scarcely fail to strike the mind favorably upon a first impression. Still, examination has produced differences of opinion between statesmen of equal intelligence and patriotism, as to its influences upon the happiness and prosperity of a country and its population. Any examination of this question would lead to a discussion properly considered political, if not partisan, and all such discussions it is my settled purpose to avoid, as inappropriate to the place and the occasion.

I simply propose to inquire as to a fact, which must control the application of theories and principles of political economy touching this point, to our country and its agricultural population, without raising any question as to the wisdom of the one, or the soundness of the other. Is the consumption of this country equal to its agricultural production, or can it become so within any calculable period of years? How is the fact? May I not inquire without giving offence, or transcending the limits I have prescribed for myself in the discussion? Can a fair examination, scrupulously confined to this point, take a political bearing, or disturb a political feeling? It is certainly not my design to wound the feelings of any member of the society, or of any citizen of the country; and I have convinced myself that I may make this inquiry, and express the conclusions of my own mind as to the result, without doing either. If I shall prove to be in error, it will be an error as to the fact inquired after, and not as to the soundness of the principle in political economy dependent upon the fact for its application, because as to the soundness of the principle, I attempt no discussion and offer no opinion. It will be an error as to the applicability of a theory to our country, and not as to the wisdom or policy of the theory itself, because of the soundness, or unsoundness of the theory, when it can be practically applied, I studiously refrain from any expression, as inappropriate here. With the indulgence of the society, I will inquire as to the fact.

Our country is very wide and very new. It embraces every variety of climate and soil most favorable to agricultural pursuits. It produces already almost every agricultural staple, and the most important are the ordinary productions of extensive sections of the country, and are now sent to the markets in great abundance.

Yet our agriculture is in its infancy almost everywhere, and at its maturity nowhere. It is believed to be entirely safe to assume that there is not one single agricultural county in the whole Union, filled up in an agricultural sense—not one such county which has not yet land to be brought into cultivation, and much more land, the cultivation of which is to be materially improved, before it can be considered as having reached the measure of its capacity for production. If this be true of the best cultivated agricultural county in the Union, how vast is the proportion of those counties which have entire townships, and of the states which have not merely counties, but entire districts, yet wholly unpeopled, and unreclaimed from the wilderness state?

When to this broad area of the agricultural field of our country, we add our immense territories, organized and unorganized, who can compute the agricultural capacaties of the United States, or fix a limit to the period when our surplus agricultural productions will increase with increasing years and population? Compare the census of 1830 and 1840 with the map of the Union, and witness the increase of population in the new states, which are almost exclusively agricultural, and who can doubt the strong and resistless inclination of our people to this pursuit?

Connect with these considerations of extent of country, diversity of soils, varieties of climate, and partial and imperfect cultivation, the present agricultural prospects of this country. Witness the rapid advances of the last dozen years in the character of our cultivation, the quality and quantity of our productions from a given breadth of land, and the improvements in all the implements by which the labor of the farmer is assisted and applied. Mark the vast change in the current of educated mind of the country, in respect to this pursuit; the awakened attention to its high respectability as a profession, to its safety from hazards, to its healthfulness to mind and body, and to its productiveness. Listen to the calls for information, for education, upon agricultural subjects, and to the demands that this education shall constitute a department in the great and all pervading system of our common school education, a subject at this moment receiving the especial attention, and being pressed forward by the renewed energies of this society. Behold the number of professors, honored with the highest testimonials of learning conferred in our country, devoting their lives to geological and chemical researches calculated to evolve the laws of nature connected with agricultural production. Go into our colleges and institutions of learning, and count the young men toiling industriously for their diplomas, to qualify themselves to become practical and successful farmers, already convinced that equally with the clerical, the legal, and the medical professions, that of agriculture requires a thorough and systematic education, and its successful practice the exercise of an active mind devoted to diligent study.

Apply these bright, and brightening prospects to the almost boundless agricultural field of our country, with its varied and salubrious climate, its fresh and unbroken soils, its cheap lands and fee simple titles, and who can hope, if he would, to turn the inclinations of our people from this fair field of labor and of pleasure? Here the toil which secures a certain independence is sweetened by the constant and constantly varying exhibitions of nature in her most lovely forms, and cheered by the most benignant manifestations of the wonderful power and goodness of Nature's God. Cultivated by the resolute hands and enlightened minds of freemen, owners of the soil, properly educated, as farmers, under a wise and a just administration of a system of liberal public instruction should and will be, and aided by the researches of geology and chemistry, who can calculate the extent of the harvests to be gathered from this vast field of wisely directed human industry.

The present surplus of breadstuffs of this country, could not have been presented in a more distinct and interesting aspect than during the present year. A famine in Europe, as wide-spread as it has been devastating and terrible, has made its demands upon American supplies, not simply to the extent of the ability of the suffering to purchase food, but in superadded appeals to American sympathy in favor of the destitute and starving. Every call upon our markets has been fully met, and the heart of Europe has been filled with warm and grateful responses to the benevolence of our country, and of our countrymen, and yet the avenues of commerce are filled with the productions of American agriculture. Surely the consumption of this country is not now equal to its agricultural production.

If such is our surplus in the present limited extent and imperfect condition of our agriculture, can we hope that an exclusive domestic market is possible, to furnish a demand for its mature abundance? In this view of this great and glowing interest, can we see a limit to the period, when the United States will present, in the commercial markets of the world, large surpluses of all the varieties of breadstuffs, of beef, pork, butter, cheese, cotton, tobacco, and rice, beyond the consumption of our own country? And who, with the experience of the last few years before him, can doubt that the time is now at hand, when the two great staples of wool and hemp will be added to the list of our exportations?

These considerations, and others of a kindred character, which time will not permit me to detail, seem to me, with unfeigned deference, to prove that the agriculture of the United States, for an indefinite period yet to come, must continue to yield annual supplies of our principal staples, far beyond any possible demand of the domestic market, and must therefore remain, as it now is and has ever been, an exporting interest. As such, it must have a direct concern in the foreign trade and commerce of the country, and in all the regulations of our own and of foreign governments which affect either, equal to its interest in a stable and adequate market.

If this conclusion be sound, then our farmers must surrender the idea of a domestic market to furnish the demand, and measure the value of their productions, and must prepare themselves to meet the competition of the commercial world in the markets of the commercial world, in the sale of the fruits of their labor. The marts of commerce must be their market, and the demand and supply which meet in those marts must govern their prices. The demand for home consumption, as an element in that market, must directly and deeply interest them, and should be carefully cultivated and encouraged, while all the other elements acting with it, and constituting together the demand of the market, should be studied with equal care, and so far as may be in their power, and consistent with other and paramount duties, should be cherished with equal care.

Does any one believe, that for generations yet to come, the agricultural operations of the United States are to be circumscribed within narrower comparative limits than the present; or that the agricultural productions of the country are to bear a less ratio to our population and consumption than they now do? I cannot suppose that any citizen who has given his attention to the considerations which have been suggested, finds himself able to adopt either of these opinions. On the contrary, I think a fair examination must satisfy every mind that our agricultural surplus, for an indefinite future period, must increase much more rapidly than our population and the demand for domestic consumption. This I believe would be true without the efforts of associations, such as this, to improve our agriculture. The condition of the country, and the inclination and preference of our population for agricultural pursuits, would render this result unavoidable; and if this be so, when the impetus given to agricultural production by the improvements of the day; the individual and associated efforts constantly making to push forward these improvements with an accelerated movement; the mass of educated mind turned to scientific researches in aid of agricultural labor; the dawning of a systematic and universal agricultural education; and the immense bodies of cheap, and fresh, and fertile lands, which invite the application of an improved agriculture, are added to the account, who can measure the extent or duration of our agricultural surplus, or doubt the soundness of the conclusion, that the export trade must exercise a great influence upon the market for the agricultural productions of the country for a long series of years to come?

Such is the conclusion to which my mind is forced, from an examination of this subject, in its domestic aspect simply; but there is another now presented of vast magnitude and engrossing interest, and demanding alike from the citizen and the statesman of this republic, the most careful consideration. All will at once understand me as referring to the changes and promises of change in the policy of the principal commercial nations of the world, touching their trade in the productions of agriculture. By a single step, which was nothing less than commercial revolution, Great Britain practically made the change as to her trade; and subsequent events have clothed with the appearance of almost super-human sagacity, the wisdom which thus prepared that country to meet the visitation of famine, which has so soon followed, without the additional evil of trampling down the systems of law to minister to the all-controlling necessities of hunger. Changes similar in character, and measurably equal in extent, though in many cases temporary in duration, have been adopted by several other European governments, under circumstances which render it very doubtful how soon, if ever, a return will be made to the former policy of a close trade in the necessaries of human life.

New markets of vast extent and incalculable value, have thus been opened for our agricultural surplus, the durability and steadiness of which it is impossible yet to measure with certainty. It is in our power to say, however, that a great body of provocations to countervailing restrictive commercial regulations, is now removed in some instances permanently, and in others temporarily in form; and it would seem to be the part of wisdom, for the agriculture of this country, by furnishing these markets to the extent of the demand, with the best articles, at the fairest price, to show to those countries, and their respective governments, that reciprocal commercial regulations, if they offer no other and higher attractions, present to their people a safeguard against starvation.

Such is the connection, now, between our agriculture and the export trade and foreign market, and these relations are to be extended and strengthened, rather than circumscribed and weakened, by our agricultural advances. The consumption of the country is far short of its production, and cannot become equal to it within any calculable period. On the contrary, the excess of production is to increase with the increase of population and settlement, and the improvements in agriculture and agricultural education. These appear to me to be facts, arising from the condition of our country, and the tastes and inclinations of our people, fixed beyond the power of change, and to which theories and principles of political economy must be conformed, to be made practically applicable to us.

The American farmer, then, while carefully studying, as he should not fail to do, the necessities, the wants and the tastes of all classes of consumers of his productions in his own country, must not limit his researches for a market within those narrow bounds. He must extend his observations along the avenues of commerce, as far as the commerce of his country extends, or can be extended, and instruct himself to the necessities, and wants and tastes of the consumers of agricultural productions in other countries. He must observe attentively the course of trade, and the causes calculated to exert a favorable or adverse influence upon it; watch closely the commercial policy of other countries, and guard vigilantly that of his own; accommodate his productions, as far as may be, to the probable demands upon the market, and understand how to prepare them for the particular market for which they are designed. Next to the production of the best article at the cheapest price, its presentation in the market in the best order and most inviting condition, is important to secure to the farmer a ready and remunerating market.

So long as our agricultural shall continue to be an exporting interest, these considerations, as second only to the science of production itself, will demand the careful attention and study of our farmers, and in any well digested system of agricultural education, its connection with manufactures and the mechanic arts, with commerce, with the commercial policy of our own and other countries, and with the domestic and foreign markets, should hold a prominent place. A thorough and continued education in these collateral, but highly necessary branches of knowledge to the farmer, will prove extensively useful to the American citizen, beyond their application to the production and sale of the fruits of his labor. They will qualify him the more safely and intelligently to discharge the duties of a freeman; and if called by his fellow-citizens to do so, the more beneficially to serve his state and country in legislative and other public trusts.

I hope I may offer another opinion in this connection, without giving offence, or trespassing upon the properties of the place and occasion. It is that this education in the just and true connection between the agricultural, the commercial, and the manufacturing interests of our country, equally and impartially disseminated among the classes of citizens attached to each of these great branches of labor, would effectually put an end to the jealousies too frequently excited; demonstrating to every mind, so educated that, so far from either being in any degree the natural antagonist of the other, they are all parts of one great and naturally harmonious system of human industry, of which a fair encouragement to any part is a benefit to all; and that all invidious and partial encouragement to any part at the expense of any other part, will prove to be an injury to all. The education proposed will do all that can be done to mark the true line between natural and healthful encouragement to either interest, and an undue attempt to advance any one, at the expense of the united system, merely producing an unnatural and artificial relation and action, which cannot fail to work disease and injury.

The labors of this society, and of kindred associations, have done much to inform the minds of our farmers in these collateral branches of knowledge useful to them, and much remains to be done. The science of production claims the first place, and is a wide field, as yet so imperfectly cultivated as to afford a little time for collateral labors. To secure a stable and healthful market, and to learn how to retain and improve it, also opens an extensive field for the mental labors and energies of the farmer. Between these objects the relation is intimate and the dependence mutual. The production makes the market, and the market sustains the production. The prospect of a market stimulates to activity in the field of production, and the fruits of that activity urge the mind to make the prospect real. Success in both contributes to the health and vigor and prosperity of agriculture, and of that prosperity commerce and manufactures cannot fail largely to partake.

All are willing to promote the cause of agriculture in our state and country. Most are ready to lend an active coöperation, and all are cheerful to see accomplished any valuable improvement in this great branch of productive industry. The difficulty hitherto has been in adopting any general plan to effect this desirable object. Hence, most usually, when the public mind has been awakened to the subject, arbitrary, and in many cases visionary experiments have been introduced, based upon no philosophical investigation of cause and effect, but upon some accidental trial, by a single individual, of some novel mode of culture, which, under the circumstances attending the experiment, has met with success. This single experiment, without an enquiry into, or a knowledge of the cause which, in the given case, has secured the successful result, is at once recommended as an infallible rule of husbandry. The publication and dissemination of detached experiments of this character, for a long period, constituted the most material additions to the stock of literary information connected with agriculture, supplied to our farmers; while many of the experiments were too intricate and complicated to be reduced to practice with any certainty of accuracy, and others were so expensive that the most perfect success would not warrant the outlay. Unsuccessful attempts to follow the directions given for making these experiments, brought what came to be denominated "book-farming," into great disrepute with the industrious, frugal and successful farmers of the country, and excited a jealousy of, and a prejudice against this description of information upon agricultural subjects, which it has cost years of patient and unceasing effort, in any measure to allay, and which are not yet removed.

In the mean time geological research, heretofore principally confined to investigations into the mineral kingdom proper, has been extended to its legitimate office, and has brought within its examinations the formation of the various soils, and their minute constituent parts. Chemistry has commenced where geology closed, and by a careful analysis of these constituents of the various soils, of the principal agricultural products, and of the usual manures, is laboring to establish upon philosophical principles, the true relations between the soil and the manure to be applied, and between both and the crop to be planted and produced. It is seeking out, with rapid success, the appropriate food of the various vegetables cultivated by the farmer, the soils and manures in which the food for each is found, and the way in which it may be most successfully administered. So with the food of the domestic animals, and the most economical manner of feeding it.

These investigations are the reverse of the former system of arbitrary experiments. There a result was made to justify the arbitrary means adopted to produce it. Here causes are ascertained, and, being so ascertained, are relied upon to produce their natural effect, which effect is the result sought.

The importance of this great subject is effectually arousing the attention of the literary and scientific men of the country, and the success already experienced is drawing to these researches, minds qualified for the labor, and energies equal to its rapid advancement. The progress made is bringing together the unsettled mind of the country, and producing the very general impression that the time has arrived when the foundations of a systematic, practical agricultural education should be laid, and the superstructure commenced.

It is universally conceded that agriculture has shared but lightly in the fostering care and government patronage which have been liberally extended to commerce and manufactures, nor is it believed that additional public expenditure is necessary to enable the State to do all that can reasonably be required of it, to accomplish the great object. Our educational funds are rich, and the colleges, academies, and common schools of the state share liberally in the distributions from them, while a Normal School, for the education of teachers, instituted at the seat of government, is also mainly supported from these funds. These institutions present the organization, through which, perhaps better than through any independent channel, this instruction can be universally disseminated among the agricultural population of the state. The annual additions to the school district libraries may be made with reference to this branch of education, and thus place within the reach of all the discoveries as they progress, and the rules of husbandry deduced from them, as they shall be settled and given to the public from the pens of the competent professors engaged in pursuing the researches.

This society, and like associations, may, through appropriate committees, their corresponding secretaries, public spirited commercial men, and otherwise, collect and embody in their transactions, facts and information respecting the markets, foreign and domestic; the present and probable supply of agricultural products; the mode and manner of presenting the principal productions in the various markets in the most acceptable form; the state and prospects of trade at home and abroad, and the changes present and prospective in the commercial policy of our own and other countries, with the probable influences upon the agricultural press will doubtless come powerfully to the aid of the associations, in all efforts of this character, and having these great objects in view.

In this way the foundation may be gradually laid; and the materials collected for the commencement of those agricultural studies, which time and application, with the constant evidence of their utility in practice, would ripen into a system, to be engrafted upon the course of regular studies pursued in the colleges, academies and common schools, and make a branch of the studies of the male classes in the Normal School, placed under the superintendence of an instructor selected for the purpose, and qualified to prepare his classes for teaching the studies in the common schools of the state.

Thus a generation of farmers would soon come forward, well educated in the great and essential principles of agricultural production; in the true relations existing between agriculture, commerce and manufactures, and in the adaptation and preparation of their products for the agricultural markets. Such farmers, with the continued aid of the schools in which they were taught, would become the best manual labor instructors for their successors.

The passage of time reminds me that I am extending these remarks beyond the proprieties of the occasion and the patience of my audience. A single reflection shall close them.

However confidently the opinion may be entertained that other circumstances and relations might present a prospect for the agriculture of our state and country, more stable, independent and flattering, certain it is, that the future here opened, is full of cheering promise. We see in it the strongest possible security for our beloved country, through an indefinite period, against the scourge of famine. Our varied soil and climate and agriculture double this security, as the disease and failure of any one crop will not, as a necessary consequence, reduce any class of our population to an exposure to death from hunger. We see also, in addition to feeding ourselves, that our surplus is almost, if not altogether, sufficient, if faithfully and prudently applied, even now to drive famine from the length and breadth of Europe. And that it is in our power, by faithful mental and physical application, soon to make it equal to the expulsion of hunger, from the commercial world. We see that, dependent upon the commercial markets, our agriculture may bring upon our country a high degree of prosperity, and enable us, when extraordinary occasions shall call for its exercise, to practice a national benevolence as grateful to the hearts of the humane as to the wants of the destitute. And we see that by the wider diffusion and more secure establishment of a successful agriculture among our citizens, as a permanent employment, we are laying broader and deeper the foundations of our free institutions, the pride and glory of our country, and prized by its freemen as their richest earthly blessing; the history of all civil government, confirmed by the experience of this republic, furnishing demonstrative proof that a well educated, industrious, and independent yeomanry, are the safest repository of freedom and free institutions.

DESCRIPTION OF SEVERAL NEW AND INTERESTING ANIMALS.

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ÆONIA EBONINA.

Corpus nigrum, politum, supra convexum, posticè rotundatum, lobo intermedio abdominis angusto: *clypeo* integro, semicirculari postice truncato; impressione sub-marginoli circumcincta, margine sub-incrassato; fronte . . . . ; *oculis* exsertis, lævissimis: *abdomen* segmentis 10 convexis, utrinque appendiculis triangularibus in partem anteriorum seriatim instructis. Long. $8\frac{1}{3}$; clypei 3, lat. clypei $4\frac{2}{3}$ lin.

Shield or cephalothorax, wider posteriorly than the abdomen; frontal sutures indistinct; submarginal impression indistinct, placed half a line from the anterior margin, and continuous around the shield; eyes prominent, oblong-oval, and distantly veniform, with no appearance of facets. Medial lobe narrowing somewhat rapidly towards the posterior extremity, where it is half a line wide, obtusely rounded, and extends within half a line of the margin. Lateral abdominal segments subcarinate within their middle, by means of a longitudinal series of transversely triangular pieces united to the anterior face of the segments by a depressed suture, and having the apex directed forwards. Lateral extremity of the abdominal segments simple and free, directed forwards, obtusely rounded, with the anterior margin alternated, so as to admit of each segment sliding beneath the one anterior to it; anterior segments of the pygidium with the triangular addition, segments about twelve, the separating impressed striæ becoming evanescent posteriorly, and extending to a shallow submarginal groove, exterior to which is the simple confluent margin of the pygidium. The two anterior striæ exhibit a tendency to extend to the margin. Five or six impressed striæ, (becoming gradually shorter posteriorly,) are visible upon the middle lateral portion of the larger segments, indicating a bifurcation of their extremities. Posterior extremity obtusely elliptical.

The surface of the front is removed, exhibiting three transverse impressions upon each side, the posterior one the largest, and diagonally backwards.

If the three or four principal segments of the post-abdomen had an independent motion, (the posterior ones being certainly confluent,) it appears from the backward direction of the separating striæ upon the lateral edge of the margin, as exhibited upon the left side, that each of these segments moved beneath the one posterior to it, or in a direction opposite to the abdominal segments.

The first post-abdominal segment is an exception, as its lateral lobe has a narrow supernumerary segment (not apparent in the medial lobe,) attached to its anterior side near the longitudinal groove. It is half the size of the normal segment to which it is attached, and has the triangular projection of the abdominal segments, or rather it is the same part more fully developed, and separated by a depression which, however, is continuous to the margin. This narrow sub-segment is fitted for sliding forward beneath the tenth abdominal segment, whilst it appears to pass beneath the first proper post abdominal segment. Its section is apparently triangular, which would adapt it for such a movement.

This, the first species of the genus Æonia discovered in America, seems nearly allied to Burmeister's Æ. verticalis, but the eyes seem to be less reniform, and the cephalic shield more nearly semicircular, and less transverse. The pygidium is dissimilar, but this part was wanting in Burmeister's specimen, and replaced from a detached fragment, which probably belongs to another species. The processes supposed by Burmeister to arise from the posterior angles of the shield, are not justified from the perfect specimen now described.

The locality of the species is Bedford county, Pennsylvania, which would place it in the Pentamerus limestone, or perhaps in the Trenton group.

Apus affinis.

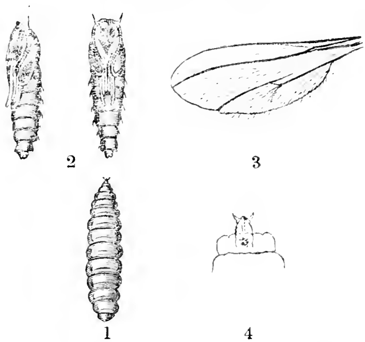
Pallidè fusco-olivaceus; scutum ovatum, carina dorsalis vix producta; excisura posterior semicircularis; segmentis caudalibus circiter 16 pone incisuram; incisura et cauda spinosa. Long. 11; cauda ultra incisuram $4\frac{1}{2}$; setæ caudales $9\frac{1}{2}$ lin. *Patria:* Insulæ hauaienses.

Pale brownish olive, shell ovate, slightly produced anteriorly; posterior incisure semicircular, armed with a row of minute spines, which are longest exteriorly; carina projecting slightly and obtusely into the incisure: labrum subquadrate, sides converging, exterior angles obtuse: antennæ small, terminal articulation fusiform: mandibles eight-dentate, teeth bifid along the cutting edge, and increasing in size posteriorly, points black: filamentous feet four-branched, filaments decreasing anteriorly, the anterior one being very small: tail with about sixteen segments projecting beyond the incisure of the shell; segments each armed with a transverse row of small spines directed backwards: two caudal filaments.

The more prominent characters are as in A. longicaudatus *Lec.* (Ann. Lycæum of New York,) the figure of which is too nearly circular, the front much too abrupt, and the posterior incisure should have been represented hemi-hexagonal. In that species at least twenty-five articulations project beyond the incisure; the carina is reddish, and the whole color darker than in A. affinis.

Until recently this was exclusively a European genus. A. longicaudatus is found on the eastern side of the Rocky Mountains, and that now described, inhabits the still more distant region of the Sandwich Islands, whence it was brought by my friend J. C. Reinhardt, M. D., Naturalist of the United States Ship Constitution. It is from the interior of one of the islands.

Cecidomyia robiniæ.



1. Larva. 2. Pupa. 3. Wing. 4. Head and Mouth.

Aurantiaca, alæ pallidè obscuræ; thorax maculis 3 longitudinalibus obscuris, pleura macula obscurà: abdomen segmentis 1–2 obscuris. Long $1\frac{1}{2}$ lin.

Pale orange; eyes black, reticulate; antennæ, front, wings, a large macula upon the pleura below the wing, and another between the anterior and medial feet, dusky: antennæ (♀) 14-articulate, verticillate, slender, articulations separated, scapus rather thick, and with the pedicellum translucent; ♂ about 24-articulate, slender; palpi slender cylindric, 3-articulate, terminal articulation more slender and longer than the preceding ones: thorax with three large oval conspicuous dusky vittæ: abdomen 9-articulate, two basal articulations dusky above.

This insect in the larva state, feeds upon the leaves of the Robinia pseudacacia, the margin of which it forms into a roll. The larva is white, or pale orange, of 13 segments, the first of which receives the retractite head; nine segments, from the fourth to the twelfth inclusive, with spiracles. The pupa does not form a cocoon, but lies without a covering. It can move itself by means of the abdomen.

The insect is not strictly a Cecidomyia, the posterior vein of the wing being interrupted, the basal portion sending a deflected filament (which does not seem to be hollow,) to the middle of the posterior margin. The disrupted parts of the posterior vein pass and run parallel to each other for a short distance, the apical portion being the more anterior.

Two species of minute parasitic Hymenoptera, destroy a great many individuals of this insect, which, in conjunction with Odontota scutellaris *œliv.*, has for the last two years killed the foliage of robinia, in south-eastern Pennsylvania, so that the trees present the appearance of having been destroyed by dry-weather, the brown leaves remaining upon the tree. This happens chiefly in August.

REPORT ON THE SUPPOSED IDENTITY OF ATOPS TRILINEATUS, (*Emmons*,) WITH TRIARTHUS BECKII.

BY S. S. HALDEMAN.

Made to the Association of American Geologists and Naturalists, during the session of September, 1847.

Since the publication of Prof. Emmons's work upon the Taconic System, there have been several discussions relative to the views offered in that work; and at the last meeting of the Association in New York, when the subject was again brought forward, an argument was drawn from the supposed identity of the above named trilobites. A committee was then appointed to investigate the question, and the present report is offered as the result. The specimens submitted for examination, are both imperfect, particularly that of *Atops*, so that it is impossible without better materials, to institute a rigid comparison between them, or even to determine the genus of the latter. Moreover, the proper external surface in the Atops, seems to be wanting; and but four abdominal segments remain. The comparison is thus restricted to these segments and the cephalic shield. The outline of these portions taken conjointly, nearly correspond in the Triarthus to a square, and in the Atops to a transverse parallelogram, the sides of which are nearly in the proportion of four to five. The medial lobe of the shield in the former has impressed lines converging backwards, whilst the traces of these in the latter are transverse. The following table presents the comparative characters offered by the two specimens.

Triarthus.	Atops.
Shield regularly semicircular; *breadth* twice the length; *medial lobe* the widest; *lateral lobes* with the base under the shortest.	*Shield* a smaller transverse segment; *breadth* thrice the length; *lobes* equal in width; *lateral lobes* approximately equilateral.
Abdomen, medial lobe widest; *lateral segments* curved and compound.	*Abdomen*, lobes equal in width; *lateral segments* transversely rectilinear.

The characters here cited are deemed sufficient to establish two species of trilobites upon the specimens under examination, the point which the association desired to have determined; and if the solution now offered is correct, Atops trilineatus remains a fossil characteristic of the strata investigated by Prof. Emmons.

Both specimens are quite flat, and the pressure having been apparently nearly equal in each, this has not been taken into account in deciding the question of identity, for although the form of the shield might have varied, the relative width of the lobes would not have been materially altered.

Future observation must determine how far these species may approximate through their respective varieties.

ATROPOS PULSATORIUS.

BY THOMAS BARLOW.

In looking over the "List of Noxious Insects" by Dr. A. Fitch, in the September number of the Journal, I found an interesting article on the subject of the *death watch*, (*Atropos pulsatorius.*) Dr. Fitch says, "Writers of the present day are not agreed whether the habit alluded to (of making a slight tapping noise like the ticking of a watch) does belong to the present species, or not. It is difficult to conceive it possible for so minute, so soft and weak an insect, to produce any audible sound. A box, purposely allowed to be much infested with these lice, has stood upon the table beside me, and often less than two feet from my ear, during the past season, yet no sound has ever been observed to issue from it."

The writer does not give an opinion whether he believes this insect does or does not make the noise, but it is inferable from what he says that he at least doubts the habit or ability.

I have been aware for years that writers attributed this noise to this insect though as Dr. Fitch says, it was difficult for me to conceive it possible, for so fragile a thing to make an audible sound. I have many a time sought with great caution and perseverance to detect the insect in the act of making the noise, in order to satisfy my doubting mind. It is astonishingly shy, and seeks some retired crevice or hidden corner, in which to venture upon its music. I have never been able to find one ticking in an exposed situation.

But in the summer of 1846, I triumphed in my pursuit and succeeded in detecting one in making its noise. Whilst walking in my room I heard one making an unusually loud noise, some fifteen or twenty feet from me, and I traced it to a vase of artificial flowers, which stood on the top of my book case. I cautiously approached it, but the shy little creature saw or heard me, and as often as I moved it would stop a short time as if fearful of me. By caution and perseverance, I succeeded in finding it between two of the leaves, and so situated that it could not escape except by springing directly towards me over the leaf. It would spring with astonishing quickness from one side of the leaf to the other as I moved, and how to catch it was the question. The least touch of anything harsh would extinguish it like a small bubble. I finally concluded to apply some fluid which would destroy its life without mutilation; so I dipped a small stick in spirits of turpentine and by the touch the insect adhered to the end of it, and I now have it in my cabinet, and those who desire may see it.

It is therefore no longer a matter of doubt in my mind whether the *Atropos pulsatorius* makes the noise. I have heard it and know it. I attribute the loudness of the sound it made to the advantageous situation it occupied between the dry artificial leaves which operated as sounding boards. It is truly inconceivably mysterious how so small and delicate a thing can make such a noise. But still this is no more strange than many, very many other things which we learn in the entomological world, and which are equally interesting and wonderful to the naturalist.

TO KEEP EGGS.

Take two pecks of unslacked lime, pour water upon it till it is only strong enough to let an egg swim with one end a little above the water; let it stand till clear; pour off the liquid, and add to it 1 lb. 8 oz. of salt, and 8 oz. cream tartar; stir the whole well together. Fill either tubs or large pickling jars with eggs, and pour the mixture over them till the tubs or jars are full, and the liquor at least three inches above the eggs. Let them stand a few days and see if the liquor decreases; if so, fill again: then put bungs into the jars, or heads into the casks and cover them over with Parker's cement.—*Gard. Chronicle.*

OSIER WILLOW—ITS CULTIVATION, &c.

BY C. N. BEMENT.

For several years past I have cultivated a small patch of the osier willow for the purpose of binding my stalks instead of straw, and for making baskets for the use of the farm. The patch consisted of four rows, each 50 feet long. My attention was first directed to a more extended cultivation from the fact of an offer made me by a German basket maker, of one dollar and fifty cents, for the cuttings of one year's growth. I refused the offer for the purpose of using them to set out a new plantation. Last spring I sold the cuttings from the same patch for four dollars.

I am not aware of its being cultivated to any extent in this country, but from the fact that large quantites of the osier willow is imported from France and Germany, I am induced to believe it may be made a profitable business.

Osier is the name given to various species of willow, chiefly employed in basket-making. The narrow leaved willows generally come under the denomination of osiers, of which this is one of the most valuable. It is cultivated for white basket-work, producing rods 8 or 9 feet long, tough and pliant, even when stripped of their bark, and very durable. There are several varieties of this species; one called the French willow; it is more slender in form, and never attains more than from 12 to 15 feet in height. Another variety, much esteemed, called the velvet osier, in which no external difference is discernable, but the sprouts are said to be more pliant.

Osiers differ from other willows in their long, straight, flexible and mostly tough twigs; their generally sessile germens, and elongated stoles, and stigmas.

Osiers are divided into two classes; the first is known by their blunt and downy or mealy leaves, which in the other are pointed, smooth and green leaves, resembling the myrtles. The common osier is one of the most abundant species. The sprouts are straight, erect, round-like, very long and slender, round, polished, downy when young, with fine silky hairs. Leaves on short footstalks, almost upright, about a span long, and half an inch wide. Many species of willow are found, bordering our rivers, creeks and swamps, the greater part of which are tender and brittle, and are susceptible of no useful purpose.

The osier willow is worthy a place on every farm, because it takes but little room and flourishes best on ground too wet for general cultivation; requires very little care after the second year, and furnishes the best materials for baskets, which are indispensable on every farm. It forms a hardy and useful hedge for excluding boisterous winds; and as it flourishes best in wet situations, is frequently planted with a view to prevent banks of rivers and dams from being washed away by the force of the current.

In the spring of 1845, I caused an acre and a quarter of rather moist ground, too wet for the finer grasses, to be carefully turned over with the plow, and then thoroughly harrowed. It was then marked into rows three feet a part, and set with cuttings of willow, about eight inches long, one foot asunder. It took about 11,000 cuttings, some of which were quite small, which rendered the growth the first and even the second year, quite diminutive. The growth of the sprouts, this year, however, will average from three to five feet high.

The osier, like all the willows, is easily porpagated by cuttings. After it has taken good root, say the third or fourth year after planting, in good moist soil, the shoots or sprouts grow from six to nine feet in a season.

The sprouts should be cut every spring, unless very large willows are wanted, and the number is thereby annually increased. The best way to divest them of the bark is to cut, sort, and tie the osiers in small bundles early in March, and place the bundles in a stream or pond of water, and at the season the leaf buds are bursting, the bark will readily peel off. The osier may then be laid up to be used when leisure will permit, or sold to the basket-makers.

The art of fabricating baskets from them, for farm purposes, is easily acquired, by any ordinary hand, and may be practised in evenings and stormy days in the winter, with little or no expense. A well made basket of the osier willow is worth three or four made of ash splints. We have them in use for years, and are still good. To give them firmness and durability, a good rim, ribs and handle of oak, hickory or other substantial wood are necessary.

PRUNING CONIFERS.

The best mode of pruning coniferous plants, particularly pinus and abies, is to pinch the tops off the young shoots when half grown; and if you mean to dwarf a cedar of Lebanon, pinch out the leading shoots until you obtain your object. No time is good for cutting away large branches of pines, but winter is the best.

The same practice is recommended for shortening grape vines, that is pinching off their extremities.

WENDELL'S MOTTLED BIGARREAU.

The appreciation of good fruit is an important feature in the husbandry of this country at the present time. In Europe, especially on the continent, no subject has elicited more attention, or engaged men so ardently as the cultivation of good fruit. There are many reasons why it should be so. The business itself is profitable, and this will always be encouragement as well as inducement to engage in the business. Then the value of good fruit in domestic life, the healthfulness it creates, to say nothing of the pleasure enjoyed in its consumption, will always constitute motives for the investment of a small capital at least, in order to secure the advantages we have enumerated. In this country no time has been so highly distinguished as the present for the rearing of fruit trees, and it is a pleasure to observe that success has most always crowned the efforts of the fruit culturist. One important discovery has been made in this business, viz., that our own climate is equal to any for the production of the best varieties of the most valuable fruits. The valley of the Hudson and Champlain must be ranked highest in the scale for producing those which possess flavor and taste. Pears, apples, plums and cherries succeed most remarkably, and in each species, there are many kinds which are not excelled, and it is to be remembered that we have but just commenced the business systematically, and hence the probability is, that we have not yet seen the best pear, apple, plum or cherry. These remarks were suggested by a seedling cherry, raised in the garden of Dr. H. Wendell of this city. The seed was sown eight years ago, and was from the White Bigarreau. The tree is of a vigorous growth, with stout limbs, and large deep green leaves, indicating hardiness and strength, and though it has been in bearing only one year, still it bids fair to rank high in the amount of fruit which it is capable of ripening.

The character of the fruit, wood, and leaf is well represented in the plate accompanying this number. When it is ripening it is quite distinctly mottled. When however, it is ripe, this character is in a measure lost in the deep red the fruit attains. The flesh is then fine, juicy, and an excellent flavor. The size is respectable, and in our opinion about right; for we doubt the practicability of combining a very great size with a very high and agreeable flavor. The size is given in the plate. While it would probably be improper to say, that this cherry is the very best which grows here, we are willing to be committed so far as this, as to say, that it is one of the best which we tasted this last season. We have the testimony of others to about the same thing.

PARA.

Is a Portuguese town, situated near the mouth of the Amazon, upon a low and level country, and but a few feet above high water. The people are native born Brazilians and Portuguese, who are always polite and accommodating, and generally well educated; the lower classes are more or less a mixed race, among which are Moorish Jews, who obtain a livelihood by trafficking with the small trades of the river, and by adulterating produce, and by various make shifts, in which the people of that nation are expert. The arts of civilization in Para, are not so far advanced as in the United States and England. The mechanics, who are generally Portuguese carry on their trades without the aid of labor saving machinery; the cabinet maker, for instance, saws out his boards with the pit saw, but industry makes some amends for want of enterprise.

The fruits are abundant, and belong to those kinds which are indigenous to the tropics, as plantain, banana, pine apples, cocoa, etc. But the principal fact which we wish to notice is the healthfulness of the climate, which would not be expected, considering that it is within the tropic, and upon a low level country, and in the midst of an exuberant vegetation. The equality of climate however, renders the place comparatively healthy, epidemics are unknown, and the average period of life is equal to that of New York. A climate like that of Para is peculiarly inviting to those persons who are suffering from pulmonary disease. The annexed observations on the thermometer, for three successive months, prove a remarkably narrow range; the extremes amounting only to 10 degrees of Fah. The extreme heat of the north seems to be unknown.

The passage to Para is but a trifle greater than that to some of the West India Islands, and the expense of living much less. Experience too, speaks in favor of Para for the residence of invalids. We are indebted for the above remarks, and the Thermometrical observations, to our friend Mr. W. H. Edwards, the author of a popular book of travels up the Amazon, and which we have had the pleasure of noticing in one of our former numbers.

Temperature at Para, Brazil, during June, July, and August, 1845, from observations by H. L. Morris, Esq., of Para.

JUNE.				JULY.				AUGUST.			
DATE.	6 A. M.	3 P. M.	8 P. M.	DATE.	6 A. M.	3 P. M.	8 P. M.	DATE.	6 A. M.	3 P. M.	8 P. M.
1	79	86	80	1	78	85	80	1	79	86	80
2	80	84	81	2	78	85	78	2	79	84	79
3	79	85	81	3	79	84	78	3	80	85	80
4	78	84	78	4	79	78	76	4	79	84	80
5	79	80	79	5	78	81	78	5	80	83	78
6	77	84	79	6	77	82	78	6	80	84	79
7	78	84	79	7	78	83	78	8	79	85	86
8	78	83	79	8	80	84	79	8	79	81	79
9	78	84	80	9	77	85	80	9	79	85	80
10	79	85	77	10	80	85	80	10	80	85	80
11	78	84	78	11	79	85	80	11	79	85	80
12	78	82	60	12	80	86	78	12	79	84	79
13	80	86	82	13	78	84	79	13	77	85	80
14	79	82	80	14	78	85	79	14	79	84	80
15	77	84	79	15	79	85	80	15	79	84	80
16	78	82	78	16	78	84	80	16	79	85	80
17	79	84	80	17	79	85	79	17	80	84	80
18	78	85	79	18	79	84	80	18	79	85	79
19	78	83	81	19	80	86	79	19	77	85	79
20	78	86	82	20	79	79	79	20	77	83	79
21	80	84	79	21	79	84	78	21	78	85	79
22	78	85	78	22	78	83	79	22	79	85	80
23	78	83	78	23	79	85	80	23	78	84	80
24	78	84	85	24	79	84	79	24	78	84	79
25	78	84	80	25	80	85	80	25	79	83	79
26	78	85	82	26	79	83	77	26	80	85	80
27	79	86	79	27	79	86	80	27	79	84	78
28	78	83	78	28	80	86	77	28	78	84	79
29	77	87	79	29	79	86	79	29	79	85	79
30	78	86	78	30	80	86	83	30	79	84	79
				31	79	84	80	31	79	85	79
Mean 79.98 Highest 86° Lowest 77°				Mean 80.54 Highest 86° Lowest 77°				Mean 80.92 Highest 86° Lowest 77°			

Mean for three months, 80.48
Highest 86° Lowest 77°

THE POTATO DISEASE.

A Prize Essay, by H. Cox, condensed from the Journal of the Royal Agricultural Society of England.

We shall attempt to give only a brief abstract of this essay; though we are inclined to give more, inasmuch as there is a general accordance of the views of this writer with our own, as our friends and readers will observe by comparing it with what we have said and written during the three years in which this journal has been published. We have however, only slight attachments to the theory herein maintained, and are ready to embrace any other when its merits are based on a foundation sufficiently substantial.

The author commences by saying, that the failure of the potato crop in 1845, has given rise to many theories as to its cause, some imagining that it was a fungus, while others contend that it was caused by atmospheric influences; this latter is the view the author maintains, principally on the ground that many other vegetables were affected by a similar disease at the same time, citing in this connexion, the ash, oak, poplar, hazel, the vine, the apple, pear and plum; but particularly the walnut, the French bean, mangel wurtzel, carrots and turnips. In the case of the walnut, it gave out of two bushels of fruit not a single nut, but that exhibited signs of disease. Its leaves exhibited also the symptoms of disease. All the early varieties of turnips decayed at the top; the swedes were affected almost as much as the potatoes, the orange globe mangel wurtzels were affected in the proportion of one in five, carrots at the rate of one in eight. Mr. Cox then proceeds to state other facts in regard to the disease, and shows that certain varieties were less subject to it than others, and especially those which were nearly mature at the time when the supposed cause began to operate, and cites the ash-leaf kidney, which was dug the first week in August, and no symptom of disease appeared in them. On the contrary, those which were a month or six weeks later, and were dug early in September were nearly all lost.

