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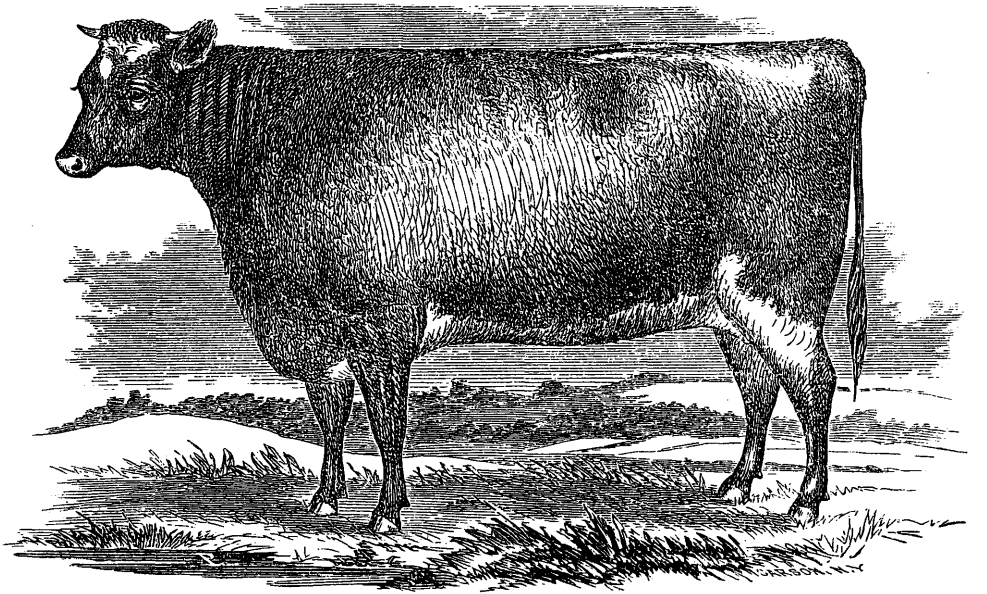
1867.



VENA.----10 Months.

Red and white—bred by and property of Burdett Loomis, Windsor Locks, Conn. Calved Sept. 29th, 1864. Got by Imperial Oxford (4905.) Dam, Victoria, by 2nd Grand Duke (14640.) g dam Vara, by Duke of Airdrie (12730.) gr g dam Valeria, by Hopewell (10332.) gr gr g dam Victoria 20th, by Broken Horn (12500.) gr gr gr g dam Victoria 14th, by Comus (12625.) gr gr gr gr g dam Victoria 9th, by Sir John Sinclair (5165.) gr gr gr gr gr g dam Victoria 3rd, by Second Comet (5101.) gr gr gr gr gr gr g dam Victoria 2nd, by Belzoni (783.) gr gr gr gr gr gr gr g dam Victoria, by Satellite (1420.) —— No. 1, Mason's Sale, by Cato (119.) —— Pope Cow by Pope (514.) —— Flora, by Favorite (252.) —— Nymph, by The White Bull, (421.) —— Lily, by Favorite, (252.) —— Miss Lax, by Dalton Duke (188.) —— Lady Maynard, by R. Alcock's Bull (19.) —— by J. Smith's Bull (608.) —— by Jolly's Bull (337.)

Vena received 1st prize as Heifer Calf at N. E. Fair held at Concord, N. H., September, 1865. Her dam received 1st prize as 4 year old Cow, and both were in the Herd that received 1st prize at same Fair.

Vena received 1st prize as a yearling at the N. E. and Vermont Fair, held at Brattleboro', Sept., 1866. Vena also received the sweepstake prize medal for the best Female Short Horn of any age, open to U. S. and Canadas, at N. E. and Vermont State Fair, 1866.

ELEVENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

MAINE BOARD OF AGRICULTURE.

1866.

AUGUSTA:
STEVENS & SAYWARD, PRINTERS TO THE STATE.
1866.

BOARD OF AGRICULTURE.

JOHN F. ANDERSON, PRESIDENT.
ASA SMITH, VICE PRESIDENT.
S. L. GOODALE, SECRETARY.

(TERM EXPIRES JANUARY, 1867.)

		Address.
JOHN F. ANDERSON,	Cumberland,	South Windham.
GEORGE A. ROGERS,	Sagadahoc,	Topsham.
AMASA BIGELOW,	Somerset,	Bloomfield.
JOHN BACHELDER,	Oxford,	North Fryeburg.
S. L. GOODALE,	York,	Saco.

(TERM EXPIRES JANUARY, 1868.)

ASA SMITH,	Penobscot,	Mattawamkeag.
SAMUEL WASSON,	Hancock,	Ellsworth.
EDWIN R. FRENCH,	Franklin,	South Chesterville.
GEORGE H. FREEMAN,	Aroostook,	Presque Isle.
PHINEHAS M. JEFFERDS,	Piscataquis,	Foxcroft.
JOHN C. TALBOT,	Washington,	East Machias.

(TERM EXPIRES JANUARY, 1869.)

J. M. CARPENTER,	Kennebec,	Pittston.
——— ———	Waldo,	———
——— ———	Lincoln,	———
RUFUS PRINCE,	Androscoggin,	Turner.
CALVIN CHAMBERLAIN,	State Society,	Foxcroft.

REPORT.

To the Senate and House of Representatives:

The members of the Board of Agriculture assembled in the Capitol, at Augusta, on Wednesday, January 17, 1866, and being called to order by the Secretary, were temporarily organized by the choice of Asa Smith, Chairman.

Messrs. Rogers, French and Anderson, were appointed a Committee on Credentials. They reported a quorum present.

Permanent organization was effected by the election of

JOHN F. ANDERSON, *President.*
ASA SMITH, *Vice President.*
S. L. GOODALE, *Secretary.*

The rules and orders of last session were adopted for present use.

Voted, That hereafter the Secretary be, *ex officio,* Chairman of the Business Committee.

The Business Committee was then constituted by the appointment of Messrs. Chamberlain, Wasson and French as additional members.

The following resolutions, introduced by Mr. French, were unanimously adopted:

"*Whereas,* It has pleased an Allwise Providence in the course of human events to remove from our midst one of the most earnest friends of agriculture the State ever had, and the pioneer of our agricultural press, therefore,

Resolved, That in the death of the late Dr. Ezekiel Holmes, we lament one who watched over the farmers of Maine and their interests with the solicitude of a father for his children; one whose mouth was ever open for instruction, whose lips dropped knowledge, and whose pre-eminent abilities made him an honor to the State, and endeared him to us all.

Resolved, That in recognition of his services, and as a fitting testimonial on behalf of this Board, the President select some member to pronounce a eulogy on his life and character, during our present session."

Mr. French was appointed to pronounce the eulogy.

Pending the Report of the Business Committee, *ad interim* reports were presented and read, as follows:

Mr. Chamberlain reported on the topic:

Is the ox-yoke, as used with us, a natural or an absurd implement of draught?

It will, perhaps, not be denied that we, in common with all people, to some extent are governed by traditions—do some things as a national habit—run on in the grooves and ruts worn by our fathers—do not often stop to test our modes and manners by our powers of reason. While we attempt to analyze many things, we fail to make an analysis of our own habits and customs and methods of doing things.

One of the greatest goods to man is found in animals adapted to do his labor. This is particularly true with the people who colonized this continent and in so brief a period have grown to powerful nations. Here forests have been cleared away, a world supplied with lumber, rocks have been removed in making farms, prairies have been broken up—the vast material requiring removal and transport over rough roads and without roads, while a wild continent has been transformed into a home of civilization, has been mainly performed by the labors of many millions of men

The colonists from the several countries of Europe brought with them their national modes of harnessing, yoking, and attaching their animals to their implements of labor. We see here the force of tradition: three hundred years having effected no change anywhere in the manner of yoking oxen. The Spaniard in the countries he subdued still lashes the yoke to the heads of his oxen. The descendants of the French colonists in the Eastern of the British North American colonies, and in Louisiana, adhere to their national mode—substantially the Spanish The English and Dutch have stamped their nationality on a portion of the continent, and yoked *their* descendants to a tradition, that, however absurd it may prove on investigation, has hitherto rarely been criticised.

The caption to this paper is doubtless wisely introduced as a topic here, but an error was committed in its reference—assigning it to a party who raises no steers. It is one of a class of practical

questions that theorizing alone can never elucidate; it must be practically and thoroughly tested.

That this subject might be presented to the Board in a dress entitling it to be kept in sight for a season, we opened a timely correspondence with gentlemen in the British Provinces, and succeeded in obtaining a reference to a competent gentleman, and a promise from him to furnish us with an account of the French method, and the comparative advantages of the two modes, as proved in the lumber operations and other heavy labor in which oxen are employed, but have failed to receive the promised information.

We invited a considerable farmer in our neighborhood to put a pair of steers in training with the Spanish yoke; but he declined the proposition in terms implying that he had no steers mean enough to be subjected to so gross an indignity. He said that "in our method oxen could exert great force, could be worked almost constantly, and with good care could be kept in a growing and thriving condition; and that the yoke admitting such results was good enough, and might as well be let alone." All of which sentiments may be characterized with good sense. But such individual conclusions should not deter us from pursuing our inquiry.

We rarely see anything written on the matter in hand. But in a recently published book from an eminently literary gentleman,* we find the following: "It is surprising to see the sagacity with which the dull and clumsy ox—hampered as he is by the rigid yoke, the most absurd implement of draught ever contrived by man—picks his way, when once trained to forest work, among rocks and roots, and even climbs over fallen trees, not only moving safely but drawing timber over ground wholly impracticable for the light and agile horse."

Another has recently broken the shell of tradition and stepped out, a vigorous, "live Yankee." He has dared to write as follows:† "An ill-founded notion seems to have possessed the minds of not a few farmers and teamsters, touching the *ability* of the ox to force a load back by the horns. To this prejudice I attribute the general failure of working cattle in this particular.

It is, however, an easily demonstrated fact that nature has

* "Man and Nature; or Physical Geography as modified by human action." By George P. Marsh.

† "The Education of the Ox." An Essay by A. B. Davis. See appendix to twelfth annual Report of the Secretary of the Mass. Board of Agriculture.

lodged more strength in the *neck* and head of the ox, than in his breast and shoulders. This is patent to the most casual observation of bulls and oxen when *fighting*. The size and strength of the *horns* of the ox also favor this view. In some parts of Europe this principle seems to be better understood; hence we find the ox and cow appropriately harnessed for draft by the horns, and executing their tasks with apparent ease.

* * * In the matter of ox-yokes my experience has not failed to impress me with the need of a revolution—most of those in common use being too *heavy*, 'bungling,' and every way inconvenient."

The yokes here referred to are very modest, unassuming articles compared with those used in our section of Maine. With us, a yoke is made from a piece of timber 14 by 8 inches. This answers to the principle involved—that the point of draft shall be below the centre of the bow—centre of the neck. Without this depth, the yoke would be condemned as too straight. It would "roll up,"—would bring the stress on the top of the neck where the ox could exert no force. This principle involves the necessity for making the yoke and bow of great strength, to resist the thrust of the breast on the bottom of the bow.

Our largest yokes, fully equipped, weigh from 70 to 100 lbs. This applied principle courts an examination. It is a transfer of the working point in the ox, from the head and the enlarged spinal cord in the neck, where nature located his strength, to his breast —well down to the legs; and to make the transfer available, the muscles of the shoulders are bound in a wooden hoop so as essentially to impede his locomotion. If this were the universally adopted theory where the yoke and bows are in use, it might carry the appearance of having been founded in reason; but the facts are, this deep-yoke-theory is a mere provincialism. We well recollect on our first visit to Massachusetts, one of the *curiosities* we found on farms was the ox-yoke made from a stick 6 by 6 inches, or about one-fifth the material required for a yoke in Maine. In reply to our first expression of surprise, that oxen could work in such a yoke, we were asked what we should think of a New York yoke, made from a stick 4 by 4 inches. This last named is supposed to be Dutch; and its use would probably have the effect to "roll up" a Maine teamster's eyes. Now oxen *have* worked, and with considerable results both in Massachusetts and New York.

One of the first objections urged against the use of the yoke as confined to the head, is, that its weight and the bearing of the load is not so easily carried as when brought nearer the shoulders. Very much of our ox-labor in summer is done with the two-wheeled cart. A loaded cart in descending a hill has its centre of gravity thrown forward of the wheels, and that in proportion to the height of the road and the inclination of the grade. Here just where the load bears the heaviest, the yoke is forced against the horns—this yoke of 70 to 100 lbs. ;—the whole weight borne upon the necks often reaching from six to eight cwt. We often see a lazy man seated on the tongue of his cart, thus adding another cwt. to the weight on the necks of his oxen.

But this summer service is tender mercy itself compared with that enacted in winter. We have seen six oxen worked on a sled in a rough forest road. The road is a series of little hills and hollows. The sled rises a hill with the united strength of the team—it balances a moment on the top, then plunges down, and is checked by the horns of the oxen on the tongue. The change of position of this deep yoke, the length of the neck, with the usual slack of the ring on the pole or sled-tongue, gives two feet or more. Here we have the momentum of this moving load of six or ten thousand pounds, unchecked through a space of two, four, or six feet, (for the team is advancing with the sled,) with the trifling addition of this yoke of 75 lbs., all caught on the naked horns of the oxen! and this to be repeated a hundred times in rapid succession, and continued for days and months. Verily! the statute wisely and humanely enacted to apply to such treatment of animals is but a dead letter.

In regard to the French or Spanish yoke, it remains to be tested on our farms, and with our national prejudice against it. It has been considered with us as a remnant of barbarism, only tolerated from necessity, to avoid the use of iron. But we have been repeatedly assured by those returned from California, that oxen move quicker on the road and draw as much with the Spanish yoke as with ours.

We believe that strong and durable yokes may be made of our lightest wood—the native poplar—of less than one-third the weight of those now in use. We believe that a less number of yokes will be required on the farm, as one yoke will near enough fit to oxen of very different sizes; that Yankee ingenuity will readily devise a simple mode of attaching the yoke, so that it may be put on as

quickly as the bow; that the yoke complete may be made much cheaper, and that oxen can work easier, because more naturally, in them, and exert more force.

Believing all this, we respectfully offer the following:

Resolved, That the importance attaching to Topic No. 5, now before the Board, demands its continuance; and that it be referred with instructions to test the utility of the Spanish yoke and report at the next session.

In this connection we present to the Board a model for a yoke, embracing our theoretical ideas, hoping it may be fruitful in eliciting thought and utilizing Yankee ingenuity.

Mr. Wasson presented the following report:

Are oats an unduly exhausting crop to seed down with?

Such is the opinion of many of our best farmers; an opinion borne out by practical experiments. Is the conclusion arrived at to be relied upon? Especially in those sections of country, where the seasons are too short and the soil is too sterile to insure paying crops of corn or wheat and where the oat is the only remunerative cereal crop, it becomes a question of more than ordinary interest to know if a paying crop of oats precludes a paying crop of hay.

In 1860, there were grown in Maine 44,149 bushels more of oats than of corn, wheat, rye, barley and buckwheat. In view of this fact, if we have premised correctly, it may well be asked, if the producing of oats is doing for Maine what the raising of tobacco has done for Virginia.

Experience is the result of a series of trials—a summary of facts, those stubborn things, and this fact, of the peculiarity of oats, is not easily to be gainsaid or controverted. So fully impressed are some of our best farmers of its truth, that the oat crop has been abandoned by them, while others equally as certain that a good crop of hay does not succeed a crop of oats, persist in the practice, although their patience is "tried as by fire." That most, if not every crop, exhausts the soil, or renders it less productive, is admitted. But oats seem to possess a special power to incapacitate the soil for the growth of the grasses. The laws that govern the growth and nourishment of the grains are wanting in some speciality for this.

As the farming interests of Maine are so dependent upon the hay crop, if the oat is obnoxious to it, the fact should be known and the cause ascertained.

Very many suggestions have been made as to the cause, as that some special fertilizer is wanting—or that the rank growth of the grain on lands in good condition shade and stifle the grass seed—or that some important grass constituent has been abstracted. Even the hypothesis of being a poor economist, has been assumed, of being a gross grower, extravagant in its demands and prodigal of the supply, drawing nourishment from the soil largely in excess of its wants and evaporating of its superabundance.

The chemical analysis of the oat has not suggested the idea of special manuring, neither has practice or experience deduced such an opinion. If some special fertilizer is wanted that the home resources for manure cannot supply, the raising of oats is objectionable, because a majority of farmers are limited to their own areas for plant food. If, then, the suggestion of a fertilizer is correct, science and experience are equally at fault.

That the rank growth of oats on soils in good condition for "seeding down" does, by overshadowing the grass seed prevent its germinating, or if it does vegetate, leaves the tender shoots in such a weak and debilitated condition as to winter-kill, may be true—and for this reason, if no other more potent and objectionable existed, should discontinue the practice of seeding down with this cereal. But it is contended that this is a contingency, rather than a *cause*, for fields sown with buckwheat, the worst of shading crops, take kindly to grass and produce satisfactorily. It is not asserted that grass-seed, with buckwheat or other rank and shading growers, sown in the spring, may not share the same fate as oats. But sown at harvest—sown at nature's time of seeding, while on oat land it is a failure, on buckwheat it is a success. The conclusion, then, is inevitable, that the cause is elsewhere.

One hypothesis is, that the oat—besides being a gross feeder—by some process possesses the power of exuding or excreting some substance obnoxious to grass—or of demoralizing the improbable—or of wasting in the "desert air" what it could not consume. But if theories had been rejected as chimerical and visionary, the world would never have emerged from the "dark ages." Theorists have advanced the idea "that large quantities of silica are taken up by plants as ammonia-silicate, the silica being deposited on the plant—the ammonia thrown off into the air." Of silica, oats consume a large percentage more than wheat. Experiments carefully made for 22 years with wheat, show that of the number of pounds of ammonia annually applied, less than half

of it is given back in the wheat and straw, (some modern writers say that the loss is greater than this,) yet with all this loss, this is comparatively a good grain to seed down with.

That oats as a seeding down crop are excessively exhausting is almost universally conceded. But by what process the soil is incapacitated for the growth of grass, is a mooted question; the full force of which we have realized in being compelled to employ only "arguments drawn from denial."

Farming in Maine is no trifling matter. It is only by economy, foresight and diligence that our farmers can thrive. Their success is contingent upon well-educated and well-directed labor. Hay is the great object of production. Without it, one could farm with as reasonable an expectation of success in the frozen regions of Grinnell's Land, or on the parching wastes of the American Desert as in the Dirigo State. It is the crop of all crops. The Alpha and Omega to which all others are subordinate and secondary. The whole routine of cultivation, its object, aim and end, all subserve to this one purpose—*the production of hay*—hence the value and importance of a knowledge of the habits, wants and fitness of the preparatory crops, root or cereal, those which less fit and capacitate the soil, and those which from cause or causes, known or unknown, are injurious.

In closing, it may well be asked, *Is* the oat the worst of cereals to seed down with? If not, why such a wide spread opinion. If the allegation be true, what is the cause, and how can it be obviated?

Mr. Jefferds submitted the following on

Winter care of farm stock.

For nearly six months of the year the principal business of the farmer in Maine is the care of his domestic animals; and on the skill, care and judgment exercised depends his success.

The object of the stock grower is to obtain the most valuable returns for his vegetable products, and in order to do this, his animals must be made comfortable, protected from cold, sheltered from storms, exempted from hard usage, breathing pure air, drinking wholesome water, and licking salt as often and as much, as nature craves; never filthy for want of a place to keep dry and clean, and regularly fed with proper food, and at the proper time. Protection from cold is essential to the profitable keeping of stock, and the want of it, one of the great sources of loss to the farmer.

I will hazard the assertion that there is not one barn in ten, take the State through, (and I think that much below the number,) but that the loss from cold (which with little expense might be avoided) is more than twenty per cent. the cost of keeping. It is astonishing to look into the stables through the country, and see how miserably animals are housed in this cold climate. Barns with a few cobble stones for underpinning, or oftener none at all, so the wind has full sweep under them; cracks between the boarding render windows unnecessary. Now this is sheer shiftlessness; if he has not the means to make permanent improvement, he can with a few hours labor in the fall, bank up with earth or boughs, and with a few boards and nails, can divide and batten from the rest of the barn a stable comparatively warm and comfortable. The dictates of humanity as well as of interest demand that our animals should have better care. In many cases the owner had better sell a part of his hay, or better still his stock, to pay for labor and material to make his stable comfortable; the remainder would produce more income, beside the pleasure of seeing sleek, straight and lively animals, rather than bent like a new moon, with all four feet on the surface of a peck measure, and with each individual hair standing out by itself like a brush broom. Allowing stock to remain exposed to the autumn rains, and the frosty nights of October and November is a source of loss the extent of which but few farmers realize; their coat is thickening up for winter, so their loss of condition is not noticed.

At this season they need particular care, for if they lose flesh then, they will continue to do so all winter unless they have extra care, but if they are brought well into the winter in good heart, they will have good appetites to stand quite indifferent fare; especially is this the case with sheep and colts which are most neglected at this season. A fat strong animal will be warm and comfortable where a weak one will hardly live, and a hearty, vigorous one will digest and assimilate food which the weak one will hardly taste. Water in a convenient sheltered place, is another very essential thing in the winter management of stock, and one that is very much neglected. On many farms the time spent in driving cattle to water, and keeping the road open, would furnish water in the yard, to say nothing of the saving in manure and condition of the animals, which would be as much more. Cattle that go a long distance to water, are always unwilling to go in the coldest weather, and when driven, often refuse to drink, until

they become so thirsty that they drink too much. Cattle and horses will drink twice a day, if the water is convenient, and sheltered from the cold winds. The practice of leaving cattle in the open air through the day, and feeding at noon in the yard, is fast going out of date; still it is practised to some extent, and the argument in favor of it is, that they will eat coarse fodder, such as they would not in the barn. Now this economy is about the same as opening the doors and windows of a house in order to burn green wood; no doubt he could burn more wood, but to be more comfortable would be quite another thing; they would eat a rail fence in their endeavors to get away. A large portion of the food consumed in cold weather goes to keep up animal warmth, therefore they gorge themselves with coarse food, impairing their digestive organs, and laying the seeds for future disease. There are but few days from December to April in which an animal will not suffer by being in the open air, unless in exercise, and the practice of turning them out at eight o'clock in the morning, and leaving them until four in the afternoon, is inhuman, beside the loss, which is considerable; for with the melting snows and hot sun of spring a large portion of the droppings in the yard are wasted. Feeding requires the nicest tact and judgment, and must be varied according to circumstances, and the object to be attained. Still, there are general rules and principles which hold good in all cases; and one is regularity, i. e., at stated hours and in stated quantities; not gorged one day, and half starved the next. The observing herdsman will soon learn what each animal requires, and feed accordingly. He will understand the taste and appetite of each, as the good housekeeper does that of her family. The economy of cutting and steaming fodder, the amount of grain and the sorts to be fed, depends upon circumstances of location, price of labor, hay, and the object of feeding. Animals cannot be expected to give a quantity of milk, or lay on flesh, unless they have something to make it from.

It is the practice of many to feed all their straw and coarse fodder during the first of the winter, keeping their good hay until the last. Now if they must feed it in one part of the season, it would be better to reverse this practice, and feed the good hay first. Stock of all kinds, when it comes to the barn, should have good early cut hay and a few roots, and if straw is to be eaten as a principal food by any part of the stock, they should be put upon it by degrees. If my stock is to lose condition, let it be in the

spring, for then they will sooner recover. Our long winters require that everything which cattle will eat should be used to eke out our hay, and especially in such seasons as that of 1864, when the drought cut down our forage one-third, and the farmer found the market so glutted with stock that he must either sell at a loss, or get them through as best he might. A large amount of coarse fodder might be used instead of hay, by feeding a few roots or a little meal. As a general thing, milch cows, working oxen, horses and breeding sheep, should have the best of hay. Cows, sheep, and oxen when not at work, may have one feed a day of straw. They will often relish it as a change. The stocks of coarse hay left by sheep and cattle will be eaten by colts. Straw and rough fodder may be fed to young stock to advantage if fed in connection with a little nutritious food. A daily allowance of a little first class hay, a sprinkling of meal, or a few roots, will keep them in good heart, and although they may look a little gaunt they will be in good spirits and gain rapidly when turned to pasture in the spring. Thrifty two-years-old steers of good growing breeds, when fed in this way will gain at grass from ten to fifteen inches in girth. Young stock that are fed with concentrated food so as to fatten them in winter, will not do as well at grass, as those that are only kept growing; so the excess of food over that required to keep them in a growing condition is thrown away. I have frequently seen this where such stock have been pastured together. The largest growth can be obtained in the shortest time, by feeding good succulent food, enough to keep them growing, and not enough to make them excessively fat. But with our practice of keeping mixed stock, I think it more profitable to feed rough fodder to such stock, and depend on the feed of the pasture for their growth, although they may not attain it quite as young.

It may seem that their feed had been lost to find them no larger in the spring than they were in the fall; the food consumed is of little worth for other stock, and if they are in good health and have good pasture, not overstocked, they will make a handsome return in the fall.

Animals should have their regular meals and be kept eating until filled, and then left in quiet until the next hour for feeding. It is better to give them their meal at two or more feedings, than to give it all at once, for when a large quantity is given, they pick it over and it becomes foul with their breath. and they will not eat it as clean as when fed in small quantities. Their cribs should be

cleaned once a day at least. The hours of feeding must be governed by circumstances, as those who have the care of stock often have other work to do. It is better not to feed very early in the morning, or late at night. They should not be disturbed after they lie down for the night.

Salt should be furnished regularly. It is best to have it in some convenient place, if possible, near their watering place, where they can get it when they please, if not, it should be given them as often as once a week, unless they are fed salt hay, when a change from English to salt hay will do as well.

Kind treatment has much to do with the profitable management of stock. An irritable man or boy, who has the care of it, will take more from a stock of cattle than a feed of grain a day, while he will make the animal vicious and uncomfortable to handle, and thereby lessen their value, by abuse. This abuse is oftener the result of thoughtlessness or habit than wanton cruelty. He forgets that the animal is not endowed with reason, and acting from instinct himself, becomes the greater brute.

God has given them for our use, and we are responsible for them. One of the first lessons to the boy in the care of domestic animals should be, to treat them kindly. Hired help should never be allowed to thrash and kick the animals he has in charge. If he does so in the absence of the owner, they will report the fact when he makes them a visit, as plainly as if they could speak. Any one can tell by going among a stock of cattle whether they have received kind usage.

Experience and observation have taught me that by greater attention to the comfort of our domestic animals, and better care in feeding, we may obtain larger profits from our crops, (which we labor so hard to get,) than we now do by our careless haphazard management.

Mr. French presented the following on

The cultivation of rural taste, architecture, &c.

It may be assumed as one of the great facts of civilization that a people are refined and cultivated in proportion as they improve the privileges at their command and make the most of their surroundings. There is no country so devoid of natural beauty or so rich in varied scenery, but that art can heighten the effect of the landscape. Tourists, in their notes of travel in the lands of our ancestors, give glowing descriptions of the ancient domain, where

nature and art combined produce a picture "rich and rare," but our people need not go abroad to seek for rural pleasures, our own country and perhaps our own homes have natural attractions and natural beauties equal to any—taste and art alone are wanting to produce the effect.

As yet there is to be seen among us but little of landscape gardening, except around our cities, and occasionally an individual instance to be met with, but the little already accomplished shows how much may be done when the means are applied.

Our efforts at rural embellishment are principally confined to persons with large means at their command, who are able to avail themselves of the services of experienced gardeners, but we desire that our entire rural population shall engage in the agreeable occupation of rural art. We do not propose that much be done at once, but that each adapt him or herself to their circumstances, and little by little improve and add to the charms nature has lent them. The rich and costly embellishments, where wealth luxuriates in gardens of rare and beautiful flowers or strolls in woods mid artificial rocks and waterfalls, are not to be imitated; these please more than they instruct; we want the exercise of those simple tastes that give real pleasure. Let each be content to make the most of what he has, be it a shady dell, or cosy nook, or rugged rock, or purling brook, or copse of wood, or waterfall; and each contributing his mite thus shall help to form an endlessly varying scene, pleasing to the eye, refining to the taste, and agreeable to the senses; exerting an influence from which none can escape, a school in which all will be taught.

The farmer, be his circumstances what they may, has ample opportunity for the exercise of rural tastes. His dwelling, his field, his pasture, his wood, may be the constant objects of embellishment and improvement, and a life-long pleasure realized in doing it. Farmers as a class do not realize that there may be a pleasure in life and labor as well as a profit, and that their occupation above all others is best fitted to enjoy the substantial comforts of life.

Let every farmer's home be made attractive, and endeared to its occupants by association with whatever renders it pleasant as a home, be it a tree, or a vine, or garden. I speak now of immediate surroundings; these can all be had for their planting, and afterwards they will grow with us and for us, and be of us. If situation favors, he should take into consideration more distant

objects and their relation to the *view* around his house, and study to produce the greatest effect by their combination. What tree shall be used for ornamentation and how applied, individual tastes must decide. If the shade trees and vines be fruit bearing, we do not object, we rather commend it; it will be pleasure and profit combined, and as a first step may have much to do in removing the prejudices many farmers and others cherish against such improvements. Our fruit trees may be trained in symmetrical forms, and their flower, and leaf and fruit are attractive, agreeable and enjoyable, and *all* in turn may be served by them.

The farmer can add much to the beauty of his farm and the convenience of his labor by having his fields laid out in regular form, having reference to the amount of land he annually cultivates. It is better to have all his labor confined to one spot than to be running all over the farm after his work, but it is not *always* practicable, as his fields may be so situated that a suitable division cannot be made, but in most cases it can be reduced to two or at most three parcels for a summer's work. A farm thus cultivated makes a favorable impression upon even the casual observer, and if a man thus begins in a systematic arrangement of his labor, it will soon pervade all his operations.

A field need not necessarily be square or rectangular to accomplish this; it may be applied to any irregular shapes, and if there be waste spots, as rock or ledge, or swale, they may all be made to combine in the improvements. This is emphatically true of large boulders or outcropping ledges,—cover them with vines and the grape will flourish by their sides and ripen its fruit on their warm surfaces.

The pasture, so generally overrun and neglected, may be made attractive by a tree here and there in favorable spots, under which the cattle may find a grateful shade in a hot summer day. We knew a man once to cut down the widest-spreading ash we ever saw because his cattle sought shelter beneath it from the hot sun, when *he* thought they ought to be out feeding. We do not advocate much shade in our pastures, rather the contrary, and that only where the excrements left under the trees may be dissolved and washed over the grass land by the snows and rains.

The wood lot affords abundant room for following out suggestions already made. The farmer from necessity has his "wood roads," and they may be made comfortable and *permanent* as other farm roads, and if the lot is neatly kept and all parts accessible, a

stroll in it may afford both pleasure and comfort to the farmer's family akin to that enjoyed in the rich man's forest or grove. The "sugar berth," if the farmer have one, and every farmer may thus provide, can be as really an ornament to his place as the shade tree he plants before his door.

The road-side presents advantages that should not be overlooked, and instead of the bushes and briars we so often see, let the tree and shrub that spring up there naturally be cultivated, and fruit and shade trees fill up the waste places, and especially those kinds that shall make ample returns for the labor bestowed. In this way the whole face of the country may present a pleasing and cultivated aspect, and the traveller's eye rest continually on an ever-varying picture.

Thus much with regard to the improvement of rural tastes and pleasures. Let us glance at the homes of the million. As yet our architecture in the country has no name, deserves none; it is not classic, it does not belong to the "orders," it is hermaphrodite; a jumbling together of whatever pleases the carpenter's fancy, without regard to rule, and oftentimes in gross violation of good taste. Occasionally there is to be met with a princely mansion of the provincial days, raised by some "good old English gentleman," and copied from patrician Rome, but these are fast going to decay, or being transformed into what is termed "modern style."

Our houses, as seen in the country, are very much alike, one copied from another, except now and then an innovation in the shape of a steeple roof, or an attempt at a Gothic cottage with nothing gothic about it except its irregularity of form. It is not a strict adherence to *style* that is necessary to improve our rural dwellings, but the exercise of good taste in their construction and arrangement; the execution of some well-devised plan.

A man begins to build a house without knowing *just* what he wants, and as he discovers its deficiencies adds on piece after piece, "ell and porch," till instead of a house he has a kind of rope-walk structure with *no* harmony of design, and disfiguring the comely parts of the original structure. We have one consolation when looking upon such deformities: they are of wood, and the fire may devour them, or they will eventually go to decay.

Our people want to learn that it costs no more to build a neat and commodious dwelling in the aggregate than it does to pursue the hap-hazard way so much in vogue among us, and the influence

it exerts on the home thus made, ten-fold more than pays the cost. And another thing we would have taken into account; we build of *too* perishable materials in this land of hemlock, spruce and pine; our homes will not become ancestral till more firmly established.

We hope the time is coming when more durable substances will be employed in the construction of farm-houses and country residences; when stone, and brick, and concrete will build up the external walls. One or the other of these materials exist in almost any section, and taking a life-time into account, their expense is not so much greater as is supposed. It is not necessary that country houses be castles with suits of "spare rooms;" less pretentious, more commodious and permanent, should be the rule, our means governing in each particular, and if necessary, a series of years may be consumed in preparation.

The Grecian and Roman styles of architecture are not to be imitated in the country. They were devised by rules of art to be used where art alone gives effect, and are not suited to the endless variety of form and peculiarities of situation that control in rural architecture. The Gothic is always available, always appropriate, but is too expensive to be indulged in except by persons with ample means to do it justice.

What is known as the Tudor style, is so thoroughly English in its composition, so full of resource, so easily applied in any situation, and so well adapted to permanent construction, that it deserves to be the favorite in rural architecture. There is a home look about it that satisfies at once, and it is sufficiently pretentious to answer almost any requirement. It sprang from the necessities of the English people, is in fact the only style ever originated by us, and whatever modification it may undergo, will long continue to be the true representative of the Anglo-Saxon home.

We do not advocate a radical change in what we have endeavored to call attention to, but propose that it be gradual, that the people educate themselves in what pertains to pleasure and art, as well as labor and profit; that our dwellings become homes where rational and intelligent beings live, not stay; that we improve upon nature, instead of borrowing from it, till in the future, not far remote, our whole country shall be rich in landscape views or exhibitions of rural art, and the whole people dwell in gardens, beautiful as that primitive one in which lived the first pair,

and bearing all manner of fruit, not excepting the "tree of *knowledge.*"

The Business Committee reported the following topics for consideration at this session, to which chairmen of committees were appointed as follows:

1. What lessons in agriculture are taught by the peculiar circumstances of the past four years? Chamberlain, of Maine State Society.

2. Ought the more extensive cultivation of peas, as a sure crop, and beans, as a *valuable* crop, to be recommended? Anderson, of Cumberland.

3. Should measures additional to the act of Congress be adopted by the State to secure immunity from the cattle plague now prevailing in Europe? Wasson, of Hancock.

4. Which of the products of the farm should be exchanged for other commodities of life, or sold off the farm? Prince, of Androscoggin.

5. Can farming in Maine be conducted with success as compared with other branches of industry? Smith, of Penobscot.

6. The best construction of farm buildings, with reference to their convenience and adaptability to all the requirements of the farm. French, of Franklin.

7. On which can a farmer live the easier—on a farm of two hundred acres or more, or on one of forty or fifty—the soil of like quality? Carpenter, of Kennebec.

8. Ought the Board, while regarding the fearfully increasing pests to our vegetation, to recommend the appointment of a State Entomologist? Wasson, of Hancock.

9. To consider the practicability and expediency of transferring the labors and duties of the Board of Agriculture to the Agricultural College whenever the same may go into effectual operation, in order to have one central agency for the promotion of agriculture in the State. Goodale, of York.

10. Can effective measures be adopted to increase the hay crop, without the use of barn manure or concentrated fertilizers? Bigelow, of Somerset.

11. Should the use of horses be encouraged to the exclusion of oxen for farm labor? Jefferds, of Piscataquis.

Mr. Chamberlain presented the following report on Topic No. 1:

What lessons in agriculture are taught by the peculiar circumstances of the past four years?

Lesson 1st. Agriculture has improved her social relations with her more accomplished sister—*horticulture*—in seeking her advice and considering her precepts. The reduced numbers of our domestic animals, and the consequent advance in the price of meats, tend to its reduced consumption under the dictates of a compulsory economy. We believe that a mixed diet is better in our climate than a purely vegetable one; but if our future shall be a sensible departure from former habit as gross flesh eaters, that future will be blest through it.

An important and growing interest in this country is the production of garden vegetables and small fruits. This production concerns every land owner, as affecting the health, comfort and thrift of his family. This interest has increased by a much larger ratio than has the population, and far greater than that of the three important staples of butter, potatoes and Indian corn. The increase in the productions of the market gardens of the three States—Massachusetts, New York and New Jersey—was more than 100 per cent. in each of the last two decades. This ratio of increase, accelerated since 1860, with the facts applicable to so many of the States, is instructive. It indicates the direction our industry is to take as the resources of the country become further developed. After acknowledging all the proper claims of grass, hay and the grain crops, the produce of our orchards and gardens should be considered as a very important interest, and one of increasing value. Our climate matures a very great variety of delicious and nourishing vegetables and fruits to supply our tables from early summer to late autumn. Another class succeeds and supplies us for the other half of the year. These, with the products from our cows and our poultry, enable the American farmer to live better than any other people. If he is not seen to do so, he cannot blame our skies nor our soil.

Lesson 2d. It is very certain that the state of any art is intimately connected with that of its instruments. If these are imperfect, it cannot be much advanced, and this is so universally the case, that agriculture is no exception. Having taken another lesson from the horticulturist, the farmer, short handed, concentrates his operations and improves on their thoroughness. He

manifests an increased anxiety to avail himself of all aids in the way of improved implements. This matter of improved implements having been treated in an extended article at a former session, we may be excused from entering upon it in this connection, further than to name it as the lesson of the hour—a lesson that will remain a practical one when the country shall have been restored to its normal condition of affairs, and one to endure through our nation's future.