In the first week in April, our author planted a piece with second early kinds, called *prolific,* and a few china orange potatoes. The rows ran north and south; one end running up a steepish bank, the other descending into a damp peat. The higher parts of the field were poorer than the lower, the potatoes on the latter grew luxuriant and rank, and covered the ground, so that no air could circulate among them. Now the rate at which the ends were affected was as follows; those upon the upper and poorer soil were affected at the rate of one in twenty-seven; those at the lower end, in the rich ground at the rate of one in four. The affection first appears in a brown spot where the tuber is connected with haulm. To ascertain which were diseased, the author sliced off a portion at this extremity from which a practical hint is given: viz., to save from entire loss, ascertain in this way the part of the diseased condition, and use them before they have affected the tube to any important extent; by selecting for keeping those which are not diseased, a great saving is effected. Of the cause of the disease in 1845, Mr. Cox believes that the cold damp weather in the latter part of July and first of August when it is usually dry, and which was succeeded by hot sultry weather, had much to do in causing the disease of that year. The disease is considered as simply a decay which began in the stalks.*

The author next proceeds to consider the precautions which afford the best hope for averting the disease.

1. To choose sound tubers for seed.

2. Choose dry ground which *is not overrich;* this precaution is regarded as one of great importance.

3. Choose manures, which do not ferment readily as charcoal dust, peat ashes, &c. An experiment detailed at some length, shows the great advantage of charcoal and peat ashes, over guano, cow dung, horse dung, &c.

4. Give plenty of room, that air may freely circulate through the crop.

The author decidedly discourages autumn planting, as had been recommended by some writers.

Taking up and storing. Let potatoes be harvested in dry weather. If designed for planting, they may lie three or four days on the ground; but if designed for eating, they should not lie longer than three or four hours. They should be put in a dry situation, as under a shed, and if they lie thick should be turned to prevent fermentation, and while here the diseased ones are picked out. The potatoes should afterwards be stored in a dark and moderately damp place, so damp at least as not to generate any dust on the bottom of the store house. A store house expressly for their preservation is recommended, where they can be examined, ventilated, and the poor ones removed.

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* At one time we entertained similar views as to the part first affected, but have seen cause to alter them, by later and more careful observations. The part first diseased is the stem, which is connected with the seed tubers, and the stalks, the disease tends upward. That other vegetables are affected in common with the potato plant, we have observed every year, and precisely at the period, when the potato itself is affected, examples of which have been stated in this journal.—Ed.

PEAT CHARCOAL.

The use of charcoal as a fertilizer is generally well known. Its expense, however, often precludes its use. To cut down a forest for the sake of the charcoal it would furnish for agriculture would undoubtedly be bad policy. As a substitute, however, for the ordinary wood charcoal, it is certainly important for many to know, that peat charcoal will prove an excellent substitute. In some respects it may be regarded as a superior article to wood charcoal, inasmuch as it will be obtained in a state of fine subdivision, and consequently in a state to operate to the best advantage. In the state of New York peat is a most abundant product. In Champlain, Clinton county, a peat swamp exists, which extends between one and two miles in length, and half a mile in breadth; besides many in other parts of the county which occupy less extent. In Warren, in Warrensburgh, a peat swamp is known of about fifty acres, the middle portion of which is sixty feet deep. So, in most of the towns upon the Hudson river peat is an abundant product, though rarely in extensive deposits. In the western counties it is still more abundant, and is accompanied with marl. The great level extending west from Rome, contains an inexhaustible supply of this substance, and which in process of time must become of vast importance to the state. Those who have access to the geological reports will be able to learn where a vast amount of peat is deposited; and yet New York is not a cold and wet part of the Union. Many of the depressions upon higher parts of the state are small basins of peat and marl.

The peat is cut from its bed by a spade, in rectangular pieces of a convenient size, and which when dry will shrink to the size of a brick. It is necessary that these pieces should be dried by exposure to the sun and winds for four or five days. When dried sufficiently to ignite, they may be arranged in conical heaps, or in the form of an ordinary coal-pit. At the bottom a parcel of wood must be laid, which when ignited will set fire to the mass.

It is scarcely necessary to add, that the fire must always be smothered, and never suffered to break through the outside. To the first mass, when it has ignited, more peat may be added from time to time, when the fire will continue to extend outwards. A precaution which it may be well to observe is, to lay the pits where water is accessible, in case the fire is likely to obtain the mastery.

Peat coal may be considered about one half as valuable as wood coal, or $2.50 per hundred bushels, or sixty to sixty-five cents per cubic yard. Every farmer, however, must be his own judge of the price he can afford to pay for fertilizers belonging to this class. When, however, it is once known that charcoal is probably one of the best fertilizers for potatoes, and bids fair to counteract the potatoe malady to a certain extent, it appears rational to maintain that it will be a good investment to purchase peat coal at the rate of twenty-five dollars per thousand bushels. The subject especially commends itself to the attention of those who have peat beds upon their estates. Its home profit will pay a heavy interest upon the outlay of labor and capital.

Peat coal being more porous than common charcoal, will exert a greater influence upon the soil. It may be regarded as an absorber of ammonia and water, and undergoing a slow combustion it will furnish before it is consumed, a vast amount of carbonic acid. Most persons are perfectly familiar with the effects of charcoal upon vegetation. The great desideratum is how to obtain it in quantities, and at a rate to make it an object in husbandry. Surely no one can afford to buy coal, not because there is so much expense in making it, but on account of the value of the materials of which it is formed. Peat however, is a material lying in a waste, useless as it is, and in order to make it valuable, it is only necessary to raise from its half submerged condition, and char it. Or it may be used as a fuel quite economically, and then its ashes are valuable fertilizers also. In this operation no timber is sacrificed, no groves of fine trees are destroyed. We reclaim however, an unhealthy marsh, and bring into cultivation, a new field which has laid barren and useless. More considerations than one recommend peat charcoal to the consideration of farmers throughout the Union.

THIN SOWING.

In England the question has been discussed, whether thick or thin seeding was the most profitable. This is a question equally important on this side of the Atlantic. We have little doubt that the practice of thick seeding has had as many advocates here as abroad.

A friend of ours who is a good farmer recommends thick seeding for the purpose of preventing the numerous secondary stalks, which can never be so strong, healthy and productive as the main stem, which first rises from the seed. That thick seeding has the effect to prevent *tillering out*, as it is termed, is supported by observation. There is more food for the few stalks which may grow together, than to the many which are often formed where the seeding is thin.

METEOROLOGICAL OBSERVATIONS ON GREY LOCK MOUNTAIN.

The following communication from our esteemed friend we give entire, and in the form it was received. We deem it a valuable communication, and wish most sincerely that similar observations may be multiplied. A few explanatory remarks seeem to be required for the benefit of our readers who are not acquainted with the localities referred to in the communication.

Grey Lock is the highest point of land in Massachusetts, and is 3,500 feet above the level of the sea. This is the highest station. The lowest station, that of the observatory, is about 800 feet above tide-water at Albany. The station in the Hopper is upon the west side of Saddle Mountain, the summit of which is called Grey Lock, and is situated in a deeply shaded position; but the observations are important, particularly so, in consequence of their showing the influence of location and exposure in modifying the results. The station must have been about 1,000 feet below Gray Lock, and is yet a colder position than this high peak.

The latitude of these places is 42° 43′ N.—Ed.

Williams College, Oct. 1, 1847.

Dr. Emmons:

Two or three years since, our Meteorological Society made some observations, with a view to determine the law of decrease in temperature at different elevations. Prof. Coffin, who was at that time an instructor here, has recently requested me to repeat these observations. During the last term some young men volunteered their services for a week, and the result of their observations and those made at the observatory, will be found below. Prof. Coffin suggested the Astronomical Observatory, the Hopper, and the summit of Grey Lock, as the three places of observation; these seemed eligible points, and we, accordingly, took them. Messrs. Bumstead & Chadbourne repairing to the latter, whilst a small encampment was pitched in the Hopper by Messrs. Bradley & Corwin. The observations were commenced on Monday, July 5th, and continued till Saturday morning. The result of these observations will not, I fear, assist my friend Coffin, materially, in his meteorological researches. It reminds me of a result to which, I recollect Prof. Eaton said he once came, in getting barometrically the height of Mt. Ida, at Troy. The summit of the hill turned out to be "several feet below the surface of the North

River;" so, in the present instance, the lowest station, in defiance of the law, gives the lowest temperature; that is, comparing the Hopper with Grey Lock. Comparing the results at Grey Lock, however, with those at the Astronomical Observatory, we have a somewhat near approximation to what the law has been conceived to be. I give the mean of the three stations. The observations were taken part of the time, hourly, day, and night, part of the time once in two hours.

Mean temperature of the week at the Observatory, .	75.116
" " " " Hopper, . .	69.556
" " " " Grey Lock. .	70.678

Allowing Grey Lock to be 2,850 feet above the Observatory, we should have a diminution of one degree in about 645 feet. But this is considerably less than the diminution has been commonly estimated. Gay Lussac, and Biot, in their celebrated æronantic expedition, found the diminution to be one degree *Centigrade*, for 174 metres or 570 feet, which would give one degree Fahrenheit for 317 feet nearly; showing a diminution twice as rapid as in our experiments. Had the thermometers at Grey Lock been suspended in the woods near the Observatory there, instead upon the shady side of the building, a very little removed from the building itself, probably its position would have corresponded better with that of our standard thermometer at the Astronomical Observatory, which was hung in rather a cool situation, north of the latter building, which is of stone. The apparent anomaly presented by the observation in the Hopper and on the mountain, I account for from the peculiar conformation of the place. Those who have visited this grand feature in our natural scenery, are aware that the bottom of the Hopper corresponds, in some measure, to the bottom of a well. Vast mountain masses are piled on all sides but one. These, in mid-summer, would naturally reduce the mean temperature. A different result would doubtless be obtained at mid-winter, or even at this season. We propose to prosecute this subject with a view to obtain data for some general formula which shall express the law of diminution sought.

Our observers took the liberty to extend their observations beyond the department of Meteorology, and made a somewhat complete botanical survey of the mountain. They were rewarded with some new plants, and have received from Chadbourne a fine specimen of the Luzula melanocarpa, a grass which has been supposed to be confined to the White Hills, (in New England,) but which he found near the top of Grey Lock, and determined to be the above species. Perhaps this communication is not quite relevant to the purposes of your Journal; you can make any disposition of it you please. A. Hopkins.

AMERICAN ASSOCIATION OF GEOLOGISTS AND NATURALISTS.

The association convened according to adjournment, at the Rooms of the Natural History Society, in Boston, at 10 o'clock, A. M., Sept. 20. In consequence of the decease of Dr. Amos Binney, who had been elected to preside at this meeting, the association proceeded to the choice of a President pro tem., until a regular nomination by the Standing Committee might be made, and Dr. J. C. Warren, of Boston, was chosen. The preliminary business being partially transacted, the association adjourned, to meet at 4 P. M.

The meeting in the afternoon was spent in the completion of preliminary business; and in consequence of the prospect of a larger attendance than the rooms would accommodate, it was agreed to adjourn, to meet at the Malboro' Chapel, at 10 A. M.

An invitation was given by the Hon. Nathan Appleton, to spend the evening at his house.

The association met according to adjournment, in the Marlborough Chapel, Tuesday morning at 10 o'clock.

The meeting was called to order by Dr. John C. Warren, of this city, Chairman, *pro tempore*. The proceedings of Monday were then read by the Secretary, Dr. J. Wyman. Professor Silliman, of the Standing Committee, after making a few remarks relative to the death of Dr. Binney, nominated Professor William Rogers, as permanent Chairman of the present meeting, and he was unanimously elected. Previous to the commencement of the regular proceedings, Mr. Teschmacher of this city, informed the members that large masses of the Lake Superior Copper ore were left at the Providence Railroad Depot, and that individuals interested might have an opportunity of examing them.

A paper was presented by Mr. B. L. C. Wales upon the formation of the Mississippi Bluff, near Natchez. This paper, in the absence of Mr. Wales, was read by the Secretary.

There was a large number of specimens from the locality, of Favossiter, carnelians, jaspers, ochres, fossil woods, &c.

The locality examined extends from Vicksburgh to Baton Rouge, presenting an average breath of 12 miles. It is certain that this extensive tract was formed chiefly by diluvial agency; the lowermost depositions are certainly due to this agency; they contain quartz, agate, carnelian, jasper, and various silicified corals.

The rocks from which these come do not form the basis rocks of this S. West portion of the Union; where is then their origin? We have to go more than 1000 miles in a N. West direction to find their origin; some of the trap rocks of Lake Superior are rich in the same identical materials. How could these have been so largely spread; no agency of water, flowing even with the velocity of a mountain torrent, could have effected it: it is extremely probable that ice has been here the most important agent.

The parallel zones of sand-stone in the Great Gulf were caused by waves of translation, either from the upheaving of the Rocky Mountains, or volcanic action in the Arctic Ocean.

Dr. Binney supposed this vast tract analogous to the "loess" of the Rhine; its rate of deposition must have been very slow. Fresh water shells do not belong to it; in it are the remains of many extinct races, the mastodon, &c. It must have been deposited rapidly, yet quietly from this chaldron ocean, and not by rivers. The fresh water shells, and various other organic remains which so often puzzle naturalists, were deposited, after heavy rains, by slides from post diluvial lakes.

The origin of this alluvial clay, or marl-beds: The loam was laid down during a long period of subsidence of the land, allowing annual or successive innundations of the river-beds.

Mr. P. A. Browne, of Philadelphia, read a paper entitled "Animal Torpidity." He first treated of the respiration of hibernating animals. With mammals the respiration does not cease at once, but gradually, and no oxygen is consumed by the animal in a completely torpid state. The respiration of the torpid state may be only imperfect, as for instance, when the animal breathes and then ceases from breathing for minutes and it may be for hours. Animals, when about to enter the torpid state, seek retirement. The mammals roll themselves up into as small a compass as possible, and retire into holes or caverns; the mollusca retreat into their shells; flies, spiders, &c., creep into holes.

A hamster kept in a box of straw, in a sufficiently cold place, did not become torpid, and revived as soon as he was dug up. Hamsters have been kept in a cage and fed, eating during the season when they usually hibernate. Opinions are various upon the point of the total extinguishment of respiration during torpidity. Some naturalists assert that in hibernation, animals do not breathe, while others contend that respiration is not extinct. A torpid animal immersed in carbonic acid gas will not die. The respiration of animals is subordinate to temperature—in summer, quick, in autumn, slow; in winter, none at all. Experiments have shown that hibernating animals consume oxygen, considerable in volume, when in an active state; that the consumption diminishes as the temperature falls; that they can exist in an air which will neither support life nor combustion; that in a torpid state the consumption of oxygen is small, and that in a perfect state of torpidity no oxygen is consumed, and there is no respiration.

The aligator, when about to hibernate, takes a pine or cypress knot in his mouth, completely closing it; it then retires into holes under water, where it remains until the warm weather in the spring comes on. A water rat was ploughed up in England, in the year 1769, completely enclosed in a hibernaculum. A mouse was dug up in 1798, enclosed in a ball of clay about the size of a goose egg; when brought into a warm room, it revived and escaped. Twenty or thirty frogs were once taken in a torpid state from a depth of twenty feet in the earth, where they must have remained a hundred years or more. The snail, when about to hibernate, retires into its shell, closing its operculum with a partition of a silky membrane, and a deposite of carbonate of lime. Sometimes, as many as six membraneous partitions are formed between the operculum and the recess of the shell. In this state it remains for months, and the only evidence of life, is a susceptibility to muscular sensation. It lives without food, without air, and exercising none of the animal generative functions. It does not subsist upon the modicum of air remaining in the shell, as this has been examined and found capable of supporting combustion, this fact showing that it had not been breathed.

Torpidity is neither life nor death, but an intermediate state, neither is it sleep in the ordinary sense of the word.

The circulation of hibernating animals is suspended in a state of profound torpidity.

The digestion also is arrested, and all food is declined. A hedge-hog kept in a room without fire, ate of its food regularly up to December when it refused it, went into a torpid state and remained so during the winter, never eating food laid before it. A land tortoise kept for forty years, ate voraciously in summer, but refused all food in winter when hibernating. Absorption goes on, but this is an entirely different process from digestion. The secretions are also arrested. The organs of relation are paralyzed. A torpid dormouse cannot be roused by a shock of electricity; bats do not feel wounds or hurts, and can be aroused only by heat and currents of air.

In the anatomical structure and physiology of hibernating animals a similarity is observed especially in the construction of the thymus gland. Some naturalists are of the opinion, that fat or the omentum is provided as a covering from the cold or for consumption, while others look upon it as purely an accidental circumstance. But Mr. Browne is of the opinion that fat is not an accidental circnmstance, but has to do with hibernation. It remains in a fluid state during hibernation.

Mr. Browne is of opinion that the fibrine and albumen which was deficient in the blood of hibernating animals was converted into *fat;* in consequence of which the blood was preserved from concretibility and the storehouse of fat was laid up, upon which the animal subsisted when digestion was extinguished.

There is nothing in the habits of hibernating animals to distinguish them, for their habits vary in different countries. Hibernation may depend on a difference of temperature. Lizards hibernate in France and do not in the Island of Santa Cruz.

The immediate causes of torpidity are cold, drought, want of oxygen and necessity for repose.

Dr. J. C. Warren expressed his gratification at the remarks made by Mr. Browne: He said that the use of the omentum, about which there had long been a difference of opinion, was to afford a soft cushion for the sensitive intestines, which are always put in pain by pressure. It may also serve as a reservoir for food when the animal is not in a state to digest it. In fevers and consumption the fat is taken up by the absorbent vessels to supply the want of food. The Doctor's impression was, that hibernation was the result of cold acting on the nervous system, and through this system paralyzing all other parts of the body.

Professor Agassiz did not agree with Mr. Browne upon the point of the cessation of circulation during hibernation. He asked what experiments had been made to test this point? Mr. Browne replied, that a French naturalist, Mr. Sacy, who had investigated the subject, had made a thousand experiments. Mr. Browne had added upwards of forty upon reptiles. Professor Agassiz was of the opinion, that until the membrane of the wings of bats in a torpid state had been examined by a microscope, to see whether the blood circulates, it was not proper to pronounce decisively that circulation ceases. He was further of the opinion that until it has been shown that the species of lizards in France and Santa Cruz were identical, it would not do to assert that hibernation depends on the difference of climate.

Remarks were also made by Mr. S. S. Haldeman of Carlisle, Pa., and Dr. Samuel Jackson of Philadelphia. The latter gentlemen expressed the opinion that respiration was not entirely suspended. Professor Agassiz stated that a friend was investigating most minutely the subject of the hibernation of the dormouse, at Nuefchatel.

Dr. F. Roemer of Berlin, Prussia, made a report on the results of a geological tour recently made in Texas. The fossils of the corresponding formation of the old and new world were compared, and reference was made to their geograpical distribution. He had ascertained that the isothermal lines of the cretaceous epoch (as indicated by the fossils) were the same on the two continents of Europe and America, as at the actual epoch.

Professor S. S. Haldeman presented an interesting fact in the geograpical distribution of animals. He stated that an insect was sent to him from Rio, by Dr. J. C. Reinhart, with information that this or an allied species, had been seen by him on board the U. S. ship Constitution, Cochin-China, and subsequently in all the ports of the Pacific—the ship touching at the Sandwich Islands and Western Mexico, and passing Capes Horn and Brazil,—a wider geographical distribution than has heretofore been given to this genus. The insect proves to be an Evania, and its extensive distribution is attributable to the fact, that this genus is parasitic on the Blatta (or cockroach) which is known to be extensively abundant upon ships between the tropics.

In the afternoon, Mr. J. E. Teschmacher, of this city, made a communication upon the subject of the fossil vegetation of anthracite coal, showing that the plants of which the coal is formed, are the same as those found in the shale. He treated his subject under the five divisions of the external parts of plants—the internal parts, the vessels, the leaves, and the seed. Several specimens of coal were exhibited by Mr. T. to illustrate his ideas upon the subject. They were very beautifully marked by leaves, seeds and vessels of plants.

Professor Agassiz made a communication upon the subject of echinoderms, showing that there is no essential difference between the types of families of echimus and asterias. He explained many points in the animal economy of the echinoderms not before known, and showed the affinities existing between the echinus and asterias. He fully proved great uniformity of structure in the two genera. He showed that asterias has an external skeleton as well as echinus. He explained the circulation, and while speaking of the functions of certain organs, took occasion to observe that physiologists were greatly in error when they determined an organ by its function. He also showed the existence of minute aquatic tubes or canals, and of gills in both genera. The echinoderms when first taken from the water, are of a brilliant red color, but they shortly change to a bright green after death. They can only be obtained from water to the depth of from 90 to 150 and 200 feet. Professor Agassiz had a month's excursion in one of the United States surveying vessels, Lieutenant Commanding Davis, on the coast, and collected his specimens during this excursion.

Dr. Le Conte, of New York, made a communication upon specimens of five new species of fossil mammalia, discovered at Galena, Ill. He believes them to belong to the Tapiroids and Suelline families.

Professor Hitchcock read a letter from Robert Chambers, of Edinburgh, asking for information of the terraces or former sea-levels of this country. Professor H. said it was an interesting subject, and he hoped that information might be elicited from members of the Association. He stated that terraces existed on the banks of the Jordan in Asia, similar in character to the terraces formed in this country. Upon the banks of our streams there are generally two terrace levels. Mr. Chambers says that the terraces of Great Britain bear the same level throughout the country.

Professor Hitchcock thought this could not be the case in America—the terraces of the same basin might have corresponding levels, but terraces of different basins could not possibly have the same level above the ocean tide. Professor Silliman hoped that members would turn their attention to this subject. He had lately visited the terraces in New Hampshire, and had an opportunity to examine their internal structure through the cuttings of the rail road through them. They presented a very beautiful appearance. Mr. Hall, one of the Geologists of the state of New York, said that the terraces along lake Ontairo, had an almost uniform height on both the Canadian and American shores. M. Desor, a French gentlemen, stated that the terraces in Finmark were nearly of the same height, but not perfectly horizontal, which was presumed to arise from the subsidences.

Prof. Silliman, sen., exhibited a specimen of uncrystalized Corundum from North Carolina, and stated that he had received a specimen of this same mineral many years since from the same state.

Mr. Clingman of North Carolina, who had brought this specimen from North Carolina, gave an account of the circumstance of its discovery, which placed the statement that it was a native specimen beyond a doubt.

A paper was read by Mr. W. C. Redfield, of New York, "on the remains of marine shells of existing species, found interspersed in deep portions of the hills of drift and boulders, in the heights on Brooklyn, Long Island, near New York city." These remains had long since attracted the attention of Dr. Mitchell, and other naturalists of the vicinity, but the true character of the formation, and the peculiar positions in which the shells were found, were not distinctly known to geologists.

It fortunately happened that M. Desor and Count Portailis, while on a visit to Brooklyn a few months since, discovered fragments of those remains in the great masses of boulder-drift in South Brooklyn, through which the new streets are being excavated. At their invitation, Mr. R. had examined the place in company with Professor Agassiz, and had obtained a variety of specimens, which were found at depths varying from twenty-five to forty feet below the original surface of the hills, in which they were imbedded.

Since that occasion, Mr. Redfield has found similar remains in those hills about two miles northward from the first locality, and has collected numerous specimens which he exhibited to the meeting, together with samples or fragments of the original beds inclosing these shells, which had been dispersed by the drift and thus lodged in the Brooklyn hills. The number of species comprised in the collection amounts to ten or twelve, among which are those now most common to our shores.

These discoveries in regard to the drift appear to agree with those which Sir R. Murchison states to have been made in the drift of Europe. They must be admitted as proving that the most common species of our present mollusks were of prior origin to the hills where the remains were found, and probably older than the entire formation of drift and boulders which is found in the Northern States. The species obtained are not such as indicate a colder climate than now prevails. But the shells found by Professor Emmons and others in the pleistocene clays on the borders of Lake Champlain, and by Mr. Lyell and others in Canada, appears to belong to a later period of the drift, and Mr. Redfield infers that they were brought in from more northern regions, or from deeper waters, by the great arctic currents which must have swept over this region, during the drift period, when this portion of the continent was deeply submerged. These polar currents annually freighted with immense fields and islands of floating ice, such as are now diverted along the shores and banks of Newfoundland, till they are met by the dissolving influence of the Gulf stream, nearly in the latitude of Boston and New York, he considered to have been among the chief agents in producing the remarkable phenomena of the drift period.

M. Desor stated that discoveries in Scandinavia and Northern Europe, that the first deposite of the drift consisting of coarse clay and gravel, and stratified, was of a turbulent character, while the second deposite was a quiet one. Boulders have been brought from the northwest, striæted and scratched all over their surfaces. How much of the phenomena presented upon a close survey of these drifts was attributable to currents of water, M. Desor would leave to others to say. For his own part he believed that these drifts gave evidence of the action of a body different from water. If the drift and boulders were connected in the action, he fully believed that some other agent than water must be looked for to account for their existing. He could not agree with Mr. Redfield in the positions which he had assumed.

Mr. Redfield was not disposed to look for foreign causes to account for geological phenomena when one of a more domestic character was entirely adequate to produce these phenomena.

Two great polar currents are constantly setting southwards—one to the Southeast from Hudson's Bay, the other southwest from the shores of Greenland—these two currents unite near the Gulf stream, and result in one current. These currents bring along immense masses and islands of ice. These islands bear along rocks, pebbles, &c., collected on them before their separation from the land where they originally formed glaciers—they often ground and remain grounded for months, turned and moved in every possible position by the wind and waves. They would scratch the bottoms of the valleys of the ocean, and would cause the excoriated appearance which the rocks present. In Mr. Redfield's view, this agent, of currents of water, was sufficient to account for many of the geological phenomena which the earth presents.

Mr. Desor could not conceive how the sides of the valley could be scratched by this agent if the bottoms were. He exhibited specimens of strata or scratched rocks from the glaciers of the Grindelwold and Aar of Switzerland, from Essex County, this state, from Norway, and from the terraces near Lake Ontario. They are all similar in character—one cause must have produced effects so similar. It would not do to say that one cause operated in Norway, another in Switzerland, and still another on this continent. The effects were brought about by the slow action of a mighty body. Glaciers have been observed not only in the Alps but also in the polar regions. In Iceland glaciers exist for 50 miles in extent—such being the case, it requires no great effort to believe in the existence of a glacier 3 or 400 miles in extent. It is only necessary that the temperature should be lowered a few degrees for them to exist.

Commander Wilkes, U. S. N., late of the Exploring Expedition remarked that icebergs have a wide distribution, that they were constantly changing their specific gravity, changing their positions—what was a side at one time would become the bottom, &c.—in this way the variety of striæ might be accounted for.

Professor Silliman with no view to object to the glacier theory, for he desired to learn, asked its advocates to explain the existence of glaciers in regions where there were no mountains. The theory as applied to the Alps and other mountainious districts was good.

Professor Adams, of Vermont, made a drawing of a rock of talcose slate in the valley of Onion river, Vermont. It was rounded, beautifully polished and striæted on its surface. Near the bottom on the rock was a depression or hollow, and upon the side on which the power, whatever it was, first acted. This hollow was not touched—it presents a rough and jagged outline. The body appears to have struck the rock near its lower edge, and, through the resistance made to its passage by the rock, to have been forced over it, polishing and striæting its surface. If water was the agent, it would appear as if it should have acted equally on the depressed or hollow surface.

Professor Hitchcock said that the rock referred to by Professor Adams, a representation of which was drawn on the black-board, was a miniature representation of the mountains of New England. Mountains Monadnock and Holyoke, were prominent examples. They are all rounded and polished with striæ running in one general direction over their surfaces. It was evident to his mind that whatever body produced these effects, was held in its place by a mighty agency, and that it would have turned to the right or left when it encountered the resistance of the mountains, if it had been possible for it to have done so. Striæ are not only worked upon the rocks, in situ, but deep valleys are cut in their surfaces. And it is only on the struck side that these marks are to be observed. He had arrived to the conclusion that whether in the form of an iceberg or a glacier, it was ice in mass which had produced the effects above referred to. He could not believe that waves of translation were of themselves sufficient to accomplish these results.

Professor Silliman asked Captain Wilkes if it was within his own knowledge whether the iceberg in the Southern Ocean, along which the vessels of the Exploring Expedition coasted for some 60 or 70 miles, was attached to the coast or was afloat. He replied that it was not afloat. Mr. Redfield could generally coincide in the views expressed by Professor Hitchcock. He felt inclined to admit that icebergs were the principal agency in causing the striæ, rounded and polished surfaces of the rocks of this country and Europe. He did not believe that there was any such antagonism in the glacier and iceberg theories. It was difficult to explain on the iceberg theory how the different striæ had been produced, but he believed it more difficult to explain the same phenomenon on the theory of the glaciers. Waves of translation have been unfrequent.

M. Desor remarked that scratches were observed on the mountains of Scandinavia at a height of 6000 feet, on the White Mountains, N. H., at a height of 5000 feet. Mount Washington which is some 5300 feet high, is not scratched—its top is covered with loose boulders, presenting a fine specimen of what has been denominated a lake of stones. Just beneath the summit of this mountain the scratches take the general direction of the scratches in the harbor of Boston. The scratches are observed at a height of 5000 feet, 10 feet, and below the surface of the water, but to what depth is not at the present time known. The same is true of the mountains of Scandinavia. The glaciers of Greenland do not run beneath the sea, but form a vertical wall at its surface, where the water melts the ice, and large icebergs are broken off and float away. Murchison says that glaciers have left their marks as far as the mountains extend, but that currents have produced the phenomena observed in the valleys.

This cannot be true—for the striæ of the mountains and valleys preserve one general direction. Now the striæ being similar in character when observed in different parts of the world, he was led to conclude that one general cause had produced these effects.

Mr. Redfield did not think that the striæ were marked upon the mountains and valleys at the same time.

Remarks were also made by Dr. Reed and Prof. H. D. Rogers. The latter spoke of the terraces of the St. Lawrence and the Lakes. Some of them give evidence that they had been formed by drainings of the upper lakes.

A few additional facts gleaned from Mr. Redfield's paper, upon the Drift of Long Island. The subject has acquired a deeper interest, in consequence of the discovery of Marine shells in that of Long Island. These are limited, however, to a few localities, The drift referred to, is derived principally from the sand stone and trap of New Jersey. The marine shells consist of individuals belonging to the genera Venus, Ostrya, Solecurtis, and several others. The Solecurtis carribeus is interesting, and its presence taken in connection with other facts, go to prove that the climate of this vicinity has not materially changed, as has been inferred by Mr Lyell. Some of the specimens of shells were derived from ancient indurated beds, which were of course partially broken up during the drift period. Most, if not all the shells are in a broken condition, and sometimes worn. Dr. Mitchell had noticed the shells in Long Island, but was not aware of their existence in the drift. Marine, post pleiocene shells have been described by Mr. Murchison in the drift of northern Europe. Mr. Redfield connects the origin of drift with the existence of icebergs, aided by transporting currents flowing from the north to the south, one of which may have flowed from the Gulf of St. Lawrence to New York bay, through the great fracture and depression, stretching through the valleys of Lake Champlain and the Hudson river. Icebergs are still found in the latitude of New York. Their effect on climate is to be regarded as temporary, and not as furnishing proof of a general reduction of the temperature.

In the discussion which followed, Mr. Desor maintained the doctrine of glacial action, as a cause which has given origin to the drift of all countries—referring to the drift of Scandinavia and the Alps, for facts to support the main features which were announced. Specimens of scratched rocks were also exhibited from glacial regions, as the fiords of Christiana, the polar regions and the Alps, whose general appearance agreed with what is observed in this country.

Prof. Silliman in answer to the doctrine just advanced, observed that the cause could not apply to, nor explain the phenomena of the drift of his country.

Prof. Henry D. Rodgers referred to the different periods of drift, that of Montreal Island as a more recent accumulation of drift, and which was derived from the post pleiocene marine deposit of the valley of the St. Lawrence and Lake Champlain, and as disconnected with the great period of drift which was moved forward anterior to the clay deposits formed in a period of repose.

Remarks by the Editor.—There are two or three interesting points brought out by Mr. Redfield, and by the remarks of gentlemen who engaged in the discussion.

1. That there is little or no evidence of a change of climate about the drift period.

2. That a direct communication formerly existed in the course of the valleys of the Hudson river and Lake Champlain, and which would necessarily make New England an Island.

3. That at least two periods of drift must be recognized; one of which was anterior to the deposit of clay in the valleys first referred to, the second that during which the shells on the summit of Montreal Island and Long Island were deposited.

Prof. J. W. Bailey read a paper upon the structure of anthracite coal. Thin slices of coal showed very plainly the vegetable tissue. But there was no evidence that arborescent plants had entered into the formation of coal—it was only the deciduous and soft portions which had been converted into coal. Anthracite coal had been examined—soft coal containing so large a quantity of bitumen could not so readily be tested.

A few remarks passed between Professor Bailey and Mr. Teschmacher, upon an apparent discrepancy in their views in relation to the subject of coal.

Professor Hitchcock read a paper, being an attempt to discriminate the animals which had made the fossil footmarks in the Connecticut valley. He had discovered forty-seven species in nineteen localities. At some length, he urged the propriety of his giving names to the birds as well as to the footprints. He then stated the peculiar characteristics of the footmarks which led him to assign the names that he had done, to the birds,—such as thick and narrow toes, winged feet, number of toes, projection of middle toe beyond the lateral ones, distance between the tips of the lateral toes, distance between the tips of the middle and outer toes, direction of hind toe, character of the claw, width of toe, number and length of the phalanges, the impression on the mud, length of step, distance of feet from line of direction, &c. The number of toes varies from three to five.

He explained the means by which to distinguish between quadrupeds and bipeds, described the classes into which he had divided the birds, and pointed out their affinities. In one specimen which he had found, every alternate step was turned at an angle of 45 degrees from the line of direction. He could explain this only by the conjecture that the animal had broken its leg, and for want of good medical advice the leg was set awry, and this was the cause of the very singular footmark left on the rock. Some giant footsteps, twenty inches in length, he believed to be those of frogs. They resembled closely in character the embryo foot of a frog which had been shown to him by Professor Agassiz, and here he would remark that the fossils discovered more generally resemble the embryo of animals of the present day, than adults.

ANNUAL MEETING AND FAIR OF THE MASSACHUSETTS HORTICULTURAL SOCIETY, IN BOSTON.

Probably no society has exerted so much influence upon the culture of fruits as this ancient and honorable society. Its organic management belongs to the superior orders of all associations formed to promote important interests. Its fairs indicate a judicious zeal for the promotion of its objects, and the display of fruits during this fair at least, show a greater knowledge of fruits and their several excellencies, than is found at any other similar institution on this side of the Atlantic. The fruits which are exhibited besides being a rich luxuriant show, are themselves worthy of intense study as varieties. It is very probable that in flowers, this society may be excelled, although the less imposing display in this branch may be owing to the greater attention which is given to fruits.

In grapes cultivated under glass, we believe the show must rank very high, if not in No. 1. Certainly in one sample we should by no means be surprised to learn, if Joshua and Caleb, were a committee, that they awarded the premium to the Boston cluster; and if the grapes of Eschol were better, they must have been in wonderful clusters. However, *pears* were the most imposing. In apples, western New York can carry off the palm. It must be remembered however, that the eastern part of Massachusetts has a hard soil, and climate rather severe, and it is under these disadvantages that this fine display of fruits excites so much surprise and pleasure in the minds of strangers. It is no use to speak of Boston hospitality, when the phrase has become proverbial, we therefore let it alone. Neither can we speak of the kindness and attention of the officers of the society, and we know that they do not wish it; it may be said however, that a stranger is very apt in the presence of both members and officers, to forget that he is a stranger, and has continually to spur up his memory on the subject, lest the great familiarity and kindness, should beget in him, a behavior that would render him obnoxious to the charge that *he made himself a little too much at home.*

The annual dinner usually follows the close of the exhibition; this year however, it was served up at the Tremont House, on Friday evening, in what was called an informal manner. To this feat there are assembled the officers and members of the soci-ty, the delegates, and distinguished strangers who happen to be in the city. It consisted this year of a serving of tea, coffee, meats, a few cakes, and ice creams. The principal attractions in eatables however, are the fruits, and this is as it should be. Here the standard pears, peaches, grapes, and apples, load the broad and ample dishes. But these usually attractive objects are forgotten in the animated and instructive conversation of the members and guests, and the essence of the treat is the rational part. We ought however, not to forget some of the chemical products of the fruits, which, though not very profusely, appear upon the side board.

Another meeting is regularly held by the society for the purpose of testing the value of such new varieties of fruit as may be sent it. Delegates, and a few strangers are also invited. The meeting is regularly organized, and its proceedings and judgments duly recorded. The following is an imperfect abstract of the proceedings of the meeting held in the committee room. Mr. Treasurer Walker in the chair, and acting as President. 1. Fruits submitted for trial, by tasting, which are distributed to all for an expression of opinion.

1. Apples. Hollow Crowned Apple. Good size, red, flesh yellowish, skin rather tough, great bearer, uniformly good, and obtains the remarkable price for a fall apple, of $1.33 cts. per bushel.

2. Fonting Apple. Beautiful red, presented by Mr. E. Smith. Original tree dead. In eating from the middle of September to the last of October. Flavor good, pleasant acid, valuable for cooking as well as eating, takes a respectable rank.

II. Pears. Dunmore Pear, presented by Josiah Stickney, Esq. Green and mottled with deeper green; size good, has not proved itself so good as was expected from the recommendation of the London Horticultural Society. It ranks, according to the unanimous opinion of judges in the second rank.

New Pear, Knight's Seedling, originated thirty years ago, in Cranston, R. I. Some things to recommend it, a good bearer and good size, but rather deficient in flavor; when the tree bears profusely as it is apt to do, not first rate.

Washington Pear, smallish, rather long. Presented by Vice President Newhall. Highly perfumed, rich, tender, juicy, first rate.

Cushing Pear, presented by Mr. Pond. By Mr. Hovery it is regarded as standing in the first rank; this, the specimen, was not high flavored.

Frederick of Wurtemburgh, (Capiamont) not regarded as worthy of a place in the first rank. It is rather a beautiful pear.

Fondante D'Autome, sweet, flavor good, and is generally regarded as first rate, though not in the first rank.

Wilbur Pear. A seedling, sweetish, tender and juicy, a great bearer.

Rappelje Pear. Seedling, by Dr. Stevens of New York, specimen over ripe. Placed in the second rank.

Cap Shief. A seedling from Rhode Island. Sure bearer, has been known for 50 years, hardly more than second rate.

Another of Knight's Seedlings. Introduced to the meeting by Mr. H. Smith, President of the Rhode Island Horticultural society. Very good.

Harvard Pear. Rots at the core though it continues a month in eating.

Jahonnet. Originated in Salem, Mass. Flavor high, small, rusty coated, juicy. First class, and best yet tasted, though it lacks size.

Ives Seedling. No. 1, according to the representation, but the society says it is No. 3 only, not worth cultivating.

Andrews Pear. Good shape and size, long and never cracks. All things considered a worthy pear.

Doyenne De Bosecouck. From Mr. Manning's garden.

Henkel from Manning, of Salem, stem long, fruit flattish, regarded as first rate, though by no means best.

No. 177 of Van Mons collection, from Mr. Manning, rather too sweet, flavor not high, skin rather thick.

Liberale, new pear from Orleans. Past eating, a very good fruit. Tasting faculties having become rather blunted about this stage of the business it was moved to adjourn.

CLINTON COUNTY FAIR.

Was held at Keesville, on Tuesday, the 7th of October, and as business called us into this section of the State at this time, we gave an hour or two to the exhibition. It is at these gatherings of the farmers, that the spirit and life of the profession manifests itself. If the exhibition of stock, and the fruits of the earth is of an high order, there can be no doubt of the existence of the right spirit in the community. Seeking the exhibition then, as an index of the conditions of agriculture in Clinton county, we have no hesitation in saying that it is entitled to a respectable rank among the leading agricultural counties of the State. The greatest deficiency in the exhibition, was in neat stock. The cows and bulls were scarcely more than ordinary. The horses in their several kinds were very good, though there were none which could claim the first rank. The hogs were very good.

The roots and fruits were as good as those of any fair we have attended, excepting in some of the minor kinds, as plums, pears, etc., though it was too late in the season to expect even a common exhibition of some species. Clinton county in part, is one of the best agricultural counties in the State. The soil is well adapted to grain, grass and pasturage, and though it has been regarded as deficient in many of the requisites of a good farming county, still this view is not just. It can apply only to the western part, where the country is elevated some 1000 or 1200 feet above lake Champlain. The towns adjacent to the lake are all excellent farming towns, and the land is fertile, and capable of being brought to vie in productiveness with the best lands in the State.