When farm labor and farm products shall be cheapened through the subsidence of disturbed elements, when our people shall have relieved themselves from onerous burthens, when domestic tranquility shall everywhere prevail, any provision that may have been made for rapid and efficient conduct of general farm operations through a liberal investment in improved implements, will serve the purpose to save to the farmer in the more prudent expenditure of his own physical force, and leave to him time, ability and inclination to cultivate his own mind, and provide the same inestimable advantages for those dependent upon him. Thus may we read the lessons of the hour, believing there is much good in store for us and for our country, and that we shall receive of it in full measure as we prove ourselves worthy of it.

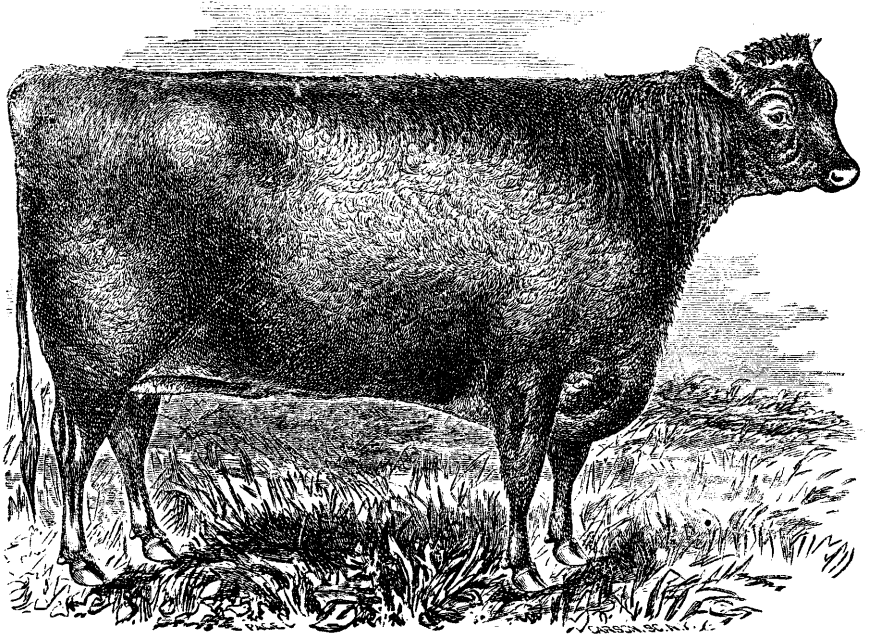
Mr. Anderson submitted the following report on Topic No. 2:

Ought the more extensive culture of peas and beans to be recommended?

It has, for years, impressed the mind of your committee that a most important point in practical and economical farming in Maine is to provide for some sure and abundant crop which may be readily *and directly* converted into human and animal food, without the necessity of carrying it to the mill or market for either transformation or exchange. Something which may be grown cheaply as regards not only labor, but also, by not drawing heavily upon the riches of the soil and consuming too rapidly the treasure on deposit there; thus truly husbanding our resources, at the same time allowing us to feel that we can well afford its free or lavish consumption. Every farmer knows the importance of having a good supply of some sort of concentrated food at his command. But it seems as if too much dependence was placed upon that one most exacting of labor and requiring of fertilizers—Indian corn—and the other exhaustive cereals—wheat, barley, and oats. And that too little regard is given to those leguminous plants which

form the subject of the topic assigned to your committee. In the agricultural branch of the Eighth Census Report, one of the most valuable agricultural contributions yet exhibited by any department of our General Government—we find the following: "With the exception of flax and decorticated cotton seed, peas and beans contain more nitrogen than any other grain. The droppings of animals fed on peas and beans are consequently more valuable than that from animals fed on any other grain. The growth of these crops when fed on the farm increases the fertility more than any other grain crops. When consumed on the farm and the manure returned to the land, or when ploughed under as a manure, peas may be considered as a renovating crop. As a crop to alternate with wheat, peas are exceedingly useful. They tax the soil but lightly, and when a heavy crop is produced they smother the weeds. They also ripen early enough to afford ample time to sow wheat after the peas are harvested." In the same report, Mr. Kennedy also says: "The great want of American agriculture is a plant which shall occupy in our system of rotation the place which the turnip occupies in British agriculture. We have no such crop The bean at the north has more of the necessary qualities than any other plant extensively cultivated. It is planted in rows and admits the use of the horse-hoe in cleaning the land. It does not draw heavily on the soil, and contains a large amount of nitrogen, the element which the cereals so much need."

Here certainly we find much that we want, so much that it undoubtedly would warrant a wider cultivation than it has yet received. Although Maine raises more peas and beans than all the other New England States, (246,915 bushels,) the total of these two crops in New England is less than half a million bushels. And we have no doubt it might be introduced quite liberally into the food of our domestic animals in this country, as one species, the horse bean, has for years formed a very important part in the feeding of horses, neat cattle, sheep and swine in Great Britain; entering largely into the composition of all those commercial articles so widely advertised, and to a very considerable extent used, under the name of this or that man's *feed*,—Horsfall's being perhaps the one most generally known. While we acknowledge the great value of the bean, and would urge its more extended culture in the field, there is too much uncertainty about the crop; from its tenderness and liability to serious injury from frost, and the attacks of worms and insects, and from rust, for us to rest



Short Horn Heifer "LADY MARY," at one year old.

The property of H. G. White, South Framingham, Mass. Red (white star). Calved January 27, 1864. Got by Hotspur, 4030, [see note], out of Baroness by Barrington, 1229—Red Rose, 2d, by Napier (6238)—Tube Rose by South Durham (5281)—Rose Ann by Bellerophon (3119)—Rosette by Belvedere (1706)—Red Rose by Waterloo (2816)—Moss Rose by Baron (58)—Angelina by Phenomenon (491)—Anne Boleyn by Favorite (252)—Princess by Favorite (252)—Brighteyes by Favorite (252)—by Hubback (319)—by Snowden's bull (612)—by Masterman's bull (492)—by Harrison's bull (592)—by the Studley bull (606).

NOTE. Hotspur, 4030—bred by Mr. Harrison. Got by imported Duke of Gloster (11382) out of imported Daphne by Harold (10299)—Limpid by Viceroy (7678)—Lemon by Marquis (2271)—Lowly by Isaac (1129)—Lisette by Blucher (83)—Lady by Cecil (120).

Lady Mary was winner of Silver Medal, (sweepstakes open to all comers), and also first prize as yearling at the show of the New England Agricultural Society, at Concord, N. H., in 1865. Her sire Hotspur, 4030, received first prize at the show of the New York State Agricultural Society, in 1863.

here in search after that material aid to which we may confidingly trust as one of the principal supports in a proper system of husbandry. But may we not find all the required qualities and conditions in the pea?

With proper care and the simplest means all its enemies can be guarded against. It is among the hardiest of our plants. It will produce according to culture from five to fifteen bushels to one of sowing, of food adapted to the use of every living creature which properly belongs upon the farm; and except hay, is perhaps less liable to injury and loss from storage than any of our crops.

This topic which has been assigned to your committee in the form of a query, seems to us an eminently practical question; one which cannot be satisfactorily treated in any merely speculative way, and although we ask leave to submit hereafter, to add to and form part of this paper when complete, such analysis of the two plants named in the topic, and other extracts from the writings of more able men about them, as we have thought might add interest and perhaps instruction to a more deliberate study of the subject matter, yet we desire to so fashion this preliminary report as to court and elicit the freest criticisms from members of the Board, animated by the desire to counsel their brother farmers well, and controlled by the knowledge they have derived from actual experience and observation. The conclusion to which your Committee have arrived is that the Board of Agriculture should

Resolve, That the largest practical cultivation of the pea cannot be too thoroughly urged upon every farmer in Maine, as one of the surest crops that he can grow, and every way a remunerative one; and that a much greater breadth of land than has yet been given to it might be very profitably devoted to the bean crop.

Mr. Wasson submitted the following report on Topic No. 3:

Should measures additional to the act of Congress be adopted to secure immunity from the cattle plague?

To show the necessity of "means additional," a brief expose of the history and character of the rinderpest is required.

This disease, which is now raging so fatally in England, and that has baffled every attempt to check its progress, is of all infectious diseases the most to be feared. Every precaution should be taken without delay to prevent its introduction to this continent. Once with a foothold here, none can foresee the consequences.

The disease is known in England as the cattle plague, in France as *typhus contageaux*, in Germany as the rinderpest.

The disease first appeared among the cattle inhabiting the *steppes* or treeless plains in the southeast of Russia. From the 47th to the 55th parallels of latitude, the Volga, Don and Dneiper rivers, with their numerous tributaries, flow leisurely through a vast plain of rich soil, occasionally overflowing the lands, causing a luxuriant vegetation. Here stock is abundant, with no winter food provided, as in California. Here rinderpest originated.

The pleuro-pneumonia is well said to be a most formidable disease, destroying as it did in Holland $660,000 worth of cattle in a single year, and in two years more than 28,000 animals. But rinderpest in England in the month of November last destroyed 5000 head, and later reports show that 50,000 animals have died in England within the past six months; a number equal to 17 *per cent.* of the cattle in Maine.

Of the character of this disease it is said "that in all cases which tend to a fatal termination the animals rarely live beyond the fourth day. Many die the second day. The greater number die the third day. The deaths number about 90 *per cent.* The nature of the disease seems closely allied to spotted fever—a poisoning of the blood. An English paper says, "nothing can be more fallacious than the supposition that the disease is curable." The experience gained in England confirms that of Europe as a whole, that medical skill is powerless in arresting its progress. The homœopathic theory of curing diseases brightened the gloomy prospect for a few weeks. But even that gleam of hope has been blasted; the treatment proved an utter failure. It is one of the most infectious maladies of which we have any experience. It is capable of being conveyed from animal to animal by persons and articles of clothing. On one of the estates in Austria where the cattle were diseased, a carpenter's apprentice employed on the estate escaped the vigilance of the guards and went to his father's house, which was distant about a mile. While there he repaired his father's cattle stall, and also changed his clothes. The rinderpest, in consequence of this, broke out among his father's cattle, and all were destroyed.

One of the worst features of the disease is, that animals appear perfectly healthy so long after they are infected; for it is said the disease may lie *dormant* in the system as long as fourteen days

before any symptoms are seen—a length of time equal to that of a voyage from Europe.

After medical skill had exhausted itself in vain attempts to combat the disease, recourse to military *cordons* established by government was had. Wherever the disease broke out, the diseased cattle were slaughtered by order of the government, and a military *cordon* drawn around the place. All dogs, cats, rabbits, domestic poultry, pigeons, &c., have to be kept in places of security and close confinement. If the disease exists in a village through which a high road runs, the course of the road is turned if possible; but when this is not praticable, then a guard accompanies the several travellers who arrive at the boundaries of the *cordon* to see that they do not go upon any of the infected premises. The *cordon* is frequently maintained by the peasants, but none are taken for this purpose from an infected village, the selection being made from contiguous villages or farms where the cattle are healthy.

"As soon as the malady is observed in a commune, notices are sent to all the surrounding places, that precautionary measures may be immediately adopted by the owners of cattle. Each commune has to provide a place for the burial of the animals which die or are slaughtered, and also a wagon and horses to carry them upon; and on the disease passing away the wagon is burned and the horses washed with a solution of chloride of lime. The place of interment is likewise enclosed, and not allowed to be disturbed for several years."

In spite of all these energetic measures, this malignant disease has visited nearly every country in Europe.

It was imported into Holland. It was imported into England. And if ever introduced into this country, it will be by that same agency—*importation.*

Once here, the die is cast, and a loss of millions of dollars worth of cattle the result.

The means of communication between us and England have become so rapid and so easy, that her relative position on the globe has been changed, bringing her, commercially considered, to our very doors. In that regard, as well as geographically considered, Maine, of all the States, is her nearest neighbor. Our thousand miles of sea-coast, with its capacious and inviting harbors bordering upon the great "highway of nations," expose us in a pre-eminent degree to danger. Like the outer ledges upon her coast,

she is first in the way. With the province of New Brunswick belting our eastern frontier, the Canadas contiguous on our northern and northwestern sides, adding immensely to increase our exposure, and railroads, having a foreign terminus, intersecting the State at several points—prospectively at least—including numerous other over-land channels of communication, all demand "additional measures to secure immunity from the cattle plague." From the Grand Falls to the mouth of the St. Croix, the boundary line of the State, at each point of ingress or egress is simply a *mathematical* point. The communication across the "line" is as perfect and unbroken, and the social relations of every day life are as closely interwoven, as in neighborhoods more remote from that line.

Here is contact, social daily contact, an extended line for *communication* by contact, an intercourse that "acts" and edicts are powerless to interclude, until into those relations can be incorporated a wholesome regard for the observance of such laws, until each, united by common interest or danger, becomes a law unto himself. This is a subject for alarm, for genuine alarm. We just learn that the disease has broken out in the Zoological Garden in Paris, and the goats as well as sheep and cattle are dying. Mr. Clay, the American Minister, writing recently from St. Petersburg, says, "the cattle are dying by hundreds and the sheep by thousands."

The foreign files, by every arrival, are still repeating the story of unabating malignity, of new and extending conquests, in spite of sanitary measures and medicinal skill, thus affording fresh fuel to kindle agitation in the public mind. Here is our security in maintaining a thorough and an efficient blockade, an absolute prohibition of traffic, in animals, or any and everything appertaining to them, or that has been in contact with them.

The following preamble and resolve accompanying the report were adopted:

Whereas, A malignant disease is making fearful ravages among the cattle and sheep of England and other countries of Europe—and whereas said disease or plague is easily communicated by contact—and whereas Maine, from its geographical position, is more exposed than any other of the States—and whereas in the opinion of members of this Board, measures additional to the act

of Congress are required to secure immunity from said disease or plague;

Resolved, That the Governor and Council be requested to take immediate action in the premises, by correspondence with the local Governments of the British North American Provinces, contiguous to this State, and invite their co-operation to the same end.

Mr. Prince submitted the following report on Topic No. 4:

What products can be sold to go off the farm with the least detriment to its fertility, and at the same time be profitable to the producer?

The above is without doubt one of the most important questions that can be asked the farmers of Maine, as we cannot, like those of the western prairies, keep up the productiveness of our farms, without replenishing them with some kind of fertilizers, and we believe that the large body of our farmers will agree with us when we say that we must rely mainly upon home manufacture rather than such concentrated fertilizers as are usually sold to our farmers; not but what great benefit is many times derived from these fertilizers, but that they cannot be counted on as sure of producing the desired effect.

We have so many different varieties of soils, that what would be considered a good system of farming in one locality would inevitably result in a failure in another. Still, there are some general principles that can be laid down, by which we can all be governed—principles that will hold good upon all soils and in any part of our State. One of these is, never sell any corn, grain, or hay from our farms, except perhaps near the seacoast, where an unlimited supply of dressing may be obtained without money and without price. All the crops of our farms should be consumed upon them. Another principle should be, never let a season pass without making a strong effort to increase your fruit crop, as some of the different varieties can be raised and sold from any soil in Maine, and the land at the same time be kept in good condition, with a small outlay for mulching that can be obtained in almost unlimited supply in any locality. The apple and pear can be raised on any of our gravelly soils in any part of our State, with a profit that would rival even the fabulous stories of profitable crops of the great West.

Many of the earlier varieties of grapes are now becoming a sure and most profitable crop on almost any soil that is well dressed,

and we would recommend that our farmers should give more attention to their cultivation. There are but very few farms but what have some swampy place where cranberries can be grown with even greater profit than any other crop, and that too without any outlay after the vines are once well set. Will not our farmers look around and see if they have not some deserted spot on their farms that is now an eye-sore to them, that can be turned to good account with this crop? We are satisfied that although our fruit crop has more enemies to contend with than formerly, it can now be made the most profitable and least exhaustive of any that can be raised in Maine.

Fruit being the leading branch, we must ascertain what live stock is best adapted to our location, not only returning us good profit at present, but keeping our farms in good condition. On one that has a pasture that grows a good quantity of rich nutritive grasses, and cuts a large proportion of good English hay, the cow should undoubtedly take the lead, as from the refuse of the dairy swine can be kept, and with the two combined with judicious management, a farm can not only be prevented from deteriorating, but made to improve in productiveness. But a farm that cuts a large proportion of swale or meadow hay, it is folly to think can be made profitable as a dairy farm, for cows must not only have good pasturage in summer, but good English hay, with meal, roots, or, what is better, swill, in winter. On the dairy farm, we would mulch the orchard as far as the limbs of the trees extend, and as soon as the apples begin to drop from the trees, turn in the store pigs, that they may pick them up, to prevent their being a nursery for pests for succeeding years.

On a farm that cuts a large proportion of poor hay, sheep should be the leading stock, as they can be kept in good condition through the winter on very poor hay with the addition of a few roots or refuse apples, daily, and although a farm cannot be kept in as good condition with sheep as with cows, it can be equally as good as in rearing neat stock, and at the same time be a source of much greater profit to the owners. Your orchard, too, can be pastured with sheep, after the trees attain to a size large enough, so that they will not be injured by them. We think that any one following the course pointed out above, and selling his fruit, butter and cheese, or wool, as the case may be, can not only make farming remunerative at present, but add yearly to the productiveness of his farm.

Mr. Smith submitted the following on Topic No. 5:

Can farming in Maine be conducted with success as compared with other branches of industry?

A great many things in this world are taken for granted; the faith of one is too often pinned to the sleeve of another. Opinions are formed without investigation; certain notions are gathered from casual observation. There is a certain amount of jumping at conclusions. In some or in all of the ways thus indicated, may not the opinion, so freely expressed, have obtained that the field of agriculture is less inviting than that of any of the other industrial interests. If it be true that farming is not a paying business as compared with the other branches of industry, are there not other causes or surroundings, to which the default is chargeable, locality, mismanagement, want of interest, or a divided interest. A farmer, to succeed, must love his calling, and devote both his time and attention to it.

It is said that but about one in thirty succeed of those engaged in lumbering. How untrue of farming. In mercantile life or in manufactures, the number of those who acquire a competency is believed to be far less than those who reach the same results as farmers.

But few perhaps are aware of the amount of capital invested in agriculture in our own State. But few would suppose that sum to be what it is, $97,424,385; and this large sum is paying a dividend yearly of more than 14 per cent.; the orchard products alone foot up the neat little sum of $501,767. Now we have not the means of knowing the amount invested in other avocations, but we feel safe in saying, that the investments in farming will not suffer in the comparison. If it be true, and true it is, that the business of farming is paying 14 *per cent.* on a dollar, we can confidently say to our young men, here in Maine is as inviting a field as elsewhere, and farming in Maine is as lucrative and as promising a business as any other. And in view of the facts herein presented, we say to our brother farmers, push on your enterprises, your calling is not only honorable but profitable. Your investments in your business are paying as good a dividend as the other branches of business in the State.

Mr. Carpenter presented the following report on Topic No. 7:

On which can a farmer live the easier, on a farm of two hundred acres or more, or one of forty or fifty; the soil of like quality?

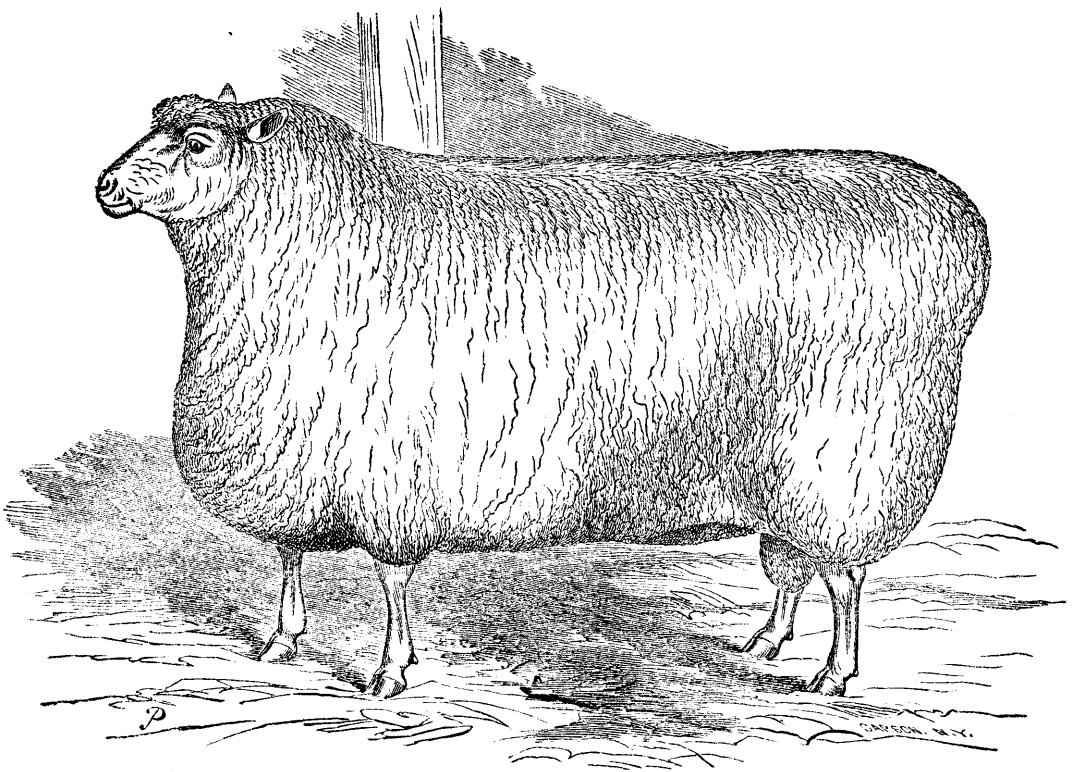
Here is something that cannot be weighed or measured, and we shall be obliged to exercise one of the rights conceded to the people of this section of our country, and resort to some "guessing," in order to arrive at a probable solution of this, to the farmers of Maine, important question.

In making a comparison, it is assumed that the circumstances of the farmer are the same so far as the family and location are concerned, and also equal as to skill and ability to labor in the prosecution of his business. It is understood that the style of living in both instances is to correspond. The buildings on the two farms will be equally plain or expensive, according to the taste or ability of the occupants, and the outlay would be the same, with this exception, that the larger farm will require the addition of barn room sufficient to house the stock and crops.

We frequently hear remarks of this kind: "You have too much land, enough for two farms; why not divide it, or sell out and buy a small place where you can live easier?" And on the other hand, it is common to hear something that sounds more complaining: "I can do but little for a living on this small farm of only forty acres. I have a large family, and it takes about all we can produce to live on." Everything produced on the farm and consumed by the family is worth what it would cost in the market, adding thereto the expense of transportation. The farmer that comes the nearest to living within himself may in the end, we believe, be found to have met with the best success.

"The soil of like quality," taking an average of the farms as they are now through the State, will admit of a division into tillage, pasture, and woodland of about one-third to each. The forty acres, about fifteen in field, fifteen in pasture, and ten in wood-lot. The same proportion will give for the two hundred acres seventy-five in field, seventy-five in pasture, and fifty in wood-lot This division is not made with any intention of raising an objection to a system of rotation, where the soil and circumstances will admit.

It will be readily admitted that the outlay for the dwelling, furniture, carriages for family use, and expenditure for the ornamented surroundings, together with the expense of keeping all in good repair, will be the same in one case as the other. That for other



IMPORTED COTSWOLD RAM, "HIS ROYAL HIGHNESS."

Bred by Robert Garne, Aldsworth, England. Imported by and property of Burdett Loomis, Windsor Locks, Conn. Winner of 1st prize as a two-year-old at Brattleboro', Sept., 1866. Winner of sweepstake medal offered for best Long Wooled Ram of any age, open to United States and Canadas, at Brattleboro', Sept., 1866.

buildings will of course vary according to the size of the farm. The additional cost of land will have to be taken into the account.

The objection usually raised against the small farm, and that entitled to much weight, is the want of land. The complaint generally most frequent on the large farm, is a want of labor. If the occupant of the former has a family of boys and girls, they very soon find the limits of the farm too small, and either the children or the father seek employment elsewhere—often at a distance from home and its protecting influences—causing a separation of family ties that may never be united. If the owner of a larger farm has a like family, his want of labor is in a great measure supplied, and the extent of his land will give them useful employment and scope for improvement.

Again, if there are no spare laborers on the small farm, and the owner is obliged to hire, he will not, as a general rule, engage help by the month, but by the day, as his needs require. He will endeavor to perform all the labor his strength will admit of, and it is believed look with much doubt upon the wisdom of leaving a large farm for a small one, with the expectation of a less laborious life. Should the larger farmer be similarly situated he will consider himself able to employ help constantly, and will always aim to have a good strong man to relieve him of the heavier portions of farm work.

The want of land can seldom be supplied to advantage by the small farmer. Whereas the want of labor experienced by the owner of the large farm can usually be met without much difficulty. The first will also be obliged to keep a small team, whether of oxen or horses. The other will be able to keep a team of either oxen or horses, or both, of sufficient strength to do all heavy work, such as "breaking up," &c., without the expense of additional teams, or of exchanging with neighbors, as the practice of many is. The cost of labor-saving machines and implements, together with farming tools to cultivate the forty acres economically and successfully, will amount to nearly as much as for the two hundred acres.

The additional quantity of land will enable the owner to keep a much larger stock on the farm, the annual growth of which will be a source of income. He will be able to rear his young calves and other young stock, and sell them when they have arrived at maturity, and are the most valuable. On the other hand, the small quantity of land renders it necessary to dispose of many of the

calves to the butcher, for want of room to keep them. The ten-acre wood-lot, it is estimated, if well husbanded, will support the fires. A like quantity taken from the fifty-acre lot will leave forty acres, which, in many localities, may be turned to good account. What has already been said in reference to labor, may be applied to the affairs of the household, as well as to outdoor labor, with equal force.

We are aware that the friends of the theory, "Two acres enough," "Ten acres enough," and that small farms have advantages over large ones, will be very likely to disagree with the position taken in this paper. But as yet, no sufficient evidence has appeared to prevent any one who is in possession of two hundred acres or more, keeping only one cow, or going into the business of raising blackberry canes on a corner of his lot, if his locality, circumstances and inclination should happen to lead him in that direction.

It is not the intention of the writer to say anything to dampen the ardor or enthusiasm of the cultivators of small quantities of land. Too much commendation cannot well be bestowed for the courage and industry exhibited by many in rescuing some forbidden portion of the earth's surface, and making it both beautiful and profitable, and many a farmer on forty acres has done more for the improvement and dignity of agriculture than some of those in possession of broader acres. What especially is contended for, is that nearly all the advantages claimed by the friends of a small quantity of land, are also possessed by the owner of the larger quantity, and that his hopes of relief by a change would, in all probability, be disappointed.

Mr. Goodale submitted the following report on Topic No. 9:

The committee charged with the following topic, viz: "*To consider the practicability and expediency of transferring to the Agricultural College, whenever the same shall go into effective operation, the labors and duties of the Board of Agriculture,*" respectfully report as follows:

The policy of the State, which has become defined and established in the twenty years past, toward that great interest which embraces a very large proportion of the population and wealth of the State, may be fairly characterized as a liberal one. At various times the legislature has created instrumentalities calculated to

foster and encourage it. To societies formed for the same purpose, it annually extends material aid.

To a considerable extent, these organizations accomplish their ends *by the diffusion of knowledge*, and so, in a true, although not in the ordinary acceptation of the term, they may be considered as educational in their nature.

By the premiums offered by agricultural societies emulation is excited, and when the various specimens of crops, of animals, of implements, etc., are brought together, opportunities are furnished for comparison and for the study of facts and of objects which are highly instructive. The labors of the adjudging committees do sometimes, and might much oftener than they do, result in the preparation of a report, which, besides announcing the awards of premiums offered, embraces the data, facts and views upon which the decisions were based, and often much valuable information upon the general subject involved.

Besides these, whenever anything is offered for premium, the nature of which admits of it, as a crop of roots or grains, or a fine animal, the law requires a statement to be made which shall convey to all interested in the subject a knowledge of the methods by which and of the conditions under which such a result was attained, and how it was brought to the degree of perfection exhibited. The publication of such statements may not only result in diffusion of knowledge, but in positive additions to our stock of knowledge.

There is greater need of such aids to progress in agriculture than in other branches of industry, from the fact that those who pursue it, are, by their vocation, for the most part, necessarily confined upon their own acres, and so being isolated from each other, have little opportunity otherwise of learning what improvements are made, and how the most productive results are attained.

The State Board of Agriculture is another instrumentality created by the State. It is a deliberative and advisory body, holding an annual session for discussion and investigation of matters pertaining to the general husbandry and rural economy of the State. Besides which are presented essays, carefully prepared at home before the session, and also reports of experiments which have been instituted and carried on in order to ascertain the conditions of successful cultivation. Among the duties of the Secretary of the Board, we may allude to the requirement that he become acquainted with the agricultural capacities of the State, its soil,

its crops, its means of fertilization, its methods of husbandry; and to suggest improvements, to learn what progress is making in agriculture in other States and countries, to correspond and invite exchange of documents with kindred associations elsewhere, and to prepare an annual report embracing the doings of the Board, the results of his investigations, with such recommendations or suggestions as the interests of agriculture seem to require. This report is published and circulated among the farmers of the State.

It may be said, therefore, that the aim of the Board is, even more exclusively than of agricultural societies, the acquisition and diffusion of knowledge. The success which has attended the employment of these instrumentalities is marked and highly gratifying. Perhaps the most tangible and definite indications of this success are furnished by a comparison of the United States census returns for 1850 and 1860. Although these were alluded to in a report made to the Board some time ago, it may be well here to refer again to some of the facts thus elicited. By such a comparison we find that, be the causes what they may, we did not retain our natural increase in numbers, the increase of population in that decade being only six and one-half per cent., but notwithstanding this the number of acres in farms increased from 2,039,596 to 2,677,136, or about thirty per cent. We find the value of farms to have increased from $54,861,748 to $78,688,525, or equal to forty-three per cent. Be it remembered that none of this can be ascribed to advanced prices due to a depreciated currency. It was a time of peace and of equable values, all alike based upon a currency as good as gold. The improvement in stock was even greater—while in numbers the animals increased less than seven per cent., (or just about the same as the population,) the value advanced from $9,705,726 in 1850, to $15,437,380 in 1880, being no less than fifty-nine per cent., and the value of slaughtered animals showed an advance of sixty-eight per cent. This is a record of which any people may be proud; and while it is not claimed that all this increase was due to the labors of agricultural societies or of the Board, yet it may be fairly claimed that the various improvements by means of which this result was brought about, were, all of them, *initiated* and steadily fostered by them, and that thousands of farmers who had no direct connection with them were excited to emulation, stimulated to improvement, and induced to adopt improved methods when they had seen these prove successful with others.

The years which have passed since the last census was taken, have been eventful ones. The energies of farmers have been taxed to the utmost. Is it unwarrantable, in view of the above facts, to assume that the progress made, the improvements effected, and the knowledge gained during the previous years, were largely instrumental in enabling the accomplishment of what has since been done by the lessened numbers engaged in agriculture? We think not—nor do we believe that any candid mind will fail to be convinced that the fostering aid extended by the State to this, its greatest material interest, has been repaid many fold in the increased wealth and power of the State, and its present ability to bear the unusual burdens which have fallen to our lot.

We are not aware of any desire to see these instrumentalities done away, or seriously modified, but we are approaching a new era in the history of agriculture in Maine, and it may be well to cast a glance, as far as we can, into the future. Before long, we hope to see a new instrumentality at work, which, we trust, in due time, will accomplish greater results than have yet been attained. The Congressional grant in aid of a college for the liberal and practical education of the *industrial classes*, has been accepted by the State. An act to establish such a college and defining its characteristic features has been passed. We trust the time is not far distant when it will go into operation. Its means are small, much smaller than may be needed to secure able teachers and other requisites to give it due effectiveness. As yet, the State has bestowed upon it no endowment or stipend—whether it may is uncertain.

The object of this institution is to train up generations of youth better drilled than their fathers have been in the practice of farming, and more conversant with those laws of nature which must ever underlie practice. The farm upon which the college is located is to be the theatre of careful investigations. It is expressly provided for by the act of Congress, that an annual report shall issue therefrom regarding the progress of the college, recording the results of the experiments and investigations made, and such other matters, including statistics, as may be deemed useful. Having clearly in view the above named facts and prospects, we are better prepared to approach the questions embraced in our topic—Is it practicable and is it expedient to transfer to the Agricultural College the labors and duties of this Board? or, more properly, *will it* be practicable and expedient? These are ques-

tions of such importance as to demand serious and careful thought and investigation. We are not prepared to do more at this time than to invite attention to this subject. As members of a Board representing the agricultural interests of the State, our desire is simply that the greatest good to the cause be effected with the least expenditure. We have no desire for place other than as it may afford means of greater usefulness. There is no occasion for hasty action now, and if its consideration be entered upon in season, there can be no excuse for hasty action hereafter.

As the result of such thought as we have been able to bestow on the subject, we may remark that there does seem to be a possibility that by adding to the means of the college an amount equal to the expense attending the operations of the Board, more might be accomplished by some persons connected with the college whose acquirements and training have specially fitted them for the work, and whose time is given to such labors continuously through the year, and year after year, than can be expected of members of the Board as it is now constituted.

It seems not unlikely also, (if means admitted it) that the report to be issued from the college might be made such as worthily to supersede the report now annually issued from the Board, that it might be circulated to an equal extent and with as good result among the farmers of the State; and that, generally, the concentration of means and efforts might accomplish more valuable results than can be expected by laboring separately. While we would deem it palpably unwise to decide these questions in advance of the further development of the college, and the selection of the persons to be charged with its more active operations, we commend the consideration of the topic to all who feel interested in the advancement of agriculture among us.

Mr. Wasson presented the following report on Topic No. 8:

Is it expedient for the Board, while regarding the fearfully increasing pests to vegetation, to recommend the appointment of a State Entomologist?

Mr. President: I propose to discuss this topic in general terms, rather than to that specific point indicated in the text.

"Have an eye upon your fences," was for many a year the initial motto of the Old Farmer's Almanac, until repeated so often it came to be regarded as an indispensable condition of success,

to build efficient barriers against whatever it was desired to shut in or to exclude.

Time was, when with the greatest investment of capital in this country in common fences, (and the same is true to-day,) when to be environed by a lawful fence, was a guarantee against mischievous or destructive animals. But under this *insect* dispensation, this huge amount of capital is, to all intents and purposes, dead, as a protection. For o'erleaping ditch and dike, scaling fence and wall, inexorable as death at the appointed time, they come. Monarchs of all they survey, the whole vegetable world pays tribute to satiate their voracious demands. Nothing escapes, nothing is invulnerable. Their capacity to devastate, to "lay waste," is incredible.

As foragers they excel. Millions of dollars worth of vegetation are annually destroyed, and too often has the cause been attributed to some fancied freak of nature, as if her laws were dictated by coquettish whims.

For years the midge in wheat was supposed to be a mildew or blight. A peculiar shrivelling of rye, supposed to be caused by some unfavorable condition of soil or climate, has recently been found to be the work of a minute insect. And who is prepared to say how much some insect has contributed towards the cause of the potato-rot.

For a number of years before insects were supposed to seriously injure the cultivated crops, the caterpillars were known to be making sad havoc with the forest trees in Europe. In 1837, Switzerland paid $1000 for the destruction of these pests, to save the forests. From 1790 to 1800, the caterpillars destroyed $300,000 worth of vineyards on the borders of the Rhine.

Within the past ten years the Swiss government has paid for ten millions of butterflies.

But with the work of devastation going on *here*, a diverting of our attention *there* savors strongly of "misery seeking company."

It is estimated that in Illinois the midge destroyed in a single year $20,000,000 worth of wheat, and in New York $15,000,000 worth. With the advent of the midge as a co-worker with the Hessian fly in 1834, the culture of wheat was almost temporarily abandoned in Maine, excepting in favored localities. In Monroe county, N. Y., which in 1845 raised more wheat than all New England, the midge proved so destructive, that for several years

the propriety of abandoning the wheat crop was seriously discussed.

It is estimated that 15 per cent. or $75,000 worth of apples are destroyed annually by the caterpillars alone, in the State of Maine. Who can estimate the real or prospective loss of apple trees caused by the borer, or the value of fruit punctured and destroyed by the curculio?

While the number of plant-feeding insects, says Harris, "is not legion but legions in our country," there being some 25,000 distinct species, every year is adding by importation to natural increase, to spread over the country, causing losses too great for calculation.

Every year, with the return of vegetation, come again myriads of insects, old acquaintances and new, to prey upon the farmer's toil.

It has been recently stated that in the western basin of the Mississippi, an insect fatally destructive to the potato has appeared, which is travelling eastward at the rate of 50 miles a year. This insect, called the Ten-Lined Potatoe Beetle, was first discovered on the Upper Missouri.

In June, of 1864, in Nebraska, an insect, hitherto unknown in the world, was discovered, called the "Bee-Killer"

During the season of 1865, an unnamed and unknown insect was discovered preying upon the Canada thistle. If they will only stick to the thistle, we will quote so much of Shakspeare to them as to say "your graces are right welcome."

We may well query, from whence these new insects? Are they of spontaneous origin? Is the work of creation still incomplete? Has the "letting down of a great sheet from heaven"—as in Peter's time—"with all manner of creeping things," been repeated?

The capacity of insects to increase, to propagate their kind, is incomprehensible. Some species of the caterpillar will lay from 150 to 600 eggs twice in a summer. Some insects, as the pine spider, will lay 800 twice and often three times in a season. Indeed, many of them, like the hens in Holland, are "everlasting" layers. The fecundity of plant-lice is marvellous. It is said that one aphis may become, in a single season, the progenitor of over five thousand millions of descendants. With such enormous powers of multiplication, we might reasonably apprehend the speedy destruction of all our crops. But the increase is governed by

natural causes, and by natural causes held in check. The balance of causes has only been removed, giving the insects much the longest end of the lever.

This condition of affairs can and must be reformed.

The importance of a knowledge of insects must be obvious to every one who reflects upon the devastations committed by them. The problem of course is, how to destroy this legion of enemies. To do this with the greatest effect, we must watch them through all their changes.

But however desirable a knowledge of entomology may be, but few have the time to acquire it. The farmers at large must glean what information they can, and guard their crops as best they may—but I submit if its importance does not demand the establishment in every State of some *central Head* with whom this science shall be a speciality. Some point from which shall radiate instruction, information and protection.

We have accustomed ourselves to suffer the depredations of insects as a "train of abuses" from which there was neither escape or appeal. New guards for our future security are now demanded. Without them, however much our operations are governed by the most approved rules of agricultural jurisprudence, success, the end desired, is not attained. New guards against a new enemy must be invented, or old guards revived against an old enemy multiplied to excess.