ANTIDOTE TO POISONS.

Animal charcoal (freshly prepared ivory black) is an antidote to poisons, especially those belonging to the vegetable kingdom. Thus strychnin and nux vomica, and other poisons of this class, when taken mixed with charcoal are perfectly harmless, provided the charcoal is administered in doses proportioned to the quantity of the poison. Three or four grains of strychnin are neutralised by $1\frac{1}{2}$ or 2 ounces of charcoal. Even the effects of arsenic, are greatly diminished by a speedy administration of charcoal. Corrosive sublimate is more surely rendered inert by white of eggs. Dogs, which have been poisoned by nux vomica, may possibly be cured by charcoal, though it is quite important that it should be administered early, and in large doses, not less than $1\frac{1}{2}$ or 2 ounces. In the absence of animal charcoal, administer freely fine fresh charcoal from the fire place.

Notes on the Iroquois, or Contributions to American History, Antiquities and General Ethnology, by Henry R. Schoolcraft, Hon. Member of the Royal Soc. of Northern Antiquaries, etc. Albany: Erastus H. Pease & Co., 82 State street. J. Munsell, Printer, 1847—*pp.* 498.

The work with the above title is an enlarged and corrected edition of Mr. Schoolcraft's Notes on the Iroquois, published in 1846 as a Legislative document. More than two hundred pages have been added to this volume, which had not been given to the public before. The report of 1846 was regarded by its author as imperfect. The Notes as they now appear, in their enlarged, improved and corrected form, embrace all the main facts which are known respecting the Iroquois; it hence becomes an important historical work which throws much light upon the difficulties attending the early settlement of this country by the Europeans, and which should be read in connection with their early history. This, however, is only a secondary use of this work, there is still another subject upon which it treats, viz. the Alleghans, the mound builders probably. It seems to us that the way at least is now opened to the successful prosecution of the history of this people, which has hitherto been so obscure. We have only room to say this much upon Mr. Schoolcraft's work. At some future time we may make some extracts which will give our readers a better idea of the work.

EXPORTS.

Statement of the value of the exports of the growth, produce and manufacture of the United States for the year ending 30th June, 1845 and 1846, copied from the N. Y. Cour. and Enquir.

THE SEA.		
Fisheries.	1845.	1846.
Dried fish or codfisheries,	803,353	699,559
Pickled fish or river fisheries, (herring, shad, salmon, mackerel,)	208,654	230,495
Whale and other fish oil,	1,520,363	946,298
Spermaceti oil,	975,195	697,570
Whalebone,	762,642	583,870
Spermaceti candles,	236,917	295,606
	$4,507,124	$3,453,398
THE FOREST.		
Skins and furs,	1,248,355	1,063,009
Ginseng,	177,146	237,572
	$1,425,501	$1,300,571

Product of Wood.		
Staves, shingles, boards, hewn timber,	1,953,222	2,319,443
Other lumber,	369,505	324,979
Masts and spars,	28,692	21,582
Oak, bark and other dye,	70,616	61,382
All manufactures of wood	677,420	957,790
Naval stores—tar, pitch, rosin, turpentine,	814,969	1,085,712
Ashes, pot and pearl,	1,210,496	735,689
	$5,121,920	$5,506,677
AGRICULTURE.		
Product of Animals.		
Beef, tallow, hides, horned cattle,	1,926,809	2,474,208
Butter and cheese,	878,865	1,063,087

Pork, (picked,) bacon, lard, live hogs,	2,991,284	3,883,884
Horses and mules,	385,488	382,382
Sheep,	23,948	30,303
	$6,206,393	$7,833,864
Vegetable Food.		
Wheat,	336,779	1,681,975
Flour,	5,398,593	11,668,669
Indian corn,	411,741	1,186,663
Indian meal,	641.552	945,081
Rye meal,	112,908	138,110
Rye, oats. other small grain and pulse,	177,953	638,221
Biscuit or ship-bread,	366.394	366,688
Potatoes,	122,926	69,934
Apples,	81,306	69,253
Rice,	2,160,456	2,564,991
	$9,810,508	$19,329,585
Cotton, { 1845, lbs. 872,905,996 } { 1846, lbs. 547,557,055 }	51,769,643	42,767.341
Tobacco,	7,469,819	8,478,270
All other Agricultural Products.		
Flax seed,	81,978	165,438
Hops,	90,311	41,693
Brown sugar,	11,107	7,235
Indigo,	70	80
	$183,496	$214,455
MANUFACTURES.		
Soap and tallow candles,	623.946	630.041
Leather, boots and shoes,	328.091	346,516
Household furniture,	277,488	317,407
Coaches and carriages,	55.821	87,712
Hats,	70,597	74,722
Saddlery,	20,847	24,357
Wax,	234,794	162,790
Spirits from grain,	75,108	73,716
Beer, ale, porter & cider,	69,582	67,735
Snuff and tobacco manufactured,	538,498	695,914
Linseed oil and spirits of turpentine,	92,614	159,915
Cordage and cables,	55.016	62,775
Iron—pig, bar, and nails,	77,669	122,225
Castings,	118,248	107,905
All manufactur's of	649,100	921,652
Spirits from molasses,	216,118	268,652
Sugar refined,	164,662	392,312
Chocolate,	1,461	2,177
Gunpowder,	122,599	140.879
Copper and brass,	94.736	62.088
Medicinal drugs,	212,837	200,505
	$1.099,832	$4,921,995
Cotton Piece Goods.		
Printed and colored,	516,243	380,549
White,	2.343,104	1,978,331
Nankeens,	1,174,038	848,989
Twist yarn and thread,	14.379	81,813
All other manufactures of,	280,164	255,799
	$4,327,928	$3,545,481
Flax and hemp, bags and all manufactures of,	14,762	12,129
Wearing apparel,	59,653	45,140
Combs and buttons,	23,794	35,945
Brushes,	2,206	3,110
Billiard tables and apparatus,	1,551	1,583
Umbrellas and parasols,	2,583	2,447
Leather & morocco skins not sold per pound,	16,363	25,667
Fire engines & apparatus,	12.660	9,802
Printing presses and type,	26,774	43,792
Musical instruments,	18,309	25,375
Books and maps,	43,298	63,567
Paper and stationery,	106,190	124,597
Paints and varnish,	56,165	52,182
Vinegar,	14,375	17,489
Earthen and stoneware,	7,393	6,521
Manufactures of glass,	98,760	90,860
tin,	10,114	8,902
pewter and lead,	14,404	10,278
marble & stone,	17,626	14,234
gold and silver, and gold leaf,	3,229	3.660
Gold and silver coin,	844,446	423,851
Artifiial flowers and jewelry,	10.435	24,420
Molasses,	20,771	1.531
Trunks,	3,336	10,613
Bricks and lime,	8,701	12.578
Domestic salt,	45,151	30,520
	$1,477,049	$1,101,873
Lead, { 1845, 10,188.021 lbs. } { 1846, 16,827,766 lbs }	342,646	614,516
Wool, 668.386 lbs.		203,996
Articles not enumerated,		
Manufactnred,	1.269,338	1,379,566
Other,	1,315,578	1,490,303
	$2,584,916	$2,869,869

RECAPITULATION.

The Sea—Fisheries,	$4,507,124	$3.453,398
The Forest—Skins and furs and ginseng,	1.425,501	1.300,571
Product of wood,	5,124,920	5,506,677
Agriculture—Product of animals,	6.206,394	7,883,864
Vegetable food,	9.810.508	19,329,585
Tobacco,	7.469,819	8,478,270
Cotton,	51,739,643	42,767,341
All other agricultural products,	183 496	214,455
Manufactures,	4,099,832	4,921,995
Of cotton,	4,327,923	3,545,481
	1,477,049	1,101,878
Lead,	342,646	614,518
Wool,		203,996
Articles not enumerated—Manufactur'd	1,269,338	1,379,666
Other,	1,315,578	1,490.303
	$99,299,776	$102,111,893

Of the total amount, $78,634,410 was exported in American vessels, and $23,507,483 in foreign vessels.

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CONDUCTED BY

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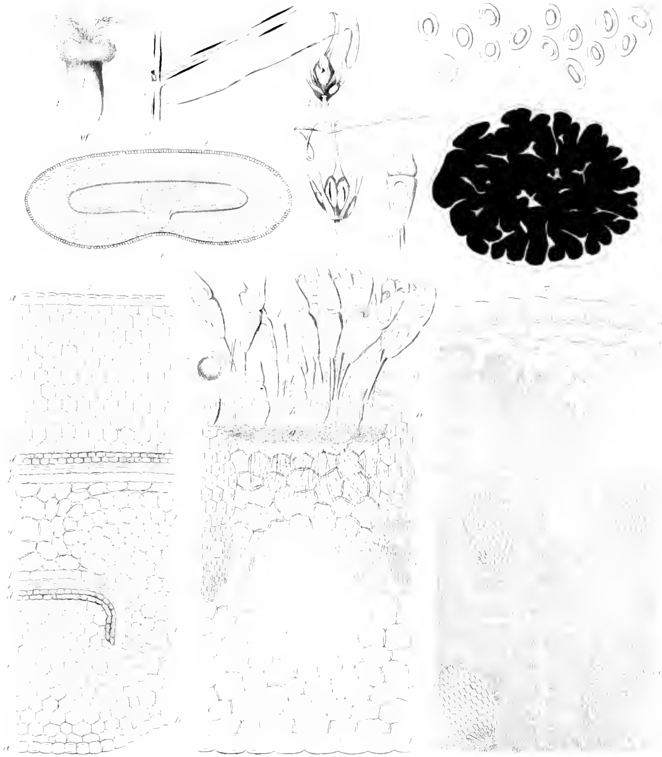


Fig 1–8 Ured. scutellum Pers. Fig 9–11 Ured. [illegible] Pers.

BRAND IN CEREALS

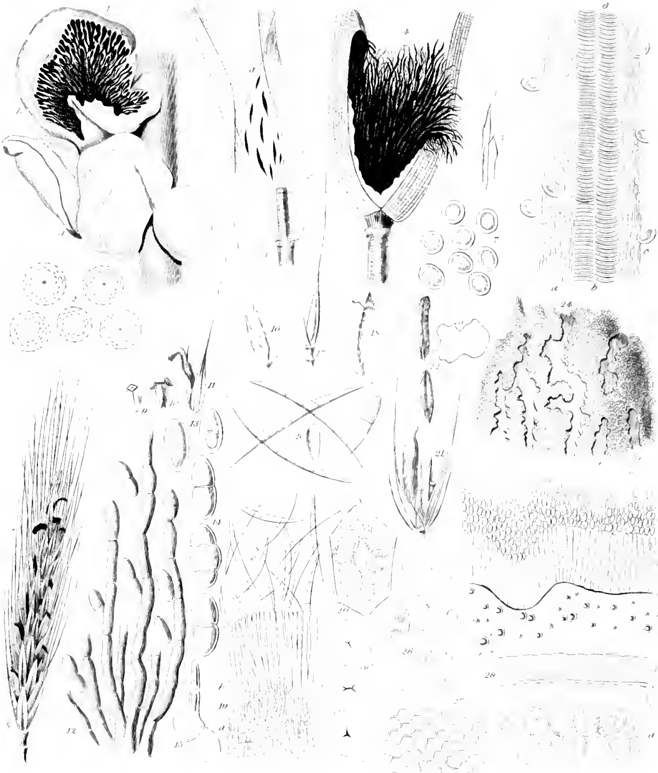


Fig 1-2 Uredo Maydis Fig 3-7 Uredo destruens Schlecht Fig 8-[illegible] [illegible] Link

Fig 15-20 Septosporium [illegible] Corda Fig 21-[illegible] [illegible] Corda

AMERICAN JOURNAL

OF

AGRICULTURE AND SCIENCE.

No. XIX. NOVEMBER, 1847.

BRAND IN THE CEREALS.

BY E. GOODRICH SMITH, OF THE PATENT OFFICE.

[Continued from page 122.]

III. The Barley Brand. *Flug Brand, Nagel Brand, Russ Brand, Rust, Staub Brand. French—La Réticulaire dés Blés, Charbon, Nielle, Fuligine, Uredo segetum, (Pers.) or Uredo hordei.**

Plate II. Figs. 1—8.

The brand which has its seat in the ears of barley, as we have already mentioned, is by not a few naturalists confounded with many of the other species of brand, which are found in our cultivated grasses. Like the wheat, oat, and millet brands, it inhabits the floral parts, (*blüthentheile*) of the barley, but it causes the most peculiar appearances in the fruit knots, in which it lodges itself. The wheat and oat brands in general, wholly destroy the fruit knots of these two kinds of grain, without causing any new organic formations, except that of the brand. But the case is entirely different, with the barley brand. Here are developed in the fruit knots, new organs, not belonging to the brand, which in the normal state are wanting in the fruit knots as well as in the seed. Between the layers of brand are formed woody bundles, (Plate II, Fig. 7, d, d), of which, on the closest examination into the young seed (the fruit knots), or in the ripe grain, not a trace exists.

If, too, we examine the fruit knots of barley (Fig. 1), in the early state and cut off a section (Fig. 2), below the middle of the little shield, (schildchen) covering the germ, (embryo) we find neither in the albumen, nor in the germ (embryo) itself when moderately magnified, any woody bundles. In order to illustrate this deficiency of woody bundles as much as possible, I magnified the section in Fig. 2, which lies between the brackets a, a, and is

*Tessier. Traite des maladies des grains, page 306, Fig. 2—4.

represented in Fig. 3; and we can hence clearly discern the structure of all the particular parts which constitute the fruit knots, as well as when ripe, the seed on the outside the outer skin (seed skin), (Fig. 3, a, a), formed of thick-walled cells, standing in a single layer, covers the fruit knots, somewhat bending in on the fold, lengthwise of the fruit knot, (Fig. 3, b); directly beneath the same lies the second seed skin, which afterwards forms the albumen (c, c), and which is composed of six-sided cellular tissue, filled with small fine grains. In the hollow space of this, lies the third seed skin (Fig. 3, d, e, f, d, e, f), which is formed of triple layers of cells, and appears to open towards the fold lengthwise or to the inner side of the seed (Fig. 3, g). The first or outermost layer of the same consists of small green cells arranged in double layers (Fig. 3, d, d); the second layer of clear, thick-walled cells also in double layers (Fig. 3, e, e); but the third layer is formed of a single layer of large white cells almost as clear as crystal (Fig. 3, f, f). This layer directly encloses the cellular tissue forming the nucleus or kernel of the germ of the plant, (*pflantzencie*) (Fig. 3, h), and which is composed of large, somewhat round, yellow thin-walled cells, containing juice, and which afterwards is absorbed by the formation of the embryo or germ, (Fig. 3, j, i). If now we view this section of all the organs constituting the fruit knot and seed, we find in it not a vestige of a woody bundle.

On examining the fruit knots which are affected by the brand, (Fig. 4, 5), we can scarcely discern the form of the sound fruit knots. All the organs of the flower, the calyx, leaves, petals and awns have wasted away, being affected by the brand, and thereby more or less luxuriantly excited; the awns, are twisted many times contrary to their normal form, and often bear little brand pustules in their grooves. If now we take a section of a fruit knot attacked by the brand, and examine it with the microscope (Fig. 6), we shall find the outer skin of the same remaining perfect, and the mass of brand itself of the outer skin intersected with white transparent and apparently watery veins, like the white veins in a black mushroom. On still further examining, by help of the microscope, particular portions of such a very delicate section (Fig. 7), we find as we proceed from the exterior to the interior, the outer skin (Fig. 7, a), remaining entirely perfect and formed like the outer skin of the sound fruit knot (Fig. 3, a), only its cells are swelled out, and somewhat larger. Directly beneath the outer skin a, we find that the veins which run through the mass of brand consist of a large celled tissue filled with a juice as clear as water (Fig. 7, b), which undeniably owes its origin to the tissue of the albumen or the second germ-skin (*eihaut*). Between this tissue lie balled up in compact smutty masses, the grains of brand c, and in the midst of them we find scattered woody bundles (Fig. 7, d, d), formed exactly like the woody bundles of the haulms of the grasses, (Fig. 10, c), and like the woody bundles of the grasses having their vessels towards the centre of the stalk (here the former, but now metamorphosed stalky fruit knot) and with thick-walled cells of the inner bark (*bartzellen*), but appearing to lie toward the periphery.

This formation of new, earlier, woody bundles, not to be found in the normal state, in the hollow space of the fruit knot, is a very remarkable appearance, and among numerous explanations which might be given for it (until fuller observations furnish a more satisfactory method of accounting for it) I shall regard it as the product of a retrograding change of the fruit knot caused by the formation of the brand.

The masses of spores of the barley brand (flug brand) itself, forms a disagreeably smutty black mass, varying into an olive green, and the spores on being very strongly magnified are oval, inclining to round bodies (Fig. 8), the clear transparent yellow-brown skin of which, and the spore kernel lying loose and separate, is of a beautiful green color, and under pressure appears to be a tolerably compact wax-like substance. The spores are minute and their diameter varies from 0.000340 to 0.000380 of a Paris inch.

This brand, like the oat brand, sheds its powder on the field before the harvest, and in respect to its seeding, I would express the same opinion I have done in regard to the oat brand. Like all the other kinds of brand, it appears most abundantly in moist cool seasons, on wet soil, and in seed which has been carelessly cleaned or selected.

Explanation of the Illustrations.

Plate II, Fig. 1, a young fruit knot, (or bead) of barley, slightly enlarged. Fig. 2, a section of the same much magnified. Fig. 3, portions of the section marked by the brackets a, a, in Fig. 2, greatly magnified; a, a, the outer skin; b, its bend inward on the outer fold lengthwise of the fruit knot; c, c, the second seed skin on the albumen; d, e, f, the third seed skin formed of three layers which appear open on the side at g; h, the kernel of the plant-egg with the embryo i, i. Figs. 4, 5, seed buds (*blüthen*) of the barley affected by the brand of the natural size, taken singly from the ear; Fig. 6, section of a fruit knot of barley affected by the brand, and magnified in order to show the outer skin, the white veins and the black masses of brand rolled up together. Fig. 7, a very delicate section of the fruit knot of barley affected by the brand, strongly magnified; a, the outer skin with its almost normal cells only somewhat enlarged; b, the remains of the cellular tissue, large, slight-walled, are derived from the albumen of the fruit knot, and yield no little grains of sap, but a juice clear as water; c, c, the mass of the brand spores; d, d, the abnormal woody bundles, lying between them which with their narrow tapering side towards the middle of the fruit knot, contain a single vessel, its woody cells small, six-sided and thick walled. Fig. 8, brand spores very greatly magnified in order clearly to show the spore skin and dark spore kernel.

IV. The Stalk Brand, *Stiel brand of the Grasses, Puccinia graminis* (*Persoon*).

Plate II. Fig. 9—11.

It infests only the stalk and leaves of our grasses and grain, and forms long, slender, dark-brown, somewhat swollen patches (Fig. 9), which are surrounded lengthwise on both sides by the remains of the outer skin of the stalk or leaves. These patches are formed beneath the outer skin, and before they break forth they appear in dark-brown shining stripes glistening through the outer skin. After they have broken forth, they are conglomerate.

If now by the help of a very sharp razor we cut off a delicate, perfectly transparent section of a culm or haulm affected with the stalk brand, running through a patch on the stalk brand which has already broken through (Fig. 10), we can clearly see its structure.

We see on the side of the patch of stalk brand, the cells of the outer skin (Fig. 10, a), separated and curled up, and also that this separation of the outer skin takes place between the two parallel woody bundles (b), and rarely runs out over an intervening bundle. Directly beneath the outer skin we find the layers of the parasite bearer (g, h), on which stand the spores (l).

But here occurs a very remarkable circumstance. The stalk brand is very rarely indeed a primary parasite on the plant. It is usually a parasite on a parasite, and especially in the *red rust* of the grasses (*Uredo rubigo vera De Caud*); and the layer of the bearer lying immediately under the outer skin, (Fig. g, h), only directly belong to it, the lowest layer lying on the cellular tissue and destroying it, (g) is flaky, rough (*derbe*) and pale colored; it forms the peculiar bearer (*Hypostroma*) of the fungus. Above developes itself a layer of cells (b), more equal in height, more perpendicular, finer, more fibrous and simple, which naturalists call basilar cells, and between which from some of them are formed by a direct club-shaped enlargement (Fig. 10, i), the spores of the red rust; which continually increase in size and finally become globular and of a deep orange-red (Fig. 10, k). In this mother-fungus the stalk brand as it were, fixes its nidus (Fig. 10, l). Its spores likewise sprout between the basilar cells (h), and rise upward while they form long, delicate stalks, on which they stand singly. But from these stalks also spreads downward through the layers g, and h, of the mother fungus, a fibrous tissue formed of divided fibrous cells, which branch out in many ways (Fig. 10, e), break through and interweave the cellular tissue of the grasses, and thus crowd into the vacancies and hollow spaces of the haulm. Often they press through the entire substance of the plant and form, particularly on the leaves of the grasses, beneath the upper skin of the opposite surfaces of the leaves, only patches of the stalk brand; which then commonly is wanting in the previous red rust. But frequently the upper skin of the opposite surface remains uninjured (Fig. 10, f), while the cellular tissue is not entirely interwoven with the fibrous tissue of the fungus, and only slight discolorations of the portion opposite the parasite, take place.

The spores (Fig. 11), of the stalk brand consist of two somewhat globular cells placed one above the other, with strong, hard, stratified, brown-colored transparent spore skin, that in the upper cells, towards the point, is decidedly thickened. In each one of the two cellular spaces we find a pale colored, waxy, and for the most part egg-shaped or elongated spore kernel. The spore stalk is a glassy, clear, round, fibrous cell, with a minute hollow space. On the base where it passes over into the bearer, it is a little thicker.

The stalk brand is injurious to farmers, only when it affects the straw and meadow grasses, in an extraordinary degree, as such are scarcely ever eaten by cattle. If the straw is employed for the purposes of manufacture, then a very frequent occurrence of this brand is extremely injurious, because the assorting of the straw costs much trouble and labor.

Explanation of the Illustrations.

Fig. 9, a stalk and part of a leaf affected by the stalk brand, of the natural size. Fig. 10, a delicate section through a patch of the stalk brand on a haulm of rye, magnified; a, the outer skin rolled back by the brand; b, outer cluster of cells in the inner bark (*bartzellenbündel*) of the woody bundle; d, the parenchyma of the haulm; e, the deficiencies in this parenchyma; f, outer skin of the opposite surface; g, the bearer of the red rust; h, the layer of basilar cells; i, the young spores of red rust; k, a ripe spore of the red rust; l, ripe spores of the stalk brand, standing in a patch. Fig. 11, a ripe spore, as above, of the stalk brand, greatly magnified, in order to exhibit the two cells, the cellular kernels, and the spore stalk.

V. The Maize Brand. *Uredo Maydis*, (*De Candolle*), *U. Zeæ*, (*Chevalier.*)

Plate III. Fig. 1—2.

All the species of brand more or less, cause decisive injury to the organs of the plants which they infest. But the maize brand among all the kinds of brand found in our cultivated grasses, produces the greatest and most extensive local transformations. It attacks all the parenchymatous organs of the maize plant and more or less completely destroys them. The stalk, however, the female and male blossoms, are the parts which it most especially affects. The leaves no longer furnish the great parenchymatous masses necessary for their development, and usually it seizes merely on their lowest parts or also only on the husk bearer. But its development here is already imperfect, and it forms on the leaf-organs, only brand bladders of the size of a poppy seed to a pea. In all the parenchymatous organs however, it developes itself in the form of masses, and in good soil, and in actual cultivation of the maize, I have seen brand bladders of the size of a child's head. Its development is a peculiar one, as it forces out great masses of cellular tissue, formed from the tissue of the mother plant, and similar in formation to the latter.

Some parts of the organs affected by the brand swell and become white. The green color and compact formation of the outer skin gradually passes into a soft watery tissue of a silky lustre; the skin of which allows the large cellular formation to be seen through it by the naked eye. If we more closely examine this pathological product, we find that it consists of tolerably large tender walled substance, the cells of which, like that of the normal vegetable tissue, contain sap, and possess a large slimy cellular kernel sticking on the side. In each of these cells at a later period is secreted a slimy granulous substance, which is yellowish, and afterwards brownish, in which still later the brand is developed. Prof. *Meyen* examined this brand formation very critically, and we may here be allowed to repeat his investigations:

At first is seen in the large and juicy cells of the maize plant, or especially in the pathological cellular substance, the above mentioned little deposites of slime, which are produced on the inner surface of the cellular walls. From these, at first wholly irregularly-formed, almost transparent deposites, proceed fibrous, dismembered and branching structures, which already exhibits a plant-like form, and which by their later changes more clearly evidence the same. These truly parasitic formations are in the beginning colorless, almost entirely transparent, and only under a strong magnifying exhibit a fine grained organised structure in their tender, slimy substance. But soon it is observed, that particular boughs of this little plant are branched out, and in individual cases yet more developed, branches and twigs stand closely crowded together. At the same time with this branching, the fibres are already partially separated into small globular bodies, sometimes at the base, and sometimes at the point of the fibres; but for the most part their little side branches first separate off themselves. Many fibres are wholly changed into little branches in a wreathed form, which still hang together. They are originally ellipsoidal and then become more or less globular, are at first of a yellowish and afterwards of a brownish color, and at last brown. But they likewise separate themselves from the branches producing them, and often before they have reached their normal size, which follows after their separation as it were by a sort of after ripening. By and by all the fibres fall away into such spores or grains of brand; by and by too the cells of the diseased vegetable substance are destroyed, and if we carefully cut through lengthwise (Fig. 1, b), the brand bladders not yet opened or sprung apart (Fig. 1, a); we find that the white cellular substance appears to be interwoven with irregular masses of brand, partially isolated and in the form of cells; the cellular substance which still remains standing, forms white sheath walls, and cells, or better described, deficiencies, the hollow space of which is filled with the dark-brown brand. By and by this remains of the cellular tissue constituting sheath walls, becomes absorbed, and only the outer skin of the brand bladder continues standing; but it begins likewise to be colored reddish, or smutty, to become wrinkled or in folds, to dry up and finally to tear open, by which the substance of the brand spores is emptied and as it were sown out. This species of brand causes manifold degenerations of particular parts and organs of the mother plants. On the stalk it forms irregularly rounded brand bladders, very greatly differing in size. On the female blossoms it never attacks all the blossoms (*blüthen*) of an ear; the blossoms on the top of the ear are for the most part more exposed to the brand than those at the base. Often only those fruit buds that stand at the very tip, and frequently only the basilar ones are diseased. Here the brand attacks only the fruit knot and changes it directly into a brand bladder; so that indeed a person may find on the latter still the remains of the wasted pistil. But the rachis (midrib?) itself I have never found entirely gone. More frequently it seizes on the husk leaves, and then changes the whole ear or the fruit bearing branch into an organ not unlike a pine apple, it thickens all the leaves and forms them similar to the scales of a fir cone. But in the male blossoms (*blüthen*) the brand seizes on the receptacle and the anthers, more rarely the petals and changes all these organs into white, curled-up, easily-bent brand bladders, one to three lines thick and often two or three inches long, which are likewise white, and of a beautiful silky lustre, slightly tinged with red at the tip and on the side springing open to let out the spores.

The spores (Fig. 2) in their normal state are globular, but they are very frequently likewise somewhat ellipsoidal. In a ripe state they are brown. The spore skin is covered with little warts and on many spores may be observed a dark point in the middle, the little opening (feusterchen? hilum) by which they were fas ened to the fibrous bearer. Their diameter varies from 0.000320—0.-000340 Paris inch.

This species, always impairs some blossoms, as soon as it is seated in the ear, while the other blossoms standing near bear good ripe kernels. The brand bladders can be very easily removed from the living plants by cutting them out, only this must be done as timely as possible in order that in cutting them out, the bladders may not scatter their powder, and thus a future crop of brand not be prevented. For seed only kernels should be selected from plants which have remained wholly free from the brand. This kind of brand is by the structure of its spores different from all others, and only related to the wheat brand.

Explanation of the Illustrations.

Fig. 1, brand bladders; a, on the stalk of maize of the natural size; b, such a brand bladder cut through lengthwise. Fig. 2, spores strongly magnified.

VI. The Millet Brand. *Uredo destruens*, (*Schlechtendahl.*)

Plate III. Fig 3—7.

As the maize brand by the formation of a mass of abnormal cellular tissue produces a peculiar covering for itself, even so, or at least analogous thereto, the millet brand produces for itself, its own peculiar covering, in which it enwraps and vitiates the collective organs of blossoming and fructification or of the panicle. Here the original formation enters within the panicle sheath, and the leaves which invest it in its earliest growth; and as soon as the brand reaches the outward surface or becomes visible, it is already perfected and immediately ripe for sowing its seed. It comes forth as a white, thin, oval-elongated body between the capsular leaves of the millet (Fig. 3, a), which on closer examination appears rough on the outer surface and resembling the outer form of an egg shell. This outer skin is very brittle, and usually becomes split into many wide openings, running lengthwise (Fig. 3) whereby the dark-olive spores are rendered visible. But in the ripening of the brand, this brand covering almost wholly falls to pieces and we find only its scanty remnants of the base.

After its destruction the mass of brand appears intersected as it were, by numberless thin sparry fibres, (Fig. 4, 5); these fibres are the woody bundle of the panicle stems (Rispenstiele) which are wholly destroyed up to these. Under the microscope we plainly see, that these fibres (Fig. 6) are the woody bundles divested of the parenchymatous tissue, to which remains nothing but the layer of inner bark, (Fig. 6, a), and the spiral vessels, (Fig. 6, b). But before the observation is made, we must carefully cleanse them from the spores which stick to them (c), and which render impossible any observation, as they surround them with a tolerably strong layer.

The spores (Fig. 7) are oval-globular, smooth, transparent, olive-brown, with large kernels filling the hollow space of the spore skin, and having pretty distinct little openings (feusterchen? hilum) Their diameter varies from 0.000420 to 0.000430 Paris inch.

From the formation of this general covering of the brand skin, the husbandman can very easily keep his millet seed clean from infection; provided he causes the branded ears to be carefully removed in time and burned. But they must not be cast on the dunghills, for multifarious experiments teach that the spores of the fungus will retain their germinating power for years in the earth, and they will even pass through the digestive organs of animals and be discharged perfectly unimpaired and produce new fungi, as I have particularly observed with respect to the common toad stool.

Explanation of the Illustrations.

Fig. 3, a millet plant with the brand a, not yet fully opened. Fig. 4, a brand shedding its powder of the natural size. Fig. 5, single fibres of this brand of the natural size. Fig. 6, such a fibre magnified; a, the cells of the inner bark; b, the spiral vessels of the woody bundles; c, the brand spores. Fig. 7, spores strongly magnified.

VII. The Rye Brand. *Roggen or Rauch brand, Cladosporium herbarum, (Link.)*

Plate III. Fig. 8—15.

It has been already remarked in the Introduction, that the author of these pages has never found rye affected by any kind of brand; which observation has been confirmed, as regards the flug brand in the following words by Prof. Dr. Kunze of Leipsic. "Obs. It is called flug brand by the farmers of Germany. It is remarkable that it never infests the cereal rye. (The fungi of Germany, No. 9, page 5, Leipsic, Voss., 1819.")*

When we therefore give to the following parasite the popular name, we by no means wish thereby to discredit the above expressed experience, and would observe that the rauch brand of rye is no species of brand, but is a kind of fungus. It affects rye in moist cloudy seasons, and is especially found in narrow high mountain valleys. It is not developed in the tissue of the mother plant, but it seats itself on its upper surface, and only sends the fibres of its root-texture into the substance of the mother plant. In rye this parasite nevertheless hinders the full ripening of the grain, and the seeds of the ears attacked by it are small, stunted, horny, and give a poor flour which is still more affected by the parasite, as the washing and moistening of the grain before grinding, cannot remove it; but on the contrary fixes it more firmly than before.

This brand, the rauch brand, belongs to the fibrous fungi and appears at first as a slight blackening of the ears, as soon as these begin to ripen and turn yellow. In its developed state it forms on the ears irregularly shaped rough masses (Fig. 18), of a dark-olive color varying to a blackish hue. This seats itself especially on the heads of the seed corns (Fig. 9, 10, 11), and only in its very highest development passes over to the other parts of the fruit bud and unites itself with them. If we closely examine this olive-green substance, we find that it consists of perpendicular articulated olive-green, transparent fibres (Fig. 12), which develope on their points elongated spores that afterwards fall off and appear scattered in among the fibres. These spores are sometimes one celled (Fig. 13), sometimes two and three celled (Fig. 14), and are light olive-green, smooth, with a delicate spore skin. In every spore cell is found a slimy spore kernel filling the hollow space. The diameter lengthwise of the spores varies from 0.000300 to 0.000860 Paris inch. The spores sprout again on the ears still standing in the field (Fig. 15), while one of their cells spreads out sideways and forms an articulated cellular fibre, like the fibre of the developed fungus (Fig. 12), which in moist and warm weather in the course of twenty-four hours again produces a new plant and new spores. This rapid reproduction makes this fungus so injurious in moist warm autumn weather, and if the grain comes to the threshing in a moist state, the fungus also increases in a truly frightful manner, indeed in damp granaries, or

* Obs. Flug brand, ab agricolis Germanial vocatur. Insigne, quod Lecate, cereale nunquam infestat. (Teutschlands Schwamme. No 9, s. 5, Leipsic, Voss., 1819.)

when the kernels are somewhat moist it increases most extraordinarily and sticks the kernels together.

Explanation of the Illustrations.

Fig. 8, an ear affected by the rauch brand of the natural size. Figs. 9, 10, 11, seeds and fruit buds (*blüthen*) of rye, affected by the rauch brand of the natural size. Fig. 12, single fibres of the fungus with spores. Fig. 13, single celled. Fig. 14, many celled spores much magnified. Fig. 15, a germinating spore of the rauch brand greatly magnified.

VIII. The Red Corn Brand. *Spindel brand, Septo sporium graminum* (*Corda*). *Fusarium heterosporum* (*Nees*).

Plate III. Fig. 16—20.

This parasite likewise belongs not to the species of brand, but to the fungi on the outer skin (*haut piltzen*). It appears on the fruit knots of the grasses, especially of the ray grasses, and of rye, and forms on the same, a deep-red, compact, afterwards confluent, moist gelatinous mass, which, generally, is from two to three times, but often becomes half an inch long, and sticks together the parts of the fruit bud (*blüthenthiele*). The kernels or seed of the grasses when they are attacked by this fungus appear swelled up and deformed (Figs. 16, 17, 18), and their outer skin is wholly impaired, while the albuminous substance remains totally unaltered, and the starchmeal also undergoes no perceptible deterioration. The fungus itself, as seen in their sections under a microscope, forms directly over the destroyed seed skin, a confused cellular, fleshy, thin, reddish-white layer (Fig. 19 a); on which the cells forming the spores called basidal (Fig. 19, b), are developed, as single separate fibres. These cells form on their tops and partly between themselves, long spindle-shaped, four celled, transparent, pale-red spores (Fig. 19 b, 20 c), tapering at both ends, of from 0,00090 to 0.00110 Paris inch in length; which when balled up together compose the deep-red cover of the fungus. Between the spores are often found wasted three celled or single celled egg-shaped spores (Fig. 20). The fungus itself is not injurious, but on damp meadows it often to a considerable extent, deteriorates the ears of ray grasses; on rye I have seen it to appear abundantly, only in quite elevated situations on the borders of the rye culture.

Explanation of the Illustrations.

Figs. 16, 17, 18, single degenerated seeds of rye affected by the fungus of the natural size. Fig. 19, a thinner section of the fungus magnified; a, the fleshy bearer, the bassidæ; c, the spores. Fig, 20, single spores much magnified.

IX. The Ergot. *Mutter korn, Kormz apfen, Roggen mutter, Martin's korn, Halinsporn, Todlenkopf, Gerslen mutter, &c. Hymenula Clavus* (*Corda*). *French—Ergot,* (*Tessier, Malad. des grains, p.* 21). *English—Cockspur, Black grain of corn, Ergot.*

Plate III. Fig. 21—30.

This disease so noxious to our cultivated grasses ever since the time of Tessier, has been investigated, in various forms, as to its natural history by *Queckett, Bauer, Fee* and *Léveillé,* and the illustrations of it as well as the hypotheses of its origin have induced critical study respecting this so simple fungus. More particularly has the transformation of the seed in the fungus been subjected to examination; but without any previous decided knowledge of natural history, and the microscopic analyses, have been very negligently performed by naturalists. On the other hand however, it has been carefully inquired, whether or not this or that part of the seed was contained, and could be discovered in the ergot. Similar has been the case with the investigation of the parasite which causes this deformity, it exhibits numerous names of naturalists because they have made no perfect analysis of the fungus. The reader who may be interested in the contradictory opinions, often expressed, may find the same scattered through the following works:

Meyen ueber das Mutter korn, in Müller's archiv. for Anatomie und Physiologie, 1838, § 357.

Spiering de Lecale cornuto. Diss. inaug. Berol. 1839. Léveillé Memoires sur l'ergot. In the Mém. de la Societ. Lienéenne de Paris, v. p. 365.

Phoebus Teutsche, Giftgewachse, 1838, p. 97.

Meyen, Pflanzenpathologie, 1841, p. 195.

Observations on the cause of Ergot, by Mr. James Smith.

A. L. S. Linnean Society Trans. XVIII. 3 p. 449.

Observations on the Ergot of Rye and some other Grasses, by Edwin J. Queckett, Esq., F. L. S. (Linn. Tr. 1 c. p. 475.)

For the sake of brevity I shall here omit all the opinions and views, and only relate what I have myself observed, and can also be responsible for, little as it may indeed be.

If we closely examine the seed affected by the ergot, we find it covered with a bluish-gray growth, resembling down, which is easily wiped off, whereby the dark-violet color of the layer beneath is made to appear. In many seeds we see the pistil still remaining and thickened towards the top (Fig. 21), but in all these are yet found traces of the little shield (schildchen), (Fig. 22), at the base of the fungus. Viewed in the section, the fungus forms a white, compact homogenous mass, which at the first appears to be composed of the dark line of the basilar layer, and from the middle to the margin exhibits yellow, unequally connected rays (Fig. 23). On considering the outer surface still more closely, the ergot, in almost all the portions I have seen, is found covered with four furrows, or cracks on the side lengthways, which often penetrate through the black covering. If now we examine the individual parts of the already ripened kernel from without, with the microscope, we find that the rime, or white growth, is spread in fine downy masses (Fig. 24, a), over the black covering b, and that it is formed from the fruit bed (frucht-lager) of the fungus which thus transforms the seed. Cut off a very thin section; but it must be taken off through the fine downy mass of the fruit bed, without destroying it; we find on examining from the interior outward, (1), that the *inner white mass* of the ergot consists of an extraordinarily fine cellular tissue (Fig. 25, d), which in section under water, gives out drops of oil more or less large (Fig. 25, e). This viewed by a stronger magnifier, consists of small six-angled somewhat thick walled cells (Fig. 27), each of which contains within it one or two little drops of oil. The oil is yellowish, and on the light being passed through it, greenish. This mass of cellular tissue forms the peculiar bearer of the fungus, and as it were runs into the stem and cap, and towards the outside terminates in a dark black line (Fig. 25, c), which consists of a simple layer of black cells, imparts the black color to the fungus seen from without, and forms an extremely thin layer, on which (2) the fruit bed (frucht-lager) of the fungus toward the outside rests. This consists of a single layer of fibrous, single one celled undivided basidial cells (Fig. 25, b), of white color, which towards the upper part produce and accumulate the spores (Fig. 25, a, 3). The spores form fine down that may be rubbed off, on the spurred grain, and to this is to be attributed in a great degree the poisonous effects of the ergot. They are, viewed when powerfully magnified (Fig. 26) elongated, ellipsoidal, often curled upon the side, smooth, greenish-white; their spore skin is extraordinarily delicate, transparent, lying close to the crooked, greenish, wax-like, transparent spore kernels, and frequently containing two greenish little drops of oil. The spores are from 0.00030 to 0.00035 Paris inch in length. When placed on fresh moist fruit knots or on other portions of the plant, they germinate with extraordinary rapidity and on the object bearer of the microscope under water we can see them germinate also in twelve to twenty-four hours, while they lengthen out one or two points of their spore skin into fibres, and these fibres afterwards open into cells, whereby from the branching out at the openings as it were, a new root texture is formed for the future fungus. It is a matter of regret that Messrs. *Queckett's* and *Francis Bauer's* illustrations of this microscopic process are so unsatisfactory. I shall repeat them elsewhere after my own observations.

According to my accurately made analysis, the fungus belongs to the species Hymenula among the fleshy fungi, where also on decaying remains of plants it has a multitude of associates, which likewise greatly impair and destroy their mother plants and lodging places. The noxious quality of the fungus as well as its medicinal use I take for granted to be already well known, and will now pass over to the comparison of the appearances in the diseased and the sound seed, in order to sketch the injurious power of this hardly visible parasite.