As a first step towards its accomplishment, I submit the following resolution:

Resolved, That the Board of Agriculture recommend the appointment of a State Entomologist.

Mr. Bigelow submitted the following report on Topic No. 10:

Can effective measures be adopted to increase our crops of hay without the use of barn manures or concentrated fertilizers?

In treating this topic, we are aware of the difficulties under which we labor, in instituting methods of cultivation upon such portions of our worn out meadow lands, as will produce the desired result without the use of manures or fertilizers, yet we propose to offer a few hints; and first, plowing and seeding with clover, and turning under when the clover is ripe enough for the seed to grow, and repeating this until the soil becomes enriched with vegetable matter, would be a safe and profitable method to prepare the soil for a future crop of hay; at least we are told that

it has been extensively practised by agriculturists in New England and the Middle States with satisfactory results, and we have no reason to doubt the fact.

Our second method would be to plow in the month of June and sow buckwheat, Indian corn, or other seed for a grain crop, and turn this under in August, and then seed with timothy and clover by way of preparing the ground for a crop of hay the next season.

Summer fallowing, we can have no doubt, would be a profitable method to pursue to bring our exhausted meadow lands to the production of larger crops of hay.

The harrow may be used in August on non-producing meadow lands with good results. It would loosen the soil among the roots of grasses, and by sowing grass seed (not sparingly) would make a profitable return for all needful expenditures.

The mower and scythe may both be used so as greatly to injure the succeeding crop of hay, by cutting the grass too close. Great care should be taken not to cut less than two or three inches from the root; cutting clover and timothy below the lower joint, lets in the water and destroys the plant.

The practice of feeding meadow lands, after the crop of hay is taken off, or before, is one which we believe injurious and largely lessens the crop. Cannot some general method be adopted to avoid the necessity of pasturing our meadow lands, by instituting some green crop on which to feed and be a future benefit to the agriculturists of Maine?

Rotation, or changing from meadow to pasture and from pasture to meadow, would, oftener than generally practised, naturally have a tendency to increase the crop of hay.

Drainage, whenever required, is a most effectual method of securing larger and more uniform crops, and hay of better quality also.

The hay crop, being the largest and most important of all in this State, as well as the basis of all our farm operations, should receive the greatest care and thought, and no means neglected to insure its success.

Mr. Jefferds presented the following report on Topic No. 11:

Should the use of horses be encouraged to the exclusion of oxen, for farm labor?

That horses have taken the place of oxen to advantage, in many branches of business requiring animal labor, is evident to all. We

no longer see teams of oxen wending their way twenty or thirty miles, with spars, keels, shingles or other lumber. Railroads in some sections, and horses in others, have taken their place. The slow gait of the ox, and his increased value other than for labor, have made the horse more profitable for these purposes: so, in the lumber region, the timber being exhausted on the banks of the streams and near the lakes, the long roads now used require an animal of quicker pace, and the price of beef makes it expensive to leave the "tallow on the landing," and bring the team out with only the "hide and horns," which was the motto in the days when lumber was king, and the pine tree thought by many to be our only resource. Oxen are now used to some extent for lumbering, and it is maintained by some, that they are more profitable when properly used, even on long roads. We often see teams that have made a good winter's work, come out in the spring, fat and sleek, so that after a few weeks feeding they are in condition to grace the stall of some city market.

Horses have also taken the place of oxen to some extent in farm labor, and we think in some instances to the farmer's disadvantage. While the horse has more attractions, in his lively actions and excitable temperament, we think the prosy ox more economical, and better suited to much of our farm labor; and to give a reason for the faith within us, we will enumerate some of his advantages. It is less labor to harness the ox, and the cost and wear and tear of harness and implements are much less than with the horse. He has the advantage of being put to labor at an earlier age, enabling the farmer to obtain both labor and growth at the same time. With the horse, we have to wait until he has nearly attained his growth, and then he is not a pleasant and safe animal until he has accomplished one or more years work, so that, when he is fit for farm work, he has attained his full value. Oxen can be turned into cash at their full market value at almost any time, while the horse, being valuable for that one purpose, has to wait for a market. The liability of the horse to accidents which diminish his value, or render him worthless, is a large item against him compared with the ox. The season requiring constant animal labor is short, and while the ox is paying for his food in flesh and growth, the horse is an expense.

We know many farmers, who keep but one yoke of oxen to do their farm labor, who realize from fifty to one hundred dollars from the growth and flesh of their oxen yearly, and this almost wholly

on hay and grass. We think we are warranted in the assertion that, as a general thing, take the country through, the farmers that keep good fat sleek oxen, are more successful than those who keep horses to the exclusion of oxen; not but that some good farmers use horses exclusively, (and no doubt under some circumstances they are best); still, as a general rule, we think the horse should not yet take the place of oxen for farm labor; that instead of selling our steers, at one, two, or three years old, to go out of the State, they should be worked on the farm until matured, and fitted for beef.

On the evening of January 29th, in the Representatives' Hall, Mr. French pronounced the following

EULOGY ON THE LIFE AND CHARACTER OF DR. EZEKIEL HOLMES.

Great men live two lives;—the one material and simple in the midst of our common humanity, the other memorial and sacred in the just appreciation of future generations. The world is slow to recognize its great benefactors, and has no standard to measure their influence till after they have passed the pale of mortal existence. While among us they live and move as do their fellow men; the soul-aspirations, the heart-impulses that are the secret springs of action in their lives, are not felt by the busy multitudes that throng the ways of the world, and when at length they pass to that exalted state whence their aspirations came, and where the generous impulses that so often moved them to godlike acts here meet fraternal greetings from kindred spirits, men wonder at the void they have left, and recall their many virtues as they would gather up lost treasures.

Those whose names are most illustrious as philanthropists and well-wishers of mankind, have lived in spirit far in advance of their time, anticipating the world's millenial state by hundreds of years. They have been to us glimpses of a nobler man, of a purer life, of a more exalted being, such as the good hope to attain to and the promise is the world shall see. They have chafed sorely at the wickedness around them, and sometimes have drawn darker pictures of life and human depravity than the most unfavorable construction given to passing events would warrant. Others no less exalted in spirit, but always recognizing the great facts inseparably connected with man's earthly existence, have always labored for the greatest good of the great whole, and have never failed to make their lives sublime. The foot-prints such men leave behind

them are as distinct as bird tracks in the "old red sandstone," and the record they bear as reliable as the eternal testimony of the rocks.

The masses judge of men and things from external circumstances. To them earth is earth though diamonds lie embedded in its mould, and shining sands attract the simple and unlearned more than the fine gold they see not.

There are men whom some great wave of popular favor brings into notice, and for a time they are able to sustain themselves before the public, but if there are no sterling qualities of head or heart, they soon sink to a level with the common strata of mankind, and are soon lost sight of among the crowds that go down to oblivion.

Humanity in the end is true to itself, and sooner or later acknowledges the power and might of individual influence. Greatness wears no trappings—needs none. The conception of great thought is its insignia, and the execution of mighty deeds gives the world's commission to command. *All* do not wear both alike; *all* do not bear the palm; even as *great* gods were few when divinities dwelt with men and hero-worship was supreme.

Such are some of our reflections when we contemplate the life and character of the late Ezekiel Holmes. A man whose like had not been before him among the ancient men of our State; the like of whom we shall look for in vain in the present generation. Born at Kingston, Old Colony, August 24, 1801, he graduated from Brown University in 1821, and received the degree of Doctor of Medicine from Bowdoin College in 1824. From this time forth he became a resident of this State, practising his profession, Principal of the Gardiner Lyceum, Professor of Natural Science in Waterville College, Editor of the Maine Farmer for more than thirty years, a member of the Legislature for five consecutive years, conducting scientific surveys on behalf of the State, first Secretary of the Board of Agriculture and of the State Agricultural Society, Vice President of the National and the New England Agricultural Societies, and member of various historical and scientific societies, several of which positions he filled at the time of his death, and in all the posts of honor to which he was elevated discharging his duties with a faithfulness and ability that strengthened the estimation in which he was held by the public.

The character of his mind was suggestive rather than practical. While laying down premises and drawing conclusions that others

would seize upon and work out successfully, he rarely availed himself in practice of the benefits thus arising from his own labors. His power of generalization was greater than is possessed by many men, even of his attainments. He comprehended at a glance, and was quick to perceive the relations the parts bore to each other. The minutest details were entered into and understood as well as the more generous principles, and he was thus able to comprehend fully whatever came under his observation. He saw things for himself; he saw things as others looked upon them, and having this distinctness of conception combined with a clearness of expression that left no point in doubt, he was both the instructor of the humblest and the wisest. Herein was the secret of the power he exercised over those who came within the sphere of his influence, whether he discoursed to them in the popular assembly, or from the editorial chair.

He thirsted for knowledge continually; not the knowledge of books, but the knowledge of nature. He had no desire to revel in classic lore, no taste for the subtleties of mathematical calculation, but when he opened the book of nature, his whole soul was absorbed in its mysteries, and he delved among its treasures as the miner working on golden sands dreams of boundless wealth. He let the dead past sleep with the slumbering ages of by-gone centuries, waiting its own resurrection, he lived with the living present, anticipating the future, sufficiently to stay no march of progress already indicated by the shadow of coming events. With him right was right, no matter who opposed, and his fearless soul dared to defend it. His own consciousness of duty performed was more to him than the consciousness of the world's applause. The cause of humanity, the rights of the oppressed, the defence of government, and loyalty to country in darkest hours, found in him a ready defender, and the patriotic utterances of his heart were akin to the devotion of the fathers.

He was the true conservator of the industrial and domestic interests of Maine, and watched their progress and development with all the solicitude and care of one whose vital concerns were at stake. To the farmers whom he so often met in the midst of his labors, he was emphatically a father, and in the many homes in his own and other States lived a numerous family. When he went forth he moved as a patriarch of old among his children, their herds and their flocks; all were ready to bid him welcome, and thousands rose up to do him reverence.

From a neighboring province comes a most fitting and appropriate recognition of his services in the great cause to which his life was devoted, in a valuable contribution to the monument the people are voluntarily dedicating to his memory.

His sympathies were emphatically with the masses. Man was his brother, and in whatever state or condition he met him he was ever ready to extend the right hand of fellowship to his equals and comrades in life, or relieve the wants of the mendicant that sought his charity. He was thought sometimes to be open to censure in this respect, so forgetful would he be of the duties and obligations he owed to himself and family, that the needy should not go away empty from his door; but it was all of the generous promptings of his own heart, and the world forgives it in him now he is gone.

He lived not to himself, nor for himself. While he lived in the present, he lived to the future also; two lives blended in one, that the harmony of that life might be the more complete. With him the question was never considered whether he was to gain or lose by the transaction, but would it be productive of individual or public good? And having settled this point in his own mind, he entered into the execution of it with all the zest of a disciple of mammon, and the enthusiasm of a votary of pleasure.

He was a remarkably public-spirited man; he was made for the public, not for himself; had no interest, seemingly, in himself. His own identity was lost in that of others, to the entire exclusion of personal preferences, if he had any. His idea seemed to be, judging from the tenor of his life, that humanity had a common right in the bestowals of Providence, and whether they chose to avail themselves of that right or not, it mattered not to him, he admitted the principle. That he had faults, men that knew him will not deny; all fail in some particular in the rule of life, and his was no exception. Great men are great in all things pertaining to themselves. If they excel in great virtues, they may likewise sink into great vices; in proportion as they excel the world's average ability in what makes them great, they may fail of doing in what makes men successful. To this latter class of great men, Dr. Holmes undoubtedly belonged. Acknowledged as a great teacher of men in things pertaining to the visible universe, yet he was not their exemplar, but had need

rather that he be taught *of men* in what were the first principles of practical life.

In his intercourse with the world he was affable, courteous, always approachable. Men came to him without restraint, and though sensible of the presence of superior intelligence, yet enjoyed a freedom of communication allowed among the commonest. He drew men to him rather than repelled them, and thus was able through a long and useful life to retain his hold on the popular heart. Honest in his convictions, he always defended the positions he assumed with a pertinacity of purpose and a vigor of intellect that made him no mean antagonist in polemic contests, and soon assured his rival that "there would be blows to take as well as blows to give." His tastes were simple, his wants were few and easily supplied, his morals were correct, his testimony believed, and his whole life in harmony with himself if not with the world; and when the great destroyer came he was stricken down, but did not fall; he rose to a higher plane of existence, to that memorial state in which men cease to admire but to revere; and the legacy he left behind became the common heritage of all.

When the act of Congress bestowing grants of land to the several States for the endowment of agricultural colleges passed, he entered into the consideration of measures whereby the State might avail itself of the benefits of the appropriation, with all the strength and ability his life had given him, centred on this one enterprise all his energies, deeming that he saw in it the consummation of his desire in the present, and the realization of his hopes for the future. He guarded every avenue of approach to its funds with the jealous care, the eagle eye of a sentinel on some lofty watch-tower, and wo to the falcon claws that presumed to clutch at the prize. The last and most distinct impression we have of Dr. Holmes is on the occasion of one of those contests for the bestowal of the gift the State has witnessed since accepting the favor, and will be recalled by many present as the first hearing before the Committee of Agriculture on the proposition from Bowdoin College, contained in the report of the Commissioners. The case had been stated, the claim set up, its advantages fully set forth, and it came the Doctor's time to reply. He arose to speak with eyebrows knit, with lips contracted, and in an analysis of the whole subject, clear and distinct as his own thought, he pointed out what he deemed would be the gross injustice done to the industrial classes if the national gift was diverted from its original

purpose by connecting with any existing college, and warming with his subject, his countenance all aglow with the fire of his soul, his eye lit up with a view of the present and visions of the vast multitudes reaching far into the future, whose champion he now was, he drew himself up to his fullest height, his whole frame thrilled through with emotion, and throwing back his head with the right arm extended, pointing to the committee, exclaimed: "and now I tell you, Mr. Chairman, that the farmers of Maine, after having desired this thing so long, and hoped for it so long, and prayed for it so long, and *waited* for it so long, are not now going to sell their birthright for a mess of pottage."

I see him now as I saw him then, one year ago to-night, standing in this hall, and the scene will ever remain a vivid picture while time and reason last. The occasion was historic and worthy the pencil of a painter, and could it be delineated with the hand of a master, would be a most fitting memorial of the closing labors of his life. The next week he was again before the committee, earnestly contending for the people's right to the independent location of the college, where he contracted a severe cold; an attack of acute pneumonia came on, and on the 9th of February his days ended in the midst of their activities. He went from the committee room to his hotel—to his home, from his home to the grave—to the grand empyrean on which his pure thoughts often dwelt, and where in his faith he expected to meet the friends who had gone before him, and there wait to be joined again to those who should follow.

Thus lived and died one of the most useful citizens, though an adopted one, the State ever had; one whose memory will long be cherished by all who knew him, and time shall hallow it in the hearts of the people. Peace be to his ashes, he rests in peace. His name and his fame belong not to us alone; they have gone forth to the world, and his eminent abilities and distinguished services have been appropriately recognized by his compeers in scientific labors and research. One who knew him intimately and well, paid this most fitting tribute to his worth while living, in this brief comparison:—"Massachusetts boasts the wit, prose, poetry and patriotism of her Dr. Holmes; the Dr. Holmes of Maine will be remembered in his works, when prose and poetry are forgotten." He needs no stately mausoleum with lofty dome, beneath which his dust shall moulder, or colossal bronze in giant

form to perpetuate his memory; a grander symbol is his, a nobler arch is reared.

Citizens of Maine! Would you behold his monument? Look around you; the unfinished temple of knowledge rises grandly before you; the nations stand on its broad platforms, all tribes and kindreds and tongues mingle in its consecrated halls. Build it as he builded, till its pillared dome shall pierce the clouds, and everlasting sunlight plays around its summit; and when the teeming millions of generations yet to be shall crowd its courts to worship at its shrine, they shall see written on a fair stone, conspicuous among earth's honored and illustrious sires, whose fame covers its walls within and without, from foundation course to topmost stone, the name of Ezekiel Holmes."

Informal meetings were held at various times during the session, at which numerous topics were taken up. In these discussions members of the legislature freely participated, and much interest was awakened. With few exceptions, the notes of those now at my command are insufficient to do justice to the speakers, and they are accordingly omitted.

During an evening thus devoted to the subject of orcharding, some facts were presented, worth preserving. The discussion was opened by Mr. Perley, late President of the Board, who remarked that orcharding was profitable in this State. In the hilly part of Maine apple-trees can be grown successfully, and an acre in orcharding will produce as much or more than any other crop. He gave the following statement of the profits of four acres of land in orcharding for the years 1864 and 1865, which was pastured with sheep:

1864.	Account of Field No. 9.	Cr.	
By 350 bushels hand-picked apples, $1.25,		$437 50	
By 115 bushels windfall apples, 50c.,		57 50	
Pasturage,		10 00	
			$505 00
	Dr.		
To labor draining,		$11 25	
To labor grafting and pruning,		12 25	
To harvesting,		49 25	
To interest and tax on $500,		40 00	
			$112 75

Net income, $392 25.

1865. ACCOUNT OF FIELD No. 9.

By 450 bushels hand-picked apples, $1.75,	$787 50	
By 80 bushels windfall apples, 75c.,	60 00	
Pasturage,	10 00	
		$857 50
To labor draining,	$34 00	
To labor harvesting and pruning,	33 50	
To interest and tax on $500,	40 00	
		$107 50

Net income, $750 00.

We can get nursery trees that can be brought to bearing in eight or ten years; but to do this the orchard must be tended and cultivated as much as corn—especially when young.

The Baldwin apple—a valuable sort—is a little tender, especially when on low lands, but on high land it succeeds well. This fact has been proved in several localities and instances. An apple that shall take the place of the Baldwin in other qualities and be hardy, is much needed, but has not been found. The Baldwin is an excellent apple for transportation, as it does not bruise easily.

The apples in this State are more solid than those grown in New Jersey, and bear shipping and transportation better. This is an advantage States in a southern latitude do not possess. Many apples are shipped annually from Portland to the West Indies. This year apples from Nova Scotia have been brought into this State in considerable quantities.

He believed the soil along the seaboard was not adapted to apple trees; they did not succeed as in the interior of the State. Considered the Baldwin the best apple for profit—next the Rhode Island Greening. The latter has a reputation, and will always sell. Thought Maine as well adapted to pears as Massachusetts. Can give no satisfactory reason for causes of failure of the past two years. Cannot believe that the prevailing cold east winds in spring cause the failure of the fruit crop, for we have such winds every year, and fruit is made to grow in just such winds. Alluding to the severe seasons of 1856 and '57, he said that in February we had weather such as is usual in April or May; the trees started into growth, and the severe cold following killed the newly formed alburnum, and in spring the starting of the trees peeled off the bark and the trees were killed. These severe seasons had not damped his courage in the culture of fruit trees, for the same might not happen again for one hundred years.

Rev. Mr. Dike, of Bath, remarked that he resided on the sea shore. In his vicinity fruit culture is diminishing. He had, in his orchard of old trees, tried various modes of culture. The subsoil is a stiff clay, and he had underdrained with a view of improving the character of the orchard. The drains were run close by rows of trees, and with most satisfactory results. He believed we could raise pears successfully in Maine, and had found on the stiff soil in his locality underdraining necessary to success. The same was true in regard to cherries.