If a thin section of a sound kernel of rye be made (Fig. 28), we find that the seed skin (Fig. 28, a), consists of three thick walled cellular layers, and beneath these we find the second seed skin, properly the third, formed of a single layer of thick walled cells b, with scarcely any perceptible hollows. Directly after this follow the cellular layer, containing gluten c, and now first the cellular tissue of the albuminous substance d, which consists of large, somewhat round, six-sided cells, containing grains of starch meal (Fig. 26). The grains of starch meal themselves are roundish or ellipsoidal (Fig. 30), and formed like all other grains of starch meal; they are 0.000150 Paris inch in length, and are thus nearly five times larger than the spores of the parasite itself.

But all these organic tissues are transformed, or as it may be better expressed, entirely crowded out. The seed skins and cells of gluten (Fig. 28, a, b, c) in the parasite, are only indicated by the black layer (Fig. 25, c); the large cells (Fig. 28, d, Fig. 29) of the albuminous substance together with their amylum have disappeared, and are replaced by the cells of the bearer (Fig. 27) nearly fifty times less in size. The amylum here, as the contents of the cells, is replaced, as it were, by the little drops of oil contained in the cells of the bearer. And as the organization of the seed is wholly changed, so too are the organic effects of the two substances become different. The grain of rye was nutritious, palatable, healthy; the spurred rye (Mutter korn) is in the highest degree noxious, poisonous, the means of producing raphanic, insanity, and abortion; its medicinal usefulness is by no means a counterbalance to the dangerous, poisonous effects, which it produces when introduced among human food.

I conclude here the first course of investigations respecting the diseased appearance of plants generally, and once more beg of the respected reader to judge candidly and favorably of these desultory pages, and to receive the matters of fact related and illustrated without any fanciful forms of knowledge, as the pure observations of nature. Elsewhere when I shall consider these appearances in their most intimate connections with the functions of life, of the vegetable organization, collectively, these same may be more extensively estimated and the appearances, here only slightly indicated, then by an accurate anatomico-physiological delineation of the general organization, may receive their far more natural and comprehensive explanations and illustrations. The respected reader will probably thank me for having here avoided all foreign observations, and that I have only given my own experience, and kindly acknowledge it, since I have performed my work to the best of my ability.

Explanation of the Illustrations.

Figs. 21, 22, the spurred rye in its natural size. Fig. 23, a section of the same seen under a microscope and slightly magnified. Fig. 24, the top of a spurred rye-kernel seen under the microscope greatly magnified, in order to show the layers of spores b, and the bearer a. Fig. 25, a thinner section of the spurred rye very strongly magnified; a, the layer of spores; b, the basidal cells; c, the outer skin of the bearer; d, substance of the bearer; e, little drops of oil from the substance of the bearer, with the oil bearing cells powerfully magnified. Fig. 28, a thin section from a ripe kernel of rye much magnified; a, the seed skin; b, the inner seed skin; c, cellular layers of gluten; d, albuminous substance formed from the cells that bear starchmeal. Fig. 29, a cell of albuminous substance with grains of amylum very strongly magnified. Fig. 30, single grains of amylum of rye very strongly magnified.

The readers of this journal who have examined the article now first offered to the public in an English dress will doubtless have noticed the use of some words which are new to our language. Those only who have attempted to transfer a scientific essay from one language to another can fully appreciate the difficulties under which a translator labors in finding the requisite words to express his meaning. Especially is this true in respect to the production of many German writers. The investigations are carried out into such minuteness of detail, that no corresponding terms are in use among us to give the precise shades of thought implied in their compound words. For example the words *Blüthen Blüthenthiele, Frucht knoten, Frucht boden, Feusterchen,* &c., in certain modes of using them, mean a particular state of the floral or fructified plant for which we have no appropriate words. The meaning, is perhaps evident in the course of the observations of the author and by a reference to the illustrations. Our German dictionaries are wanting in many of these scientific words. I have availed myself of such helps as were within my command, and in view of the difficulties of the subject have sometimes ventured to give only a literal translation by a similar form of compound, leaving the connexion to show the meaning. In some few instances, after all the pains I have taken to arrive at the precise sense, I am not quite certain that I have gained my object. In the main however, I believe that the article will be found to be accurately translated, and as such, cannot but hope that it will be regarded as not an unworthy addition to the stock of information respecting the diseases of our most important cereals.

Since I have been engaged in this translation, I have met with an essay by the same author on the Potato Disease, characterised by the minuteness of investigation and accuracy of discrimination which is so evident in the foregoing pages; and illustrated by a number of plates, some of them colored, giving the microscopic appearances observed. At some future period, when my time will allow, I may prepare for the press this article on the Potato Disease, with perhaps a few other valuable selections from the German economists and naturalists.

MINING REPORT, NO. I.

The importance of possessing accurate descriptions and delineations of veins and deposites of mineral matter, can scarcely be overrated. The same mineral, for example iron, occurs under a great variety of circumstances; it is found in beds and veins, and in deposites interstratified with slate, sandstone and calcareous rocks. When in veins, considerable diversity attends its distribution in the rock. In this business it is useful to know what combination of circumstances are favorable to the project of working a mine, and what are unfavorable. So, it is important, as all may understand, to know what rules have been established for the working of those mines, which furnish certain irregularities, which deviate from the ordinary course which in general they are well known to follow.

The kind of information which is wanted, is not readily attainable. What has been published is scattered through many journals, but the greater part remains with the miner, or the geologists who have made this subject a matter of attention. It seems that what is wanted is the collation of facts, as furnished by the workings of the mines of this country. Observation, or experience is of course at the bottom, and it is only by an extensive series of observations that a safe system of mining can be pursued here The matter assumes every day greater importance inasmuch as the business is every day increasing, and being one which is necessarily attended with greater expense than the ordinary kinds of business, it becomes still more imperative duty to post up the facts and classes of facts which have been discovered. It is for these ends that we now propose to give a series of reports on the mines of this country, and which we trust will not prove unacceptable to our readers. We regard this kind of information as interesting to the farmer. He is usually the owner of the soil, and it is for his interest to know at least what the probabilities are for the existence of a valuable mine, or on the contrary what facts and phenomena accompany a deposit of ore which prove it worthless.

It is proper to observe here, that quantity of ore is not always a fact of sufficient consequence to give value to a mine. It may be valueless, simply from the hardness and toughness of the ore or rock which contains it, as the ore has to be broken fine, and hence its toughness may diminish its value. The distance from market, and a variety of other circumstances modify the value of any given mass of ore, or the presence of phosphate of lime, sulphuret of iron mixed with an ore of iron. It is necessary therefore that all such drawbacks upon the value of this kind of property should be well known and understood. In such cases inspection is often sufficient to enable the person who is skilled in these matters to set the question of value at rest without the expense of a trial or an analysis.

Our first report is upon the Winter ore bed, a deposit of iron ore which has been known for twenty years or more, and has been worked at times with varied prospects. Before, however, we enter upon the details of this report, it is proper that a few remarks should be made upon the geology of the region in which it is situated, and this is the more proper inasmuch as we shall speak of several mines in this vicinity.

1. *Geology of the region.*—The region referred to, is situated upon the borders of Essex and Clinton counties. The rock is gneiss, though mixed with both fine grained and reddish granite. Veins of granite and of quartz and small beds of coarse hornblende frequently occurs, but, as a whole, the rock is quite homogeneous and presents so few irregularities that very little requires to be said of it. The neighborhood of the Winter ore bed, may be regarded as a mineral district, inasmuch as numerous veins are known and worked in its vicinity. This is the most striking feature in its geology. A range of mountains pursuing a northeasterly direction and coming from the southwest from Moriah and Chesterfied in Essex county, terminates at Port Kent in Trembleau point, this range bounds this mineral district on the southeast, and is more decidedly granitic; it is also intermixed with beds of hypersthene rock, very good examples of which may be found near Port Kent. In this range,

heavy beds of primary limestone are not uncommon, some of which are sufficiently pure for lime. One of these we discovered about two miles south of Clintonville, and beneath a remarkably heavy precipice of gray granite. Some geologists have been disposed to regard these beds and veins of limestone, for it occurs in both forms, as old sedimentary deposits of limestone over which granite has been poured in a moulten state. That such an occurrence might happen, there is no doubt, and that granite more recent than our Trenton limestone exists no geologist of the present denies. Still, that these beds of limestone are sedimentary deposites and have been altered no one can prove. Indeed the facts all go to show that the limestone is an unstratified rock, and is analogous to granite, and belongs to the primary class, is sufficiently proved. The phenomena supporting this view of the subject have been fully given in geological reports of the second Geological District of New York.

Another interesting feature of this region, though by no means confined to it, is the numerous trap dykes which traverse the work in one principal direction, viz., to the northeast or some point between north and east. These dykes invariably cut across the veins of ore, which they more or less disturb. It is apparently due entirely to this disturbing force that the veins are forced out of their usual course or direction; or in other words the expense and hazard of working the veins, is incurred by the disturbances which may be traced directly in many cases to the changes effected during the process of filling rents with molten matter from beneath. Undoubtedly the forces which first fissured the rock anterior to the time at which they were filled, produced the principal disturbance which miners complain of. However this may be there seems to be much regularity in the disturbances as well as in the direction of the veins and dykes. Hence the study of these disturbances becomes a matter of considerable moment in a practical point of view, for the phenomena of one vein are often repeated in many, and what illustrates a system of veins, dykes and disturbances of one district, illustrates also those of another.

The surface of the rocks of this region is covered very extensively with a fine gray sand, near the top of which are boulders which come from the north and northeast. The contour of the country is hilly. These hills are steep on all sides, but they are not properly in ridges, but insulated hills, upon the tops of which the vein of ore usually appears. It is rare indeed that a vein appears in a valley, and though we may be satisfied that a given one crosses a valley, still there it never appears. In depressions between two given points, when a mine is worked, it rarely reaches the surface. There is it is true a larger amount of earth in valleys than upon hills, and this accumulation of earth may conceal veins in a few instances, yet there are causes which have operated quite extensively, which would generally secure their outcrop upon the more elevated parts of a country, and at the same time operate unfavorably for their appearance in valleys.

2. *Arrangement of the masses of ore constituting the Winter ore bed.*—The bed is situated, as has been intimated, upon a hill not less than 800 feet above the valley of the Ausable at Clintonville. It is a rounded prominence where the ore occurs, and when it was first worked twenty years ago, it was upon its summit. On the south, east, and west, it slopes into this valley; on the north, it descends into a small valley about 400 feet wide, when another steep ascent leads to another prominence.

The ore was first observed in a mass varying in thickness from four to six feet, lying upon the top of the rock, and dipping only slightly to the northwest. It occupied a space not far from 40 feet in width, and 60 or 70 in length. The surface was rich and uniformly so; but on penetrating the mass to the depth of four feet in some places, and six in others, it became lean, and was worthless below that depth. This mass, to use a common expression, was *skinned off;* and as a leanness appeared at this stage, in all directions, the workings were continued no farther. Subsequently however, the proprietor worked in an adit, or tunnel, from the small valley on the north, nearly two hundred feet, and directly beneath the old surface workings. But this was lost labor, no ore was met with in the adit, and this plan of working was abandoned.

The ore upon the hill, however, was not wholly confined to the mass which had been mined, and as it is time to speak of the arrangement of these masses, I will first give a sketch of the plan of the veins, as they appeared, or as they have been developed in the progress of the works. I shall then speak of the ore as it has been developed in the north valley, which although regarded as parts of the same upon the hill, yet they have been disconnected or separated by subterranean agencies. It is proper to observe that to the north, on the margin of the valley, this mass of ore terminated abruptly and formed a mural wall from four to six feet high, precisely as if it had been broken from a continuous mass.

Fig. 1 is a sectional view of the workings upon the top of the hill, where the ore was first raised; A upon the right and above 3, the flat mass already referred to, which was first removed.

In addition to the working upon the right, at A, three or four other openings were made, as a′, a″, and a‴. Considerable ore was obtained from these apparent veins; but it was rather lean, and the works were pushed more for the purpose of ascertaining the direction the vein or veins took, than for the amount of ore which they yielded. At a‴ then, and the other points, except a, and 4, the inclination of the mass was north-east; at a, to the north-west: and at 4, a lean vein penetrates the rock in the direction the veins usually pursue in this district.

The ore was afterwards, however, pursued in the valley; and hence it is proper to introduce a general plan of the workings, and the phenomena which are disclosed by them.

+ is near the centre of the valley, which opens to the east, and falls rapidly off, furnishing a drain for the surface water. A, B, C, D, E, mark the position of five shafts which have been sunk; A, 30 feet, from which ore was obtained; B, 25 feet, furnishing ore, but there was none at the surface; C, 40 feet; D, 50 feet, and no ore; E, 45 feet. From the last shaft a large amount of ore was obtained. The shaft struck a mass, or as it was termed, *a flat* of ore, dipping gently to north-east, and apparently coinciding with the first mass worked upon the hill. This was followed thirty or forty feet to north-east, when the respiration of the miners became impeded, and it was abandoned. This mass lay in the central part of the valley.

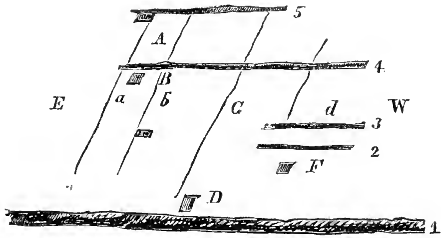
In attempting to reach the vein at D, the project failed; or at least was not found at the depth of fifty feet. But here the top of the shaft is many feet above the valley, and hence the failure is to be attributed to the early abandonment of the work.

At this stage of the description of these workings, it is proper we should attempt to obtain an idea of the construction, if we may so term it of the vein, or veins themselves, and their relations to the rock.

1. *The relations of the ore upon the hill to that found in the valley.*—Upon this point, we remark that, we regard the former as having been originally in continuity with the latter, and that it was broken off, by an elevating force. This appears first, from the nature of the termination of the mass which was first worked, which as has been described as terminating in an abrupt manner; and second, from the recurrence of a similar mass, which was struck by the shaft E, or by minings from it. This it is true dipped slightly to the northeast, while the former dipped to northwest to about the same amount.

Fig 2 represents the plan of the mine, as revealed by exposure upon the surface, and by the shafts and workings below.

A, shaft which penetrated the most eastwardly mass of ore; B, shaft which reached the ore, but no indications at the surface; C, shaft in the valley; E, shaft which struck the large mass of ore, and which was pursued to the northeast. D, shaft by the side of the 27 foot dyke, but no ore was found; 1, 2, 3, 4, 5, east and west dykes; + centre of the valley.



We may now inquire, how we may rationally explain the several apparent veins a, a′, a″, &c. Some, no doubt would regard them as lean, isolated veins, distinct and perfect in themselves. But may we not rather regard them as one vein; or perhaps two; on the supposition that the vein was folded, or bent at the time the hill was broken off from the valley. The dip, though not perfectly uniform, still favors this view; at 4, it dips steeply to the west; at a‴ it dips moderately to the east or northeast. There are some indications that there are two veins in close proximity; but it is a point not yet satisfactorily settled. At any rate, we are disposed to adopt the idea that all the ore upon the hill belongs mainly to one vein, which has been folded partly upon itself. It seems at any rate to be a view worthy of consideration. That a fracture has separated these masses from those of the valley, we are inclined to believe no one will doubt.

The dykes are numerous at this mine, they are encountered at D, and at all the shafts; at D it is 27 feet thick, and forms a steep offset on that side of the valley, and may be traced east and west nearly half a mile.

The question now comes up, is it probable that sufficient ore can be obtained here to pay for its mining, and leave a profit to the owner. 2. If so, what is the plan upon which the mining should be carried on. In answer to the first question, we believe it may be answered in the affirmative. This opinion rests on the fact that the ore of this valley was once a continuous part of that which was found upon the hill, south, and that in the valley it had not diminished in thickness or quantity; but if any thing had improved in this respect. It has been disturbed by volcanic forces, dykes have been intruded, but these, though they break up the line which the ore or vein pursues, still do not obliterate it.

Admitting then, that there is ore in an accessible position, how shall it be reached? On this point we are prepared to say that a tunnel or adit should be driven into the hill, on its eastern slope, close up to the north side of the valley. As the rock is gneiss, we would propose following up the 27 foot dyke which runs east, and is found at least 150 feet below where the shaft is sunk in it at D. The dyke is easily mined, drills easily, and upon the whole is the most feasible rock to work, while its direction is in the line of the most important point of the vein. The dyke can be tunneled for $5 per foot linear measure, with an opening 6 feet high, and 5 wide. If the dyke is tunneled as proposed, it will be necessary to carry it entirely upon one side, so as not to miss, or pass the vein, for it never happens that a particle of the ore is carried into the dyke. Hence if it were mined in its centre, the ore would be passed unperceived.

Another mode of working the mine would be to carry the shaft in the same dyke, or by its side deeper, and then work to the east and west until the miner obtained the vein.

Upon the whole, and in conclusion, we remark that this mine is quite remarkable for its irregularities. The most interesting enquiry, and what we are anxious to know, is whether this vein would assume the common dip to the west, or whether it is really as we have supposed a single vein which has been folded upon itself. The tunneling and farther working of it as has been proposed we expect will decide those points.

AMERICAN ASSOCIATION OF GEOLOGISTS AND NATURALISTS.

[Continued from p. 319.]

Afternoon Session, Wednesday, Sept. 22, 1847.

Prof. Horsford read a paper to show that the group of alkaline earths are in their intensity in the order of their atomic weights: which are barium 68.6; strontium 43.8: calcium 20.1; magnesia 12.8.

On the Antiquity of the Western Mounds, by Mr. Squier.

These earth-works have been supposed by some to be the results of diluvial agency, especially as some are stratified : but most of them are of artificial origin.

There are several varieties ; the sepulchral ; those connected with military achievements; and the sacred.

The sepulchral are isolated. The sacred are smaller, always in an enclosure, and stratified. The outer layer consists of pebbles and water-worn stones—under this is a fine loam, of a mottled appearance, indicating the deposition of the different earths—then a stratum of fine white sand—and thus alternating to the bottom, where the loam rests on an altar: these strata are well defined, though their arrangement is not always uniform: excavations will always be found near by, from which the materials were obtained.

They cover altars of burnt clay or stone, containing various implements of ancient art.

None are found on the first, or latest formed terraces of rivers, excepting in the Mississippi valley. Very old trees are found growing on them; they date back at least 1200 or 1000 years; this is shown from the fact that they are covered by the same trees as those of the surrounding forests; for when a spot has been cleared of trees the next growth is of a different tree, and it is only after a very long time that the primitive tree reappears

In the mounds are found objects foreign to the region in which they are situated; these are very interesting, as showing the state of civilization, and the commercial intercourse of the mound-builders. Obsidian is found in considerable quanity; and as Central Mexico is the nearest spot where it occurs abundantly, their migrations must have been thus extended—native silver from Lake Superior, pearls from the southern waters, and other objects from very distant localities, are found; considerable quantities of galena; the occurrence of gold is questionable; no iron is found, except in the latest deposits, and it is certain that this ancient people were unacquainted with it; axes, plates, and bracelets of copper, and masses of the native unwrought copper are found; these bracelets are identical in form with those of the ancient Eygptians. The implements are mostly of stone; the lance and arrow heads of different varieties of quartz; the stone-axes are identical with those found in Denmark, except in material; there are many specimens of porphyry; great quantities of mica, cut into various ornamental shapes; beads of marine shells; pearls; fossil teeth of sharks, cetacea, etc.; carvings, true to nature, of almost every living thing in the country, and of many non-indigenous animals; carvings of the human head, resembling the ancient Peruvian.

On the Structure of the Polypi, by Prof. Agassiz.

Their anatomical structure presents peculiarities which bear upon the Echinoderms. The little holes on the surface of Actinia, are analagous to the water holes on the surface of the Echinoderms. The Echinoderms, though radiated, have a bilateral, symmetrical structure. In Actinia, the mouth is not circular, but elongated, one end being the widest, where the undigested food escapes. The young have fewer tentacles than the adult; there is a tendency to a pentangular form, the largest tentacle being on a line with the long diameter of the mouth. The Actinia, at least, is bilateral or symmetrical, and this is probably a universal law. They are very variable in their form at different times. They are divided into as many lamellæ as there are tentacles; these lamellæ are muscular membranes, going from the top to the centre, for the movements of the animal; the tentacles have both longitudinal and circular fibres. The same animal is both oviparous and vivaparous—the digestive cavity, widely open below, receives the food always mixed with water—the tentacles are folds from the body of the animal.

In the Tubulariæ, the ovaries hang outside the body, between the tentacles. There is the closest affinity between the common Polypi and the Actiniæ; they also vary much in form, and have both vertical and circular muscular fibres. The affinities between all the radiated animals are very striking; for instance, the Echinarachnius seems to be different from the Medusæ, only in having a hard shell.

Prof. Dana confirmed these views of the bilateral character of the Radiata, by his observations on Madrepores; in the Zoanthidæ, one tentacle is larger than the rest, and white, while the rest are green. He did not find the tentacles, a multiple of the number five in the corals, but rather of four. In the Actinia of Boston harbor, the lamellæ are arranged in couplets.

Prof. Agassiz believed the tentacles of the Actinia were multiples of five—even in the corals, he was glad to see that Prof. Dana found that the mere fact of their tentacles being a multiple of four, was not an objection to their bilateral structure; even in them this idea is still more confirmed. In the Lucernaris, there are colored oculiform spots, the beginning of eyes; hence there must be a nervous structure.

The evening was spent most delightfully at the house of Hon. Abbott Lawrence, where the members received a most cordial welcome.

Morning Session—Thursday, Sept. 23.

On the Mastodon, by Dr. J. C. Warren.

The first notice of this animal, seems to have been in the first part of the last century. Mr. Jefferson made a collection of these bones, which was sent to Paris, and examined by Cuvier.

A mastodon was found a few years ago, in New Jersey, which is now at Harvard University. In 1845, one was found at Newburgh, which belongs to Dr. Warren. Four out of five skeletons were found in or near New York state.

The mastodon and elephant belong to the same order; and the different resemblances and differences were clearly pointed out.

There is, in the mastodon, a remarkable preponderance of the anterior over the posterior extremities. The upper part of the head is more flattened, and the facial angle less than in the elephant, and the cavity of the cranium is less. The bones of the cranium are filled with large cells, probably to ensure lightness; the nasal cavity and the proboscis resemble those of the elephant. He entered into a careful comparison of the teeth in these two animals, showing many interesting analogies. He alluded to the remarkably sound condition of the bones, which he attributed chiefly to their being excluded from the air, and having been preserved in marl. Some are silicified, others ferruginated.

It is impossible to determine the cause or time of the disappearance of this animal; but it was not, certainly, at some general catastrophe. History and tradition are silent on this subject. The period of their disappearance was at least, as far as history goes, one thousand years ago.

Prof. Agassiz remarked, how gratifying it must be to naturalists, to be able to examine the bones themselves, instead of fanciful representations of them; and to be able to compare them with those of the elephant, both old and young.

On the Laws of Cohesive Attraction, by Prof. Dana.

He remarked that solidification and crystallization are the same. He instanced ice, snow, steel, granite, &c. If so, then the laws of solidification are the laws of cohesive attraction. Each species of matter has a distinct characteristic crystallization; molecules have the same axis as the resulting form.

His inferences from the facts brought forward, were:

1. Cohesive attraction is characterized by fixed angles, as regards the direction of its action, and by specific relations of force in certain axial directions—different in different substances.
2. In the aggregation of molecules by attraction, only equal homologous axes unite.
3. The axes of cohesive attraction in molecules have opposite polarity at opposite extremities.
4. The polarity of molecules may be reversed by extrinsic influence.
5. The axis and polarity of cohesive attraction exist before the union of the molecules, instead of being a consequence of that union.
6. The axial lines of cohesive attraction are not indefinitely fixed in position, but are modified in direction and force by temperature.
7. The variations which the attraction of cohesion undergoes take place according to some simple ratio.

8. The homologous parts of molecules similarly and simultaneously undergo this variation as regards the attraction.

9. The parts of a molecule on opposite sides of a pole, have a different amount of variation of attraction.

10. If the state of the attraction which produces a primary cube or prism, is considered its normal state, when secondary planes are produced, there is a decrease of force in the direction of the principal axes, and in a simple ratio.

11. The diminution of attracting force in the primary axes, on which the formation of a secondary depends, consists partial action of their force along intermediate axes, symmetrically situated with reference to the primary axes; and the greater or less amount of diminution determines the kind of distribution.

12. The direction of cleavage may indicate in any species of matter which set of axes is dominant, or strongest in attracting force, the primary or a secondary set.

13. Those variations of attraction, producing secondary forms, depend often on surrounding bodies, favoring the concentration or diffusion of the attracting force; and the causes often act simultaneously in nature over wide areas.

14. In an enlarging crystal, one axis (or two,) may have the action of attraction accelerated by extrinsic influence, and this acceleration or retardation affects equally all crystals forming together under the common circumstances.

15. The action of cohesive attraction is often intermittent, producing seriate results, as exemplified in the cleavage of crystals; and the specific rate of intermittent action is different for unequal axes.

A specimen of clay stone was exhibited in confirmation of these views, taken from Sharon, Vermont, (nine miles west of the Connecticut;) it occurs in successive deposits at least one hundred and twenty feet deep.

A letter from Mr. Bond was read, stating that the great nebula of Orion, which had been hitherto unresolved, was resolved, by the Cambridge instrument, into innumerable bright points of light.

Cambridge Observatory, Sept. 22, 1847.

Dear Sir—You will rejoice with me, that the great nebula of Orion has yielded to the powers of our incomparable telescope. This morning, the atmosphere being in a favorable condition at about 3 o'clock, the telescope was set upon the Trapezium in the great nebula of Orion. Under a power of 200, the fifth star was immediately conspicuous; but our attention was directly absorbed with the splendid revelations made in its immediate neighborhood. This part of the nebula was resolved into bright points of light. The number of stars was too great to attempt counting them; many were, however, readily located and mapped. The double character of the brightest star in the Trapezium was readily recognized with a power of 600. This is "Struve's 6th star;" and certain of the stars composing the nebula were seen as double stars under the power. It should be borne in mind that this nebula, and that of Andromeda, have been the last stronghold of the nebular theory; that is, of the idea first thrown out by the elder Herschel, of masses of nebulous matter in process of condensation into systems. The nebula in Orion yielded not to the unrivaled skill of both the Herschel's armed with their excellent reflectors. It even defied the power of Lord Rosse's three foot mirrors, giving "not the slightest trace of resolvability" or separation into a number of *single* sparkling points. And even when, for the first time, Lord Rosse's grand reflector, of 6 foot speculum, was directed to this object "not the veriest trace of a star was to be seen." Subsequently his lordship communicated the result of his farther examination of Orion, as follows:

"I think I may safely say that there can be little, if any doubt as to the resolvability of the nebula. We could plainly see that all about the Trapezium is a mass of stars, the rest of the nebula also abounding in stars, and exhibiting the characteristics of resolvability strongly marked."

This has hitherto been considered as the greatest effort of the largest reflecting telescope in the world, and this our own telescope had accomplished. I feel deeply sensible of the odiousness of comparisons, but innumerable applications have been made to me for evidence of the excellence of the instrument, and I can see no other way in which the public can be made acquainted with its merits.

With sincere respect and esteem,

I remain, sir, your obedient servant,

W. C. BOND.

On the Nebular Hypothesis, by Prof. B. Peirce.

This vast and magnificent speculation rested on the tripod of geology, physical astronomy and celestial mechanics. The argument from geology will not be considered here. The argument from physical astronomy has been much shaken by the resolution of many of the great nebulæ. There are two kinds of nebulæ: the irregular, which are resolvable into stars; the rounded, well defined nebulæ have been the strong holds of the partizans of the nebular theory; they resemble comets. The nebula in Andromeda, hitherto unresolvable, has been seen at Cambridge to be of an irregular outline, and is, therefore, probably resolvable. Since the resolution of the planetary nebulæ, there is no existing proof in the heavens of chaotic nebulous matter.

The argument from celestial mechanics was considered at length, and the beautiful theory of La Place briefly sketched. While speaking of the separation of the rings, he remarked that no ring or satelite had been seen around Neptune.

The first difficulty in the third argument is the comets: why are their orbits so different and peculiar? Is it said that they are inter-stellar matter, tending to one of the suns? We may answer, we have *periodic* comets—if they are thrown off from the sun, as the comet of 1845, they will fall into it again, and there will be the end of them. *Could the earth have ever been a nebula?* It rotates on its axis *once a day;* how often when it was a nebulous ring? *Once a year.* The size of the earth, when it rotated once a year, would only be twenty times its present radius, or only one-third of the way to the moon; put in the lunar months, it would only reach half way to the moon. When the moon was thrown off, the earth rotated once in a lunar month, when it had only five times its present radius; how then got the moon at its present distance from the earth?

He thought the theory totally incapable of advancing astronomy.

On a new species of Orang, by Prof. Jeffries Wyman.

This cannot be referred to any of the four recognized species; it is not the adult of the Chimpanze; the skull is much larger; and it has a crest on the top and sides, which the Chimpanze has not; its face is perfectly straight, unlike the Chimpanze; the orifice of the nostrils, instead of being a triangle with the apex upwards, has the apex downwards, and it is quadrangular. The infra-orbital canal is obliterated at the posterior part of the orbit, which is considered by Prof. Agassiz, a mark of degradation; the nasal bones in the Chimpanze are quadrangular; in the new species they are triangular, apex upwards, with a bridge on the median line. In man, the humerus is much longer than the ulna; in the Chimpanze the humerus and ulna are nearly of the same length; in the Eastern Orang the ulna is the longest; in the new species, the ulna is shorter; in this respect, the last comes the nearest to man; the scapulæ are also very large.

The anterior face of the bodies of the vertebræ is shorter, less high, than the posterior face; so that the spine has an anterior *concavity*, which throws the trunk *forwards;* the opposite is the case in man, whose spinal column is *convex* anteriorly, throwing the trunk *backwards.* This is a distinguishing mark between man and the quadrumana; it is impossible for the monkeys to walk erect without supporting the trunk in some way by the hands. He named it Troglodytes gorylllus. It inhabits Guinea. It is five feet high, and covered with coarse black hair, which becomes gray in the old animal. Head—the face is wide, the cranium small, the eyes large; in the course of the sagittal suture, there is a high crest of hair, which meets another going behind from one ear to the other; as it moves the scalp freely, these hairy crests point forward when the animal is enraged, giving him a very ferocious appearance. The shoulders are very broad, the arms long, the hands large, the thumb very large, in which it differs from the Chimpanze; its gait is rolling, the legs being swung forward between the arms. They live in bands; one male in every band of females. Their dwellings are merely sticks laid from one tree to another, affording no shelter, and these are only used at night. They are very ferocious, and less intelligent than the chimpanze; they live on fruit, branches of trees, &c.

AFTERNOON SESSION—Thursday, 23d.

Prof. Bailey exhibited some fossils from New Mexico. On the eastern side of the Rocky mountains, there is coal of a recent epoch, containing leaves of dicotyledonous plants—on the west side is a cretaceous deposit, upheaved since that period.

On the geographical distribution of animals along the coast of New England, by Prof. Agassiz.

The most difficult question to settle here is, where the different animals were created; this is difficult from the nature of the data, influenced by the locomotive powers of animals, external circumstances, and the agency of man. The general result of such investigations is that the animals differ in different localities; none, except domestic animals, are distributed generally, or universally, over the earth's surface. This difference is greatest at the equator, while at the poles the species are identical; the species of temperate Europe and America are analogous; our wild carnivora and herbivora have originated here, and were not derived from Europe. The difficulty of deriving animals from distant localities, is exemplified in the fresh water fishes, which die if their external circumstances be changed to any great extent; those fishes, considered identical in Europe and America, will be found different; hence we may conclude that similar distant species were created where they are found. From the researches of the United States exploring expedition, we know that each group of islands of the Pacific has its peculiar and distinct species of land shells, which must have originated on the spot. As a general rule, wild animals were created where they are found. There are geological reasons for this belief.

The great Pachydermata and the monkeys belong to tropical climates; other animals belong to the temperate, others to the frigid zones. Almost all the marsupial animals are found only in New Holland and the surrounding islands; the edentata are quite limited to South America, even to Brazil. Now compare the fossils found in New Holland and Brazil, &c., and they will be found belonging to the families now living there—they originated where they are found.

The highest animals of a family are always found in the warmest latitudes; thus crocodiles are found in the torrid zones; serpents in the torrid and temperate zones; salamanders and frogs in the temperate and cold climates. Monkeys, the animal next to man, belong to the torrid zone; this is the expression of a universal law, which we ought not to overlook, from the conclusions it might lead to in regard to the human race.

In arctic regions, there are few species, and numerous individuals; in the torrid regions there are many species, containing each but few individuals. There seems to be an exception to the above rule, in that the lower terrestrial mammalia are most numerous in tropical climates, as some of the lower pachydermata; but we know that the lower animals were created first, probably under warmer climates in ancient times; so that these animals now exist there, because they are the representatives of *ancient* types, rather than from being *higher* types of creation.

The radiata and crustacea have been most neglected in New England; the shells have been accurately classed and described by Dr. Gould, and the fishes by Dr. Storer. It is important to know not only in what latitude marine animals live, but at what depth below the surface. The fishes of the deep sea do not live near the shore; as on mountains, animals, and plants have each their special horizon or limits, where they are only found, so in the deep, marine animals have their unvarying limits. Between high and low water mark there is a special Fauna; between low water mark and four fathoms, another Fauna, &c.; the difference between the levels of the tide will make more difference in animal life, than one thousand feet on a mountain.

Prof. Adams supported this view of the geographical distribution of animals by reference to the shells of the West Indies; he also alluded to the different horizons of shells found in a lake on the peninsula of Port Royal.

Prof. Johnson made also, confirmatory remarks on the distribution of fishes.

Prof. Agassiz mentioned the occurrence of the same fishes in the head waters (and in them only,) of the Rhine, Rhone, and

Danube; and the same are found in the rivers of Norway; these could not communicate with each other, and must have been created in loco.

On the Cypress of Mississippi and Louisiana, by Dr. Dickerson.

It has no marked geographical position, except in being near the Mississippi; its latitude is about the same as that of the cotton plant. It comprises about one-seventy-fifth of the forests there, and only one-fifth of this is available for useful purposes: much of it is heavier than water, and can therefore not be easily got to market; its growth is very slow; it will probably soon fail.

It grows in soils completely saturated with water, most of the year, in basin-like depressions, of various heights above the river. Its top ends in a cup-shaped cap; its roots extend to a great distance: from the concentric laminæ some have been found which must have been two thousand years old.

Prof. H. D. Rogers read a report from Lieut. Maury, on the currents of the North Atlantic, which will be of great importance to navigation. Between New York and Havre, and New York and Liverpool, there is only a difference of one day's sailing in *distance*, while in *time* there is an average distance of nearly a week. This may be obviated by a knowledge of the currents. In going from Havana to New Orleans, vessels stem a current of three miles an hour against them, when they might have a current in their favor of two miles an hour.

Evening Session—Thursday, 23d.

A report was read on the fishes of Lake Winipiseogee, by Dr. Wm. Prescott. Dr. Storer stated that no marine cusk exists in our lakes; what Dr. Prescott described as such, was a lota.

Prof. Adams made a verbal report on claystone concretions. They are either simple, or compound; binary, ternary, &c. The simple commence by a nucleus, not necessarily a foreign body; around this concentric layers are deposited; these are rare. The complex are made up of two or more simple ones, united laterally, or face to face. The simple ones are modified spheres; in these specimens they are depressed; in the oolitic they are concentric, very perfect spheres; they are caused by the molecular attraction acting in the direction of the radii of a sphere. The kinds of matter subject to this modification are various; carbonate of lime, silex, &c. Each locality has a peculiar type of form. It is easy enough to frame theories of their composition; but none that he knew of explained satisfactorily the phenomena.

Mr. S. S. Haldemann made some remarks on these concretions; and more particularly on the temperature of the liquid, or semiliquid in which they are formed. He alluded to the calcareous depositions on the shells of fresh water shell-fish — in the worms of stills, lime is deposited, not at the top or bottom, but at a certain level, according to temperature — in steam-boilers, the lime is deposited long before the water is a saturated solution.

The remainder of the evening was spent by invitation at the house of Dr. J. C. Warren.

Morning Session—Friday, Sept. 24.

On the Natchez Bluff Formation, by Dr. N. D. Gale.

Some time ago a fragment of a human ilium was found with the fossil remains of the megatherium; it was therefore supposed to belong to the same geological epoch as the latter. This was undoubtedly a human ilium, and it was certainly found with the remains of extinct animals. The object of the paper was to show that the bone was deposited there at a comparatively recent period, and was not coeval with the fossils among which it was found.

The Natchez bluff is a fresh-water drift, from one hundred to two hundred feet high — it consists of three beds; the lowest, a bed of gravel, coarse at the bottom, and gradually becoming fine sand; the middle is a bed of sand, of about eighty feet average depth; the upper is a bed of loam — the whole resting on half-solid tertiary clay. In the lowest bed the fossils are silicified; in the same bed, they consist chiefly of oxygenous woods; in the loam bed, (the most interesting,) land shells especially, and a few [illegible]rine shells are found — it is in this loam bed that the bones of [illegible] mastodon are found.

This region abounds in grave-yards, made either by the aborigines, or by the whites, who bury their dead on their own plantations; this human bone was undoubtedly transported to the ravine in which it was found, by a current, which swept it from some of these burial grounds.

Prof. Wm. B. Rogers made some remarks on the transporting power of currents of water. Though much has been said and written about this, very little is certainly known, as the data are very insufficient; the subject is still open for investigation. Among other causes of error, he mentioned that not only the velocity of a current, but the nature of the bottom over which the stream flows, should be taken into consideration; we want the rate of velocity not only in the middle of the stream, but at the sides; at different depths; and at the bottom.

Prof. Agassiz remarked that the moving power, and rate of water currents, was intimately connected with the transportation of drift and boulders. It is indeed strange that the advocates of the aqueous theory, having no definite data for discovering the rate of progress of their transporting agent, should so boldly and obstinately oppose the glacier theory, fortified as it is by positive knowledge of the movement of the ice in its different portions. He exemplified the little confidence to be placed in strictly mathematical results in such questions by reference to the glaciers; the rate of movement of the glacier was mathematically, and it was supposed of couise exactly, determined, the rate of movement of currents probably serving as a starting point; the experimental results showed that these mathematically precise calculations were completely wrong. The same will be found to be true of the currents of water.

On the Absorption of Carbonic Acid by different Liquids; by Wm. B. and R. E. Rogers.

Among other curious facts, it was mentioned that sulphuric acid absorbed carbonic acid nearly volume for volume; so that many extremely nice analyses, carried even to a third decimal point, are quite unworthy of confidence. Among other consequences of this fact, is the most important conclusion, that the atmosphere contains a greater amount of carbonic acid than is usually supposed; this is exceedingly interesting, when it is considered in connexion with the far greater quantity of this great "pabulum of life" in the ancient atmosphere.

On the Languages of the Aborigines of the Southwest; by S. S. Haldeman.

Among other curious facts, it was stated that these languages have comparatively few labials. They have the *wh*, in which it is difficult to say whether it is pronounced *wh*, or *hw*, and this immediately before a consonant. The northern nations have sounds proceeding from the glottis, which is closed after a vowel; in these nations it is closed. They have a whispered final vowel, resembling the final *e*, mute of the French language; with a peculiar *t*, pronounced without the action of the lungs. They have double letters, *pp*, in which both are distinctly pronounced; an intermediate sound between *s*, and *sh*, &c.

On the Mounds of the Southwest, by Dr. M. W. Dickerson.

He entered into minute details on the different kinds of mounds; their constitution and the relics found in them. He showed that in the construction of these mounds, and their precise location, the ancient races must have had some standard of measurement, and some instrument for measuring angles. It will be unnecessary to enter into the details, which have been so fully given in the notice of Mr. Squier's paper; according to this gentleman, the mounds, and their contents, of the southwestern Indians, are identical with those observed by him in Ohio.

On the general results of investigations in the Palæontology of the lower strata of New York; by James Hall.

In this interesting paper many important geological results were obtained, and much valuable information on the fossils of America, which show that the European types can no longer be made the basis of our classification of fossils.

Mr. Agassiz observed that it is idle to draw a parallel between the European and American types; those of Europe have been too much disturbed by Plutonic action; America, where there is not such disturbance, is by far the most favorable locality to observe. He was glad to see so good a beginning in the work of establishing American fossils on a foundation independent of European authority.

On the depth and saltness of the Ocean, by Com. C. Wilkes.

There were few positive results on the actual depth of the ocean; in fact, bottom has not been found in the deepest parts—at any rate, 4600 fathoms had not reached it. To give an idea of the difficulty of making deep sea soundings, he remarked, that it took the crew of a well manned frigate, and her officers, three hours to make one sounding. He concluded, from his observations, that the great valleys of the ocean run at right angles with the great mountain chains. After alluding to different ways of making these soundings, and their difficulty, he mentioned that attempts had been made to obtain the depth of the ocean, by the rebounding of the echo of sound produced by exploding a shell under water, or at the bottom.

He stated that the mean temperature of the ocean between 54 deg. and 60 deg. S. was 39.5; it has been stated by some, that the minimum temperature in the Mediterranean is 55 deg.

The penetration of solar light varied in different latitudes and at different temperatures; it would naturally be supposed that the depth at which a body disappears would vary between sunrise and sunset, according to the obliquity of the sun's rays; but a difference of only one fathom was observed. In the Gulf Stream, a white body of eighteen inches diameter, disappeared at twenty-seven fathoms; the depth of disappearance varies from six to thirty fathoms; the disappearance is gradual. In these experiments the eye was vertically over the object, and the observer in an ordinary boat. In warm latitudes, the ship's copper could be distinctly seen from the surface of the water; when in colder latitudes, a similar examination was made, to see if the ice had torn off any of the copper, the bottom could not be seen at all.

Prof. Henry mentioned the commencement of a series of experiments on the effects of increased pressure on animals; alluding to experiments made by subjecting the common mosquito to great pressure under water.

Prof. Agassiz remarked that fishes would also live a long time under greatly diminished pressure, if it was gradually effected. He praised very highly the plates of the works of the Exploring Expedition. The plates of fishes were by far the most beautiful he had ever seen, and were an honor to all concerned in their production. The work by Prof. Dana, on corals, &c., would long be the standard work on the subject.

Prof. Silliman observed that it was much to be deplored that a work of such value as the results of the Exploring Expedition, should be issued in so small an edition, that all would be consumed in the gifts which the government would very properly make to other governments and the states. Its result would be almost wholly lost to science. He considered this a national calamity. He hoped, for the honor of America, and the advancement of science the world over that the edition would be so enlarged, that every searcher after truth might obtain a copy.

Afternoon Session—Friday, Sept. 24th.

On Heat, by Prof. Henry.

He showed the analogy between light and heat, by stating that as two rays of *light* might be so opposed as to produce *darkness*, so two rays of *heat* might be so opposed as to produce *cold;* showing that the theory of undulation is not an imagination, but the expression of a *law.* The minimum of heat, as proved by his experiments with the thermo-electric pile, does not correspond with the minimum of light. Among flames, there are many which give but little light, but which give great heat, as for example, the flame of hydrogen. The amount of radiant heat and radiant light were found to be about the same.

The spots on the sun are colder than the surrounding surface; and its surface is variously heated. This result he obtained by a very simple experiment of throwing the disc of the sun on a screen, and placing the very sensitive thermo-electric pile before its different parts. He had not yet concluded his experiments on the sun, and had not measured the comparative heating powers of he centre and circumference, from which results very important onsequences would be drawn.

This apparatus he fitted to a common pasteboard tube, covered with gilt paper externally, and blackened internally, with which he measured the heat of distant objects. He could detect the heat of a man's face a mile off; that of a house five miles off. He thus discovered that the coldest spot in the sky is at the zenith. One day, on directing his tube to a cloud, from which flashes of lightning proceeded, he was astonished to find it indicated a great degree of *cold;* he afterwards found out that a considerable quantity of hail had falled from this cloud. *Forming* clouds probably evolve *heat;* and *dissolving* clouds, *cold.*

He was not satisfied with the appearances of heat supposed to have been derived from the moon. The heat that other observers have got is probably the reflected heat of the sun, and not the moon's proper heat.

A lens made of ice may set fire to a combustible: it may reflect heat, as well as light.

These are a few of the important results at which he arrived. The thermo-electrical telescope will be found of vast importance, from the immense range of phenomena to which it may be applied.

It was voted to extend the objects of the association, so as to comprise every branch of positive science; and a new name was therefore adopted, viz: American Association for the Promotion of Science.

On the Taconic System, by Prof. Adams.

This range, in Vermont, is between the Green mountains and Lake Champlain. It diverges from the granitic, in the north part of the state; it presents fewer traces of metamorphosis. He concluded that the "red sand rock" is newer than the Hudson river group; that, from the fossils found and exhibited, it is equivalent to the Medina sandstone and Clinton group of New York.

Dr. Emmons, in a brief reply to Prof. Adams' remarks on the Taconic system, maintained that he had overlooked entirely the *fault* which passes through Snake mountain, in Addison, Vt; that the mass called by Mr. A. the Trenton limestone, could not be that rock, inasmuch as he had placed it above the Hudson river group, and that the fossils were not proved to be those of the Trenton limestone; and furthermore, that the masses which Mr. Adams attempted to show, belonged to the Clinton group, were merely in fact the calciferous sandrock or Potsdam sandstone, being proved to be those rocks, by fossils at other localities, and which, as in the case of the same rocks at Snake mountain, rest upon the Taconic slate. Overlooking the fault in the geological position of the rocks at the Snake mountain, Prof. Adams had been led into error. (Remarks discontinued for want of time.)

A report was read from Mr. Vanuxem, on the Taconic system, to show that there are rocks intermediate between the primary rocks and the Potsdam sandstone.

Mr. S. S. Haldeman read a report, showing that *Atops Trilineatus* and *Triarthus Beckii* are not identical.

EVENING SESSION—Friday, Sept. 24.

Mr. Hodge made some remarks on the economic geology of the Berkshire valley. He exhibited some very fine, pure, and white sand, for the manufacture of glass, obtained there in vast quantities, and at very little expense. He exhibited a beautiful glass vase made from it. He believed we should soon be able to make the best of plate glass.

On the Phenomena of Drift and Glacial Action in New England, by Mr. Desor.

There are four forms of drift. The first consists of coarse stones, imbedded in loam, as on the shores of New England and New York: this has no stratification. It contains not a few fossils; most of these stones are scratched. The city of Boston is built on this formation, and the islands of its harbor consist of it. The next is the clay formation, which is called tertiary, or pleistocene clay; this is the true drift, and contains many fossils. This is found in the lower parts and depressions, and may be seen in almost all the railroad cuts in the valleys. It is stratified; the fossils preserve their color, the calcareous parts being destroyed, while the animal parts are not. Over this clay bed is a bed of sand, between which and the clay, or just at the top of the clay, the fossils are found. The ridges (the moraines of Prof. Hitchcock,) are hills on the surface of the clay, or sand. They sometimes extend for miles, and form natural roads in many countries, as in Sweden. Many consider them submarine beaches. There is a good instance at Andover, Mass. The boulders have two kinds of distribution — one on the top of these ridges, and one general. These four forms are not all found together.

The whole surface of New England is scratched; this is the *rule*, not the *exception*, the summit of Mt. Washington is the only spot in New England which is not thus scratched.

These same phenomena of the drift occur in Scandinavia. They each correspond to a peculiar era of the earth's surface.

From the examination of these scratches and polishings, we may say that there has been a subsidence, and afterwards a gradual emergence of this whole hemisphere. The same shells are found on the heights of Montreal, and at Augusta, Maine, four hundred and thirty feet below it; they were first deposited at

Montreal, and at Augusta at a later period of emergence; at this period of emergence the ridges were deposited.

He drew a parallel between the fiords of Norway and the bays of Maine, in their deep and narrow forms; these bays having always near the same limits from the shore.

On the Drift of New England and the River St. Lawrence, by Prof. H. D. Rogers.

He thought there was evidence in the lower drift, of great paroxysmal movement; he refused to the clay the title of drift, thinking it indicated a long period of repose: on this we find the boulders. He maintained that the heights of Montreal were not the level of the ancient sea; he believes them the consequence of a local paroxysm, surging it up the sides of the mountain.

He entered into the theory of a paroxysmal inundation, caused by an uplift in the Arctic ocean, to explain the phenomena of the drift. There is no trace of marine organic remains in the great northern drift; he could not explain this by the submersion of the land. There are, then, three theories of the drift—the iceberg, the glacial, the paroxysmal.

He showed, on a map, the course of the curious Berkshire boulder train, consisting of immense angular stones, wholly unlike the drift of the adjacent country; different causes must have been concerned in its production.

Prof. Agassiz thought that the experimentum crucis in these opposing theories was this; the drift has no stratification, no evidence of the action of water; and he defied any one to show that the phenomena of the scratches are any where due to the action of water. He could explain these local trains of angular boulders very easily; upon the true drift, strata, with their fossils and angular rocks, were afterwards deposited by the icebergs. He could show an actual cause, *known* from observation to be capable of producing the phenomena of the drift, viz.: the *glaciers.* Where can the opponents of this theory show an equally strong argument in their favor?

Prof. Emmons thought the glacier theory lacking in one important point, viz.: that the striæ are not in America directed to one culminating point, as in the Alps, in Scandinavia, &c.; the lines of striæ in America are in the same direction, not convergent.

Prof. Agassiz replied that no central culminating point was at all necessary for the production of glaciers; they are a mere climatic phenomenon; they form every winter in our very streets and gutters. As there are no high mountains in America, to serve as starting points for glaciers, and to which, as a centre, all the striæ should radiate, we have only to suppose a considerable accumulation of snow in the northern latitudes, for a long period; different quantities of water would fall on this snow, from different temperatures, in its vast extent from north to south, which would produce a general movement of the glacier in one direction, and explain the uniformity of the striæ of America.

After adjournment, many of the members visited, by invitation, the house of Francis Alger, Esq., and were afforded an opportunity of examining his splendid collection of minerals.

Saturday Morning—Final Session.

Prof. Johnson made some remarks on the construction of geological sections; in which, in order to get the true color, he proposed to use the powdered rock itself, fixed by a solution of gum arabic.

He read a report on the *incrustations of steam boilers*, which are so very troublesome in sea steamers. The proportion of incrustation is very different in different sea water. In the scales from the boiler of a sea steamer, as examined by him, sulphate of lime was the principal ingredient; in that obtained from the waters of the Schuylkill, it was chiefly the carbonate of lime, with very little sulphate.

Count Pourtales read a memoir on the *Structure of the Holothuridæ*, accompanied by specimens, with description of a new species, and remarks on the species hitherto found on the coast of New England.

On motion of Com. Wilkes, a committee was appointed to communicate with the Secretary of the Navy, on the subject of deep sea soundings by our national vessels.

Prof. Emmons read a paper on *the distribution of inorganic matter in forest and fruit trees.*

On the Distribution of the Inorganic Matter of Forest and Fruit Trees, by Ebenezer Emmons, Albany, N. Y.

The object of this paper is two-fold. 1. To show what kinds of inorganic matter exist in the ash of trees. 2. How the several elements existing in the ash are distributed through the parts and organs composing the individual tree.

The object of the paper was illustrated by a few examples only of the analyses which had been made.

The following are copied from the paper, for illustration of the mode of treating the subject:

SUGAR MAPLE; *Acer saccharinum.*

Tree, sound. Diameter, 3 feet from the ground, 28 inches, 12 feet from the ground, 21½ inches. From the base to the limbs, of bark, ¾ inch. Age of the tree, 224 years, 12 feet from the 62 feet. Whole length of the tree, 107 feet. Average thickness base. The 100 outside layers taken for the ash of the outside wood; the remainder taken to form the ash of the inside wood. Growth, uniform. Average thickness of each layer, .044 of an inch. Grew upon the lower part of the shales of the Chemung group, in Cortland County, N. Y.,

Composition of the ash obtained from the wood 12 feet from the ground.

	Bark.	Outside wood.	Heart wood.
Potash,	0.38	8.77	4.21
Soda,	7.75	0.96	0
Chloride of sodium,	0.08	0	0.08
Sulphuric acid,	0.14	.77	0.31
Carbonic acid,	38.12	37.24	33.33
Lime,	49.33	31.86	43.14
Magnesia,	3.64	8.40	7.24
Phosphate of per oxide of iron,	0.32	0.70	1.34
Do. lime,	3.13	5.70	5.09
Do. magnesia,	0.02	1.80	0.22
Organic matter,	1.50	2.40	1.93
Silica,	0.15	0.50	0.55

Proportions of ash as found in the different parts of vegetables.

WHITE OAK; *Quercus alba.*

	Heart wood.	Sap wood.	Bark.	Twigs.
Dry Wood,	69.10	64.46	72.29	59.76
Ash,	0.18	0.64	11.30	4.72

BLACK WALNUT; *Juglans nigra.*

	Heart wood.	Sap wood.	Bark.	Twigs.
Dry Wood,	54.95	61.10	51.25	50.80
Ash,	0.36	0.54	3.99	3.71

Horse Chestnut; *Æsculus hippocostanum.*

	Tree in full bloom. Root.		Young Root.			
	Bark.	Wood.	Bark.	Wood.	Leaves.	Flowers.
Potash,	10.88	16.83	17.97	26.33	7.58	30.71
Soda,	15.71	3.27			0	0
Chloride of sodium,	0.76	0.36	2.27	4.47	0	0
Sulphuric acid,	7.32	6.39	26.45	28.46	30.93	30.55
Carbonic acid,	28.47	4.01	5.71	0.04	2.27	0.13
Lime,	36.83	5.19	7.39	0.06	2.91	0.17
Magnesia,	0.90	5.30	0.25	0.05	3.00	0.01
Phosphates,	11.80	46.74	16.70	23.10	18.80	33.50
Organic matter,	5.60	3.60	22.46	17.09	6.24	3.20
Silica,	2.00	3.30	0.80	0.50	5.50	2.00
Coal,	0.80	11.00	0	0	0	0

The above tree stands in the rear of the Old State House, Albany, and is abundantly supplied with the usual wash of such places.

Proportion of ash.

	Bark. Root.	Wood. Root.	Bark. Young twigs.	Wood. Young twigs.	Leaves.	Flowers.
Dry Wood,	42 05	49 86	17 10	11 90	12 06	14 76
Ash,	3 88	1 04	1 63	1 15	1 56	1 83

Inferences, as deduced from 150 analyses.

1. That the inorganic matter, as determined by the movements of the sap, are in two principal directions: *a*, To the head of the tree; *b*, to the outside of the tree; by which movements the proportion of ash in the limbs and branches is greater than in the inside wood, and greater also in the outside than in the inside wood. Exceptions occur as to the latter inference.

2. In the bark of the trunk the inorganic matter acquires its maximum proportion.

3. The alkalies acquire their maximum proportion in the fruit and its envelopes.

4. The phosphates acquire their maximum proportions in the outside wood, fruit and envelopes.

5. Lime is found in its maximum proportion in the bark.

6. The phosphates and alkalies are found in their minimum proportion in the bark of the trunk.

7. The final cause of the distribution of the inorganic matter of vegetables, is the speedy restoration to the soil of the important elements of which they are composed. They are first brought

from great depths in the soil, by the action of roots; after which they are assimilated to the nature of the plant, and after fulfilling their respective functions, are restored to the soil, where undergoing a slow combustion they are refitted to pass into the organism of the vegetable again; thus they go their rounds repeatedly, during the life of the tree.

8. The frequent preservation of the bark in vegetables, in a fossil state, is due to the large amount of inorganic matter it contains.

9. The amount of phosphates and alkalies in vegetables depends in part on the season of the year when they are cut.

10. A portion of the inorganic matter forms by a regular arrangement the organized tissue of the vegetable, and is, probably, an invariable quantity in every species, while in a healthy state.

11. That advantage will probably arise from manuring trees in mid-summer, that an abundance of food may be furnished to the ripening fruit, and to be stored up in the tree for use the succeeding spring.

Prof. H. D. Rogers exhibited a geological map of Pennsylvania. He spoke of the numerous physical absurdities of the maps in common use. He applies the names of nine periods of the day to the divisions of the great geological day.

He found independent and strong proofs of aqueous action on the terraces, and of the aqueous theory of drift.

Mr. Desor maintained the theory of soulevement against the theory of waves, in the explanation of these plicæ or flexures—the plicæ of the Jura chain are broken at the summit, and certainly were not caused by a wave, but by uplifting of the Alps.

Prof. Agassiz remarked that the Appalachian chain resembles the Jura; the first is ancient; the second, recent; showing that the same causes, whatever they were, acted in the production of both. The impulse which acted on the Jura was *lateral*, from the elevation of the Alps; was it so in the Appalachian chain? There were three separate elevations of the Jura, the last only of which was caused by the Alps.

Mr. S. S. Haldeman announced the discovery in the Trenton limestone of a species of Aonia, a genus hitherto unknown to the American continent.

Prof. Hall made a report on the Trilobites, Crinidea, &c., of New York, in which he gave their distinguishing characters. The Crinoids of the lower strata differ from those of the upper. He thought the *Atops trilineatus* and the *Triarthus Beckii* absolutely identical.

Prof. H. D. Rogers offered some remarks on the geological age of the rocks of Maine and New Brunswick, which were supposed to contain coal. From the examination of their fossils, he believed them identical with the Clinton group of New York; they contain no coal—there is none beyond Grand lake, in New Brunswick.

On the Organization and Objects of the Smithsonian Institution, by Prof. Henry.

Mr. Smithson was born in England in 1798; he died in Genoa in 1829; leaving a bequest of $500,000 to the United States of America, to found at Washington an institution, which should bear his name, for the increase and diffusion of knowledge among men.

It is not a national institution. He gave a brief sketch of his plan for carrying into execution the intentions of Mr. Smithson.

After a tribute of respect to the late president, Dr. Binney, the chairman concluded the session by a few eloquent remarks, on the perfect harmony which ought always to exist in a brotherhood of science; and congratulated the members on the glorious results which would certainly follow the labors of the association, under its more extended organization.

The association then adjourned, to meet in Philadelphia in September, 1848.

TURNING OVER A NEW LEAF.

"Are you going to get in that corn to-day?" said John Hendricks to Mr. Butler, the farmer for whom he was at work by the month.

"Yes," said Mr. Butler, "we must try to get it in, in course of the day."

"If it is to be got in to-day, we must go about it this morning. It is time it was in, it is half destroyed now. Benton's cattle were in again last night."

"I know they were. Here Saul, do you run over to Benton's, and tell him his cattle lay in our corn last night, and ask him to take care of them."

"And he will tell me to tell you to put up the fence," said Saul.

"The fence ought to be seen to. Hendricks you bring me the axe, and I'll go now and tackle it up a little," said Mr. B.

Hendricks went for the axe, and having searched in vain for it, returned to Mr. Butler, who was trying to set up a wash tub, which had fallen to pieces in despair of the fulfilment of Mr. Butler's promise, that he would get a hoe to-morrow."

"I can't find the axe, I would as soon undertake to make a thing as to find it in this place. It seems to be a rule with every one who uses a tool here to put it where it can't be found no how. If it was left where it was used last, a body might find something once in a while, but as it is, 'tis about impossible. I expect the barn will be among the missing some day."

"Never mind" said Mr. Butler, in a conciliating tone, "the axe will turn up in course of the day. You see if you can set these staves up, I want to step over and see if Holmes can come and cut that buckwheat to-day."

Hendricks did as he was requested. He set up the staves, and looked round for the hoop to confine them in place. "I wonder," said he, "If I am expected to sit here and hold these in place all day. There is no hoop between here and the blacksmith's, I dare say. I have done harder work than sitting and doing nothing, and more profitable work for my employer; but I must obey orders. Benton's cows are to have another pull at that corn, I see plainly."

In due time Mr. Benton came, and Mr. Holmes with him, and Holmes was ready to go at the buckwheat as soon as he had ground up his new scythe, and spliced one of the fingers of his cradle.

"You have got them set up have you?"

"Yes, but what is a going to hold them up when I let go of them?"

"Here is a hoop," said Mr. B. "I forgot to tell you about it."

Hendricks took it, and while Butler and Holmes were grinding the scythe he put it on and drove it down. "There," said he "that's the first job I've known to be finished on this ground since I came here three months ago." At this moment Saul returned. "Well Saul, what's the news?"

"Benton says Hyde's cattle are in the lower meadow."

"Very likely, I saw a red squirrel running towards the fence, and I thought it likely he would get on it and throw it down. If they find the potatoes, it will save some labor."

"What about the potatoes?" said Mr. Butler, coming up at that moment.

"Hyde's cows are taking care of them," said Hendricks.

"You run and drive them out Saul, and find out where they got in, and put up the fence a little, just enough to turn them for the present, I'll see to it in a day or two. Hendricks, you harness the horses, we will try to get a load of that corn in before dinner."

In about half an hour, during which time Messrs. Butler and Holmes had been employed in splicing the cradle finger, Hendricks came to Butler, and asked, "where is the harness for the off horse?"

"Oh, I let Finkle have it last night. I didn't know as we should want it to-day. Isn't there something else you can do to-day?"

"Yes, there is enough to do, if a body could ever get at it. There he comes with the harness. You are sure you havn't lost any of the linch pins?"

"I guess not."

"Well, it may be," said Hendricks to himself, "that some of that corn will be saved after all."

The reader has had a specimen of the mode of proceeding on Mr. Butler's farm, and will be enabled to form a pretty shrewd guess why it was that Mr. Butler, who had an excellent farm and who was always busy about something, was not "deemed and taken" by his neighbors to be a forehanded man.

Hendricks with the aid of Saul, succeeded in getting in most of the corn to which allusion has been made, so that Mr. Benton's cows came home the next day, which was the Sabbath, much less well filled than ordinary.

On Monday morning Hendricks was out by daylight, and at work when Saul made his appearance, which was not till he had given the sun due precedence. Hendricks informed him that a new leaf was to be turned over. "Things about the place are going to be done this week as they ought to be done," said he.

"I'm agreed" said Saul, who was quite willing to work, but wished very much to be relieved from the responsibility of directing his own movements.

"Mr. Butler," said John after breakfast, "has that axe come to light yet?"

"I havn't seen it."

"Here it is," said Lizzy, "I found it in the grass in the garden."

"And took care of it like a sensible body," said John, taking the axe from her hand, "Thankee."

The compliment was not a very polished one, but it brought over her beautiful countenance a blush which she hastened into the pantry to conceal.

"Now," said he, "if you and Saul will go at those potatoes, I will put that fence in a shape that will keep Hyde's cattle out of that meadow for some time I guess."

"Hyde ought to put up part of it," said Butler.

"I know he had, but he will never do it, you might as well try to get a hen to do a sum in the rule of three, as to get him to do anything worth while. Come let us have all those potatoes in, and that fence up before sunset."

"If we get all the potatoes in, it is not much matter about the fence."

"What is the reason it isn't? Who wants the cattle making mortar of the meadow? Come on."

They got into the wagon which had been brought to the door before breakfast, and Hendricks drove off at a rapid rate, making a great clattering of the loose boards in the wagon, and rendering it somewhat difficult for Mr. Butler and Saul, to keep themselves, or rather the board on which they sat, in place.

"What has got into John?" said Mrs. Butler, pausing from her efforts over the butter bowl, and watching the rapidly disappearing wagon.

"I don't know," said Lizzy softly. Now she had better not have made any reply to the question, for it was not asked with any expectation of a reply. I say she had better not have answered it, for I am not sure but that she strained the truth a little in so doing. Some passages which had taken place between John and herself as they came home from meeting together on Sabbath evening, and sat in the "front room" together, till the roosters crowed, were in fact the causes of the turning over of the new leaf in the management of the farm.

Before night the fence was put up, in the most substantial manner, and the potatoes all put in the cellar.

The next morning when they were all at breakfast, John inquired, "Is Holmes to work for you to-day?"

"He promised to come and do what he could towards finishing the buckwheat. He thinks it will take him a day and a half to finish cradling it."

"Well, you don't want him to-day. Send the cradle home, and tell him it is cradled."

"Cradled! who did it?"

"I did it."

"When?"

"This morning."

The look of astonishment and admiration with which Mr. Butler regarded John, was not unobserved by Lizzy, and led her to meditate on the propriety of another retreat to the pantry. She adopted however, the expedient of holding a coffee cup to her lips for a very unnecessary length of time.

"What shall we go at to-day after we have shocked up the buckwheat?" said Hendricks.

"I don't know; what do you think we had best do?"

"Have the rye in where we took the corn off."

"Well, we will go at that then."

In like manner John's advice was asked daily and followed; so that before winter set in, the farm presented a very different aspect from that which it usually wore at that time. Commonly, some potatoes were frozen up, and some portion of the intended sowing left undone, in consequence of the frost overtaking the plow. But now, every crop was secured, the grain sown, and up quite green, the house banked, and quite a "string of stone wall" made. That the corn was all husked in season, might have been owing to the fact, that the turning over the new leaf had inspired the family with such a spirit of industry, that Lizzy had joined them in their evening huskings, and took her seat near John, that he might break off such of the ears as were beyond her strength. It happened on one or two occasions that these two continued their labors long after Saul and his father had gone to bed.

In course of time it came to this, that Mr. Butler used to ask John what he was a going to do, as though his right to direct operations was unquestionable. For example, one morning John had a stone boat, with several crow bars in it, at the door.

"What are you going to do?" said Mr. Butler.

"I am going to build a stone wall, on the east side of the meadow. The ground is high enough there for a wall to stand, and there are stone enough on the knoll there which ought to come out to make."

Mr. Butler made no reply, but together with Saul went to digging stone.

"This looks like a new farm," said Mr. George one day to his neighbor, as they rode by Mr. Butler's house.

"Yes," replied his neighbor, "there is a new hand at the bellows."

"Does Hendricks work it on shares?"

"No, he works by the month."

"Does he? What makes him drive on so?"

"I don't know for certain, but I guess Butler's daughter is at the bottom of it."

When winter set in, Saul, though he was a good boy to work, felt a desire to have a little more furniture in the upper story, asked leave to go to the *Centre* to school. "Uncle Zeb says he will board me if I'll come."

"I don't see how I can spare you. We must build in the spring, and we have all the timber to get out, and logs to get to the mill, said Mr. Butler.

Saul looked rather down hearted.

"You can go," said John, who was sitting before the blazing fire, between Saul and Lizzy. "I'm a going to stay, that is, if they will let me. I tell you what it is, turning to Mr. Butler, if you will give me *this critter*, laying his hand on Lizzy's arm, I'll stay and work for you at any lay you choose."

Lizzy turned very red, but neither ran for the pantry, or pushed away John's hand.

"Well," said Mr. Butler who had recently seen what things were coming to, "that must be pretty much as you and she can agree, musn't it mother?"

"I guess so," said Mrs. Butler, dropping several stitches in a stocking she was knitting for John.

"There won't be much difficulty about it then, I guess," said John. Saul must go to school. He may go to college if he has a mind. I can get his support out of the farm without hurting any body, I reckon." Then turning to Lizzy, he said, "The road is good, and Jack wants to stir himself, and I want to go over to mother's. Suppose you just hop into the wagon and ride over with me."

Lizzy looked towards her mother, and rose up and went to "put on her things." The horse was soon at the door, and Lizzy was soon in the wagon, and the wagon was soon at John's mother's, and John's mother was soon introduced to Lizzy, who soon became her daughter-in-law, that is to say, on New Year's eve.

ON THE ALTERNATION OF GENERATIONS, ETC.,

The Royal Society of London was instituted for the purpose of publishing memoirs upon Natural History which booksellers are unwilling to undertake in consequence of their expected limited sales. Among its publications for 1846, is one with the above title, a translation first from the Danish into German and then from the German into English. It is attempted to prove in this essay, that in the propagation and development of some animals, the like is only obtained in the alternate generation; the immediate offspring of the parent, being a peculiar form and differing from the parent as much as two species differ, but which constitute in themselves *foster parents* to a progeny in which the likeness of the original parentage is restored.

We do not design to undertake a review of this work, but to give its doctrines without comment, knowing very well that their establishment must rest only upon numerous observations. In the preface, the design of the work is clearly stated, and as follows: to show that there exists in the lower orders of beings, *alternation of generations*; or in other words, it is an explanation of the remarkable and until now inexplicable natural phenomenon of an animal producing an offspring which at no time resembles its parent, but which on the other hand, brings forth itself a progeny, which returns in its form and nature to the parent animal, so that the maternal animal does not meet with its resemblance in its own brood, but in the descendants of the second, third or fourth degree or generation; and this always takes place in the different animals which exhibit the phenomenon in a determinate number of generations.

The first instance which the author adduces as an example of this kind of generation is the Medusæ, an animal which is soft and like jelly, and frequently in the form of an umbrella with fingers dependant from the margin. They are well known animals, especially to those who reside upon or frequent the sea shore. They are also called sea nettles and jelly fishes.

These beautiful and singular beings, which really are almost entirely composed of sea water and seem to float almost at random, bring forth their young in a condition capable of rowing themselves about, and form at the proper time, swarms, which at this period are quite distinct in form from the parent. They are small and in shape like a slightly compressed cylinder, though larger at one end, and covered over with ciliæ, which serve to row them about. In swimming the large end is forward, and as it is furnished with a depression it would be taken for the oval aperture. But the observer is soon led to correct this mistake, as it soon plants this end downward when it becomes permanently attached; it is to be regarded as a suctorial disc. When this attachment is formed, the other end presents a small orifice. This end soon enlarges and a border is formed around the upper extremity, and in the course of five or six days there shoots out from the border tentaculæ or arms. In this state it closely resembles a polypi. In process of time, eight tentaculæ are formed. After this the nnmber increases and they continue to spring up until they amount to thirty. When the full number of tentaculæ are attained a new kind of life manifests itself. At equal distances along the soft pulpy body, wrinkles begin to appear, which, extending transversely, form a channel with a distinct border, and with an edge. From this edge again arms shoot out, in form and shape like those which first appeared upon the young medusa, when it became fixed. It now appears like a series of fringed cups set into each other. Each of those little fringed discs or cups become vitalized, and when the process of separation is completed, each fringed body becomes a distinct individual and rows itself about upon its own hook. The state in which these individuals now are, is that of a young medusa, and in process of time, and by growth each individual detached as described above, becomes a perfect one. Here then, the writer recognized in the first polypi form which becomes fixed, a being which originates from the ova of these gelatinous animals, an individual or product unlike the parent. It has its own individuality, which it retains for a time, till finally a change takes place by which numerous individuals are developed, one above another, on a parent stalk. It is in these last developments that the polypi form is changed back to the medusæ.

The next instance which we shall notice, and where the mode of generation tends to support the doctrine announced, is the *Salpæ*, a singular animal well known to voyagers upon the deep. One of these beings is that of a chain of individuals of forty or fifty in number, linked together at their extremities by appropriate organs. This chain moves, as a whole, each individual moving in concert with its fellows. In company with the chain salpæ are found some free individuals, but in most respects like the linked ones. In this instance the generation of salpæ are alternately free and linked, or associated; the free salpæ bringing forth the associated, and the associated bringing forth the free; and it is consequently considered that the free is more advanced, inasmuch as multiplicity indicates a low grade of organization. The free salpa then, is the mother, who brings forth the chain salpæ, a depressed type of organization, but which are designed, in its own individual power, to bring forth an offspring which will return to its parent form.

To us, and we think to many, a more interesting example of this kind of generation is found in the *Trematoda*, the fluke or liver worms of sheep and other animals. The details of the changes however, in this order of animals, is drawn from the fluke of the snail of stagnant water, Lymea stagnalis.

The facts as stated by our author are these; the snail is surrounded by thousands of little polypi-like animals, or animals with soft extensible bodies, which at one end have the appearance of a neck, above which their appears a border regularly serrated or armed with small teeth within. These creatures are regarded, or have been regarded as a distinct species, and have received a name indicating the same being known among naturalists as the Cercaria echinata? Within the spines spoken of above, there is an oval orifice. The other extremity is terminated by a tail proportionally long, and near its base is a sucking disc, by which the animal can adhere to other bodies. Without attempting to follow the author's minute anatomical description of this animal we shall proceed to speak of their metamorphosis. By the sucker already spoken of, they frequently attach themselves to the lymnea or snail, around which they sport, and for a time as frequently detach themselves again. When the period arrives for a farther change, they then attach themselves for a permanent hold. Their first effort then, is to rid themselves of their tails, which they do by frequent jerks, and being cast off, it then becomes a lifeless particle. The Cercaria, as if to gain a better footing upon the snail after casting off its appendage the tail, turns around again and again, in order to bore itself deeper into the flesh. During this time it throws off from its body an abundant mucous secretion which is designed to form a case or covering which becomes slightly indurated. Beneath this case which is considered analogous to a pupa case, the animal remains in comparatively a quiescent state. The animal having encased itself as above stated, and this is usually, if not always effected in autumn, remains till about January. It now penetrates through the skin, and finally into the liver of the snail. In its progress it loses its organization in part, the rows of spires fall off, the viscera become obscure, and it assumes more and more the form of the fluke, more liver-like in its condition, or more shapeless. It however preserves its identity, it is an animal feeding upon the highly animalized part, the liver, and here its ova for another brood are formed and ejected, passing into the fluids, and then outwards, assuming a state and condition which observation has not yet determined on. So probably every species of fluke, which inhabit sheep and other higher grades of animal kind, appear in a peculiar state, and under peculiar forms, before they are prepared to penetrate these highly animalized abodes, where though they are less active or more sluggish, yet are evidently in a higher grade of existence, than the one during which true ova are formed, and from which a numerous progeny of flukes will arise.

We pass now to the concluding remarks of the author, though we have by no means brought out one of his main ideas so full as we ought, viz., that the sustenance of the individual destined to become identical with the parent by the instrumentality of *nurses*, the latter being the direct product of the mother, and which is the generation so unlike its parent. But we shall state first an interesting as well as important doctrine, that so far as a complete conception in our minds of a species is formed, it must take in all the stages and forms in which they exist. An idea of a male female parent is insufficient, so long as their unlike progeny is unknown or left out. With this idea an individual cannot represent the species. This idea of a nursing progeny differs from that involved in the common metamorphosis of the larva of a butterfly.

Organism, analogy, and indeed observation to a certain extent go to prove that the entozoa, intestinal worms, tape worms, flukes, etc., all exist in an individual state out of the body, and never become perfect and capable of producing ova, unless by some means they can secure a lodgment in the viscera.

Analogy also points out the similarity of these nurses, the immediate type, to what occurs in the economy of ants, wasps and bees. In the former, the nursing is performed by an unconscious activity of an organism apparently, and probably really so, and independent of will. In the latter, as ants, bees, &c., the nursing is what may be determined a *willing impulse*, or instinct, a voluntary act, always directed to one purpose. This is a progress upon the former condition, and probably in the first, the activity of an organism is unattended with pleasure, while in the latter enjoyment attends the instinctive impulse, or the conscious instinct. This is not what our author says, but we have herein made an interpolation of our own ideas of the matter.

Now the difference in the cases of wasps, bees, &c., is this, the foster parent or nurse is an individual which feeds and supports a progeny out of its own body and not within it. The neuter bee for example performs the part of the nurse; it is the foster parent who takes in charge the management of the eggs, and afterwards the larva of the queen bee, who has no more to do with her progeny than many modern mothers. But the neuters form first the habitation, put the eggs therein, and when they are hatched supply the necessary food. But this is not all, they provide prospectively for the events of a future community. This is effected by putting these eggs, which are designed for workers or neuters, into one order of cells, which are smallest, those which are designed for males into another, and the female into another still more roomy. The larva being hatched, then commences the duty of feeding or nursing them. The individuals in the first order of cells are fed with a poor quality of food. Certain organs in consequence both of food and position are undeveloped, they are the small neuter bee. The next order is better fed, the male is consequently developed, and in the part; the best food of the community is furnished and in abundance, and here we have developed the female or queen bee.

The system requiring nursing individuals, is a remnant of the vegetable economy brought up from a lower grade of existence and destined to expire in the lowest forms which border the outskirts of the animal kingdom. It is a vegetative function as unconscious of an end as the forces which develope the acorn or the apple. Says the author, it is the great and significant resemblance to the vegetable kingdom which is presented in the eutozoa as well as in all *nurse* generations, though he regards the state of continued dependance incidental to the animal life, as one of less perfection than that which is presented in the progressive development effected by the agency of the vegetative life.

EXTRACTS FROM THE OLDER JOURNALS.

We have occasionally given extracts from the older journals for the purpose of furnishing our readers with comparative views of the past and the present. Those who think, will be able to estimate the progress we are making, and have been making for the last half century. Many suppose that they are living in a new era of science and agriculture; that the doctrines which are promulgated now, are absolutely new and are especially the product of the mind of the present generation. But we shall see how it is by reference to the works of the Agriculturists of 1790—1799.

If we do not find the identical doctrine now received, we shall find at least their germs, or what have been the suggestive ideas upon which has been reared some of the most popular works of the day.

Agricultural Inquiries on Plaster of Paris. Also Facts, Observations, and Conjectures on that Substance, when applied as a Manure, &c. By Richard Peters. Philadelphia. Cist & Markland. 8vo. pp. 111, 1797.

With great pleasure we announce this small publication, which is intended, as the author modestly says, "to invite as well as to give information," and which is collected chiefly from the practice of farmers in Pennsylvania. The subject of manures appears, as yet, to be in need of much further elucidation than it has hitherto received; and on scarcely any article of the whole tribe of fertilizing substances is a rational theory more wanted than in the case of gypsum. Mr. Peters has proceeded in the proper way to come to a right understanding of his subject, by laboriously and patiently collecting, not only the facts which fell under his own eye, but those which occurred to the intelligent farmers of the country around him.

The mode adopted to collect information was by a circular letter, containing about a dozen queries. To these queries answers have been returned by Messrs. West, Frazier, Price, Hand, Curwen, Sellers, Duffield, Wharton, Roberts, Heckewelder, and by Mr. Peters himself. So that the materials collected are to be considered as the result of the agricultural experience of these respectable cultivators. They all agree in the vast utility of gypsum as a manure in most parts of Pennsylvania, where it has been tried. It seems to be agreed on, that after ten or eleven years use, the gentlemen still entertain their good opinion of it; that it remarkably recovers exhausted and impoverished soils; that one bushel and an half, or two bushels, will be sufficient, if yearly repeated, for clover; that it will answer well in a sandy loam, upon a limestone bottom; that though it is serviceable when strewed in powder, on growing plants, it succeeds best in repetition, after cultivating and dressing slightly with stable manure, or with ploughing in green manures. As to the supposed sterility occasioned by gypsum, Mr. Peters observes, that his own experience teaches him it does not exhaust more than other manures do, particularly dung, and that to produce its full effect, it must have something to feed on, as some farmers express it; must meet with something in the soil to decompound it; and where this is wanting, the Plaster of Paris does no good. When strewed on the surface, it most remarkably benefits white and red clover and most grasses; though it did not appear to do any good to winter grain. It is good for all leguminous plants, buck-wheat, flax, hemp, rape, and oily seeded plants; most products of the kitchen-garden, and for fruit-trees; as well as for oats and barley, when sprinkled at sowing time on the wetted seeds. Mr. Peters has sowed gypsum at all times of the year, and has found it answer well, if strewed over the land at any time from the beginning of February to the middle of April; and he directs it to be sowed in misty weather to avoid the loss of having it blown away with the winds if sown in a dry time. Some do not sow it until vegetation begins, though our author thinks it will have an effect if sowed at any season. As to the quantity of produce by the acre, Mr. Peters affirms, he gets as much from gypsum as from any other manure; that the hay is better than that produced by dung; that the cattle waste less of it; and if the grass is used for pasture, the creatures are much more fond of the *plastered* than of the *dunged* produce. He is satisfied with a ton and a half the acre at a cutting; he mows twice, and has a third growth for grazing afterwards. Its durability is such, that though sometimes it will be exhausted in one year, yet the efforts of one dressing, of three or four bushels to the acre, has been felt for five or six years, gradually decreasing in its powers, and seems to be capable of prolonging the efficacy of dung; and has been known to do good, when sowed repeatedly and in small quantities, for a continuance of twelve years and more. The author expresses himself with much propriety, on the pernicious increase of weeds, through the neglect of husbandmen, and thinks the French gypsum preferable for agricultural purposes, to that brought from Nova Scotia. We believe, with him, that there is a great variety in the gypsum, and are of opinion, that in order to make the whole subject well understood, there should be a set of correct and well conducted experiments, on the actual composition and relative properties of the several sorts of plaster. But who that can be relied on will undertake this inquiry?

Further Facts tending towards an Explanation of the true Operation of Alkalies and Lime upon other substances. In a letter from Dr. Mitchell to Thomas Beddoes, M. D., dated New York, September 15, 1797.

What I wrote to Dr. Percival on the 17th of January, 1797, was an attempt to reduce the phenomena of alkaline remedies and neutral salts, in febrile distempers, to a general principle, by shewing how they overcame or expelled the putrid miasmata, or the contagion which induced the symptoms. Since that time, when in the spring of the present year, it was agitated among the citizens of New York, whether manufactories of soap and candles generated pestilential air, the facts which presented themselves to my view led to a conviction, that calcareous earths, alkaline salts, animal fats, and vegetable oils, attracted the matter which imparted to the atmosphere its epidemic and sickly influence, and, consequently neutralized or deadened the septic effluvia which were the cause of fevers. (Case of the manufacturers, &c., stated and examined.) And more recently still, on considering these noxious exhalations, in relation to soils, manures, and vegetation, it seemed obvious, that lime and alkalies could repress them; and by so doing, did purify the air and fertilize the land; and were thus serviceable in agriculture, not by any septic influence they possessed, but, in a considerable degree, by neutralizing the septic or acid of putrefaction. (Medical Repository, p. 39.) Indeed, the united force of the facts afforded by the materia medica, by arts and trades, and by agriculture, prevailed over all the former notions I possessed; and, as I believed, did exhibit in evidence too strong to be resisted, that the principle I had laid down was grounded upon a very broad induction of facts.