As a good eating apple, he would put many kinds before the Baldwin, although he agreed with the remark of Mr. Perley as to its market qualities.

Mr. Prince made some remarks, giving an account of his experience in orcharding, and believed that it can be made the most remunerative branch of farming in Maine, but it must be attended to, and great care must be exercised over the trees to keep them healthy and guard them from the borer, &c. Had succeeded well with the Bartlett pear, which had proved sufficiently hardy Thought it would be a good plan for agricultural societies to encourage the planting of nurseries. In regard to planting trees, preferred to set in fall instead of spring. Sets his apple trees thirty feet apart.

Mr. Hills, of Northport, stated that in setting out a new orchard, he first drained his land, and the trees nearest the drains are the healthiest and bear the best of any in the orchard. Cultivates pears as easily as apples, and the trees are healthier. Soil loamy, with stiff clay subsoil. Has been very little troubled with the borer. Grows several varieties of pears. The Madaleine succeeds well, and grows and bears well. In his locality trees with the same care will do as well as in any part of the State. Uses rockweed for a mulch with excellent results. Trees thus mulched were not infested with caterpillars as were those not having the rockweed about them. It is also a preventive against the borer. Thought the Flemish Beauty one of the best pears grown, and had sold his for $5 per bushel the past summer.

Mr. Bigelow remarked that in his section of Somerset county the apple trees were as bare in June last as they are in December, on account of the ravages of the caterpillars. Acres and acres of forest growth were also completely stripped of their foliage. If some sure remedy for this pest could be found out, it would be of untold benefit to the State.

Mr. French stated that he had a tree bearing apples called the "Grindstone," (which originated in South Hadley, Mass.,) growing by the side of a Golden Russet tree. The branches of the former extended into the Russet, and on one twig of the Russet were three apples, two of which were Russets, the other being to all appearance a "Grindstone." Specimens of these apples were exhibited, and gave evidence of a curious freak of nature in the production of fruit.

Another evening was devoted to the question, "What is the preferable season of the year for preparing land and manuring for hoed crops?"

Several gentlemen were heard with interest in detailing facts of their experience, going to show that autumn presented greater advantages for this purpose than the farmers of Maine had been accustomed to avail themselves of. Phinehas Barnes, Esq., of Portland, spoke at considerable length. The views presented by him were the same as he urged upon the farmers of Cumberland in an unwritten address, at their exhibition the year previous. Kindly acceding to the request of the Board, he has consented to write out his remarks, and they may be looked for in subsequent pages of this volume—and are commended to careful perusal.

The final adjournment of the session was on January 30th.

ON THE CULTIVATION OF THE HOP.

As a general rule, the gains of agriculture are moderate and sure; but the rule is not without exceptions. The Hop is generally reputed to be one of the most uncertain of agricultural crops, in respect to the pecuniary returns which it yields. This uncertainty has been due mainly to two causes—first, the enemies which the plant has to encounter, and which reduce the yield; and secondly, to the excessive fluctuation in prices. The latter has been largely occasioned by the fact that no means have yet been successfully adopted on the large scale to retain the crop of abundant seasons for use in subsequent years of scarcity without serious loss of quality, and consequently of market value. There seems to be reason to believe that the difficulty may be overcome, as I shall presently have occasion to show, and that in future fluctuations in price may be less than heretofore.

The result of personal inquiry among the growers in Maine, has led to the belief that the crops during twenty to thirty years past have been much more uniform in this State than they have been reported to be in other sections; no serious hindrance to successful culture having been encountered except the aphis, or louse, which has been troublesome for a few years past. A very intelligent and skilful cultivator of hops for more than twenty years, Mr. Noah Jones of China, and who has made the hop the specialty of his farming operations, informed me that during his experience there had been but one season when it proved a failure, and that, as a whole, the culture was exceedingly satisfactory, the best paying branch of farming which he knew of.

The hop has never been grown very extensively in Maine, yet sufficiently, it would seem, to give tolerable data from which to judge of its adaptation to the climate and other conditions which prevail here, and of the success of the crop so far as it depends on these conditions.

According to the census returns of 1850, the amount grown in Maine was then 40,120 lbs., of which 31,417 lbs. were grown in Oxford county. In 1860 the crop is stated to be 102,987 lbs., of which 85,000 were grown in Oxford county, and 11,000 in

Franklin county. The total amount grown in the United States is reported to be 3,497,029 lbs. in 1850, and in 1860 10,991,996 lbs., of which New York produced 9,671,931 lbs., Vermont ranking next, 638,677, Wisconsin 135,587, New Hampshires 130,428, and Massachusetts 111,301 lbs.,—five States only raising more than Maine. The increase of production since 1860 is believed to be even more rapid than in any previous period, and the demand has more than kept pace with the production, the price being greatly enhanced, and appearing likely to continue at a high figure.

The German element in the population of the United States is a large and increasing one, and many of foreign birth deem their beer as needful as their bread, and not a few born among us tend to the same way of thinking. With the present and prospective demand for malt liquors, the probability of a corresponding demand for hops at highly remunerative prices seems very strong. Whether this large consumption of ale and beer consists with benefit to the individual consumers and to the public at large is not a point here in question. We are now simply considering its mercantile aspect, a question of demand and supply of an agricultural product. Those who conscienciously prefer to discourage the consumption of malt liquors will let beer drinking and hop growing alone. And the latter may also be let alone by those who are content with moderate and surer compensation for their labor in all seasons. Should the aphis and other hindrances become as serious here as they are reported elsewhere, the culture of the hop will be attended with some hazard, and, on the whole, it is rather to those who, living by husbandry and possessing natural advantages for its prosecution, are impatient of the slow gains of its more common branches, and envious of the occasional success of speculators, are willing to put something at risk for large possible gains, that hop culture is specially commended. The risk assumed is much in the nature of an insurance upon the weather, and more against the depredations of enemies; and it may result in a return of somewhere, and almost anywhere, between fifty cents and five dollars per day for the labor expended; or from fifty to five hundred dollars per acre for the crop, and perhaps between even less and more.*

* Mr. M. A. Mason, of Bethel, showed me an acre *in its first year of bearing*, which was then being picked, (near the end of August,) from which he confidently expected to obtain, at least, a ton of choice quality, worth at present rates something over a thousand dollars.

The successful prosecution of hop culture is not to be expected without the investment of a considerably larger amount of capital per acre than Maine farmers are generally accustomed to employ, and the needful outlay for hop house, kiln, press, &c., renders it expedient that the area under cultivation should be of corresponding extent. Less than three or four acres would rarely pay well enough, and if more than double that surface were cultivated, there might be difficulty, in many of our towns, to secure the necessary labor in picking, curing, &c. On the whole, we would not recommend any to begin with more than three or four acres at the outset, to be enlarged as results may warrant; nor without capital enough to carry it on easily and well, and also to bear the loss of one crop without serious embarrassment.

To an inconsiderable extent the hop is used medicinally, but the plant would not be grown as a field crop except for the properties it possesses as an important agent in the brewing of ale, beer or porter, which it tends to preserve, and to which it imparts a peculiar flavor. When first largely used for this purpose in Great Britain, a strong prejudice was raised against it, and Parliament was petitioned to enact laws against its employment, because, as was alleged, it was "a wicked weed that would spoil the taste of the drink and endanger the people."

The parts of the hop which enter into the composition of the beer are the seeds and the lupulin, or the yellow glutinous matter which attaches near the seed. The latter is the most important and active portion, possessing an intensely bitter taste, and a peculiar, agreeable aromatic odor.

It is because its aroma is so volatile that it is necessary to pack closely as soon as the hops are dried; and with the utmost care the aroma nearly all escapes by the time another crop is grown, so that the value of hops a year old is trifling compared with new ones, which last are indispensable for the finer qualities of malt liquors. Numerous attempts have been made to prepare a concentrated extract from fresh hops, which could be kept long without deterioration, so that the product of plentiful years could be made available in seasons when the crop was small, but such attempts were generally entire failures.

A few years ago, Prof. S. R. Percy, of New York, experimented upon the subject, and I have by me now a specimen of a lot which I saw him make from the crop of 1863, which has been kept now for more than two years in my office with no apparent injury or

deterioration of flavor. Should this or any similar attempt prove successful, as now seems very probable, it would go far towards preventing the excessive fluctuations in prices which have hitherto prevailed.*

The *humulus lupulus* or common hop, is a coarse, twining plant, with rough, angular and hollow stems; the leaves rough, heart-shaped, lobed and serrated. The male and female flowers are distinct and grow on separate plants. The male flowers grow in loose branching panicles, the female flowers are close together in scaly cones, or, in what are called grape hops, in clusters. When grown from seed, a large proportion of the plants are males. This, however, is only done to procure new varieties, and a very small proportion of such would probably be worth cultivation, as they vary as much from the parents as apples, and the seedlings are mostly quite inferior. Male plants are useful to impregnate the flowers and secure greater fertility, but for this purpose one in twenty or even fifty is quite sufficient.

Soil.—Hops naturally prefer a rich, strong loam. As a general rule, such soil as Indian corn succeeds well upon will grow good hops, though probably one rather stiffer would yield a larger quantity. The extent to which hops exhaust the soil is a disputed point. Most foreign writers call it a highly exhausting crop, as perhaps may be indicated by the name *lupulus*, signifying a little wolf. Growers in the United States generally do not so consider it. Mr. Colman, in one of his reports on the agriculture of Massachusetts, after an examination of the subject and consultation with many growers, says, "the crop exhausts the soil less than almost any crop grown." How this can be is not clear, unless, like the Jerusalem artichoke, it possesses the power to procure its mineral constituents from mere soil without much aid from manure.

According to careful analysis by Prof. Way of a specimen of hops procured from a field bearing a very large crop, (2240 lbs. to the acre,) there were removed from one acre of the field, of potash 54 lbs. in the hops, 57 lbs. in the leaves, and 23 lbs. in the bines; and of phosphoric acid 30 lbs. in the hops, 40 lbs. in the leaves, and 15 lbs. in the bine. Whatever may be the exact truth on this matter, two points are universally conceded; first, that the hop requires and will pay for liberal manuring, and

* It is said that a concentrated extract of malt and hops is successfully manufactured on a large scale at Rochester, New York.

second, that after successive croppings for a term of years with hops, the land having been well treated, good crops of grain, hay, &c., can be obtained for another term of years with little or no additional manure. To keep a hop garden in productive and profitable condition, an annual or semi-annual application of manure should be made. A few shovels of good compost to each hill, applied in the fall, serve the double purpose of fertilization and of protection to the roots. Various substances are used for top-dressing, which are usually applied early in spring. The best of these are wood ashes, bone dust and superphosphate of lime; and it is recommended by the most successful growers that these be used alternately, that is to say, that one of them be applied one year, and one of the others in each of the two succeeding years.

No definite term of years can be given as the best during which to continue the cultivation of the hop on the same land. This depends much on its original degree of fertility in both soil and subsoil, also on the degree in which it is exposed to damage in the roots in winter, by lack of covering with snow or other causes. In practice I have generally found the term considerably shorter in Maine than in other States, although in one instance a field was pointed out which had been in continuous cultivation for about thirty years, and cases are not unusual of half that time.

When grown in a congenial soil and well cared for, the durability of the plant is very great. In some cases they have flourished for upwards of a hundred years, and it is asserted that in Mr. Paine's celebrated "Heart Gardens" they have been continuously grown ever since the culture of the hop was introduced into England—say three hundred years or more.

Forming of Plantations.—The site of the hop field having been decided upon with reference to character of soil, security against high winds, and other desirable conditions, the land is to be prepared very much as for Indian corn, except that it needs to be more heavily manured than are most of our corn fields, and it should be not only plowed but subsoiled. If not dry enough naturally, underdraining is very important. The manure should be spread and well incorporated *near the surface*, deep manuring being profitable. The distance between the hills may be seven or eight feet; the first giving, if in squares, 889 hills to the acre, or, if planted in triangles, 1025 hills. At eight feet apart, and in squares, we have 680 hills per acre. It is usual, and in fact almost universal practice, to plant cuttings of roots, two to five to

each hill. Two plants only are required to form the hill, and if the cuttings are good and carefully planted, and the season favorable, only two pieces of root need to be used, but often three, four or five are planted. A surer method, and one considerably practised in England, is to plant what are called "bedded sets," that is, to have the cuttings grown one year in a nursery upon good soil before permanent planting in the hop field. Two of these "sets" only are used, and failures even in dry seasons are very rare. The first season of planting, Indian corn, potatoes or other hoed crops may also be planted on the ground in the vacant spaces, as the hops need to occupy not more than a quarter or third of the land.

In the spring of the second year the poles are set, and from this time no other crop nor weeds should be grown with it.

Two poles generally go to each hill, and two of the strongest and thriftiest bines to each pole. These when about two feet high are secured by some slight fastening.

The furnishing and replenishing of hop fields with poles is a considerable item in the expense of cultivation. In this regard, however, the grower in Maine has a marked advantage over the one in England or in New York. Their length should be from sixteen to twenty-two feet—depending on the richness and strength of the soil, and the natural degree of vigor of the variety which is grown. Cedar, larch, (often called hacmetac,) and spruce are preferred, and with care will last eight or ten years. Elasticity in a hop pole is a quality much preferable to stiffness. They should be set firmly in the grounds so as to resist the winds. These being injurious to the plant in other ways than by blowing down poles, it is highly important, other things being equal, to select a locality well sheltered by some natural provision, as by hills or forest growth.

Latterly, a horizontal method of training has obtained in some sections, for which it is understood a patent is claimed, and is by some highly commended. F. W. Collins, of Rochester, N. Y., (whether interested in the patent claim or not I do not know,) in a recent communication to the Farmers Club connected with the American Institute, speaks of it as follows:

"The roots should be set eight feet apart each way. A free exposure to the sun and air is as necessary to the hop vine as to the grape. The common plan of training a mass of hops up a 20 to 30 foot pole is as detrimental to the perfect development of the

fruit as would be the same method with the grape vine. The fruit-bearing arms, few of which are thrown out less than seven feet from the ground, need to hang freely in the air to do well. In the horizontal method of training hops four vines are allowed to run up a stake seven feet in height, when they are separated and trained upon twines stretched across the yard in both directions, by which means the fruit-bearing arms, hanging freely from the twines, receive all the light, heat and air requisite to ripen the fruit and prepare it for harvest several days earlier than hops grown by their side upon long poles. The twine used may be that known as wool twine or broom-makers' twine, either flax or hemp. The best way is for each hop-grower to raise a bed of flax and hire his twine spun. A man or boy upon horseback, with a basket of twine fastened to a belt, should put the twine upon the stakes. Fastening it securely to the strong outside stake, he should ride along the row, winding it once around each stake, at the top, to the end of the row, where it is again secured. The same process is repeated for each row in both directions, and thus a network of twine is spread over the yard seven feet above the ground. Occasionally the hop-grower should ride through the yard and place the vines upon the strings. Standing with his back to the stake he should place the vine over the string with his right hand, and receive it underneath with his left—to let it grow with the sun, and it will show no tendency to leave the twine.

The stakes may be either small round, split, or sawed, except the outside rows, which should be as strong as ordinary hop poles. They should be cut eight feet in length, and set one foot in the ground. The outside rows of stakes in each direction should be placed one row outside of the outer row of hop plants; this will prevent any crowding in the outer rows of the yard, and add much to the neatness of its appearance. Indeed, I do not know of anything more beautiful in the line of agriculture, than a hop yard trained as thoroughly as it should be in this manner. That it is the most profitable crop a farmer can raise does not prevent its also being the most attractive to an artistic eye.

The saving in the expense of training a yard in this manner is worthy of note. By the old method two poles, from 15 to 30 feet in length, were necessary to each hill; by the horizontal method, one stake eight feet in length, with 17 feet of twine, is all that is required. Seven hundred stakes, eight feet in length, take the place of 1400 expensive hop poles. Prices vary in different portions of the country, and yet the relative prices remain the same.

In picking hops the universal practice has been to cut off the vine, raise the pole, and carry it with the vines to the box, leaving the roots to bleed freely. By this means the roots are all greatly weakened, and the stronger and most vigorous plants, if they survive the trial, prove the weakest plants the ensuing season.

Canada thistles would scarcely survive the treatment in this respect, which has most thoughtlessly been practiced upon hop vines. By using stakes and twine the necessity for cutting off the vine at the root is obviated. The box-tender, by the aid of a stool, if necessary, can reach every arm and cut it from the vine without injuring the vine that is left, and this secures a strong, vigorous plant for another year."

ENEMIES.—In other sections the hop is liable to injury from a variety of causes, which are either unknown here or operate to so small extent as scarcely to affect results. As before remarked the only serious obstacle thus far encountered by growers in Maine is from the ravages of the hop louse, so called. It is not properly a louse at all, but an aphis—one of a numerous family to which many plants are subject—a little green, semi-transparent insect, the females wingless and the males winged. They operate by sucking the juices of the plant. They are formidable from their numbers. Being endowed with most marvellous fecundity they increase with unparalleled rapidity—each female producing a dozen or twenty daily, and these in turn very soon issuing progeny with like dispatch. If no hindrance to their increase occurs, loss of vitality rapidly ensues, and a blight to vine and leaves and prospect of crop is the result. Fortunately it has natural enemies which oftentimes hold it in check, and sometimes cause its sudden and mysterious disappearance. Another insect, the lady bug, or lady bird, is most efficient in this work; and sometimes their entire disappearance follows some peculiar condition of the atmosphere, the nature or causes of which are very imperfectly or not at all understood, and are not under our control. As for remedial measures, so far as I can learn, the same which are effective with the aphides which trouble other plants are equally so with these. Every gardener knows that the aphis cannot abide tobacco either in smoke or in decoction, and also that a solution of Whale Oil Soap* very quickly destroys them.

* The Whale Oil Soap here referred to is not a soap made from whale oil and for this use, but it is a side product of the purification of crude whale oil. This last is treated

I would recommend the keeping of a sharp outlook for the aphis and on its first appearance, the application by means of a syringe, of a decoction of tobacco, in which is also dissolved a portion of whale oil soap, prepared somewhat as follows:—Take of coarse cheap tobacco, one pound, and steep it in two gallons of boiling water until its strength is extracted, and then add a pound of whale oil soap; when this is thoroughly dissolved add five gallons of water—perhaps it might prove strong enough if eight gallons were added. In many places, refuse stems might be procured of the tobacconists very cheap, which would answer equally well by using double or treble the quantity. The application should be repeated until they disappear—because if all the living ones are killed to-day there may be a new crop hatched out to-morrow or next day. The trouble is not so much to kill or destroy a few thousands or scores of thousands as to reach the whole number.

Some very good cultivators think it quite as well not to attempt any remedial measures whatever, but to let them alone and take the chance of some providential interposition in their behalf, or of the loss of the crop.