Besides the considerations alluded to, my opinion of the power of lime to absorb, and, in some degree to neutralize the fluids produced by putrifying animal substances, was strengthened by reading Grayden's paper concerning the fishes inclosed in the limestone of Monte Bolca, near Verona. (5 Trans. of the Royal Irish Academy, p. 281.) Here is a mass, or part of a stratum of calcareous rock, which contains, not the mere impressions or likenesses of animals, as shistic fossils commonly do, nor *petrifactions* of them, as is generally the case with calcareous rocks, *but the actual remains of dead fishes,* of their natural size and figure *preserved like mummies,* and so complete that their genera and species can be perfectly ascertained. The lime, in this case, is penetrated by animal matter, which seems to have imparted to it the quality of emitting a fœtid and unpleasant smell when scraped or struck. No analysis that I know of has been made of the rock; but among the matters with which it is charged are evidently these; whatever of fixed air has been formed by the union of oxygen with carbon, during the putrifaction of the fishes, has been attracted by the calcareous matter, and consolidated with it; the whole of the water produced by the junction of their oxygen with hydrogen, has been absorbed by the porous earth; all the oil formed by the union of their hydrogen with carbon, has been drunk up in the same way, and the septic acid, formed by the combination of their azote with oxygen has likewise become embodied with the surrounding lime. Thus, as fast as any thing fluid was formed, it was immediately imbibed; and as the fluids formed by putrifaction are thus combined with the calcareous stone, the residuary matter of the animals is left in a dry and somewhat firm condition, resembling mummies; the lime having had, as it were, an embalming effect, or, at most, having literally acted the part of a sarcophagus. In particular, it may be considered, that the total decay of the bodies of the fishes was prevented by the absorption of the water and septic acid produced during the first stages of corruption.

Yet this preserving power of lime is not peculiar to it, for it belongs to alkalies too. Dean Hamilton's experiments on the power of the *fixed caustic, alkaline salts,* to preserve the flesh of animals from purtrifaction (Ibid. p. 319) are sufficient of themselves to correct many of the mistakes we labor under in respect to alkaline salts and putrifying bodies. They shew that caustic pot-ash possesses a power of preserving animal flesh from corruption, fully as remarkable as the anti-septic power of caustic lime. It preserves flesh incorruptible, though it has been generally believed caustic alkalies would consume it. Flesh preserved in this way is so durable, that after twenty-two years keeping, it remained unaltered; when broken, the parts hung together by fibres, and looked like a piece of plaster taken from a wall; the fibrous or stringy parts of the flesh not seeming to have been corroded or dissolved by the salt.

The strong *antiseptic* powers possessed in so high a degree, both by quick-lime and caustic alkalies, must induce a change of opinion relative to their effects upon the dead parts of animals. They are antiseptics, and particularly so, for this reason, among others, that they attach and neutralize that great destroyer of organized bodies, the septic acid.

Such a change of opinion would probably have happened long ago, if the leading medical characters in Great Britain had attended to a hint of the Italian Lancisi, and improved upon it. This attentive observer of the noxious exhalations of the marshes around Rome, entertained no doubt of the efficacy of *quick-lime* and soda to correct pestilential miasmata, "*non enim dubitamus*," he writes treating of the tanning of leather, *quin lixivium ex viva calce paratum et pulvis myrti et sodæ, quibus pelles absterguntur et condiunter*, PESTIFERUM MIASMA POSSUNT CORRIGERE (De bovilla peste, par. ii, cap. 2). It is strange that the effects of lime-water, employed in tanning, to preserve the hides from putrifaction, has not been more attended to by philosophical inquirers. And it is no less strange that the power of lime, to destroy putrid vapor, (septic acid,) if any should be formed, during the preparation of the skins, and thereby prevent the business from growing unhealthy, has been almost entirely overlooked, though the facts are so plain and palpable. The antiseptic operation of lime keeps the pelts from turning to pestilential air, and instantly attracts to itself every particle of it, if any should be formed. It exercises a like power upon water put into casks for mariners' use at sea. The good effects of lime-water in putrid scurvies, and some other diseases, to which seamen are liable, have been so evident, that Alston, in 1752, under a conviction of its beneficial tendency, recommended one pound of fresh, well-burned quick lime, to be put into a hogshead of water, and to be used as common drink by the diseased, and by way of prevention for the healthy (Dissertation on Quick-lime and Lime-water); and also to put some of it in the ship's well, to prevent the putrid streams and foul air rising from thence. (Lind on the Scurvy, p. 442.)

The disposition of lime to preserve animal substances is further evinced by the incrustations and petrifactions so plentifully to be found in caves and quarries of calcareous earth, and so frequently seen in the collections of the curious. All nature is full of this kind of evidence. There is, therefore, no necessity of mentioning in detail, the petrified serpents, toads, and almost all sorts of creatures, that have been found embalmed in lime-stone.

But, though alkalies are such great resisters of putrifaction in carcases of their parts, caustic pot-ash produces some effects upon the living human body, which are not generally known. By attending to them, it will appear, this latter may destroy life, though not by inducing any form of malignant or pestilential disorder. Pursuant to the law which provides for the inspection of pot-ash and pearl-ash in the city of New York, large quantities of those articles are deposited in the store-houses of the persons appointed by the government to examine them. The quantity of these salts is so great, that the inspectors are frequently obliged to employ several men to assist them in the capacity of clerks and laborers. In order to make a complete inspection of the alkalies, it has been often times judged necessary to empty the barrels in whole or in part. During this operation, it generally happened that some of the materials flew about in the form of dry-powder, and passed with the air into the nostrils, mouth, throat, and lungs of the by-standers. The effects of the inhaled powder of caustic pot-ash, are well worthy to be noted. One of the inspectors ascribed to it the purity and soundness of his teeth, and relief from the sensation formerly caused by an acid in his stomach. His decaying teeth ceased to rot any more since he applied pot-ash to them. But much more serious was its operation upon the steady laborers. Sneezing, coughing, and impeded respiration were among the first of its effects. Spitting of blood sometimes came on afterwards. The lungs, if still exposed to the saline dust, became more and more disordered, the strength diminished, and as the disease increased, the persons were affected, as with a sort of consumption, and died. The death of a number of men that had worked in the pot-ash stores, is thus accounted for by the inspectors. It has been common to have a considerable part of the work done by slaves; for free laborers, who are acquainted with the nature of the business, engage in it reluctantly, and many of them altogether refuse to work at it. Apprehensive of the danger which arises from starting all the contents of every barrel upon the floor, the inspectors have been reduced to the necessity of discontinuing this part of the practice in some degree. These caustic alkaline atoms, when they are inhaled and dissolved in the mucus of the passages, are thus productive of a lingering indisposition, in which the lungs particularly suffer; but they have never been known to excite yellow fever, or any set of symptoms that resemble it; so far is this from being the case, that during that epidemic sickness which has so often visited the city of New York, I could discover no instance of the inspectors and their assistants having hitherto been infected by it.

The information you gave me in your letter from Clifton, of June 15, concerning the cure of diabetes mellitus by hepatized ammonia, or by volatile alkali alone, is very interesting. In addition to the plan I suggest the propriety of prescribing lime in preference to ammonia. The reason of my hint is this: It is said at Schoharie, in the state of New York, that in that part of the country, where much sugar and molasses is made from the juice of the maple tree (acer saccharinum), and used plentifully by the inhabitants, diabetes is a frequent disorder. To get relief from the complaint, it is a common practice to take astringents, and that the drinking plentifully of *lime-water* in addition to them, often, wrought a cure. This fact leads to a little speculation. The sugar-making process is familiar to many plants. Diabetes seems a sugar-making operation going on in animals, and to be in them a formidable disease. The benefit derived from lime leads to a suspicion of the presence of the oxalic acid. The Schoharie people are cured by lime, and this probably acts by neutralizing the acid of sugar, and checking that morbid action of the vessels which favors the saccharine secretion in men. Now, from the known stronger attraction of lime for oxalic acid than ammoniac or other alkalies possess, is there not a good reason for preferring it? I wish you would mention it to Dr. Rollo.

The fact now related is connected with another still more important. The part of the country alluded to is underlaid with limestone and calcareous marl, and is remarkable for its freedom from epidemic, intermittent, malignant and pestilential fevers. This appears to be the case in Tennessee, Kentucky, and all our western country, where lime constitutes extensive strata. These disorders, when they break out, happen sporadically, from an improper state of the alimentary canal, bad management about the house, or some such cause. But the universal spread of such distempers among the people is prevented by the lime, which attracts and neutralizes the septic and pestilential vapors, turning with them to calcareous nitre, fertilizing the soil, and rendering the settlements there friendly at once to animal and vegetable life. The lime with which the water is charged, has, when drank, a like operation on the contents of the stomach and bowels.

MARSHES, AND THEIR EFFECTS UPON HUMAN HEALTH.

It is well known that the effect of marshes on health is great and decided. In districts which abound in them, the inhabitants suffer not only from intermitting fevers, but from rheumatism and its kindred diseases. Their influences are not of that insidious character which some suppose, or at least the effects are always evident in the countenance and frame of the individuals. Emaciation, enlarged abdomen, feebleness, are some of the general effects which manifest themselves in persons who claim to enjoy health. But it is not necessary that these wet and marshy ground should be extensive in order to exhibit a deleterious influence upon health; even ditches, stagnant pools, motionless water, each exhale matters which change healthy to unhealthy actions of the system. Puddles and pools, drains and sewers, operate most injuriously, and contain poisonous elements which are exhaling so long as a particle remains to moisten the surface. Our country abounds in marshes. Some places which are now healthy and free from intermittents, were once abounding in them. The progress of agriculture has in many instances entirely banished this severe disease, and so as good husbandry extends a two fold influence, beneficial in its character is sure to follow healthfulness and wealth. Man never benefits himself in a legitimate way, without doubling his blessing, first receiving them into his own bosom, and then that of his neighbor. It is not however at all essential that a marsh or pool should exist, in order that poisonous vapor should be generated. Animal and vegetable matters in combination in deep mould, such as is found in the western prairie is sufficient to generate a pestilence when exposed to the sun beams, and when moistened merely with dew, is sufficient in itself to form the miasm and float it in the atmosphere. Turf new ploughed, or turned over, especially if the areas are large, turns a country before healthy, into a region of sickness. From researches which have been instituted by Thenard and Dupuytren, Moscati, and by M. Regaud d l' Isle, the miasmatic exhalations have been found to contain animal matter, and hence it is probable that it is really composed of both animal and vegetable matter. It has been shown by Vauquelin, that the exhalations from the Pontine marshes afforded animal matter in a putrescent state. In the foregoing instances however, this matter was obtained from the water or soil, but Boussingault succeeded in obtaining it from the atmosphere over the great southern American marshes, a fact which goes to show that the poisonous effluvia is exhaled in a tangible state. These poisonous gasses contain in addition to animal matter, light carburetted hydrogen, azote and carbonic acid, and sulphuretted hydrogen, and sometimes a trace of phosphuretted hydrogen. By vaporization of dew in the rains upon our western prairies, and the water of marshes, these organic and poisonous effluvias are disseminated in the atmosphere, and are wafted by the breeze over wide areas.

An interesting and important fact may be stated in this place, viz. that age influences or modifies the effects of marsh miasm. Infants or children under two, are less affected than those of three or four years. This may arise from the greater exposure of the latter. So old persons are less affected than those of middle age, or who are engaged in artisan pursuits. Children when attacked with disease fall victims to its influence, more easily than adults; their mortality is greater in the proportion of 1000 to 1546, and it has been observed that fewer deaths occur in infants below one year than in those of three or four years; after ten years the influence of marshes is less to be feared, and the capability to resist marsh miasm increases up to twenty-five years, from twenty-five to fifty-five the susceptibility again increases, though it is never so great as in children between the ages of two and ten years.

Old persons as already stated, are more exempt from marsh influence. Food and exposure furnish conditions which favor its influence. Bad and ill conditioned food, night air, especially when heavy dews are formed, favor very strongly miasmatic disease. When ill clothed and ill fed troops are forced to march by night in a marshy country, it may be expected their ranks will be decimated. The emigrants from New England to the rich western prairies, or to the rich bottom lands of the western rivers, may expect disease and death; provided they plough up those prairies or bottoms, and thereby expose themselves to exhalations from a surface charged with animal and vegetable matter. These are calamities which the first settlers can scarcely expect to escape; circumstances may delay the development of diseases, when a favorable season may occur, but they seem to be inevitable in the end.

From observation it appears that disease will be in proportion to the concentration or amount of miasm to which an individual may have been exposed. Hence precautionary measures will not be useless. A residence by the side of a marsh or upon a prairie where the turf has been newly turned up should be closed upon that side towards the miasmatic grounds, when the wind blows from them. So the night air should be avoided, especially after hot and sultry days when much dew will be formed, or rather where much exhalation will take place when the miasm will be concentrated in it at night fall. So it is important that the vigor of the system should be promoted, and that during the period when there is greater exposure to poison, the different vegetable tonics should be employed, as quinine, which is the most powerful, or for want of this, pulverised bitter barks, or infusions of them, as the eupatorium, boneset, &c. Such a plan would at least mitigate the effects of the effluvia.

Great fatigue, hard labor favor also the influence of marsh poison. Closing windows, keeping within doors, avoiding dews, moderate labors, and a tonic regimen, may be set down as some of the preventives to the influence of the poisonous exhalations of marshes.

We are indebted to our friend Robert W. Gibbs, of South Carolina, for a copy of his valuable memoir on the fossil genus—Basilosaurus (Zeuglodon). It is well illustrated by lithographic plates. It is in the folio form, and its execution is honorable to the taste as well as the researches of the author.

FARM HOUSES.

The style which is getting into fashion of late, of building farm houses with turrets and towers, with many angles and pointed windows, we cannot regard with favor. It is true that houses built in the semi-gothic style look finely and are no doubt tasteful, and yet are they more tasteful than a plain rectangular house of one and a half or two stories?

As farm houses, we object to them for country farmers with moderate incomes, on account of their expense. Second, on account of their greater liability to get out of repair, and thirdly, the great expense of repairing them, and keeping them in repair. With us these considerations are sufficient to induce us to discourage this plan of building farm houses.

Wealthy men however, can do as they please. Merchants retiring from business with pockets burdened with cash, had better adopt this style. It will ease them of the dropsy, and cure their *billious* condition. It will distribute the proceeds of their accumulated income, and equalise the circulating medium, and make frequent exchange of surplus products to the advantage of real producers. We do not consider him however a benefactor, who to promote what is called a fine taste, leads a farmer to sacrifice his means, on an expensive establishment.

PUBLICATIONS.

Elements of Geometry, with practical applications, designed for beginners, by George R. Perkins, Professor of Mathematics in the New York State Normal School; author of Elements of Arithmetic, Higher Arithmetic, Elements of Algebra, Treatise of Algebra, etc. Utica: H. H. Hawley & Co. Hartford: J. H. Mather & Co. 1847.

The reputation of Mr. Perkins as a mathematician, is based upon a durable foundation. His mathematical works are of a high order, and he ranks among mathematicians one of the first of the day. We recommend the treatise to students, because we think it a good one, but more from the high reputation of the author. The book is printed on good paper, and its execution is excellent, and the size of it convenient. We hope it will be adopted by the schools and academies of this and the neighboring states, as a text book for the teaching of the elements of Geometry.

TO OUR SUBSCRIBERS.

We deem it proper to say, that when we undertook the task of conducting this Journal it was not for the purpose of pecuniary gain. We had a higher object in view, that of disseminating information of a higher order than had been attempted by the journals then established. This object we have steadily kept in view, and our pages will speak for themselves whether the object has failed or not. We think not. The doctrines we have laid down we are ready still to sustain and support. We have not run after any of the false lights. We have not induced our patrons to adopt practices in husbandry which have failed, and by which losses have ensued. Our views of the progress of husbandry, and the means by which it is to make progress, are probably somewhat different from our cotemporaries. We do not expect a rapid progress; the establishment and dissemination of correct principles of farming will require time. Whoever expects agriculture will make rapid advances will be disappointed. Whoever expects that farming will be conducted without labor and study will be disappointed, and so will those who are expecting much from electro-culture and other analogous substitutes for fertilizers, will fall into the same ranks.

The application of chemical principles and facts combined with a knowledge of physiology of plants and animals, and then the application of mechanics to practical husbandry, must lie at the foundation of progress in agriculture. It must not be forgotten that agriculture is complex in its relations, that it really involves in its practices a knowledge of most of the sciences. It is especially so, as conducted by agriculturists as a body. All raise stock, grass and the grains, with the tuberous and tap rooted vegetables. It is true a farmer's boy can scatter seed, can feed potatoes or grain to a fatting ox, or a pen of pigs. But the doing of this in the most economical way involves something more than pouring out the contents of a basket or pail, and yet this constitutes, even now with many, the whole operation of fattening animals. How potatoes and corn are converted into pork and beef, wool or hair, is never thought of; much less is it supposed that circumstances can modify results. But we did not sit down to write an essay, nor to find fault with any body. Our object being to call the attention of our present subscribers to the Journal for another year. We have said the labor of conducting it was not undertaken with the view of making money, neither do we ask support at the present time with the expectation of promoting this object.

Some and even many object to our Journal because they cannot understand it; it is too scientific. Well, admit it, we mean to make it so, and if farmers are determined to remain in ignorance, it shall not be our fault. If they are determined to remain in the back ground of knowledge we can't help it. We shall not make it any the less scientific to accommodate any person. If people will not think, if they will not cultivate that part of themselves, which makes them men, and intelligent men, we can't help it. But we shall not give the pages of our Journal to matter which our subscribers can read without exercising some of their mental powers. Instead of making the work less scientific for the accommodation of a few lazy men, we design to make it more so, and if any are displeased with it on this account, let them pay up for what they have had and stop it.

Another fact we wish to remind our subscribers of, and it is this; that this work was reduced in its price from three to two dollars per annum, for the purpose of accommodating our mail subscribers, so that they could afford to pay its postage. We hope however some arrangements may be made by which its postage may be reduced. We are aware that most of the monthlies pay only newspaper postage which gives them an advantage over those which are published in a pamphlet form. This subject, we shall speak of in the December number. For the present we only ask of our friends, an examination of the work since its establishment, and satisfy themselves whether it merits their continued support.

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OF

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No. XX. DECEMBER, 1847.

TEMPERATURE OF THE SOIL,

As indicated by a Series of Observations at Albany, New York, for Six Months, beginning with May, 1847, and ending with October of the same Year.

The importance of determining terrestrial temperature is felt more and more as advances are made in scientific agriculture and gardening. We have no space here for general observations on the utility of the subject. Our observations were made primarily for the New York Agricultural Report, now in progress. They have been regulaıly kept by Mr. Salisbury, who is the chemical assistant, and may be relied upon for accuracy and fidelity.

Albany is in latitude 42 deg., 39 min. The observed mean temperature of the place is 48 deg., 47 min., at an elevation of 130 feet above tide. The elevation of the place where the following observations were made is about 100 feet above tide, in the open space in the rear of the old State House, where the morning sun shines early, and continues till the after part of the day, when the spot is shaded by the walls upon the west side of the area.

MAY.

OBSERVATIONS ON ATMOSPHERE, DEW RAIN, AND WIND

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	
1	43		42			N.	56		47		N.					S.	53		50		S.W.	
2	41		46			S.	45		46		S.					N.W.	46		46		S.	
3	44		45			W.	53		46		N.W.	53		47		N.W.	48		48		N.W.	
4	39		45			W.	58		47		W.	60		49		N.W.	56		50		N.W.	
5	40		47			W.	62		48		W.	67		49		N.W.	61		51		N.W.	
6	43		48			N.W.	69		49		N.W.	68		54		N.W.	62		53		N.	
7	45		51			W.	73		52		N.	72		54		N.W.	66		55		N.W.	
Mean,	39⅞		46				59½		47⅞			65		50¾			56¼		50			
Highest,	45		48				93		52			72		54			66		55			
Lowest,	40		42				56		46			52		47			46		46			

*1. Morning clear. Afternoon few thin clouds. 2 Cloudy. Rainy Moderate breeze. 3. Morning rainy. Afternoon thick clouds. Stiff n. w. breeze. 4. Heavy dew. Afternoon few clouds. Stiff n. w. breeze. 5. Heavy dew. Few clouds Slight breeze. 6 Morning clear. Heavy dew. Afternoon few clouds. Moderate breeze 7. Morning clear. Smoky. Heavy dew. Afternoon few clouds. Slight breeze.

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Dew.	Rain	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	
8	50	54	53			N.	60	$56\frac{1}{2}$	53		N.	62	57	54		N.W.	60	57	54		N.W.	
9	54	$53\frac{1}{2}$	53			N.	68	58	54		N.W.	72	65	$55\frac{1}{2}$		N.W.	68	63	57		N.W.	
10	52	$55\frac{1}{2}$	55			N.W.	73	62	58		S.	74	65	58		S.W.	68	62	59		S.W.	
11	58	57	57	57		S.W.	74	62	58		S.W.	$75\frac{1}{2}$	62	58		S.	69	64	62		S.	
12	56	55	57	55		S.	72	$62\frac{1}{2}$	62		S.	69	65	60		E.	66	63	$59\frac{1}{2}$		N.	
13	53	55	59	49		N.	70	63	62		N.	72	65	58		N.	64	62	60		N.	
Mean,	$53\frac{7}{8}$	55	$55\frac{1}{1}$	$53\frac{2}{3}$			$69\frac{1}{2}$	$60\frac{2}{3}$	$67\frac{7}{8}$			71	$69\frac{1}{2}$	$57\frac{1}{8}$			$65\frac{7}{8}$	$61\frac{7}{8}$	$58\frac{1}{3}$			
Highest,	58	57	59	57			74	63	62			$75\frac{1}{2}$	65	60			69	64	62			
Lowest.	52	$53\frac{1}{2}$	53	49			68	$56\frac{1}{2}$	53			62	57	54			60	57	54			

* 8. Cloudy. Commenced raining at 5 A M., and continued till 11 A M. Afternoon cloudy. Moderate breeze. 9. Few clouds. Soil in good working order. Horse chesnut leaves 2 inches long. 10. Few thin clouds. Warm. Currants in flowers. 11. Few clouds. Moderate breeze Heavy dew. 12 Heavy dew. Few clouds. Strong breeze. Variable. 13. Few thin clouds. Light dew. Moderate breeze.

MAY.

DAY OF MONTH.	OBSERVATIONS ON GRASS LAND. 5 o'clock A. M. Surface.	4 inches below surface.	9 inches below surface.	12 o'clock M. Surface.	4 inches below surface.	9 inches below surface.	7 o'clock P. M. Surface.	4 inches below surface.	9 inches below surface.	3 o'clock P. M. Surface.	4 inches below surface.	9 inches below surface.	OBSERVATIONS.
14		53	55	80	64	57	79	68	57	64	63	58	Heavy dew. Few thin clouds. Soil dry.
15	42	53	55	72	62	57	80	70	60	65	63	59	Heavy dew. Few thin clouds. Smoky.
16	46	53	55	74	66	58	75	67	62	62	62	59	Clear. Smoky. Slight breeze.
17	41	49	53	76	65	57	88	73	58	66	65½	58½	Few thin clouds. Smoky. Slight breeze. Horse chesnut in flower.
18	53½	55	56	66	60	57	68	62	58	58	58	56½	Morning few thin clouds. Smoky. Afternoon cloudy. Stiff n. breeze.
19	52½	55	55	72	60	56	75	61	57	64	58½	57½	Forenoon cloudy. Rainy. Afternoon few clouds. Soil wet 1 in deep.
20	47	53	55	80	64	59	78	77	58	64	63	58	Clear. N breeze. Smoky.
21	50	54	56					77	58	60	62	58	Clear. Smoky. Strong S. breeze.
22	53	55	56	62½	57	56				63	55	57	Cloudy. Strong S. wind. Slight sprinkle.
Mean,	48	53⅓	55	85	82¼	57	77⅜	69⅜	59¾	62⅞	61	57⅞	
Highest,	53	55	56	80	66	59	88	77	62	66	65	59	
Lowest,	41	49	53	64	62	56	68	61	58	58	58	57	

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
14	48	44	40	40		N.	70	71			N.	73	74	72		N.	68	65			N.	
15	46	44	40	40		N.W.	71	70	68		N.W.	75	74	72		N.W.	69	$66\frac{1}{2}$	64		N.W.	
16	47	44	43			S.W.	74	74	71		S.W.	74	74	73		S.W.	66	63	62		S.W.	
17	45	$42\frac{1}{2}$	42			N.	70	71	$70\frac{1}{2}$		S.	73	$74\frac{1}{2}$			S.	70	61			S.	
18	54	$53\frac{1}{2}$	$53\frac{1}{2}$			N.	65	65			N.	61	61			N.	56	56			N.	
19	50	51	51		53	N.W.	65	66			N.	$66\frac{1}{2}$	$66\frac{1}{2}$			N.	59	$58\frac{1}{2}$			N.	
20	48	47	56	45		N.	70	72			N.	72	72			N.	67	59			N.	
21	56	52	$52\frac{1}{2}$			S.W.					S.	74	75			S.	65	67	58		S.	
22	54	54	$53\frac{1}{2}$	52		S.	62	62	62		S.					S.	63	65	62		S.	
Mean,	$49\frac{7}{8}$	$48\frac{1}{4}$	$47\frac{7}{8}$				$68\frac{3}{8}$	68	67			61	71	$72\frac{1}{8}$			65	$62\frac{2}{3}$	61			
Highest,	56	53	56				74	74	71			75	75	73			70	68	64			
Lowest,	41	44	40				65	62	62			61	61				56	56	58			

MAY.

DAY OF MONTH.	Observations on Soil of Grass Land. 5 o'clock A. M. Surface.	5 A. M. 4 inches below surface.	5 A. M. 9 inches below surface.	12 o'clock M. Surface.	12 M. 4 inches below surface.	12 M. 9 inches below surface.	3 o'clock P. M. Surface.	3 P. M. 4 inches below surface.	3 P. M. 9 inches below surface.	7 o'clock P. M. Surface.	7 P. M. 4 inches below surface.	7 P. M. 9 inches below surface.	OBSERVATIONS.
23	57	56	56	65	59	57	$64\frac{1}{2}$	66	58	63	60	58	Cloudy. S. breeze. Morning slight shower. Soil wet 1 inch deep.
24	59	58	57	72	64	58	60	64	60	62	$61\frac{1}{2}$	60	Cloudy. Slight showers. Leaves and twigs of apple trees commence dying at Syracuse.
25	58	58	57	88	69	66	86	70	62	66	65	62	Morning cloudy. Slight showers. Afternoon few heavy clouds.
26	61	61	60	59	58	58	70	61	58		57	58	Morning cloudy. Slight showers. Afternoon few clouds.
27	43	49	54	65	58	56	81	71	58	60	61	58	Heavy dew. Few clouds. Slight breeze.
28	41	54	56	74	63	58	91	72	62	$70\frac{1}{2}$	66	63	Heavy dew. Few thin clouds. Slight breeze.
29	$53\frac{1}{2}$	57	58	78	66	62				70	68	63	Heavy dew. Few clouds. Soil in good working order.
30	54	55	58	57	57	58	$58\frac{1}{2}$	58	58	55	58	58	Morning cloudy. N. breeze. Afternoon few thin clouds.
31	48	52	55	58	56	55	54	55	54	52	54	54	Morning few clouds. Afternoon cloudy. Rainy. Soil wet at 7 P. M. 2 inches deep.
Mean,	$52\frac{2}{3}$	$55\frac{1}{2}$	$56\frac{7}{8}$	$68\frac{1}{2}$	$61\frac{1}{8}$	$68\frac{2}{3}$	$70\frac{5}{8}$	$64\frac{5}{8}$	$58\frac{3}{4}$	$62\frac{1}{3}$	$61\frac{1}{8}$	$59\frac{1}{3}$	
Highest,	61	61	60	88	65	66	86	70	62	$70\frac{1}{2}$	68	63	
Lowest,	43	49	54	57	56	54	55	55	54	52	54	54	

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M. Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain	Wind.	12 o'clock M. Air, 4 feet above surface	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	3 o'clock P. M. Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land	Rain.	Wind.	7 o'clock P. M. Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land	Rain.	Wind.	Observations.*
23	59	59	57		57	S.	64	64	64		S.	65	64	64		S.	65	64	62		S.	
24	63	63	62		62	S.	70	70	70		S. E.	67	67	67		S.E.	63	62	62		S.E.	
25	58	58	58		57	S.	76	78	62		S.W.	75	77	72		S.W.	71	66	62		S.W.	
26	64	63	62		58	S.	51	51	51		S.	66	60	60		S.W.	53	51	65		S.W.	
27	44	42	42	40		S.	65	64	64		S.E.	70	70	68⅝		S.E.	62	60	58		S.E.	
28	50	48	47½	46		S.E.	74	74	72		S.E.	80	80	78		S.E.	74	69	67		S.E.	
29	53½	53	52	52		N.	78	78	77								74	70	68		N.	
30	49½	50	48	48		N.	55	55	55		N.	57	56	56		S.E.	56	54	58		S.E.	
31	48	46	46⅝	45		N.E.	56	56	56	52	S.	54	52	51	52	S.E.	52	51	53	52	N.E.	
Mean,	54½	53½	52⅞				65⅞	65⅞	64⅓			66¾	65¾	64⅝			63⅓	60⅞	61⅓			
Highest,	64	63	62				78	78	77			80	80	78			74	70	67			
Lowest,	44	46	46⅝				54	54	54			54	52	51			52	51	53			

JUNE.

DAY OF MONTH.	OBSERVATIONS ON SOIL OF GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below the surface	9 inches below surface.	Surface.	4 inches below surface	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
1	52	54	55	69	63	57	67	63	58	63	63	58	52	53	54	68	69	55	68	63	57	63	62	58
2	57	58	58	81	65	58	76	70	62	62	64	61	56	56	56	74	64	58	80	69	59	60	64	60
3	52	57	56	74	67	60	66	65	60	64	64	61	51	54	56	74	64	58	66	63	58	63	62	59
4	60	60	60	73	64	60	76	68	60	62	63	60	59	58	58	73	62	59	80	67	60	62	62	60
5	53	57	58	77	62	60	74	70	61	61	64	61	50	54	58	69	59	58	77	66	60	58	62	59
6	54	58	59	72	66	60	75	66	60	64	65	60	52	54	57	71	66	59	75	67	59	64	64	59
7	54	59	60	75	63	60	75	72	64	64	68	65	50	55	57	76	62	61	80	70	64	64	63	62
Mean,	$54\frac{5}{8}$	$57\frac{3}{8}$	58	$74\frac{3}{8}$	$64\frac{1}{4}$	$59\frac{1}{4}$	$72\frac{3}{4}$	$67\frac{3}{4}$	$60\frac{3}{4}$	$62\frac{7}{8}$	$64\frac{3}{8}$	$60\frac{7}{8}$	$52\frac{7}{8}$	$54\frac{7}{8}$	$56\frac{5}{8}$	$72\frac{1}{8}$	$63\frac{3}{4}$	$58\frac{1}{4}$	$75\frac{1}{8}$	$66\frac{1}{4}$	$59\frac{5}{8}$	62	$62\frac{3}{4}$	$59\frac{5}{8}$
Highest,	60	60	60	81	67	60	76	72	64	64	68	65	59	58	58	76	69	61	80	70	64	64	64	62
Lowest,	52	54	55	69	62	57	66	63	58	61	63	58	50	53	54	68	59	55	66	63	57	58	62	58

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
1	52	52	52		52	S.E.	64	65	64		S.	68	68	68		S.	66	64	64		S.E.	
2	58	57	57			W.	68	70	69		S.W.	69	70	69		S.W.	64	60	58		S.W.	
3	52	49	49	48		W.	71	70	70		S.	68	66	66		S.	66	65	64		S.	
4	60	60	61		59	S.W.	70	69	69		S.W.	70	70	70		W.	62	62	62		N.W.	
5	50	49	48			N.	64	63	63		S.W.	65	66	65		W.	56	55	55		N.W.	
6	53	52	52	52		N.W.	68	68	68		N.	74	72	70		N.W.	67	64	62		W.	
7	52	49	48	48		N.	73	74	74		E.	74	76	74		E.	68	64	64		S.	
Mean	53 7/8	52 1/8	52 3/8				66 7/8	67	66 5/8			69 3/4	69 3/4	68 7/8			64 1/8	62	61 1/4			
Highest,	60	60	61				73	74	74			74	76	74			68	65	64			
Lowest,	50	49	48				64	63	63			65	66	65			56	55	55			

* 1. Morning cloudy. Slight shower Soil wet 4 inches deep. Occasional sunshine during day. Slight wind. 2. Morning cloudy. A fine thunder shower last night Soil very wet At 7 P. M. clear, moderate breeze. 3. Morning few clouds Afternoon cloudy Moderate wind. 4. Morning cloudy. Rainy. Soil wet 9 inches deep Afternoon few clouds Warm. The leaves of the Button wood (Platinus occidentalis) begin to die. 5. Few floating clouds. Slight breeze Pleasant. 6. Few floating clouds. Moderate breeze. Pleasant. Dew. The leaves of the Thorn bush (Crataegus Coccinnea) begin to die. 7. Clear. Slight breeze. Warm. Light dew.

JUNE.

DAY OF MONTH.	OBSERVATIONS ON SOIL OF GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below the surface	9 inches below surface.	Surface.	4 inches below surface	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
8	58	60	61	74	63	66	65	66	65	64	65	64	56	59	58	74	62	59	67	64	61	64	64	61
9	58	59	62	68	64	64	72	69	65	68	68	64	57	58	58	67	62	69	76	64	61	68	66	62
10	68	65	64	65	71	67	83	72	68	72	72	68	68	63	61	85	74	70	84	73	70	72	72	66
11	66	66	65	68	66	61	69	66	65	67	67	64	65	65	64	68	66	61	69	66	63	67	66	63
12	60	62	62	64	62	62	73	66	62	62	64	63	58	58	60	63	60	60	73	66	60	59	63	62
13	56	58	59	77	70	66	78	70	66	66	66	64	52	55	58	77	67	63	78	68	63	66	64	61
14	62	62	63	73	65	63	69	67	63	60	65	63	61	60	60	71	64	61	70	66	62	60	64	62
Mean,	61	60	$60\frac{1}{2}$	69	66	$64\frac{1}{2}$	$69\frac{7}{8}$	65	$62\frac{7}{8}$	67	$65\frac{1}{3}$	$64\frac{1}{3}$	$59\frac{5}{8}$	$59\frac{3}{4}$	60	72	65	$63\frac{5}{8}$	$73\frac{7}{8}$	78	$62\frac{7}{8}$	65	$65\frac{5}{8}$	$62\frac{3}{8}$
Highest,	68	66	65	77	71	67	83	72	66	72	72	64	68	65	64	85	74	70	84	73	70	72	72	66
Lowest,	56	58	59	65	62	62	65	66	62	62	64	63	52	55	58	63	60	59	67	64	60	60	63	61

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
8	60	56	58	58		s.	74	73	73		s.	68	67	66	63	s.	66	65	64	62	s.	
9	58	58	57		57	s.	67	67	68		s.e.	74	76	72		s.	71	71	71		s.	
10	71	70	70			s.	82	84	82		s.	81	82	81		s.	70	76	75		s.	
11	68	68	68			s.	70	68	68	66	s.	70	70	70		s.	68	68	68	67	s.	
12	59	58	58			s.w.	59	59	59		w.	65	67	65		w.	60	60	59		w.	
13	54	54	54	53		s.	76	74	76		s.	74	75	75		s.	66	66	66	64	s.	
14	62	61	61			s.e.	66	67	67		s.	65	66	66	62	w.	56	56	56		w.	
Mean,	61 5/8	60 5/8	60 3/4				69	70	70 3/8			71	71 3/4	70 5/8			65	66	65			
Highest,	71	70	70				82	84	82			81	82	81			71	76	71			
Lowest,	54	54	54				59	59	59			65	66	65			56	56	56			

* 8. Cloudy in forenoon. Afternoon showery. South wind. 9. Night rainy. Forenoon cloudy. Strong S. wind. Afternoon few clouds. Moderate breeze. The leaves of the Iron wood (ostrya virginica) and Black Walnut (juglans nigra) begin to die near Albany. 10. Few clouds. Strong S. breeze. 11. Cloudy. Strong S breeze. Towards night showery. The leaves and small twigs of Apple, Pear and Quince begin to die near Albany. 12. Forenoon cloudy. Towards night clear. Moderate breeze. 13. Morning clear. Moderate dew. Afternoon cloudy at 7 P. M. Slight shower. 14. Showery during night. Heavy thunder shower about 2 P. M. At 7. P. M. thick clouds. Strong W. breeze. Cool.

JUNE.

DAY OF MONTH.	OBSERVATIONS ON GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			7 o'clock P. M.			3 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
15	56	57	60	56	58	59	56	58	58	55	57	58	50	51	56	55	55	56	53	55	57	52	53	56
16	53	55	57	76	64	58				58	62	60	50	53	56	74	60	56				57	60	58
17	55	57	59	78	64	61	74	70	62				52	51	56	74	60	58	80	73	59			
18	56	60	61	74	66	62	78	72	65	66	67	65	53	56	59	71	68	59	83	75	60	65	66	63
19	61	62	62	62	62	61	61	61	61	59	60	61	60	60	60	64	60	60	60	60	60	58	59	60
20	62	60	60	68	63	62	66	64	62	64	64	62	60	58	58	63	61	60	66	61	60	64	64	61
21	62	62	61				73	68	62	68	67	64	61	61	60				73	70	64	68	68	63
22	64	64	62	70	68	64	82	72	63	70	70	66	64	62	62	70	64	62	82	73	65	69	70	64
Mean,	$58\frac{1}{2}$	$59\frac{2}{3}$	$60\frac{1}{4}$	$60\frac{1}{2}$	$55\frac{5}{8}$	$53\frac{3}{8}$	$61\frac{1}{4}$	$58\frac{1}{8}$	$54\frac{1}{8}$	55	55	$54\frac{1}{2}$	$56\frac{1}{4}$	$57\frac{1}{4}$	$58\frac{3}{4}$	$59\frac{1}{8}$	$53\frac{7}{8}$	$51\frac{3}{8}$	$62\frac{1}{8}$	$88\frac{3}{4}$	$53\frac{1}{8}$	$54\frac{1}{8}$	55	$53\frac{1}{8}$
Highest,	64	64	62	78	68	64	82	72	65	70	70	66	64	62	62	74	68	62	83	75	65	69	70	64
Lowest,	53	55	57	56	58	58	56	58	58	55	57	58	50	53	56	55	55	56	53	55	57	52	53	56

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	
15	48	48	48			W.	52	52	52		W.	52	52	52		W.	51	51	51		W.	
16	53	53	53			W.	66	67	66		S.W.						60	59	59		W.	
17	54	53	53	52		N.	70	72	72		N.E.	72	73	74		N.E.						
18	54	52	53	50		N.	74	74	73		S.E.	76	78	76		S.	67	66	66		S.	
19	61	60	60		61	S.	62	61	61		S.	63	62	62	57	S.E.	60	59	59		S.E.	
20	62	61	61		62	S.E.	66	66	66		S.E.	66	66	66		S.E.	66	65	65		S.E.	
21	62	62	62		61	W.				73	W.	66	66	66	73	S.	67	67	67		S.	
22	64	64	64			S.	71	71	71		S.	73	76	75		S.	66	66	66		N.	
Mean,	$57\frac{1}{4}$	$59\frac{3}{4}$	$56\frac{5}{8}$				$57\frac{5}{8}$	$57\frac{7}{8}$	$57\frac{7}{8}$			$58\frac{1}{2}$	$56\frac{1}{8}$	$58\frac{5}{8}$			$54\frac{5}{8}$	$54\frac{1}{8}$	$54\frac{1}{8}$			
Highest,	64	64	64				74	74	73			76	78	76			67	67	67			
Lowest,	48	48	48				52	52	52			52	52	52			51	51	51			

* 15. Cloudy. Strong W. wind. Cool. 16. Morning few clouds. Strong W. breeze. Afternoon clear. Moderate breeze. 17. Morning clear. Light dew. Afternoon few clouds. Moderate breeze. 18. Morning clear. Afternoon few clouds. Light dew. Slight breeze. 19. Cloudy. Showery. Strong wind. 20. Cloudy. Showery. Strong breeze. 21. Cloudy. Showery. Thunder shower at 12 M. 22. Floating clouds. Soil very wet. Warm.

JUNE.

DAY OF MONTH.	Observations on Soil of Grass Land. 5 o'clock A. M. Surface.	5 o'clock A. M. 4 inches below surface.	5 o'clock A. M. 9 inches below surface.	12 o'clock M. Surface.	12 o'clock M. 4 inches below surface.	12 o'clock M. 9 inches below surface.	3 o'clock P. M. Surface.	3 o'clock P. M. 4 inches below surface.	3 o'clock P. M. 9 inches below surface.	7 o'clock P. M. Surface.	7 o'clock P. M. 4 inches below surface.	7 o'clock P. M. 9 inches below surface.	Observations on Naked Soil. 5 o'clock A. M. Surface.	5 o'clock A. M. 4 inches below surface.	5 o'clock A. M. 9 inches below surface.	12 o'clock M. Surface.	12 o'clock M. 4 inches below surface.	12 o'clock M. 9 inches below surface.	3 o'clock P. M. Surface.	3 o'clock P. M. 4 inches below surface.	3 o'clock P. M. 9 inches below surface.	7 o'clock P. M. Surface.	7 o'clock P. M. 4 inches below surface.	7 o'clock P. M. 9 inches below surface.
23	64	64	64	74	69	65	82	74	67	72	72	66	62	62	62	71	66	63	86	76	64	71	71	66
24	62	64	64	81	68	66	84	76	66	72	72	68	60	62	63	81	66	64	85	75	64	72	72	66
25	64	63	66	84	74	68	85	76	70	76	74	69	62	64	65	85	73	67	88	80	69	76	76	69
26	69	69	68	82	71	68	78	75	71	72	70	68	68	67	66	83	72	69	78	75	69	72	72	68
27	68	68	66	78	70	68	86	78	72	74	74	70	66	66	64	80	70	66	88	84	67	74	76	69
28	67	68	68	87	76	71	93	80	74	76	76	72	67	67	67	88	74	69	94	80	73	77	76	71
29	69	70	69	68	68	68	67	68	68	66	67	68	68	68	68	68	68	67	67	68	67	66	67	67
30	64	66	67	72	70	68	84	74	68	68	70	68	61	64	66	72	70	66	93	76	66	68	71	68
Mean,	65 7/5	66 1/2	66 1/2	78 1/4	70 3/4	67 3/4	82 3/8	75 1/8	69 1/2	72	71 7/8	68 5/8	44 1/4	65	65 1/8	78 1/2	69 7/8	66 3/8	84 7/8	76 3/4	67 3/8	78	72 5/8	68
Highest,	69	70	69	87	76	71	93	80	74	76	76	72	68	68	68	88	74	69	94	84	73	77	76	71
Lowest,	44	63	64	68	68	65	67	68	66	66	67	66	60	62	62	68	66	63	67	68	64	66	71	66

OBSERVATIONS ON ATMOSPHERE, DEW RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4" inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	
23	62	62	62	62		N.	71	72	71		N.W.	76	76	78		W.	70	70	69		W.	
24	63	60	60	58		N.E.	77	76	76		S.W.	82	82	82		S.W.	73	71	70		W.	
25	64	63	63	62		N.	84	84	84		S.	83	84	83		W.	78	77	77		S.W.	
26	70	69	69	68		S.W.	84	82	83		S.W.	76	75	75		S.	75	74	73		S.	
27	72	70	70	66		W.	82	80	80		W.	86	87	84		W.	78	74	73		S.W.	
28	68	68	68	66		N.	84	84	84		W.	86	87	86		W.	77	75	75		S.W.	
29	68	68	67			N.	66	66	66	64	N.	66	66	66	69	N.W.	65	65	65		N.W.	
30	60	61	61	61		N.W.	74	74	74		N.	76	78	76		N.	69	68	67		N.	
Mean,	$65\frac{5}{8}$	$65\frac{1}{8}$	$65\frac{1}{8}$				$77\frac{3}{4}$	$77\frac{1}{4}$	$77\frac{1}{4}$			$78\frac{3}{4}$	$70\frac{3}{4}$	$78\frac{1}{2}$			$73\frac{1}{8}$	$71\frac{1}{8}$	$71\frac{1}{8}$			
Highest,	72	70	70				84	84	84			86	87	86			78	77	77			
Lowest,	60	61	60				66	66	66			66	66	66			65	65	65			

JULY.

DAY OF MONTH.	OBSERVATIONS ON GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
1	62	64	66	73	68	69	74	72	68	69	69	67	58	62	65	73	65	66	87	72	68	69	70	67
2	64	65	66	79	72	68	78	73	68	70	71	68	60	64	65	82	72	68	85	74	69	72	71	68
3	65	66	66	79	71	69	84	77	70	76	75	69	65	65	65	79	71	69	96	89	69	76	76	69
4	67	68	68	78	70	68	82	76	69	75	72	68	67	67	68	78	69	68	99	75	69	78	74	68
5	64	67	67	85	72	70	88	78	70	75	73	70	62	66	66	86	73	71	99	76	71	78	74	70
6	66	69	68	81	73	69	80	73	70	72	73	70	67	68	68	85	70	69	95	74	71	73	74	70
7	68	68	68	80	72	69	84	75	70	75	74	70	66	68	67	86	74	70	98	77	70	78	75	70
Mean,	65	$66\frac{5}{8}$	67	$79\frac{1}{4}$	$71\frac{1}{8}$	$68\frac{5}{8}$	70	75	$69\frac{3}{8}$	73	70	69	64	55	66	$79\frac{3}{4}$	$70\frac{1}{2}$	$68\frac{5}{8}$	$79\frac{3}{4}$	$76\frac{3}{4}$	$69\frac{5}{8}$	75	73	69
Highest,	67	69	68	85	73	70	88	77	70	75	75	70	67	68	68	86	78	71	99	89	71	78	76	70
Lowest,	63	64	66	73	68	68	74	72	68	69	69	67	58	62	65	73	65	66	87	72	68	69	70	67

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
1	59	58	58	56		N.	76	76	76		N.	78	78	76		N.	72	69	68		N.	
2	65	64	64	62		N.	80	80	78		N.	80	80	78		N.	73	70	69		N.E.	
3	66	66	64	62		N.E.	80	80	80		N.E.	85	86	86		N.	77	76	76		N.	
4	68	68	66	67		N.E.	83	81	81		N.E.	85	87	85		S.	78	76	75		W.	
5	62	62	60	60		N.	84	85	84		N.	88	90	89		N.	78	77	75		N.	
6	67	67	66	66		N.	84	84	83		N.	86	86	85		N.	74	73	72		N.	
7	67	67	66	66		N.	87	86	84		N.	87	86	84		N.	79	77	75		N.	
Mean,	65	70	65	$62\frac{5}{8}$			82	$81\frac{5}{8}$	$80\frac{3}{4}$			84	$82\frac{5}{8}$	$83\frac{1}{4}$			$75\frac{5}{8}$	74	$72\frac{5}{8}$			
Highest,	68	68	66	67			87	86	84			87	90	89			79	77	76			
Lowest,	59	58	58	56			76	76	76			78	78	76			72	69	68			

* 1. Few clouds. N. breeze. Leaves of ostrya virginica and coculus hippocastanum continue to die. 2 Very few thin clouds. Moderate breeze. Light dew. 3. Few thin clouds Moderate breeze. Light dew. 4. Morning clear Afternoon few thin clouds. Slight breeze. Light dew. 5. Very few thin clouds. Slight breeze. Light dew. Warm. 6. Clear. N. breeze. Light dew. 7. Morning clear. Afternoon very few thin clouds. N. breeze. Light dew.

JULY.

OBSERVATIONS ON GRASS LAND.

DAY OF MONTH.	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
8	68	69	69	90	73	70	82	76	70	77	76	70
9	69	70	70	89	78	71	84	78	72	78	76	72
10	70	72	72	86	75	73	94	80	75	82	76	75
11	74	74	73	96	78	76	89	80	76	81	79	76
12	75	74	73	92	78	76	90	79	76	78	78	76
13	70	72	72	90	80	76	78	76	73	74	76	73
14	64	69	70	90	77	71	86	79	74	73	76	72
15	63	68	70	90	75	71	81	78	72	73	76	72
Mean,	$69\frac{1}{8}$	71	$71\frac{1}{8}$	$91\frac{3}{8}$	$76\frac{3}{4}$	73	$85\frac{1}{2}$	$78\frac{1}{4}$	$73\frac{1}{2}$	77	$76\frac{5}{8}$	$73\frac{1}{4}$
Highest,	75	74	73	96	80	76	94	80	76	82	79	76
Lowest,	63	68	69	86	73	70	78	76	70	73	76	70

OBSERVATIONS ON NAKED SOIL.

DAY OF MONTH.	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
8	65	68	68	94	77	69	105	76	70	84	76	70
9	69	69	69	101	82	71	94	98	72	81	80	73
10	68	72	71	91	76	73	104	92	76	86	86	76
11	74	74	73	103	85	77	100	86	77	85	85	77
12	76	75	74	98	84	77	100	86	77	80	84	77
13	69	71	72	100	84	76	78	76	73	74	75	73
14	64	67	69	91	80	71	92	84	74	72	76	72
15	58	65	69	96	78	72	88	82	74	73	76	72
Mean,	68	$70\frac{1}{8}$	$70\frac{5}{8}$	$97\frac{1}{8}$	$80\frac{3}{4}$	$73\frac{1}{4}$	94	85	$74\frac{1}{8}$	$69\frac{1}{4}$	$79\frac{3}{4}$	$73\frac{3}{4}$
Highest,	76	75	77	104	85	77	105	98	77	86	86	77
Lowest,	58	65	68	91	76	69	78	76	70	72	75	70

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
8	67	65	64	64		N.	87	89	88		S.	89	90	87		S.E.	84	83	80		S.	
9	69	69	68	67		N.	88	90	88		S.	88	88	87		S.	81	80	78		S.E.	
10	68	66	66	66		S.E.	82	83	82		S.E.	86	88	88		S.	78	78	77		S.	
11	73	74	74			E.	85	89	87		S.	84	84	82		S.E.	80	80	79		S.E.	
12	74	74	74			S.	83	89	88		E.	84	86	86		S.	74	74	73		W.	
13	69	69	69		69	W.	83	87	87		N.W.	74	73	73	73	N.W.	74	74	74	73	N.	
14	64	64	64		65	N.	76	77	76		N.	76	78	78		N.	70	70	69		N.	
15	57	57	57	55		N.	77	80	79		E.	76	78	77		S.W.	70	69	67		N.	
Mean,	67⅝	67¼	68¼				82⅝	85½	84			82⅛	83⅛	82¼			76⅜	76	69⅝			
Highest,	74	74	74				88	90	88			89	90	88			84	83	80			
Lowest,	57	57	57				76	77	76			74	73	73			70	69	67			

* 8. Clear. Smoky. Slight dew. Moderate breeze. 9. Morning clear. Light dew. Afternoon few hazy clouds. Smoky. Slight breeze. 10. Light dew Few hazy clouks Smoky. Slight breeze. 11 Morning floating clouds Slight breeze. Warm. 7 P. M Cloudy. Stiff S. E. breeze. 12 Forenoon moderately cloudy. Slight breeze Warm. 7 P. M. Cloudy. Signs of rain. 13 Cloudy. Shower last night. Wet soil 1 inch deep. Heavy thunder shower between 1 and 2 P. M. Wet soil 8 inches deep. Moderate breeze. 14. Clear N. breeze. Soil wet from 8 to 10 inches deep. Shower during night. Few hazy clouds. Light dew. Moderate breeze. Smoky.

JULY.

Day of Month.	Observations on Grass Land: 5 o'clock A. M. Surface.	[illegible] inches below surface.	[illegible] inches below surface.	12 o'clock M. Surface.	[illegible] inches below surface.	[illegible] inches below surface.	7 o'clock P. M. Surface.	[illegible] inches below surface.	[illegible] inches below surface.	3 o'clock P. M. Surface.	[illegible] inches below surface.	[illegible] inches below surface.	Observations on Naked Soil: 5 o'clock A. M. Surface.	[illegible] inches below surface.	[illegible] inches below surface.	12 o'clock M. Surface.	[illegible] inches below surface.	[illegible] inches below surface.	3 o'clock P. M. Surface.	[illegible] inches below surface.	[illegible] inches below surface.	7 o'clock P. M. Surface.	[illegible] inches below surface.	[illegible] inches below surface.
16	65	68	70	88	66	72½	87	77	73	77	76	73	62	67	69	100	84	73	97	84	73	78	82	73
17	69	71	72	90	78	73	90	80	75	81	79	75	67	70	71	104	82	74	99	88	76	84	82	76
18	73	74	73	90	77	74	86	80	75	81	80	76	73	71	73	97	78	74	90	84	75	82	80	76
19	74	75	74	99	82	76	86	84	77	82	80	77	72	74	74	106	86	76	86	94	77	80	82	77
20	75	76	76	102	88	77	84	86	79	76	83	79	74	75	75	106	92	77	86	86	79	76	82	79
21	74	75	75	80	75	75	76	76	75	75	75	75	73	74	74	80	76	74	76	76	74	74	74	74
22	73	74	74	84	78	75	80	78	76	76	76	75	73	72	72	85	84	74	78	78	75	74	76	74
23	69	74	73	92	79	75	92	82	76	76	78	76	65	68	72	101	84	74	102	84	75	76	80	75
Mean,	71¼	73	73⅜	90⅜	78⅞	74⅛	85⅛	80⅜	75¾	78	78⅜	75¾	69⅞	71¾	72⅖	97¾	83⅞	74⅕	89¼	84¼	75⅕	78	79½	75½
Highest,	75	76	76	102	88	77	92	86	79	82	83	79	74	75	75	106	92	77	102	94	79	84	82	79
Lowest,	65	68	70	80	66	72½	76	76	75	75	75	73	62	67	69	80	76	73	76	76	73	74	74	73

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air 4 feet above surface.	Air 4 inches above surface, naked soil.	Air 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air 4 feet above surface.	Air 4 inches above surface, naked soil.	Air 4 inches above surface, grass land.	Rain.	Wind.	Air 4 feet above surface.	Air 4 inches above surface, naked soil.	Air 4 inches above surface, grass land.	Rain.	Wind.	Air 4 feet above surface.	Air 4 inches above surface, naked soil.	Air 4 inches above surface, grass land.	Rain.	Wind.	
16	62	60	60	59		N.E.	81	83	82		S.	83	84	83		S.	77	76	74		S.	
17	67	67	60			S.E.	84	88	87		S.E.	86	87	86		S.	80	80	79		S.	
18	72	72	72		78	S.	84	87	86		S.	81	82	81		S.W.	80	80	79		S.	
19	75	74	71		72	S.	89	92	91		S.	81	81	79	79	S.	84	84	84		S.E.	
20	76	76	75			S.E.	90	96	95		S.	76	77	76	77	S.	75	75	75	75	S.	
21	72	72	72		70	S.	78	78	78	70	S.	74	74	74	70	S.	74	74	74		S.	
22	75	75	75			S.	82	82	82		S.	77	78	77	74	S.	73	73	73		S.	
23	66	66	66			N.	80	84	83		W.	81	84	83		N.	73	73	73		N.	
Mean,	70 5/8	70 1/4	49 1/4				83 1/2	86 1/4	85 1/2			79 3/8	80 1/4	79 7/8			77	76 7/8	76 3/8			
Highest,	76	76	75				90	96	95			86	87	86			84	84	84			
Lowest,	62	60	60				78	78	78			71	74	74			73	73	73			

* 16. Clear. Smoky. Slight breeze. 17. Few heavy clouds. Strong breeze. 18. Morning, few heavy clouds. Afternoon cloudy. Thunder shower. 19. Morning few hazy clouds. Afternoon cloudy. Showery. Soil wet 1 1-2 inches deep. 20. Morning, floating clouds. Thunder shower between 2 and 3 P. M. 7 P. M. showery. 21. Cloudy. Showery. Soil wet 3-4 inches deep. Strong breeze. 22. Morning, thick clouds, strong s. breeze. Afternoon showery. 23. Few clouds. Smoky north breeze. Warm.

JULY.

DAY OF MONTH.	OBSERVATIONS ON GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
24	68	71	72	94	78	74	88	83	76	80	78	76	66	70	72	106	80	74	96	85	77	82	80	77
25	72	71	74	80	75	74	80	76	74	76	76	74	72	73	74	83	76	74	82	77	74	76	76	74
26	74	73	73	74	73	73	69	73	74	64	71	72	74	72	72	74	74	73	69	72	73	64	70	72
27	62	66	68	68	72	68	84	75	73	66	73	73	56	62	67	90	73	68	92	78	73	65	72	72
28	59	66	68	82	70	69	87	77	72	63	70	71	56	63	68	93	71	69	92	80	72	64	72	73
29	59	62	66	81	76	70	82	77	72	72	76	73	57	64	68	92	80	71	88	81	73	74	76	74
30	62	64	68	80	73	70	70	72	70	68	71	70	61	63	68	82	75	71	70	73	71	68	72	71
31	68	66	68	82	72	68	86	77	69	82	77	69	68	66	68	85	75	69	88	80	70	82	78	70
Mean,	$65\frac{1}{2}$	$67\frac{3}{4}$	$69\frac{5}{8}$	$80\frac{1}{2}$	$73\frac{5}{8}$	$70\frac{3}{4}$	$80\frac{3}{4}$	$76\frac{1}{2}$	$72\frac{1}{2}$	$71\frac{3}{8}$	74	$72\frac{1}{1}$	$63\frac{3}{4}$	$66\frac{5}{8}$	$69\frac{5}{8}$	$88\frac{1}{8}$	$75\frac{1}{2}$	$71\frac{1}{8}$	$84\frac{5}{8}$	$78\frac{1}{4}$	73	72	$74\frac{1}{2}$	73
Highest,	74	74	74	94	78	74	88	83	76	82	78	76	74	73	74	106	80	74	96	85	77	82	80	77
Lowest,	59	62	66	68	70	68	69	72	69	63	70	69	56	62	67	74	71	68	69	72	70	64	70	70

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
24	66	66	66	62		N.	83	87	86		S.	84	87	86		S.	80	78	78		S.	
25	72	72	71			S.	78	78	78		S.	79	79	78		S.	76	76	75		S.	
26	75	75	75		73	S.	68	68	68	66	N.W.	65	65	65	62	N.	62	62	62		N.	
27	57	57	57			N.	68	70	68		N.W.	69	72	70		N.	63	62	61	73	N.	
28	56	56	56			N.W.	72	74	73		N.W.	72	74	73		N.	64	62	64		N.	
29	58	58	55	53		S.E.	73	70	75		S.W.	73	76	75		S.	69	69	68		S.	
30	68	68	68			S.	72	74	73		S.	66	66	66	64	S.E.	65	65	65	64	S.	
31	69	69	69		67	S.	75	76	75		S.	78	81	80		E.	74	74	74		S.	
Mean,	$65\frac{1}{8}$	$65\frac{1}{8}$	$64\frac{5}{8}$				$73\frac{5}{8}$	75	$74\frac{1}{2}$			$70\frac{3}{4}$	75	$74\frac{1}{8}$			$69\frac{1}{8}$	$68\frac{1}{2}$	$68\frac{3}{8}$			
Highest,	75	75	75				83	87	86			84	87	86			80	78	78			
Lowest,	56	56	55				68	68	68			65	65	65			62	62	61			

*24. Morning clear. Light dew. Afternoon few clouds. Moderate breeze. 25. Forenoon cloudy, strong south breeze. Afternoon slight showers. 26. Cloudy, showery, moderate breeze. 27 Few clouds, moderate breeze, cool morning. 28 Few heavy clouds. Morning cool. Moderate breeze. 29. Morning clear. Heavy dew. Cool. Afternoon cloudy, showery. Moderate breeze. 30. Morning cloudy, showery. Soil wet 12—14 inches deep. Afternoon few clouds.

AUGUST.

OBSERVATIONS ON SOIL OF GRASS LAND.

DAY OF MONTH.	5 o'clock A. M. Surface.	5 o'clock A. M. 4 inches below the surface	5 o'clock A. M. 9 inches below surface.	12 o'clock M. Surface.	12 o'clock M. 4 inches below surface	12 o'clock M. 9 inches below surface.	3 o'clock P. M. Surface.	3 o'clock P. M. 4 inches below surface.	3 o'clock P. M. 9 inches below surface.	7 o'clock P. M. Surface.	7 o'clock P. M. 4 inches below surface.	7 o'clock P. M. 9 inches below surface.
1	72	70	70	86	76	72	87	76	72	74	75	72
2	67	67	70	86	77	72	82	77	72	72	74	72
3	68	69	70	86	74	71	82	76	72	73	75	72
4	66	68	70	90	77	72	86	79	73	74	76	73
5	68	69	70	86	75	71	83	76	73	74	75	73
6	67	68	70	84	75	72	79	76	73	75	76	73
7	69	70	71	69	70	71	69	70	71	69	70	71
Mean,	68	68½	70	84	75	71½	81	75½	72	73	74	72
Highest,	72	70	71	90	77	72	87	72	73	74	76	73
Lowest,	66	67	71	69	70	71	69	70	71	69	74	71

OBSERVATIONS ON NAKED SOIL.

DAY OF MONTH.	5 o'clock A. M. Surface.	5 o'clock A. M. 4 inches below surface.	5 o'clock A. M. 9 inches below surface.	12 o'clock M. Surface.	12 o'clock M. 4 inches below surface.	12 o'clock M. 9 inches below surface.	3 o'clock P. M. Surface	3 o'clock P. M. 4 inches below surface.	3 o'clock P. M. 9 inches below surface.	7 o'clock P. M. Surface.	7 o'clock P. M. 4 inches below surface.	7 o'clock P. M. 9 inches below surface.
1	72	70	70	86	76	72	88	77	72	74	75	72
2	64	66	69	87	78	72	86	79	72	70	74	72
3	60	67	68	88	76	70	82	78	73	72	74	73
4	64	67	69	92	80	73	88	81	74	74	76	74
5	65	68	70	90	77	72	84	78	74	73	75	74
6	63	67	70	88	77	73	82	78	84	76	77	74
7	68	69	70	68	69	70	68	69	70	68	69	70
Mean,	63½	69	69	85	76	72	82½	77	74	72½	74	72½
Highest,	72	70	70	92	80	73	88	81	84	72	75	74
Lowest,	64	66	68	68	89	70	68	69	72	68	69	72

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
1	72	72	71			S.	80	82	81		S.	81	83	82		S.	74	74	74		S.E.	
2	66	66	65	62		N.W.	76	80	76		W.	77	79	78		W.	69	68	68		W.	
3	65	65	65	62		W.	76	78	78		E.	76	77	77		E.	72	70	70		S.	
4	65	65	64	62		N.E.	80	82	81		N.E.	80	82	81		N.E.	72	70	70		S.E.	
5	64	64	64	62		N.E.	78	82	81		N.E.	80	81	80		N.E.	72	70	70		S.E.	
6	64	64	64			N.W.	78	80	79		N.W.	77	77	76		N.W.	74	74	74		S.	
7	67	67	66			E.	68	68	68	66	N.E.	68	68	68	68	N.E.	67	67	67	67	N.E.	
Mean,	67	67	66	62			76	79	77½			77	78	77			71	62	52			
Highest,	72	72	71				80	82	81			81	83	82			74	74	74			
Lowest,	64	64	64				68	68	68			68	68	68			67	67	67			

1. Floating clouds. Slight sprinkling between 7 and 8 A. M. 2. Few floating clouds. Moderate dew. 3. Few heavy clouds near horizon. Heavy dew. 4. Few floating clouds. Heavy dews. 5 During forenoon few heavy clouds Afternoon thick clouds. Moderate dew 6. Cloudy in morning, heavy thin clouds at noon. Thick floating clouds at night. 7. Cloudy. Slight sprinkling of rain in morning Afternoon stormy.

AUGUST.

DAY OF MONTH.	OBSERVATIONS ON SOIL OF GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface	Surface.	4 inches below surface.	9 inches below surface	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
8	68	68	69	75	72	70	74	72	70	72	72	70	68	67	68	75	72	70	74	72	70	72	72	70
9	69	69	70	78	72	70	76	72	71	75	72	71	69	69	69	79	74	70	77	74	72	76	74	72
10	72	72	71	89	76	72	84	78	74	78	77	74	72	71	70	90	80	73	85	82	75	78	78	75
11	74	74	73	92	81	74	93	82	76	78	80	76	74	74	73	94	85	74	96	84	76	78	80	76
12	72	73	74	86	78	74	86	82	76	75	78	76	72	72	73	88	79	74	90	84	76	74	78	76
13	71	73	74	87	78	74	86	82	76	76	78	76	69	70	73	92	80	74	90	84	77	78	79	76
14	72	72	73	87	78	75	86	79	75	73	77	75	70	72	73	89	80	75	88	83	76	78	78	76
15	72	73	74	87	80	75	88	83	76	76	78	76	70	72	73	92	81	75	93	86	77	76	78	76
Mean,	$71\frac{1}{4}$	$71\frac{3}{4}$	$72\frac{1}{4}$	$85\frac{1}{8}$	$76\frac{7}{8}$	$71\frac{3}{4}$	$84\frac{1}{8}$	$78\frac{3}{4}$	$74\frac{1}{4}$	$76\frac{5}{8}$	$76\frac{1}{2}$	$74\frac{1}{4}$	$70\frac{1}{2}$	$80\frac{7}{8}$	$71\frac{1}{2}$	$87\frac{3}{8}$	$78\frac{7}{8}$	$73\frac{1}{8}$	$81\frac{5}{8}$	$81\frac{1}{8}$	75	$76\frac{1}{4}$	$77\frac{1}{8}$	$74\frac{5}{8}$
Highest,	74	74	74	92	81	75	93	83	76	78	80	76	74	74	73	94	85	75	96	86	77	78	80	76
Lowest,	68	68	69	75	72	70	74	72	70	72	72	70	68	67	68	75	72	70	74	72	70	72	72	70

OBSERVATIONS ON ATMOSPHERE, DEW RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
8	67	67	67		67	N.E.	73	74	75		W.	73	73	73		N.E.	72	72	72		N.E.	
9	69	69	69			N.E.	78	79	78		E.	77	77	76		S.E.	76	76	75		S.E.	
10	73	73	73			S.E.	84	86	85		S.	85	85	84		S.	78	78	77		S.	
11	75	75	74			S.	85	88	87		N.	87	89	88		S.	73	73	73	73	N.E.	
12	72	72	72			W.	80	81	80		N.E.	80	82	81		W.	74	72	72		W.	
13	70	69	69	66		W.	82	84	83		S.	84	84	84		E.	74	74	74		N.E.	
14	68	68	68			N.W.	83	86	85		S.	82	84	83		S.	76	75	74		S.	
15	70	70	70			S.	82	86	85		S.	84	86	85		S.E.	75	75	74		S.E.	
Mean,	$70\frac{1}{2}$	$70\frac{3}{8}$	$70\frac{1}{4}$				$80\frac{7}{8}$	83	$82\frac{1}{4}$			$81\frac{1}{2}$	$82\frac{1}{2}$	$81\frac{3}{4}$			$74\frac{3}{4}$	$74\frac{3}{8}$	$73\frac{7}{8}$			
Highest,	75	75	74				89	88	87			87	89	88			78	78	77			
Lowest,	67	67	67				73	74	75			73	73	73			72	72	72			

* 8. Cloudy. Moderate breeze. 9. Cloudy. Moderate breeze. 10. Few thick floating clouds. Stiff south breeze in afternoon. 11. Few thin clouds in the forenoon. Clouds increased in the afternoon. Slight shower at 5 o'clock P. M. Slight breeze 12. Few thin clouds, moderate breeze. Pleasant. 13. Heavy dew. Clear. Slight breeze. 14. Few heavy clouds. Slight breeze. 15. Few heavy clouds. Slight breeze.

AUGUST.

DAY OF MONTH.	OBSERVATIONS ON GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			7 o'clock P. M.			3 o'clock P. M			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	1 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
16	70	72	74	82	76	74	81	76	74	73	76	76	68	71	73	86	76	74	82	76	74	75	78	76
17	72	73	74	82	76	74	85	77	75	76	76	75	72	73	73	82	77	74	87	80	75	77	76	76
18	69	72	73	76	74	73	75	75	73	69	73	73	69	72	72	78	75	73	76	76	74	67	73	74
19	62	67	70	74	71	70	72	70	70	65	69	69	62	67	69	75	72	70	71	70	70	64	68	68
20	60	63	68	74	70	69	74	73	70	68	72	70	60	63	67	81	72	69	77	75	70	68	72	70
21	64	64	69	67	72	70	76	74	72	77	72	71	64	64	68	81	74	69	79	76	72	72	73	71
22	62	63	69	78	72	69	79	74	70	76	72	71	62	63	68	78	73	69	78	75	71	71	72	71
23	61	63	68	74	71	69							61	62	67	77	73	69						
24	60	63	67	80	72	69	80	74	70				60	62	66	81	74	69	81	77	77			
25	62	64	68										62	64	67									
Mean,	64¼	66⅜	70	76⅜	72⅝	70¾	77¾	74⅛	71¾	72	72⅞	72⅛	64	67⅛	69	79⅞	74	70⅝	78⅞	75⅝	72⅛	70½	73⅛	73¼
Highest,	72	73	74	82	76	74	85	77	75	77	76	76	72	73	73	86	77	74	87	80	75	77	78	76
Lowest,	60	63	67	67	70	69	72	70	70	68	69	69	60	62	66	75	72	69	71	70	70	64	68	68

OBSERVATIONS ON ATMOSPHERE, DEW RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M					Observations.*
	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.		Wind.	Air, 4 feet above surface	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	
16	66	66	68			S.	81	82	80		S.	80	82	81		S.	74	74	73		S.	
17	71	71	70			S.	81	82	80		S.	85	87	85		S.	76	76	75		S.	
18	69	69	69		69	S.	73	73	73		W.	74	74	74		N.W.	65	65	65		W.	
19	62	62	62		56	W.	69	69	69		W.	67	67	67		W.	62	62	62		W.	
20	60	60	60	56		S.	70	70	70		S.W.	72	71	71		S.W.	66	66	66		S.W.	
21	64	64	64	60		S.	76	76	76		S.W.	76	77	76		S.W.	70	70	69		N.W.	
22	62	62	62	57		S.	75	75	75		S.	73	74	74		S.	70	70	70		S.	
23	60	60	58	55		N.	70	72	70		N.W.											
24	59	59	58	56		N.	74	76	74		N.	73	76	74		N.						
25	62	62	62	59		N.																
Mean,	63½	63½	63¼				74⅛	75	74¼			75	76	75¼			69	69	68½			
Highest,	71	71	70				80	82	81			85	87	85			76	76	75			
Lowest,	59	59	58				69	69	69			67	67	67			62	62	62			

16. Morning cloudy. Middle of day few hazy clouds. At 7 P. M. cloudy, moderate breeze. 17. Morning cloudy. Rest of day few hazy clouds, moderate breeze. 18. Thunder shower during night Thick floating clouds, stiff breeze. 19 Morning cloudy, slight shower. Middle of day, few clouds. 7 P. M. clear, moderate breeze. 20. Forepart of day few clouds. At 4 P. M. a moderate shower. Slight breeze, heavy dew. 21. Few clouds. Moderate breeze, light dew. 22. Few clouds, slight breeze, moderate dew. 23. Morning clear, heavy dew. In afternoon few clouds, moderate breeze. 24 Morning clear, heavy dew. Afternoon few clouds, slight breeze. 25. Clear north breeze. From the 25th to the 31st the weather was very moderate, about like the 20th, 21st, 22d and 23d. Most of time clear. Moderate north breeze. No rain of any consequence. Moderate dews. Nights pleasant.

SEPTEMBER.

OBSERVATIONS ON SOIL OF GRASS LAND.

DAY OF MONTH.	5 o'clock A. M. Surface.	5 o'clock A. M. 4 inches below the surface	5 o'clock A. M. 9 inches below surface.	12 o'clock M. Surface.	12 o'clock M. 4 inches below surface	12 o'clock M. 9 inches below surface.	3 o'clock P. M. Surface.	3 o'clock P. M. 4 inches below surface.	3 o'clock P. M. 9 inches below surface.	7 o'clock P. M. Surface.	7 o'clock P. M. 4 inches below surface.	7 o'clock P. M. 9 inches below surface
1	65	65	66	83	73	70				76	73	70
2	64	66	67	83	74	70				73	73	70
3	69	68	69	82	76	71				76	76	73
4	70	70	70	82	74	73	76	75	74	72	74	73
5	70	70	70	82	76	74	80	76	74	74	74	74
6	64	66	68	75	71	70	71	71	70	66	76	70
7	60	60	65	81	73	69	76	73	69	70	70	69
8	66	65	67	75	72	69	72	72	69	71	72	69
Mean,	66	$66\frac{1}{4}$	$67\frac{3}{4}$	$80\frac{3}{8}$	$73\frac{7}{8}$	$70\frac{3}{4}$	$46\frac{7}{8}$	$45\frac{7}{8}$	$44\frac{1}{2}$	$72\frac{1}{4}$	$72\frac{3}{8}$	$71\frac{1}{8}$
Highest,	70	70	70	83	76	74	80	76	74	76	76	74
Lowest,	60	60	66	75	71	69	72	71	69	66	70	70

OBSERVATIONS ON NAKED SOIL.

DAY OF MONTH.	5 o'clock A. M. Surface.	5 o'clock A. M. 4 inches below surface.	5 o'clock A. M. 9 inches below surface.	12 o'clock M. Surface.	12 o'clock M. 4 inches below surface.	12 o'clock M. 9 inches below surface.	3 o'clock P. M. Surface	3 o'clock P. M. 4 inches below surface.	3 o'clock P. M. 9 inches below surface.	7 o'clock P. M. Surface.	7 o'clock P. M. 4 inches below surface.	7 o'clock P. M. 9 inches below surface.
1	65	65	66	84	73	71				76	73	71
2	64	65	66	85	74	71				73	73	71
3	69	68	68	82	76	71				76	76	72
4	70	70	69	83	75	73	76	75	74	72	74	72
5	70	70	70	82	76	74	80	76	74	74	74	74
6	64	66	68	75	72	70	71	71	70	65	69	70
7	60	60	65	82	74	70	75	74	70	70	70	70
8	66	65	66	85	73	70	71	72	70	71	72	70
Mean,	66	$66\frac{1}{8}$	$67\frac{1}{4}$	$82\frac{1}{4}$	$74\frac{1}{8}$	$71\frac{1}{4}$	$46\frac{3}{4}$	46	$44\frac{3}{4}$	$72\frac{1}{8}$	$72\frac{5}{8}$	$78\frac{1}{4}$
Highest,	70	70	70	85	76	74	80	76	74	76	76	74
Lowest,	60	60	65	75	72	70	71	71	70	70	70	70

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches below surface, naked soil.	Air, 4 inches below surface, grass land.	Rain.	Wind.	
1	65	65	65			N.	78	77	76		N.						74	74	74		N.	
2	64	64	64			N.W.	76	88	77		N.						73	73	74		N.	
3	70	70	70			S.	79	80	80		S.						78	78	78		S.	
4	71	71	70			N.	76	78	77		N.	76	76	76		N.	72	72	72		N.	
5	74	74	74			S.	80	80	80		S.	80	80	80		S.	76	76	76		S.	
6	66	66	66			N.	70	70	70		N.	71	71	71		N.	67	67	67		W.	
7	61	61	61			N.	74	70	74		E.	74	75	74		E.	70	70	70		E.	
8	64	64	64			S.	73	73	73		S.	71	71	71		S.	70	70	70		S.	
Mean	66 7/8	66 3/4	66 3/4				75 3/4	77	75 7/8			46 1/2	46 5/8	46 1/2			72 1/2	72 1/2	72 1/2			
Highest,	74	74	74				80	80	80			80	80	80			78	78	78			
Lowest,	61	61	61				70	70	70			71	71	71			70	70	70			

* 1. Clear N. breeze. 2 Clear N. breeze. Smoky. 3. Morning cloudy. Afternoon clear. Moderate S. breeze. Warm. 4 Few hazy clouds. N. breeze. Smoky. 5. Thick floating clouds Strong S. breeze. 6. Rained during night. Thick floating clouds Moderate breeze. 7. Morning clear. Afternoon few clouds. Moderate breeze 8. Cloudy. Moderate S breeze.

SEPTEMBER.

DAY OF MONTH.	OBSERVATIONS ON SOIL OF GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M			12 o'clock M.			3 o'clock P M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
9	73	70	70	74	73	70	70	72	70	65	69	70	73	70	70	75	74	70	70	72	70	65	69	70
10	61	63	65	67	68	67	67	68	67	62	64	66	61	62	64	67	68	66	67	60	66	62	64	65
11	60	60	63	69	66	64	68	61	66	64	64	66	60	60	62	69	66	64	66	66	65	64	64	65
12	62	62	64	66	66	64	67	66	65	65	64	65	62	62	64	67	66	64	67	66	65	65	64	65
13	54	63	65	73	70	65	71	70	65	66	66	66	64	63	64	73	70	65	70	70	65	66	66	66
14	59	61	63	62	63	64	59	60	62	56	59	61	59	61	63	62	63	64	59	60	62	56	59	61
15	52	53	59	68	63	62	60	60	61	55	58	60	52	53	58	69	63	62	60	60	61	55	58	60
16	48	51	59	69	65	61	70	67	63	58	60	63	48	51	58	70	65	62	71	68	64	58	60	63
Mean,	$58\frac{5}{8}$	$60\frac{3}{8}$	$64\frac{3}{4}$	$68\frac{1}{2}$	$66\frac{3}{4}$	$64\frac{5}{8}$	$66\frac{1}{2}$	$65\frac{1}{2}$	$64\frac{5}{8}$	$61\frac{5}{8}$	63	$64\frac{5}{8}$	$59\frac{7}{8}$	$60\frac{1}{4}$	$62\frac{7}{8}$	69	$66\frac{7}{8}$	$64\frac{5}{8}$	$66\frac{1}{4}$	$66\frac{1}{4}$	$64\frac{3}{4}$	$61\frac{3}{8}$	63	$64\frac{3}{8}$
Highest,	73	70	70	74	73	70	71	72	70	66	69	70	73	70	70	75	74	70	71	72	70	66	69	70
Lowest,	48	51	59	62	63	61	59	60	61	55	58	60	48	51	58	62	63	62	60	60	61	55	58	60

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
9	76	76	76			S.	70	70	70		S.W.	65	65	65	65	S.W.	62	62	62	64	N.	
10	62	62	62			N.	66	66	66		N.	66	66	66		N.	64	64	64		N.	
11	60	60	60			N.	68	68	68		N.	68	68	68		N.	64	64	64	60	N.	
12	62	62	62			N.	66	66	66		N.	67	67	67		N.	65	65	65		N.	
13	64	64	64			N.	70	70	70		N.	68	68	68	64	N.	66	66	66		N.	
14	58	58	58			W.	61	61	61		W.	60	60	60		W.	54	54	54		W.	
15	52	52	52	46		N.	60	60	60		W.	62	62	62		W.	57	57	57		W.	
16	49	49	49	44		S.	66	66	66		N.W.	67	67	67		N.W.	60	60	60		N.W.	
Mean,	60⅜	60⅜	60⅜				65⅞	65⅝	65⅞			65⅜	65⅜	65⅜			61½	61½	61½			
Highest,	76	76	76				70	70	70			68	68	68			66	66	66			
Lowest,	49	49	49				60	60	60			60	60	60			54	54	54			

SEPTEMBER.

DAY OF MONTH.	OBSERVATIONS ON SOIL OF GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			3 o'clock P M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
17	50	51	57	80	63	61	70	66	61	61	61	62	50	51	57	82	64	62	71	66	62	61	61	62
18	56	57	61	70	61	62	68	67	64	62	65	64	56	57	60	71	62	62	68	67	64	62	64	64
19	60	59	61	62	62	62	61	61	60	62	62	62	60	58	60	65	63	62	62	61	60	62	62	62
20	54	56	59	68	64	62	65	62	62	62	62	62	54	56	58	69	65	62	65	62	62	62	62	62
21	59	58	60	71	66	62	72	66	62	62	63	62	59	58	60	72	66	62	72	65	62	62	63	62
22	62	54	59	79	66	64	79	70	65	62	65	64	52	54	58	81	67	64	81	71	65	61	64	63
23	52	53	58	74	70	63	66	65	64	62	63	63	52	53	58	80	71	63	66	64	64	62	63	63
Mean,	54¾	55⅜	59⅓	72	64⅝	62¼	68⅝	65¼	62⅝	61¾	63	62⅝	54⅝	55¼	58⅝	74¼	65⅜	62⅜	69¼	65⅛	65⅝	61⅝	62⅝	62⅝
Highest,	60	59	61	80	70	64	79	70	65	62	65	64	60	58	58	82	71	64	81	71	65	62	64	64
Lowest,	50	51	57	62	61	61	61	61	60	61	61	62	52	51	57	65	62	62	62	61	60	61	61	62

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
17	50	50	50	45		N.	67	68	67		N.E.	69	69	69		W.	64	64	63		N.	
18	58	58	57	56		N.	69	69	69		S.	68	68	68		S.	66	66	65		S.E.	
19	62	62	62			S.E.	64	64	62		N.E.	62	62	61		N.E.	63	63	62		N.E.	
20	57	57	57			N.E.	64	64	64		N.	63	63	63		N.	62	62	62		N.	
21	62	62	62			W.	68	68	68		N.	68	68	68		N.	64	63	63		N.	
22	56	56	56	50		N.	69	71	70		N.W.	69	72	70		W.	66	66	64		W.	
23	48	48	48	48		N.	70	74	72		S.	71	69	68		S.	66	62	61		S.	
Mean,	$56\frac{1}{8}$	$55\frac{1}{8}$	56				$67\frac{3}{8}$	$68\frac{3}{8}$	$67\frac{5}{8}$			$66\frac{5}{8}$	$67\frac{1}{4}$	$66\frac{5}{8}$			$65\frac{7}{8}$	$63\frac{5}{8}$	$62\frac{3}{4}$			
Highest,	62	62	62				70	74	72			71	72	70			66	66	65			
Lowest,	48	50	48				64	64	63			62	62	61			62	62	61			

* 17. Clear. Fresh N. breeze. 18. Few thin clouds. Moderate breeze. 19. Morning few thin clouds. Afternoon cloudy. Moderate breeze. 20. Morning few thin clouds. Afternoon cloudy. Moderate breeze. 21. Morning few thin clouds. Afternoon thick clouds. Strong N. breeze. 22. Clear. Moderate breeze. Heavy dew. 23. Morning foggy. Clear. Heavy dew. 7 P. M. few clouds. S. breeze.