In order to give the views of some of the best hop-growers as recently expressed on various points connected with their cultivation, I subjoin herewith an essay by John P. Smith of Worcester, England, which received the prize offered by the Royal Agricultural Society, and was recently published in their Journal:

"The hop thrives best in moderately warm climates, and this may account for Kent and Sussex, two of the most southerly counties, being selected for its cultivation, and producing a very large proportion of the annual yield of the kingdom. Worcester and Hereford stand next in importance, and yield about one-eleventh of the yearly average growth. Farnham and its neighborhood stand next as to quantity. The district known as the North Clays, in Nottinghamshire, formerly grew a fair quantity of good hops, but of late years the plantations have been much re-

with alkali which combines with matters which it is needful to extract in order to render the oil fit for the common uses to which it is put. It also combines with a portion of the oil, and the product—sometimes light colored and tolerably clean and sometimes dark, rank and offensive is what is sold at agricultural warehouses, mostly for horticultural uses, as Whale Oil Soap, and is the most reliable application known for the riddance of numerous insects injurious to vegetation. One pound is enough to dissolve in from three to five gallons of water, according to the strength of the soap and to the toughness of the insect enemy and his powers of resistance.

duced; the same remark applies to the district around Stow Market in Suffolk, and also to the county of Essex.

A southeastern aspect affords, in my opinion, the best situation for a hop-garden, and if it be well protected from the west winds that prevail during the autumn, so much the better, as great mischief is often done by wind. Due care must be taken to adapt the planting to the peculiarities of the soil. The Golding hop will be found to succeed best on dry friable soil, with a gravelly or rocky subsoil, such as we find in the hilly districts of Middle and East Kent, whilst Mathon White, and Grapes, prefer a stronger soil, approaching to clay; the former variety flourishes on the deep land in the vale of the Teme, and the latter in the Weald of Kent and Sussex, which is mostly strong clay soil. Another variety, Cooper's White, a good sort, but delicate, is best suited for good, strong *loam*. There are besides several kinds of red hops that are not approved by the brewer, and, in my opinion, cannot too soon become extinct; they are mostly grown on the poor lands of Herefordshire. Many other kinds are grown in Kent and Sussex, viz., Golden Tips, Pheasants, Golden Grapes, White Bines, Grapes, Jones's, &c., and a sort introduced some few years since by Mr. Colegate, and known by his name. This is a hardy variety and heavy cropper, but subject to blight, and repudiated by the brewer as a rank bad hop, yielding a most unpleasant flavor to the beer. A young planter should avoid this variety if he wishes to obtain a good character for his growth.*

We will now assume that a suitable field—one that has been thoroughly drained—has been selected, and the preference given to an old piece of turf; in that case I would recommend that the land be trenched two spits deep, the top spit being kept uppermost, with the turf downwards. When the digging is finished, the surface should be harrowed, and rolled down as fine and level as possible, ready for setting out. The planter must next determine on the arrangement of the rows, whether on the angle or the square, and the distance from plant to plant. The usual method

* Let me here give a caution against relying too confidently upon what may be said of the comparative merits of varieties when grown elsewhere. It is true that but little proof has yet been had, in this State, of the various esteemed sorts grown in England, and much more is needed; but what there has been shows that it is much safer and better to rely upon the results of experience here rather than upon reports from abroad. It is very desirable that all the most promising sorts should have a thorough trial here, but the *trial* should be on a *limited scale*, and continued until its merits or demerits are clearly established.—S. L. G.

in Worcestershire and Herefordshire is to lay out the rows 7 or 8 feet apart, and set the plants $2\frac{1}{2}$ to 3 feet distant in the rows. If your land be good, and likely to be highly farmed, a uniform distance of 7 *feet square* may be recommended; good cultivation will ensure a large quantity of bine, and a sufficient quantity of sun to bring the fruit to perfection, whilst at this distance you have more room to cultivate without injuring the bines.

If this plan is adopted, you must prepare 889 small sticks, a foot to 18 inches long, for every acre, that being the number of hills which an acre will take at 7 feet square. First square your field, and then commence in the centre, working right and left; you will thus be more likely to be correct than if you begin on one side.

Your field being truly set out, you may prepare for planting; if you plant bedded or yearling sets (which are far preferable to cuttings), a man should take a spade and remove the soil from two sides of the stick, the opening being 2 inches wide at the top, and 4 to 5 inches at the bottom, which should be deep enough to let the roots lie straight. Two strong-bedded roots are sufficient for a hill, but if not strong, 3 may be better. Care should be taken to bring the head of each root as close to the stick as possible, some good fine soil should then be put to the roots, and made firm with the foot. For a plantation of 20 acres, with suitable oasts and cooling rooms to dry and cool the crop in one month, for a first-class growth, the following varieties are recommended:—5 acres of Cooper's White, or 3 Coopers and 2 Jones's; 6 acres Mathons; 6 or 7 acres Goldings, and 2 or 3 Grapes; but this distribution of sorts must, in a measure, be governed by the quality of the land, that variety being most largely planted which is best suited to the soil. The crop ought to be secured in three weeks, or certainly not more than a month; and it is most important to have an early sort, such as Cooper's White, or Jones's, to commence with, then will follow your Mathons, then the Goldings, and lastly, the Grapes, a hardy sort, which will hang well for the last picking. Jones's are serviceable to use up old poles. The writer has seen a ton an acre on 7-feet poles. If, as is mostly the case in Sussex, one variety only be planted, you must begin to pick before your hops are ripe, or have a considerable proportion brown before you can finish.

If the planter should determine on a piece of old tillage, I recommend him to plough 10 inches, and subsoil as deep as he can; the

ploughing completed, he will proceed the same as if it had been a meadow, with this exception, that after the sticks are truly set, he should dig holes 2 feet in diameter, and 2 feet deep, placing the top or best soil on one side, and the bottom soil on the other side of the hole obliquely, so that the heaps may not interfere with replacing the sticks when the holes are refilled. Good dung or rather a rich compost should be wheeled on, and a fork or shovelful mixed with the *best soil* after the hole has been half filled with good soil from the surface; this being finished, you must reädjust your sticks, and when your soil has had time to settle, you may proceed to plant in the manner before described. On no account bury your manure. Should the weather be favorable, and your roots get a start, they will require two poles to each hill 6 to 7 feet long, and if the season be good, a crop of 2 or 3 cwt. an acre may be grown; if cuttings are planted you lose a year.

Potatoes and mangold are frequently planted between the rows, and an ox-cabbage between each hill; this will, by many, be condemned, but much depends on the condition of the land and the disposition of the planter to make compensation to the soil for what has been taken out by the green crops by a dressing of manure, which must be applied in the winter and dug in. Turnips may be planted if the land admits of their being fed off; and this plan, if oil-cake or corn be given, will manure the land at a cheap rate, greatly to the benefit of the hops.

February and March are the months best suited for throwing down and cutting, the land being first ploughed or dug. If the plough is used, a slip from 12 to 15 inches wide is left. Your men will commence digging these slips, cleaning the hills, and cutting the roots; this finished, your poles must be spread, and your pile rows ploughed, dug, and cut the same as the rest.

In the course of a fortnight or three weeks the bines will begin to appear, when no time should be lost in pitching the poles, which should be set by line to ensure regularity: the poles for this season, if the roots are strong, may be from 10 to 12 feet. The next operation is tying, but the tyer should first go over and take out the rank hollow bines; these should, on no account, be put up the poles, since they have a tendency to grow to an extravagant quantity of bine, without bearing a proportionate quantity of fruit—the next and less vigorous bines will be found far more fruitful. Some planters put three bines up each pole; if four poles are put to a hill, which is the custom at 7 feet square, two

bines will be found sufficient; if three poles, put two twos and a three. The writer has often seen a heavy produce from a single bine. The tyers are paid by the acre, and go over the hills three or four times until the poles are furnished, when all superfluous bines and weeds are pulled out. This completes the tying, except by ladder, which is paid for extra. The men now follow, dig round the hills, and put a shovelful of soil into each hill—this prevents new bines from springing up.

Different varieties require different sized poles. On no account overpole, as much injury has resulted from it; 14-feet poles are long enough for any variety except Goldings, and for them I would not, as a rule, exceed 15 feet. Jones' will do well with 8 feet; Grapes 10 to 12; Coopers 12, and Mathons 12 to 14 feet, according to cultivation and quality of land. When your hops are tied, no time should be lost in working them with the nidget or scuffle, followed by the harrow—this should be done both ways. All working should be finished by the 1st of July, certainly by the 10th; considerable mischief is often done by working too late, unless in years of blight. When you have vermin on your bines, do nothing to your land—leave them until the vermin disappears—then go in with all your strength, nidget both ways, and do all you can to put fresh vigor into the plant. Some planters manure in the winter, and some both winter and summer; but this may be carried too far for quality, and produce mould. The plan adopted in summer is to wheel in good dung or compost, take the soil from round the hills, put in the manure, and dig it in; or spread the compost (which I prefer) round the hills on the surface and dig in. All that is necessary after is to use your nidget, and harrow both ways, taking care not to pull up the dung. This should complete the work, unless hoeing is required to keep down annuals.

Picking commences in early seasons from the 1st to the 8th of September; in late ones, from the 15th to the 20th. Before it begins, due provision should be made, and everything got in readiness; cokes may be sent for in July and August, and a sufficient number of pickers engaged to keep your kilns or oasts properly at work. In this you must be governed by the size of the hops. Different plans are adopted in picking and measuring; some measure by tally, others by book and cards representing the number of each crib or bin. I have found it best to put two cribs into the centre of 100 hills; this is called a "house," and the cribs re-

main until the work is finished. The poles will be in two heaps at either end of the cribs, and in the proper place for stripping and piling. If this is strictly carried out, much trouble is saved in piling the poles. When a sufficient number of sacks are picked to load one kiln (and this should be done before breakfast), they should be taken and put on the oast, and so on until all your kilns or oasts are loaded; and it should be so managed that hops enough be picked to reload the kilns at night.

Hop-drying requires great attention, and the *slower*, in reason, they are dried, the better. They should be dried by a current of hot air being continuously passed through them, and not by combustion. Many say they can dry hops in seven or eight hours; rely on it, it is better to take twelve, and let your heat not exceed 112 to 115 degrees. When the hops are sufficiently dried, the fire should be raked or allowed to go down, the hops remaining on the kiln until they become soft, which will prevent their breaking on being removed to the cooling-room. These hops will be fit to be bagged the next day, and with a proper staff this should be carried out through the picking.

Poles are a heavy item in the cost of hop-cultivation, and should be carefully husbanded. Their wearing value may be *doubled* by pickling 2½ feet at the sharpened end with creosote. A tank for the purpose must be erected of size in proportion to the plantation. By the application of creosote, soft wood, such as that of the willow, &c., becomes hardened, and equal to ash or other more durable sorts.

The writer has a plantation of 75 acres, and a tank 12 feet long by 5 wide, and 3½ feet deep. This tank will hold 1000 best poles put to stand up. The tank must be filled with creosote within 8 inches of the top when the poles are in, when water fully 2 inches deep must be added to prevent evaporation. The tank should boil slowly twenty-four hours, when the poles may be removed and the tank refilled. Care must be taken that the tank does not boil over, as creosote is most inflammable and may take fire. I am so satisfied as to the value of creosoting poles that I never intend to put a new pole into my ground without its aid. If poles were pickled one year under another, and stored in a stack till dry, they would be found to last far longer than if used in a green state.

The hop-plant has a variety of enemies; on the first appearance of the bine it is frequently attacked by a *flea*, which checks its growth, and makes it look scrubby and unhealthy, but never destroys the crop. Wireworms are a great pest; the best plan to

get rid of them is to cut a potato in half, and place it close on either side the root an inch below the surface; the potato lures the worm, and, if taken up every other morning for a fortnight, enables you to take a great quantity; I have known of a dozen being taken from one root. The greatest enemy is the *aphis*, and I regret to say that on the most important subject of its history we are as ignorant as our forefathers; we go to bed leaving our garden free, and next morning we find *aphides*—from one to ten or twenty—on a small leaf, which in the course of a week have increased to countless myriads. These pests are followed by nits and lice, which some seasons multiply so rapidly as to destroy the bine and the planter's prospects. I would here repeat the recommendation which I have already given to the planter, not to work his hops when in a state of blight. When closely watching the blights of 1860, '61, and '62, I have observed that in all cases where the land was best tilled, manured, and cared for, the blight remained until too late in the season for the chance of a crop; on the other hand, where nothing was done, but weeds were suffered to grow nearly half-way up the poles, the bine became yellow and clean, and the result was a fair sprinkling of hops; in such ground, the vermin had left the hop for want of sap and taken to the weeds.

Of late years a machine has been used to pack the hops, which is very useful when there is a very large crop, as it enables you to pack your hops much sooner. Treading up is preferable, if care be taken to have the hops in a fit state not to break under the foot; if allowed to become *too* cool they are hard and lumpy in the sample, and are termed *cold*. A master's attention to the state of his hops before bagging is most necessary to good management. Hops are picked in Worcestershire and Herefordshire far more free from leaves than in Kent or Sussex. They should be sent, if possible, to the oast without a leaf, dried slowly, taken off the kiln in a *soft, not* a brittle state, and trod into the pocket as soon as sufficiently cool; they do not then break under the foot. In Kent and Sussex hops are dried in a variety of ways, and with several kinds of fuel. In oasts on the Cockle principle anything may be used, and a considerable quantity of sulphur is required; but on the open fire principle Welsh coal and coke is used, and a small quantity of sulphur.

The cokes we get from Abberly and Pensax, in Worcestershire, are highly charged with sulphur, which will account for so little being added in these counties. Its only value is to give brilliancy

to the sample, and, if used in excess, brewers object to it as affecting the fermentation of their worts.

It has been the practice in Worcestershire and Herefordshire to make eight sacks out of one piece of cloth of 36 yards, and the weight of the pockets when filled run from 1 cwt. 1 qr. to 1 cwt. 2 qrs. It is my practice to make seven sacks from a piece, and I am thereby enabled to get 1 cwt. 2 qrs. to 1 cwt. 3 qrs. into a pocket, and I would respectfully recommend my brother planters to do the same. A heavy pocket has many advantages over a light one; you pay less for weighing, porterage, and warehouse rent, and you get your hops more quickly into consumption.

It was formerly the practice to roll, riddle, and otherwise break and spoil good hops; this silly practice is in a great measure exploded. Plant the best sorts, such as Coopers, Mathons, and Goldings, pick them clean, dry them properly, and put them into the pockets as whole as possible. By breaking the hop you lose a large quantity of the pollen, which contains *the most valuable brewing properties.*

The cost of hop cultivation per acre may be estimated as follows:—*

	£.	s.	d.
Yearly charge for poles,	5	0	0
Ploughing down,	0	10	0
Digging slips (or portion not ploughed,)	0	5	0
Cutting, picking up, and burying roots,	0	4	0
Spreading poles,	0	2	0
Pitching or setting poles,	0	12	0
Tying,	0	8	0
Nidgetting or scuffling 4 times,	1	0	0
Harrowing 4 times,	0	6	0
Forking round hills and hilling up,	0	5	0
Stripping and piling poles,	0	8	0
Resharpening broken poles,	0	3	0
Ploughing up before winter,	0	10	0
Manuring, if with dung, 20 loads per acre, at 8s.,	8	0	0
If manured in summer,	4	0	0
Ladder tying,	0	2	0
	£21	15	0
If you dig, instead of plough, 15s. per acre extra,	0	15	0
Total,	£22	10	0"

* In order to compare these prices with our present currency, let the pound sterling be reckoned at five dollars, (the shilling at twenty-five cents.) and then add to this the current premium on gold. The comparison will be suggestive of various and wide differences between culture in New England and old England.—S. L. G.

A recent anonymous writer in the New York Tribune furnishes an interesting paper on hop culture, from which we quote the following:

"The New England hop district has been much longer engaged in the cultivation of this crop than the New York. It was first enunciated among the crops of the United States in 1840, when the product of the entire country was 1,200,000 pounds. It had, however, been a market crop in New England as early as 1806, and perhaps earlier. In 1833, the product of that district was 1,136,134 pounds; in 1834, 1,174,599 pounds, and in 1836, 1,441,936 pounds. From this amount it fell off rapidly, and in 1839, the year of the census of 1840, only 452,225 pounds were raised. That district has never since regained its position in 1836, though its annual product now ranges from 600,000 to 1,000,000 pounds, about the product of some single towns in New York. In 1850, the culture had made some progress in New York, where it commenced about 1842, and 3,400,000 pounds were reported for the whole country. In 1860 it had risen to 11,000,000 pounds, and in 1862 to 16,000,000 pounds. Since that time it has fallen off, being 13,000,000 pounds in 1863, and not much over 9,000,000 pounds in 1864. In 1865 it was probably still less in quantity, though somewhat better in quality. The crop of 1866 promises to rival that of 1862, the area devoted to the crop being greatly increased, though the yield per acre may be somewhat less. The fluctuations in the quantity produced, as well as the equally remarkable variations in quality, are caused by the weather, by injuries from insects, by blights, and mildew. The crop is subject to much greater fluctuations in Great Britain, than here. From 38,000 to 52,000 acres are devoted to hops in England, about half the amount being in the county of Kent, and the yield per acre ranged within 30 years from 120 to 1,465 pounds, the yield varying sometimes in successive years over 1,100 pounds to the acre. The years 1861, 1862, and 1863, which were good years here, were years of very small crops there, and the import into Great Britain in each of those years was about equal to the entire American crop.

Having thus given some of the statistics of the hop crop in the aggregate, let us suppose that some enterprising young farmer is desirous of trying his luck in the culture of the plant, and asks our advice as to the steps he shall take. Our first inquiry would be as to his means, for some capital is required for this business.

A man with less than $1000 had better not undertake it, and he will manage it much more profitably if he has $5000 or $6000. If possessed of the latter amount, the first step will be to select his place for a hop-yard. Hops will grow on good ground anywhere, but there are several advantages in selecting a place where there are other hop-growers near by; a better market, greater facility in procuring what is needful for the cultivation of the crop, and experienced tyers, grubbers and pickers, are among these. New land is better than old, and a light loam, easily drained, than a tenacious clay. The young hop-grower should be cautious in regard to buying too much land. A half-dozen acres, whether it cost much or little, will be sufficient for his first hop-yard, unless he possesses a large capital. He can cultivate more subsequently if he desires. He will need a few acres beside for his house, barn, hop-house, garden, and pasture. Let us see, now, what his outlay must be. We will suppose the place he has selected is in a farming region, somewhere in the New York hop district, at a distance of two or three miles from any considerable village. He purchases, we will say, 25 acres, including a small, but comfortable house, and a good barn, for $2000. His land is in fair condition, and he selects a plot of six acres, which has been a sheep pasture, for the hop yard. Plowing this twice, (and he must have a pair of horses worth in the neighborhood of $350 for this and other purposes,) he works in from 40 to 50 loads of barnyard or stable manure to the acre. The land must be rich, and barnyard manure is, perhaps, with the addition of lime or plaster of paris, the best dressing he can give it. Here will be a further outlay of at least $300, as, buying his farm, he has no manure accumulated. His next work is to lay out his hop-yard. The roots should be set seven feet apart, each way; at least this is the general rule, though some hop growers set them at 6 feet, 6½ feet, 7½ feet, or 8 feet. The "rough roots," as they are called, required for setting, he can procure from some neighboring hop grower, at from 50c. to $2 the bushel, and he will require about five bushels to the acre, or to be exact, if his hills are seven feet apart, 888 plants; the cost for roots being thus from $15 to $60 for the yard. It will be well, however, to procure some excess over the exact amount, as there will be gaps to be filled. Of the prevalent varieties, he will do better to select the Cluster, as it is less liable to disease than the Grape, though perhaps not quite so rich in lupuline. As he will get no return from his hop roots the first season, he will do

well to plant corn, not only in the hills with the roots, but in the intermediate spaces, making 3552 hills of corn to the acre. With a favorable season, his crop of corn will prove a most decided help to his finances.