SEPTEMBER.

DAY OF MONTH.	OBSERVATIONS ON SOIL OF GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below the surface	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
24	59	59	61	64	61	60	60	62	62	62	62	62	59	59	60	68	63	62	62	62	60	62	62	60
25	57	57	60	60	60	60	60	60	60	56	59	60	57	57	59	60	60	60	60	60	60	56	58	59
26	54	55	57	59	57	58	58	58	58	57	58	58	54	55	57	59	57	58	58	58	58	57	58	58
27	56	56	58	71	63	58	68	63	58	60	63	58	56	56	58	72	63	58	68	63	58	60	63	58
28	60	60	58	77	68	60	77	71	61	64	68	61	69	60	58	80	70	60	80	73	61	64	67	61
29	53	54	58	69	61	60	69	63	61	60	61	61	53	54	58	71	61	59	71	63	61	60	61	61
30	53	54	58	58	58	58	58	58	58	55	56	59	52	53	57	58	58	58	58	58	58	55	56	58
Mean,	56	$56\frac{3}{8}$	$58\frac{5}{8}$	$65\frac{3}{8}$	$61\frac{1}{8}$	$59\frac{1}{8}$	$64\frac{3}{8}$	$62\frac{1}{8}$	$59\frac{5}{8}$	$59\frac{1}{8}$	61	$59\frac{7}{8}$	$57\frac{1}{8}$	$56\frac{3}{8}$	$58\frac{1}{8}$	$66\frac{7}{8}$	$61\frac{5}{8}$	$59\frac{3}{8}$	$65\frac{3}{8}$	$62\frac{3}{8}$	$59\frac{3}{8}$	$59\frac{1}{8}$	$60\frac{5}{8}$	$59\frac{3}{8}$
Highest,	60	60	61	77	68	60	77	71	62	64	68	62	69	60	60	80	70	62	71	73	61	64	67	61
Lowest,	53	54	57	58	57	58	58	58	58	55	56	58	52	53	57	58	58	58	58	58	58	55	56	58

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air. 4 inches above surface, grass land.	Rain.	Wind.	
24	58	58	58			N.	66	64	63		N.	64	62	59		N.	62	61	61	62	N.	
25	58	58	58		58	N.	60	60	60	58	N.	60	60	60	58	N.	60	59	59	56	N.	
26	54	54	54		54	N.	58	58	58		N.	58	58	58		N.	56	56	56		N.	
27	56	56	56			N.	64	64	64		S.	62	62	62		S.	60	60	60	60	S.	
28	60	60	60			W.	67	68	67		N.W.	69	70	69		N.W.	64	64	64		N.	
29	53	53	53	52		N.	62	63	62		W.	63	64	63		W.	60	59	58		W.	
30	52	52	52	52		S.	56	56	56	56	N.W.	56	56	56		N.W.	56	55	54		N.	
Mean,	$55\frac{1}{8}$	$55\frac{7}{8}$	$55\frac{7}{8}$				$61\frac{7}{8}$	$61\frac{7}{8}$	$61\frac{3}{8}$			$61\frac{5}{8}$	$61\frac{5}{8}$	$61\frac{3}{8}$			$59\frac{5}{8}$	$59\frac{1}{8}$	$58\frac{7}{8}$			
Highest,	60	60	60				67	68	67			69	70	69			64	64	64			
Lowest,	52	52	52				56	56	56			56	56	56			56	55	54			

* 24. Morning light dew. hazy clouds. Afternoon cloudy. 5 P. M. commenced raining. Moderate breeze. 25. Cloudy. Showery. Moderate N. breeze. 26. Morning cloudy. Rainy. Rained steady since 5 P. M. of the 24th Afternoon cloudy. N. breeze. 27 Cloudy. Damp air. Commenced raining 4 P. M. Moderate breeze. 28. Few thin clouds. Moderate breeze. 29. Morning clear. Heavy dew. Foggy. Afternoon few floating clouds. 30. Morning cloudy. Slight showers between 11 A. M. and 2 P. M. Moderate breeze.

OCTOBER.

DAY OF MONTH.	OBSERVATIONS ON GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			7 o'clock P. M.			3 o'clock P. M			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface	Surface.	4 inches below surface.	9 inches below surface	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
1	50	52	57	59	56	57	57	57	57	54	56	67	50	52	56	59	56	59	57	57	57	54	55	56
2	49	51	57	65	58	57	67	63	58	56	60	68	49	51	56	66	58	57	67	63	58	56	60	58
3	49	53	56	70	64	59	72	67	60	59	63	60	49	52	54	73	64	58	74	67	60	59	62	60
4	50	52	56	76	62	58	78	62	57	54	56	58	50	52	54	78	62	57	78	62	58	54	56	58
5	52	52	55	75	58	57	77	66	60	62	64	60	52	52	54	77	59	56	79	66	60	61	63	60
6	53	53	56	68	60	57	67	61	58	60	61	58	53	53	55	68	60	57	67	60	58	59	60	57
7	53	53	57	69	61	58	63	61	58	60	60	58	53	53	56	70	61	58	63	61	58	59	59	58
Mean,	$50\frac{7}{8}$	$52\frac{3}{8}$	$56\frac{3}{8}$	$68\frac{7}{8}$	$59\frac{7}{8}$	$57\frac{5}{8}$	$68\frac{5}{8}$	$62\frac{8}{8}$	$58\frac{3}{8}$	$57\frac{7}{8}$	60	$58\frac{3}{8}$	$52\frac{3}{8}$	$52\frac{1}{8}$	55	$70\frac{1}{8}$	60	$57\frac{3}{8}$	$69\frac{3}{8}$	$62\frac{3}{8}$	$57\frac{5}{8}$	$57\frac{3}{8}$	$59\frac{3}{8}$	$58\frac{1}{8}$
Highest,	53	53	57	76	64	59	78	67	60	62	64	60	53	53	56	78	64	59	79	67	60	61	63	60
Lowest,	49	51	55	59	56	57	57	57	58	54	56	58	49	51	54	59	56	56	57	57	51	54	55	56

OBSERVATIONS ON ATMOSPHERE, DEW RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
1	49	49	49	48		S.	61	61	61	56	S.	60	60	60		N.	57	56	55		N.	
2	48	48	48	48		N.	59	59	59		N.	62	62	62		N.	59	58	57		N.	
3	47	47	47	47		N.	63	63	63		N.	65	66	65		N.	58	56	56		N.	
4	50	50	50	48		N.	63	64	63		N.	64	64	64		N.	60	60	60		N.	
5	48	48	48	48		S.	62	63	62		S.	68	67	69		S.	62	61	60		S.	
6	53	53	53	52		N.	64	64	64		S.	64	64	64		S.	60	59	58		S.	
7	53	53	53	52		S.	64	66	66		S.E.	63	63	63		E.	61	60	59		E.	
Mean,	$49\frac{5}{8}$	$49\frac{5}{8}$	$49\frac{5}{8}$	49			$62\frac{3}{8}$	$62\frac{7}{8}$	$62\frac{7}{8}$			$63\frac{5}{8}$	$63\frac{5}{8}$	$63\frac{7}{8}$			$64\frac{3}{8}$	$58\frac{5}{8}$	$57\frac{7}{8}$			
Highest,	53	53	53	52			64	66	65			68	67	69			62	60	60			
Lowest,	47	47	47	47			61	59	59			60	60	60			57	56	55			

* 1. Light dew. Cloudy. Damp air. Slight showers from 11 A. M. to 1 P. M. 2 Heavy dew. Floating clouds. Moderate N. breeze. 8. Heavy dew. Few thin clouds. Moderate breeze. 4 Heavy dew. Clear N. breeze. Leaves begin to fall. 5. Heavy dew. Clear. Moderate S. breeze. 6. Heavy dew. Thin clouds. Moderate breeze. 7. Heavy dew. Morning few thin clouds. Afternoon cloudy. Moderate breeze.

OCTOBER.

DAY OF MONTH.	Grass land, 5 o'clock A. M., Surface.	Grass land, 5 o'clock A. M., 4 inches below surface.	Grass land, 5 o'clock A. M., 9 inches below surface.	Grass land, 12 o'clock M., Surface.	Grass land, 12 o'clock M., 4 inches below surface.	Grass land, 12 o'clock M., 9 inches below surface.	Grass land, 3 o'clock P. M., Surface.	Grass land, 3 o'clock P. M., 4 inches below surface.	Grass land, 3 o'clock P. M., 9 inches below surface.	Grass land, 7 o'clock P. M., Surface.	Grass land, 7 o'clock P. M., 4 inches below surface.	Grass land, 7 o'clock P. M., 9 inches below surface.
8	55	55	57	62	59	58	62	61	58	59	58	58
9	53	56	57	62	60	57	55	57	57	53	56	57
10	50	52	56	62	61	58	60	61	58	55	56	58
11	46	48	55	58	57	56	56	57	56	50	53	56
12	42	46	53	50	50	53	50	50	53	50	50	53
13	52	52	53	58	56	55	54	56	55	53	54	55
14	42	45	52	56	56	53	56	56	53	50	52	53
15	40	44	51	50	51	52	50	51	52	45	49	52
Mean,	$47\frac{1}{4}$	$49\frac{3}{4}$	$54\frac{1}{4}$	$57\frac{1}{4}$	$56\frac{1}{4}$	$55\frac{1}{4}$	$55\frac{3}{8}$	$56\frac{1}{8}$	$55\frac{1}{4}$	$51\frac{7}{8}$	$53\frac{1}{2}$	$55\frac{1}{4}$
Highest,	55	55	57	62	61	58	62	61	58	59	58	58
Lowest,	40	44	51	50	51	52	50	50	52	45	49	52

DAY OF MONTH.	Naked soil, 5 o'clock A. M., Surface.	Naked soil, 5 o'clock A. M., 4 inches below surface.	Naked soil, 5 o'clock A. M., 9 inches below surface.	Naked soil, 12 o'clock M., Surface.	Naked soil, 12 o'clock M., 4 inches below surface.	Naked soil, 12 o'clock M., 9 inches below surface.	Naked soil, 3 o'clock P. M., Surface.	Naked soil, 3 o'clock P. M., 4 inches below surface.	Naked soil, 3 o'clock P. M., 9 inches below surface.	Naked soil, 7 o'clock P. M., Surface.	Naked soil, 7 o'clock P. M., 4 inches below surface.	Naked soil, 7 o'clock P. M., 9 inches below surface.
8	55	55	57	62	59	58	62	61	58	59	58	58
9	53	56	56	62	60	57	55	57	57	52	55	57
10	50	52	55	63	61	58	60	61	58	54	56	58
11	46	48	54	58	57	56	56	56	56	50	52	56
12	42	46	52	50	50	52	50	50	52	50	50	52
13	52	52	53	59	56	55	54	56	55	52	53	55
14	41	44	51	56	56	53	55	56	53	49	51	52
15	39	43	50	50	60	50	49	50	50	44	48	50
Mean,	$47\frac{1}{4}$	$49\frac{1}{2}$	$53\frac{1}{2}$	$51\frac{1}{2}$	$57\frac{3}{8}$	$54\frac{7}{8}$	$55\frac{1}{8}$	$55\frac{7}{8}$	$54\frac{7}{8}$	$51\frac{1}{4}$	$52\frac{7}{8}$	$54\frac{3}{4}$
Highest,	55	56	57	62	61	58	62	61	58	59	58	58
Lowest,	39	43	50	50	56	50	49	50	50	44	48	50

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land	Rain.	Wind.	
8	55	55	55			N.	62	62	62		S.E.	60	60	60		S.E.	60	60	60	59	S.E.	
9	54	54	54			N.	59	59	59		W.	58	58	58		N.	56	55	54		N.	
10	51	51	51	48		W.	60	60	60		W.	58	58	58		W.	53	52	51		N.	
11	47	47	47	45		W.	56	56	56		N.W.	56	56	56		W.	50	50	50		W.	
12	47	42	42	38		S.	50	50	50		S.	51	51	51		S.	50	50	50		S.	
13	52	52	52			W.	57	57	57		W.	54	54	54		W.	48	47	47		W.	
14	42	42	42	32		W.	54	54	54		W.	53	53	53		W.	47	46	46		W.	
15	36	36	35	32		N.E.	48	48	48		N.W.	48	48	48		N.W.	43	42	42		N.W.	
Mean.	47⅝	48⅛	48				55¾	55¾	55¾			55⅜	55½	54¾			50⅞	50¼	50			
Highest,	55	55	57				62	62	62			60	60	60			60	60	60			
Lowest,	36	36	35				48	48	48			48	48	48			43	42	42			

* 8. Cloudy. Afternoon slight showers. 9. Few thin clouds. Fresh W. breeze. 10. Few floating clouds. Stiff W. breeze. 7 P. M. clear. Light dew. 11. Heavy dew. Morning clear. Afternoon few clouds. Strong W. breeze. 12. Morning cool, light dew. Thin clouds. Afternoon cloudy. Strong S. breeze. 13. Few thin clouds. Moderate breeze. Smoky. 14. Morning clear, light frost. Afternoon few clouds, W. breeze. 15. Few clouds. Heavy frost. Moderate wind.

OCTOBER.

DAY OF MONTH.	OBSERVATIONS ON GRASS LAND.												OBSERVATIONS ON NAKED SOIL.											
	5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.			5 o'clock A. M.			12 o'clock M.			3 o'clock P. M.			7 o'clock P. M.		
	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.	Surface.	4 inches below surface.	9 inches below surface.
16	38	44	50	52	52	51	52	52	51	49	51	51	37	43	48	52	52	50	52	52	50	48	52	50
17	45	46	50	60	52	52	60	55	53	54	53	53	45	45	49	61	52	51	61	55	53	54	54	53
18	47	47	52				64	58	56	59	56	56	46	46	51				64	58	56	57	58	56
19										54	54	54										54	54	54
20	46	47	52	60	57	55	60	47	55	52	55	55	45	46	51	60	57	55	60	57	55	52	53	55
21	41	45	51				57	56	55	54	54	54	40	44	49				57	56	55	54	54	54
22	52	52	54				58	54	54	56	55	54	52	52	53				58	54	53	56	55	53
23	48	50	52	55	53	53				52	53	53	48	50	52	55	53	53				52	53	53
Mean,	$48\frac{1}{8}$	$47\frac{1}{4}$	$50\frac{1}{8}$	$56\frac{3}{4}$	$53\frac{1}{4}$	$52\frac{3}{4}$	$59\frac{1}{2}$	$53\frac{2}{3}$	55	$53\frac{5}{8}$	$54\frac{3}{8}$	$53\frac{3}{4}$	$44\frac{5}{8}$	$46\frac{3}{4}$	$50\frac{3}{4}$	57	53	$52\frac{1}{4}$	$57\frac{2}{3}$	55	54	$55\frac{7}{8}$	$54\frac{1}{4}$	$53\frac{1}{2}$
Highest,	52	52	54	60	57	55	64	58	56	58	58	56	52	52	57	61	57	55	64	58	56	57	58	56
Lowest,	38	44	50	52	52	51	52	54	51	49	52	51	37	43	48	52	52	50	52	52	50	43	52	50

OBSERVATIONS ON ATMOSPHERE, DEW RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land	Rain.	Wind.	Air, 4 feet above surface	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil	Air, 4 inches above surface, grass land.	Rain.	Wind.	
16	36	35	35	32		S.	54	54	54		S.	55	54	54		S.	46	46	46		S.	
17	45	45	45			S.	60	60	60		S.	60	60	60		S.	56	56	55		S.	
18	45	45	45	45		S.						68	68	68		S.	63	63	62		S.	
19																	54	54	54		W.	
20	46	46	46	42		N.	60	60	60		N.	60	60	60		N.	52	52	51		N.	
21	40	40	40	38		W.						57	57	57		N.	54	53	53		N.	
22	52	52	52		50	S.						62	62	62		S.	62	62	62		S.	
23	46	46	46			W.	52	52	52		W.						51	51	50		W.	
Mean,	$44\frac{1}{4}$	$44\frac{1}{8}$	$44\frac{1}{8}$				$56\frac{1}{2}$	$56\frac{1}{2}$	$56\frac{1}{2}$			$60\frac{1}{3}$	$60\frac{1}{3}$	$60\frac{1}{3}$			$54\frac{3}{4}$	$54\frac{5}{8}$	$54\frac{1}{8}$			
Highest,	52	52	52				60	60	60			68	68	68			63	63	63			
Lowest,	36	35	35				52	52	52			54	54	54			46	46	46			

* 16. Clear. Heavy frost. Ground frozen slightly. Moderate breeze. 17. Morning clear. Light dew. Afternoon few thin clouds. S breeze. 18. Heavy dew. Very few thin clouds. S. breeze. 19. Cloudy S. breeze. 20. Heavy dew. Very few thin clouds. N. breeze. 21. Heavy dew. Few clouds. 22. Cloudy. S. breeze. Morning rainy. 23. Morning cloudy. Stiff W. breeze. 7 P. M. clear.

OCTOBER.

DAY OF MONTH.	Observations on Grass Land. 5 o'clock A. M. Surface.	4 inches below surface.	9 inches below surface.	12 o'clock M. Surface.	4 inches below surface.	9 inches below surface.	7 o'clock P. M. Surface.	4 inches below surface.	9 inches below surface.	3 o'clock P. M. Surface.	4 inches below surface.	9 inches below surface.	Observations on Naked Soil. 5 o'clock A. M. Surface.	4 inches below surface.	9 inches below surface	12 o'clock M. Surface.	4 inches below surface.	9 inches below surface.	3 o'clock P. M. Surface.	4 inches below surface	9 inches below surface.	7 o'clock P. M. Surface.	4 inches below surface.	9 inches below surface.
24																								
25	54	52	52				60	56	54				54	52	52				60	56	54			
26																								
27	32	41	46										32	40	45									
28	32	40	46							41	44	46	32	39	45							41	44	45
29	32	38	43				54	38	47				32	38	42				54	48	47			
30	36	39	43										32	38	42									
31	39	40	43				59	54	50				39	40	43				56	54	50			
Mean,	$32\frac{1}{8}$	$35\frac{5}{8}$	39										$31\frac{5}{8}$	$35\frac{1}{4}$	$38\frac{3}{8}$									
Highest,	54	52	52										54	52	52									
Lowest,	32	38	43										32	38	42									

OBSERVATIONS ON ATMOSPHERE, DEW, RAIN, AND WIND.

DAY OF MONTH.	5 o'clock A. M.						12 o'clock M.					3 o'clock P. M.					7 o'clock P. M.					Observations.*
	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Dew.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 in hes above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	Air, 4 feet above surface.	Air, 4 inches above surface, naked soil.	Air, 4 inches above surface, grass land.	Rain.	Wind.	
24																						
25	54	44	51		51	s.w.						60	60	60		w.						
26																						
27	33	33	33	32		N.																
28	33	33	33	32		N.											40	38	38		N.	
29	32	32	32	32		s.						53	53	53		s.						
30	32	32	32	32		s.																
31	44	44	44	44		s.						57	57	57		s.						
Mean,	$32\frac{1}{2}$	$32\frac{1}{2}$	$22\frac{1}{2}$	$32\frac{1}{2}$																		
Highest,	54	54	54	54																		
Lowest,	32	32	33	32																		

* 25. Cloudy. Morning showery. 27. Heavy frost. Ice froze in vessels exposed 1-4 inch thick. 28. Ice froze 1-4 inch thick. N. breeze. 29. Heavy frost. Clear S. breeze. 30. Heavy frost. Very few clouds 31. Heavy dew. Few clouds. S. breeze.

BOTTOM HEAT.

One of the most important points to which modern gardeners have had their attention turned, is that of *Bottom Heat.* It is to a great extent the cause of their eminent success in some branches of horticulture; and the time is coming when it will be looked upon as the foundation of all practice whatsoever. As matters now stand, the subject is only considered specially in a few cases, such as Pine apples, Melons and Cucumbers, and in the operations of seed sowing and cutting striking. But it really concerns every plant that is known; more perhaps than even top heat. Those for which it is so carefully studied are only extreme cases; but they point the way to general rules. We may be sure that if one plant is so constituted that its roots require to lie in a medium of a particular temperature, all other plants will also have some temperature which suits their roots better than any other. This is acknowledged to be so with their branches and leaves; and is certainly quite as true as respects their roots.

We might be certain that this opinion is well founded, even in the absence of direct proof, because we know that the aim of cultivation is to imitate as exactly as possible in all respects, the conditions under which plants naturally grow. If in its natural state, where it arrives at the greatest perfection of which it is susceptible, a plant is continually exposed to a certain temperature of the earth, to another of the air, to a particular amount of light, of humidity of atmospheric pressure, it cannot be doubted that the first business of the gardener is to imitate those peculiarities by all the means at his command; having done that he may proceed to stall feed his plants till they resemble the bullocks at the Smithfield Club; but to cram them till he has secured their perfect health, is like overfeeding a savage debarred from his natural exercise and occupations.

A very interesting proof of the advantage of attending to this subject is to be found in Mr. Purdey's Garden at Bayswater. A vinery has been filled with wood and fruit in little more than two years, by merely warming the border in which the Vines grow. It is said that the latter made shoots 37 feet long, *strong*, *short-jointed*, and *well-ripened*, in the first year. The Grapes which we have seen, are excellent, and were ripe in the beginning of August; so that they must have been forced in good time. We fully anticipate bunches from this house which shall equal the largest of Syria. Mr. Purdey has obtained this result by applying artificial heat to his Vine-border, so as to ensure its having a suitable temperature at the season of growth. In general, Vines are treated as a man would be, if exposed to a steam bath with his feet in ice. The manner of heating that has been adopted at Bayswater has the fault of being too expensive. Let Polmaise be substituted for it, and the whole cost will consist in forming a cavity in which the warm moist air shall circulate, when desired.

The necessity of providing some means of warming the borders of Vines to be forced (we will even say grown) in a climate like this will be obvious when we compare the temperature of the earth in the south of France and Great Britain. The mean temperature of the earth, near London, in the three first months of the year, may be taken at 38 deg.; that of Marseilles or Bordeaux will be at least 65 deg. The mean temperature of the earth near London, in July and August, is 62 deg.; that of Marseilles about 78 deg., and of Bordeaux 77 deg. We will ask whether it is probable that such differences in the soil can be unimportant to the plants which grow in it. It would be a capital experiment to attempt to grow Grapes in a house whose border should be in the inside the house, and into which no other artificial source of heat should be admitted.

We have little idea in this part of the world of the temperature of the soil in some countries; Captain Newbold found the heat of the granitic soil in the vicinity of Beltary, at 2 P. M. in May, as high as 121 deg.; that of the black soil, 122 deg. 5 min.; that of the air in the shade being 95 deg. 5 min. At midnight the temperature of the black soil was still as high as 86 deg. that of the air being 80 deg. That of a bare rock of granite, in the same locality, at 2 P. M., was 120 deg. 5 min. of black basaltic rock, 122 deg.; that of the granite at midnight was 86 deg. 5 min. Other examples are given in the "Theory of Horticulture."

But in attempting to apply these principles to practice gardeners are stopped at the threshhold of their inquiry by the absence of evidence as to the temperature of soil in different countries. By a persevering search though books, they find, indeed, plenty of statements as to the temperature of the air, but that of the earth observers have almost invariably neglected. It is, therefore, interesting to inquire whether the temperature of the earth in which plants grow may not be inferred from that of the air in which rests upon the surface. It has been shown, in the "Theory of Horticulture" (p. 96), that in October, near London, the mean temperature of the earth has been found 3 deg. or 4 deg. above that of the air, although in general the difference is not more than a degree or a degree and a half in favor of the earth. The permanent heat of the earth may, therefore, be regarded as being always higher than the mean of the air; but the amonnt of difference will be regulated by the temperature to which the earth is exposed, and by its own conducting qualities. It seems to us, however, that for gardening purposes, the temperature of the earth may be taken as on an average, 5 deg. above the mean temperature of summer in warm countries; very often more, seldom less; so that if the mean temperature of Rome in the hottest month is 77 deg., it is probable that that of the soil, at the same time, will not be less than 82 deg. As we advance to the northward the difference diminishes, so that in London it is not more than 2 deg. in favor of the earth.

The correctness of this mode of computing terrestial temperature is borne out by the two best sets of observations that we have from hot countries. Captain Newbold's observations (Philosophical Transactions, 1845) at Bellary, on the centre of the table land of peninsular India, in lat. 15 deg. 5 min. N., and 1,600 feet above the level of the sea, are as follows: In the hot month of May, sky unclouded, soil reddish and light in texture, and completely sheltered by a thatched roof, the temperature of the soil at a foot below the surface was found to be as follows:

	Sunrise.		Two P. M.	
	Earth.	Air in shade.	Earth.	Air in shade.
First day,	86° 5	81°	91° 3	96° 5
Second day,	85°	78°	89°	92°
Third day,	85° 5	78° 5	90°	95°
Fourth day,	87°	75°	89°	92°

The *mean temperature* of the place about 80° 5.

This is confirmed by the results of an invaluable set of daily observations for three years, made at Trevandrum, in India, by John Caldecott, Esq., Astronomer to the Rajah of Travancore, and lately published in the "Transactions of the Royal Society of Edinburgh" vol. 16, p. 379. Professor Forbes has reduced them to the following table:

Months.	No. 1 12 feet Thermom.	No. 2 6 feet Thermom.	No. 3 3 feet Thermom.	Air Temperature.
January,	85,528	85,618	84,954	78,930
February,	85,784	86,625	86,838	80,386
March,	86,373	88,110	88,789	82,730
April,	86,916	88,527*	89,614	83,370
May,		88,224†	88,413	81,603
June,	86,878†	86,883	85,012	79,023
July,	86,537	85,114	83,250	78,450
August,	85,894	84,736	83,566	78,990
September,	85,633	85,133	84,575	79,973
October,	85,680	85,632	84,722	79,076
November,	85,651	85,271	84,622	79,750
December,	85,607	85,303	84,228	78,030
Means,	86,043	86,264	85,715	80,025

* Mean of two years only. † Result of 1843 only.

Upon this Professor Forbes observes, that the following conclusions are plainly deducible:

1. The temperature of the ground at Trevandrum, is from 5° to 6° Fahr. higher than that of the air. This result is confirmed by observations on the temperature of springs and wells at Trevandrum, which have been obligingly communicated to me by Major General Cullen, of the Madras Artillery. These observations are printed in the proceedings of this society.

2. When the monthly means of the thermometers are projected so as to show the curves of annual temperature, they are found to have one great inflection and a smaller one. The principal maximum of the temperature of the air occurs about the beginning of April, after which the rainy season sets in, and the annual curve goes through its extreme range in three months; the principal minimum occurring about the middle of July. The remaining fluctuations are comparatively insignificant, but indicate a slight maximum about the middle of October.

3. The epochs of temperature are retarded with the depth below the surface in the usual manner, and, at the same time, casual fluctuations disappear, and the ranges diminish. At 12 French feet, the principal maximum occurs five weeks later than in the open air, and the range is still at least a degree and a half.

From these facts it is easy to infer that the phenomena of the propagation of heat into the ground near the equator resemble those of temperate latitudes, though modified in extent and character. Mr. Caldecott's experiments conclusively establish (as he himself has pointed out), the error of the doctrine of Boussingault (at least for the eastern hemisphere), that the annual temperature near the equator remains unchanged at the depth of a foot below the surface in the shade. This mistake it is the more important to correct, because M. Poisson has attempted to confirm his mathematical theories of heat by applying them to this alleged fact.

The experiments of Mr. Caldecott and Captain Newbold, as indeed had those of former observers, conclusively dispose of the theory of Kupfer, who imagines the "earth's temperature to be less than that of the air between the tropics," and of Boussingault, who supposes them to be the same.—*Gardener's Chron.*

POTATO DISEASE.

June 28—Mr. Westwood made some remarks before the British Association, on the existence of the Potato Disease in Oxfordshire. Some potatoes of his own had been attacked this year, and in three different districts around Oxford he had observed its presence. As an entomologist, he wished to deny most distinctly that he thought the disease arose from the attacks of an insect. It had been stated by Mr. Smee that it arose from the attacks of a new aphis, which he called vastator, but this aphis, far from being new, had been described many years ago, and was a very common insect on decaying plants. Another gentleman proposed to call the insect A. pestilens. Mr. Westwood drew attention to the ignorance such observers displayed, as rendering it necessary that zoology should be taught as a branch of education. He was sorry to be speaking on this subject in an English University where neither zoology nor comparative anatomy we recognised as necessary to complete the education of the professional man or gentleman. Mr. J. E. Gray stated that he had compared some specimens of the aphis vastator with species of aphides in the British Museum, and found that under this name Mr. Smee had included three or four well known species. Dr. Lankester, drew attention to a bundle of potato stalks which he had brought from Pangbourne which gave every sign of disease, but not an aphis could be found among them. One fact of this kind was sufficient to prove that the disease had no dependance upon the insect. He had heard from a gentleman in Manchester that potatoes sown in new soil on Chat Moss were free from the disease, whilst those sown in old soil all had the disease. This looked as if the inorganic constituents of the soil or potato were the source of the disease. Mr. Babington referred to the potato stems from Pangbourne. He had examined the roots of these plants, and found that wherever the disease appeared in the leaves there was evidence of disease in the roots. He believed the root or haulm was first at fault. He quite agreed with Mr. Westwood in the necessity of a more general knowledge of natural history. Sir W. Jardine said that chemical investigations of a very accurate nature both of the soil and the potato were being carried on in Edinburgh. He had found that potatoes grown on moss soil were more free from disease than others. This did not arise from the newness of the soil, for he had had some potatoes entirely spoiled which were planted in an orchard recently turned up. He had seen the stem and root very much affected without the leaves being diseased at all. He was happy to say that in Edinburgh all students of the University were expected to attend the natural history lectures. Mr. Hogan called attention to a method he had pursued of preventing the disease in the potato by growing them from seed. Mr. C. Darwin had brought the seed of the potato from Peru, and the tubers grown from it were quite as much affected as any other. Dr. Kelart stated that he had recently heard from Ceylon that the potatoes had been attacked in that island.—A member said that he had just received letters from New Zealand, and the potato was also affected there[??? *Ed.*] The Rev. N. Young, of New College, exhibited some potato leaves affected by the aphis.

On the Vitality of Potato-seeds, by John D. Murray, Esq., of Murraythwaite. In 1832 or 1833 a portion of ground in my garden, which produced a crop of potatoes, was trenched to the depth of 18 in., and after bearing various crops for several years after, was turned into a flower-garden, and covered with turf, which was kept regularly mown. After having been kept as a flower-garden for eight or nine years, I this spring turned it into a kitchen-garden, and for that purpose again had it trenched 18 inches deep, and sown with Beet-root. About a month ago, when weeding and thinning the Beet-root, I observed that a considerable number (perhaps 30 plants) of seedling potatoes had sprung up. They were spread irregularly over the whole piece of ground, a few being in the rows with the Beet-root, but the greater part in the intervals between the drills. When I last saw them (about three weeks ago) they were looking very healthy, and exhibited considerable variety in the shape of the leaves. I have no doubt that they are the produce of seed from the crop of 1832 or 1833, which had been allowed to ripen on the ground, and the seed having been buried 18 inches deep had remained dormant until brought again to the surface by the trenching this spring.

Potato Disease.—Mr. C. R. Bree said: In September, 1846, I ventured to suggest that we should endeavor to arrive at sound conclusions about the nature and cause of the potatoe disease, by registering and reasoning upon facts alone. I also stated that for two years I had observed symptoms of the disease for the first time on the 23d of August. When I observed, therefore, your notice of the 20th ult., that we had nearly escaped the disease, I could not help thinking that the remark might still be premature, and the experience of the last 10 days (I write Sept. 1,) has unfortunately verified—at least partly—the truth of my anticipation. Previous to the heavy rain which fell throughout this district in the thunder-storm of the 16th of August, I heard no complaint of disease; I had not a vestige of it in my own garden, nor could I hear of it in those of my neighbors, with one exception, and that of a limited character. Between the 16th and 20th of August rumors of disease in this neighborhood sprung up, and by the 30th it became general. In some instances the loss is as great as in 1845. We thus find that in the three years this pestilence has destroyed our potato crop, it has invariable exhibited itself most severely and extensively between the 15th and 31st of August. This fact allowed, we make one step towards a rational description of the disease. Now, with regarding its nature. It appears in different parts of the plant at the same time, in the form of small black patches, resulting from the death of a portion of the tissue of the plant. These blotches in the leaves are generally dry, and crumble beneath the touch, and in some instances (the great majority) are covered with a parasitical fungus, the Botrytis Infestans. No person I think who has had the slightest experience will fall into the great error of attributing the accession of the blotches to the injury caused to the leaf by an aphis or any other insect. The two phenomena are widely different. The aphis causes the leaves which it infests to curl and form hollows, in which it generally is found to congregate in large numbers long before the vitality of the leaf is affected. This is not the case with the potato disease. I have looked carefully through my rows without finding an aphis of any description; but there is no mistaking the dark, isolated, gangrenous-looking spots, which are appearing on the leaves, along the stems, and among the tubers. How is this? I take up a root, and find five tubers perfectly sound and one diseased. I look at once at the stem and leaves and I find patches of the well known disease isolated, perfectly distinct from each other. Now I know of no law in vegetable physiology which enables an insect to cause phenomena like these. The notion is too absurd; it will not bear a moment's examination. In one of my deductions last year I suggested the soil might have a greater or less influence in effecting a change in the vital process; but I find that the gardens on our rail road, some of which are many feet below the usual surface, are all infected. One attribute of the soil I feel quite convinced has considerable influence over this disease, viz., its moisture. I have planted some potatoes in a line, part of which are among Gooseberry bushes and very damp; the other portion is very dry. In the former the potatoes are nearly all diseased, in the latter they are nearly all sound. With regard, then, to the nature of this disease. I think we may fairly define it "gangrene of the plant, occurring in the first instance in isolated patches either in the leaves and stem alone, or simultaneously in the tuber, which if left alone will ultimately destroy the plant and tubers entirely." Nearly 200 years ago Sydenham described a species of cholera affecting the human subject in August. Popular error has generally attributed this disease to the plum season; but this is a great mistake. The disease described by Sydenham may have been studied by many observers, in 1847, without a variation in the symptoms. It occurs in those who do not eat plums, and the disease caused by plums is not that described by Sydenham. It is, in fact, one of those periodic phenomena of which we know little more than its appearance and disappearance at certain seasons of the year, and which we judge by analogical reasoning is caused by some or other of those little understood, or rather little studied, laws which belong to the science of meteorology. That the potato disease belongs to the same class of diseases must, I think, be perfectly clear. It has all the characters, all the variations, and all the obscurity of a periodical epidemic. We may describe it as "Morbus niger—a gangrene of the tissues of the potato plant occurring epidemically in August; the diseased parts generally covered with a fungus, which appears subsequent to the disease. More extensive in cold and damp situations." More than this, so far as regards the etiology of the disease, I do not think we shall ever know.—*Gardener's Chron.*

ADDENDA TO OUR TABLE OF TEMPERATURE.

July 20.—Thermometer stands at 90. Potato vines begin to die South and West.

August 4.—Potato vines commenced dying in Albany. The blight in apple, quince and pear trees seems to be nearly checked *here.*

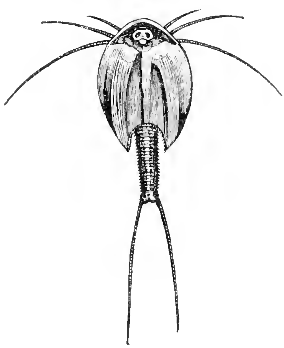
December 15–23.—The temperature of the air has varied from 20 to 12 below freezing, while the temperature of the earth four feet below the surface has remained nearly stationary at 46°5. The temperature of the clay banks is three or four degrees higher at the same depth than the ordinary soil.

NOTE.—It is probable that many errors may be found in the foregoing tables, as our health has been such that we have been unable to give them that attention they merit.

NEW MODE OF INARCHING.

Various means are resorted to by gardeners to supply a deficiency of branches in wall-trees, and with greater or less success we imagine, however, that the following French mode, whicl may be termed herbaceous inarching, so far at least as the scioi is concerned, offers advantages over any other plan at present ii use. It is adopted in the Society's garden, and consists in inarching the growing extremities of adjoining shoots to the parts o the stem from which it is desirable branches should proceed. A small slice is taken off near the extremity of the young shoot, and a corresponding extent of surface immediately below the inner bark of the stem is exposed; the two are joined together and a perfect union is very soon effected. By this means tiers of horizontals in young tiees may be formed without disappointment, and branches may be replaced in old trees more readily than by the old mode of side-grafting or budding.—*Gardener's Chron.*

APUS AFFINIS.



Described in the October No. by Prof. Haldemann, of Pa.

A FERTILIZER?

100 Grains give of water of absorption,	4.50
Organic matter,	2.90
Silicates,	66.22
Allumina and per Oxide of Iron,	14.28
Phosphate of Magnesia,	4.20
Phosphate of Lime,	Trace
Phosphate per Oxide of Iron,	0.04
Carbonate of Lime,	2.40
Magnesia,	0.08
Sulphuric Acid,	0.25
Chloride Sodium, (common salt,)	0.05
Soluble Silica,	0.48
Potash,	5.47
	100.87

Dr. Emmons :

Dear Sir,—The above analysis was made by you, or under your direction, of a fragment of rock presented by John Magee, Esq., of Bath, Steuben county. Some are of the opinion that this rock can be made highly valuable as a fertilizer, and consequently are very anxious that it should be brought into general use. As this would require a considerable outlay of money, I thought it best in the first place to obtain the opinions of those capable of judging as to its utility before commencing the work, and for this purpose sent a friend to Geneva and Rochester, but Mr. Lee being absent, he could find no person who would even venture an opinion on the subject ; consequently, (although I do it very unwillingly,) I have taken the liberty to address you on the subject, and to make a request that you will at your earliest convenience give me your opinion of the value of this rock as a fertilizer. With much esteem,

J. BRADEY.

Millport, Chemung co., N. Y. Dec. 10, 1847.

We believe, too, that this rock may be employed as a fertilizer when circumstances are favorable. Whether a business can be profitably conducted, by treating this rock as plaster is treated, and then sending it to market, may reasonably be doubted.

In its decomposition it furnishes fresh materials which are highly important. When the rock is ground it is more speedily decomposed and resolved into its elements, but whether this change will be sufficiently advanced in one year so as to show marked effects on vegetation, we are unable to decide. It must be put to the test of experiment.

A feeble fertilizer will not bear transportation, and we must always regard the ordinary sedimentary rocks as belonging to this class. As no trials have as yet been made of them which can be relied upon, we would rather recommend a trial on a small scale of the ground or pulverized rock, and its value will be increased if it is first burned in a kiln.—Ed.

FRIENDS AND PATRONS.

We had prepared a short article in which we stated that it had become necessary for the present conductors to suspend this work for three months, and *then* that its revival would depend upon circumstances. This course seemed imperative in consequence of the ill health of the principal conductor, and the labor to which he is subjected by the preparation of his second volume of the Agriculture of New York. It has happened, however, that our friend C. N. Bement, Esq., of this city, is willing to take upon himself the responsibility of conducting it. It will therefore be issued with punctuality as a monthly. This being settled, it would be our duty in most cases to commend our successor to our friends. We should be called upon to speak of his competency for the work he assumes. But we are fortunate here, for Mr. Bement is well known to the farmers of this and the other states of the Union. He has been a contributor to this and the other Journals, and to show the high estimation in which he is held, it is only necessary that we should state that his excellent article on "Hydraulics for Farmers," has been extensively copied into many of the Agricultural Journals. This we regarded as a high compliment to the future conductor of this work. We say then, that as writer and editor Mr. Bement is already so well known to the public that it is unnecessary for us to speak of his qualifications at this time.

Our subscribers who are deficient in any of their numbers will be able to obtain them by application to Mr. Osborn or Mr. Bement. We are aware that many numbers which have been sent from this office have been lost before they reached the place of destination. This we could not help.

We feel bound to acknowledge our indebtedness to many of the Journals for flattering notices of this work.

N. B. We may at this time ask those who may be indebted to us for the Journal, to make their payments to Messrs. A. Osborn or C. N. Bement, of this city.

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