As the hop plants come up, they will require supports, for the hop is a rapid climber. Some put up small cheap poles the first year, and set their permanent ones the second year, but this is generally regarded as a needless expense. The hop poles, however, are a very serious item of expense in New England and New York. The Grape and Cluster hops are both strong and heavy vines, and require poles from 16 to 20 feet in height, and $2\frac{1}{2}$ to 3 inches through the butt. The New York hop growers prefer cedar, as being more durable. They are worth, in most parts of that district, about 15 cents each, when sharpened and ready for setting. As two are required to each hill, he will require 1776 to the acre, and his poles for six acres will cost about $1600. These poles will last, however, without renewal, not far from 15 years.

Some hop growers reduce the first outlay, materially, by purchasing but half the number of poles, and setting to the hills of every other row a stout stick about four feet in height, and using twine to connect these short stakes together, and to stretch from them to the top of the taller poles on each side. This has the advantage of exposing the hop vines more fully to the sun, and perhaps increases the yield somewhat, but the cost of the twine, which must be renewed every year, and the trouble and expense of the tying, makes the ultimate outlay about the same as the supplying of poles for each hill. On the continent of Europe another plan is adopted, which is perhaps less expensive, but we doubt if it would answer as well for our vigorous and rapid climbing varieties. Along each alternate row a post, say three and a half inches in diameter and five feet high, with the bark on, and both ends dipped in a preparation of creosote, is set to each hill. A stout iron wire is run along the top of these, fastened to each by a small staple. The alternate rows are provided with small stakes, rising not more than a foot above the ground, from which strings run to the iron wire for each vine. These are much simpler and more easily replaced than those already described, but hardly afford sufficient room for the vines.

If poles are used exclusively, the second year they will require tying together at the top, and many hop growers connect adjacent hills together. Early in the season, too, a careful search for grubs

is necessary, and this can hardly be done in season by the hop grower and his single man of all work; usually he must secure the services of several men, boys, or girls, in this search. It is indispensable that the hop-yard should be kept free from weeds; and as in our dry climate it is better to plant flat than in hills, the careful use of the cultivator two or three times in the season, with a little help from the hoe, will generally suffice for this purpose.

At some time between the first setting of the hop plants and the season of picking, in the ensuing year, our young hop grower must erect his hop house and kiln. For his little yard one kiln will answer, though two would be better The kiln should be of stone except its pointed top; below it should have a furnace, and hot and cold air chambers; above these, at a height of from 12 to 16 feet, should be the drying floor, circular, about 18 feet in diameter, floored with slats an inch and a half wide, and the same distance apart, and these covered either with hemp matting or a galvanized wire cloth. The pointed top should be crowned with a swinging ventilator, which will permit a free passage of air in whatever direction the wind may be. On a level with the drying-room, is a cooling room, fully ventilated, where the hops may be laid to cool and lose their excessive bitterness, and from this they are passed to the room below, where they are pressed and baled. The cooling and packing rooms can be a wooden building. The expense of the kiln and hop house, if only a single kiln is put up, will be about $2000.

At the close of the second summer, our young friend comes to his first experience of hop picking. This, in the hop growing districts, is the gala time of the year, the epoch from which everything dates, and to which housekeepers and housemaids alike look forward, the one with anxiety, the other with the most joyous anticipations. All that Christmas and hiring time were to the Southern housekeeper, and more, is hop picking to the Northern matron in the hop district. It is the universal hegira of the maids of the kitchen; no wages can induce Bridget or Mary to do housework during the three or four weeks when their services are in demand by the hop growers If nimble-fingered and active, they can earn $2 or $2 50, aside from their board, daily, and their employers feed them well; then the change in their work, and the assurance of having "a good time generally" with their associates, adds to the pleasure. Hop picking is, nevertheless, hard and fatiguing work. The pickers begin at or before sunrise, and,

with a half hour's nooning, work as long as they can see. The hops are commonly picked in large boxes, containing from 24 to 40 bushels. These boxes are divided both by a longitudinal and transverse partition of thin lath, into four compartments holding from six to ten bushels each. They are raised a little from the ground, and have handles at the ends to facilitate their removal from place to place. One man and four women, girls, or sometimes boys, are assigned to each box. The man is called the box-tender, and it is his business to supply the boxes with poles, which he raises from the ground as needed, cutting the vines about a foot high, to see that the picking is properly done, to remove the poles after they are picked, strip them of the vines, and stack them securely. Occasionally, an active box-tender can serve two or even three boxes. The pickers deposit the hops each in their own division of the box, and are required to put in no leaves or stones, or blasted and immature hops. The boxes should be emptied at least once a day, and no hops allowed to remain in them over night. A swift and skilful picker will pick 30 bushels, or even 40, in a day. The price was formerly only from 15 to 25 cents per box or compartment of eight bushels (beside board); the present season it is 50 cents.

The boxes, as fast as filled. are carried to the kiln, which should not be too distant; usually it is necessary to keep the fires up in the kiln night and day. The morning's picking is put upon the kiln floor at noon, being spread evenly to a depth of eight to twelve inches, and the temperature regulated to the proper degree of heat, which may be at first quite high, and the steam and water of evaporation from the hops must be allowed free egress through the swinging ventilator at the top. Some hop growers have a tube which carries the hot air above the hops, and then throws it over the surface. Cool air should be admitted from below, to mingle with the hot air and force it more rapidly through them. If the hops are rusty or discolored from any cause, it is usual to burn a little sulphur under them as soon as they are well warmed through, in order to bleach them partially and bring them to a uniform appearance. Some turn the hops in the kiln in order to insure their more thorough drying; others regard this as injurious, as tending to break up the hops, which are very brittle at this time, and render them less marketable. In a properly constructed and regulated kiln there is little danger that any portion will be imperfectly dried. Ten or twelve hours are required to dry a kiln.

The picking of the afternoon is usually put on about midnight. When the drying is completed the hops are carefully raked out upon the floor to cool, and, by free ventilation, to acquire sufficient toughness and coherence to prevent their crumbling in packing. After lying for one or two days in the cooling room they are shoveled down a wooden tube or hopper to the packing room

When the hops are in a proper condition for baling they are thrown into a box, lined with bagging, which forms the lower portion of the hop press, and trodden or beaten down till the box is filled; another piece of bagging is then put over the hops and the press, which, in some cases, causes an iron follower to descend, and in others, forces up the bottom of the box, reducing them to a compact bulk, and the sides and ends of the bale having been sewed (a part of the sides and ends of the box being movable), the pressure is taken off and the bale tumbled out, marked, and it is then ready to send to the warehouse. The bales usually weigh about 200 pounds. The hop presses most in use in New York are Gifford's, Harris's, and Atwell's, all manufactured at Waterville, Oneida county. The last named is a new press, easily worked and much liked. The Harris Press has also a high reputation. American hops are not pressed so solid as the English or Continental hops, the growers believing that the packages, though somewhat more bulky, retain the aroma and volatile oils better than the compact bales of foreign markets.

Up to this point, it has been a constant succession of expenditures for our young hop grower, except what he may have been able to realize from his corn crop and from the residue of his farm; but he has now arrived at a point where he commences to realize the profits of his outlay, though he will not receive the full benefit of them before the third year. Let us now see how the account stands. The purchase of the farm is in the nature of a permanent investment, constantly increasing in value; we will not include that, therefore, in our estimate of the expenditure necessary for establishing a hop-yard, but will put down the interest on the cost of the six acres at 7 per cent per annum as a fair rental of the land. We have then on the debtor side:

Two years' interest on $480, at 7 per cent.,	$67 40
Pair of horses,	350 00
Manure, (including plaster of paris for second year's,)	350 00
Hop house and kiln,	2,000 00
Rough Roots,	40 00

Poles,	1,600 00
Tying, grubbing, and hoeing,	36 00
Picking,	250 00
Drying and baling,	50 00
Total,	$4,743 40

Of this sum the hop house and kiln are a permanent investment, and not an expenditure to be repeated often in the cultivation of the hop. The horses and the poles are also items which will not require to be renewed under ten or fifteen years. On the credit side we have:

Increased value of the land comprised in the hop yard,	$150
Value of corn crop, first year, 75 bushels to the acre, at $1 per bushel,	450
Hop crop, second year, 1,200 lbs. to the acre, 7,200 lbs., at 50 cents,	3,600
Total,	$4,200

For the next year there will be only a small outlay for manure, the vines being burned in the hop yard, and the ashes strewed around the hills, and the stable manure and some plaster of paris applied to the hills. The expenditure for tying, grubbing, hoeing, and picking, will be about the same, or perhaps a little more, than the previous year. Five hundred dollars will be ample allowance for all these items. If the season is favorable, and neither lice nor blight affect the hop, his third year's crop should be full 1400 pounds to the acre, and his receipts probably $4200. This would encourage him to enlarge his hop yard, since the cultivation of a few acres more will enhance his profit without greatly increasing his outlay. It is to be borne in mind that if hops of good quality can be grown, there is hardly a limit to their consumption at remunerative prices. The constantly increasing consumption of lager beer and of malt liquors in this country, and the demand for them in France, where they are to a great extent taking the place of the wines of the country, insures a market for all the hops which can be raised, without taking into the account the fluctuating demand from Great Britain, where in the best years, there are not enough grown for home consumption, and where, often, 15,000,000 or 16,000,000 pounds, or the entire American crop, are imported.

The Enemies of the Hop.—Were the hop crop a sure one, or liable to no more accidents than Indian corn, it would be so im-

mensely profitable that thousands would rush into it, and, if that were possible, the market would soon be glutted. But it is, in fact, a somewhat uncertain crop, though less so here than in Great Britain. In that country there is not on an average more than one really good crop in six years, and the average annual yield in any given series of years does not exceed 750 pounds to the acre. Here large crops occur on an average once in three or four years, and the average annual yield is, taking the disastrous years into the account, very little, if at all, below 1000 pounds to the acre, while in such years as 1862 it rises to 2800 pounds to the acre, or nearly double the best averages of the English hop yards.

The *weather*, which in England exerts so great an influence upon the crop, does not seem to affect it much here. A frost early in August would, indeed, produce serious injury, especially to the later varieties; but such an occasion, though, of course, possible, is very unfrequent. The present summer, especially since about the middle of July, has been remarkably wet and cool, yet the crop bids fair to be large and of fine quality.

The *aphis*, or *hop-louse*, is a more formidable source of injury to the hop. The aphides are among the worst enemies of our vegetation, destroying the foliage and fruit of the currant, raspberry, blackberry, and strawberry; infesting the potato, and producing mischief wherever they make their attacks. They have infested the hop for the past three years, blighting whole yards, and rendering their product worthless. They attack the hop in England, both early and late, and the vines, where the grounds are liberally manured, may recover from an early attack, a change of temperature or of the electrical condition of the air often proving fatal to the lice. Here, they usually appear only late in the season, and a hop which ripens by the 10th of August, or even as late as the 14th, would generally escape their attack altogether. When they once attack they multiply very rapidly, a single female *aphis* producing 15 or 20 young a day for two or three weeks, and these attaining maturity in a very short time. They feed upon the sap or juices of the vine, and speedily destroy the vitality of both the leaves and vine, causing them to turn dark brown, almost black. If the hop is fully formed, they speedily attack that also, and in a single day cause it to turn black, and exhale a most offensive odor. If the hop yard is kept rich in manure, the plant will be more vigorous and better able to resist the attack of this destructive insect.

The most efficient natural remedy against the ravages of the *aphis* is its enemy, the *ladybug*, or as it is called in England, the *ladybird*. This insect, which is usually abundant in the hop yards, kills the lice, each one destroying 30 or 40 a day, and if the weather is clear and the aphis has just commenced its destructive work, the ladybug will succeed in clearing the vines; but if the parent aphides have succeeded in depositing their young on the under side of the hop leaves during cloudy days, when the ladybug is inactive, they will have some time to carry on their ravages. The ladybug, however, is busy during this time in depositing its eggs also on the under side of the leaves, usually in clusters of about 20 each. These are soon hatched, and the progeny which creeps forth is the "black-nigger" or "serpent," as the hop pickers call them, a lizard-shaped, ferocious-looking little creature, which, as soon as hatched, pounces most voraciously upon the young lice, which are its peculiar food, and unless they are too abundant, clears the vines of them. Having gorged itself for some successive days with the aphides, the "serpent" attaches itself to the under side of the leaf, and after a short period of existence in the larva state, casts off its shell and becomes the perfect ladybug, when it again pursues its good work of destroying the aphis. The hop growers preserve, with great care, this useful little insect, regarding it, justly, as one of their most efficient friends.

In 1864, a hop grower of Otsego county, a Mr. Turney, satisfied himself that a fluid preparation which he had compounded would destroy the hop-lice and prevent their ravages, and during 1865 and the present season he has sold it largely. It is applied with a syringe, and is said to benefit the hop plant as well as destroy the aphis. He publishes numerous testimonials, from large hop-growers, of its efficacy. It has been tested to a considerable extent, and whether from this cause, or from the fact that the season has been unfavorable to their development, it is certain that they have effected very little injury to the crop the present season. Just as the time of picking commenced they appeared in considerable numbers in some yards, but were too late to injure the hops much, though they had sucked the juices from the bine pretty thoroughly.

The *mould* or *blight* is another of the parasitic enemies of the hop. It is properly a disease of the hop, and is probably a parasitic vegetable fungus usually generated in wet seasons and damp situ-

ations. It has never prevailed so universally in our American hop districts as the lice, but has affected yards planted in low grounds and those which had not a sufficiently free access to air and sunlight. To avoid any tendency to it, the plants should not be set nearer than seven feet apart, and if the ground is low or moist, the method of training the alternate rows on strings or wires and strings, will be found preferable to the exclusive use of poles, as it will favor the more free admission of sunlight and air.

When this blight appears to any considerable extent upon the hops as early as June or the beginning of July, however luxuriant the vines may then appear, there is no hope of a crop worth picking. It is at first noticeable on the upper side of the leaf as a white speck not larger than a small pin's head, the spot increasing in size till it attains a diameter of about an eighth of an inch; below this white spot, on the *under* side of the leaf, there is a corresponding indentation, which renders this incipient indication of mould unmistakable. From the spots on the surface of the leaf the seeds of this parasitical fungus are blown in all directions, and the minutest particle of this white dust, which settles on another leaf, in a few days becomes a speck of mould. Each new spot in turn propagates the disease, and thus we perceive this vegetable pestilence proceed with the fearful rapidity of geometrical progression until, if the season is damp, acre after acre is destroyed. The prudent hop grower will watch carefully his vines, and as the disease commences near the ground, will give special attention to the pulling off of the suckers, which sprout through the hills in the summer months, and to the destruction of every spotted leaf.

Marketing the Hops—has of late years become a distinct business. Formerly the hop growers consigned, or sometimes sold their hops to New York hop dealers, of whom some six or eight monopolized the business, and sold to the brewers here or exported them to England, as they deemed most advantageous. Now, in three or four of the larger villages of the New York hop district, as for instance at Waterville and Cooperstown, there are four or five firms, with ample capital, whose sole business is buying and selling hops. These firms have usually one or more partners who are thoroughly familiar with the qualities and value of the hops which are offered them, and who buy from the growers. Another partner gives his attention to the selling, visiting the breweries throughout the country, and presenting his samples. Most of these firms are in constant communication, directly or indirectly,

with the European hop dealers, and export hops to them, or import from them, as the condition of the market requires. The quotations of prices of hops in Kent and London are received almost daily by these houses during the hop season, and those of the Belgian and French markets weekly. The effect of this establishing of local markets for hops here has been, to improve the quality of the hops and the style of packing; and the analysis of the American hop having demonstrated its greater value for the brewer's purposes, it is gradually working its way into foreign markets as a high-priced hop. The hop grower profits, also, by the establishment of these local markets, in being able to obtain a better price for his crop. Formerly a very large share of the profits went into the pocket of the dealer, and the grower was at his mercy; now the profits are, as they should be, mostly with the grower. The prices of hops in the New York market, on the 1st of May, of each year, from 1855 to 1866, were as follows:

	Per Pound.		*Per Pound.*		*Per Pound.*		*Per Pound.*
1855,	19c.	1858,	8c.	1861,	16c.	1864,	28c.
1856,	9c.	1859,	13c.	1862,	15c.	1865,	35c.
1857,	10c.	1860,	10c.	1863,	20c.	1866,	65c.

It is not probable, that the price will, for many years to come, be as low as it was in 1857, 1858, and 1860. The cost of production is now about 13 cents per pound, and the demand is such that prices will, in all probability, range in the neighborhood of 50 cents per pound."

THE VALUE OF NIGHT SOIL.

"Gather up the fragments, that nothing be lost."

The possession of ample resources is never a warrant for waste. How well, then, does economy become those whose resources are limited by narrow bounds.

An indispensable requisite of successful farming in New England is a sufficient supply of manure. It matters little whence this is obtained, so long as it possesses the needful fertilizing properties.

The most fertilizing substance at the command of our farmers is, with few exceptions, utterly neglected, wasted, lost. This seems to be due, in varying measure, to two causes—ignorance and prejudice.

Such is not the case with hundreds of millions of people who till the ground for a livelihood, and whom we look upon as far beneath us in the scale of progress, enlightenment and civilization.

We depend chiefly upon our barn yards to furnish manure for our lands. Those millions have no cattle and no barn yards, and yet they annually apply manure enough to their land to insure good crops.

Their resource is equally at our command. They employ it. We ignore it.

I do not argue that because the Japanese and Chinese have accomplished the difficult task of maintaining for centuries together a high degree of productiveness, therefore we should imitate them in all things; live upon grains, without meat, reduce the size of our farms to three or four acres each, or copy divers other of their ways; but I may pertinently ask whether we may not learn a useful lesson from their successful practice. One important item in that practice is carefully and diligently to save every particle of human excrements and to fertilize their land therewith. It is their almost exclusive dependence for this purpose. With this practice a far greater number of persons are supplied with food from a given extent of surface than are fed

from a similar area in any other part of the world. The facts in their case show conclusively, that what may be saved from the food which supports a given number of persons will, if applied to the soil, more than reproduce the amount of food consumed.

My aim at this time is not so much to present an elaborate article upon the composition, properties and uses of night soil, as to call attention to the subject, and to suggest an easy and simple method whereby a great waste may be stopped, a valuable addition made to our means of fertilization, and at the same time, in many cases, an offensive, injurious domestic nuisance wholly obviated.

I suppose the efficacy of night soil as a fertilizer will be readily admitted, and that no need exists of presenting evidence on this point. It is generally understood that the value of excrementitious manures depends chiefly upon the character of the food consumed by the animal yielding it. Everybody knows that what is dropped by cattle fed on straw and bog hay is inferior to that from cattle fed upon good hay and grain. As no other animal is so well fed as man, the excrements of no other possesses so great fertilizing powers as his.

It is also true that no other is liable to such rapid loss of a large part of its manurial value. In warm weather it very quickly passes into decomposition, ammonia is evolved, and waste goes on with unexampled rapidity.

Whoever purchases the contents of vaults, as commonly managed, under the impression that they embrace the whole, or the half, or the quarter, of the fertilizing capabilities of what has gone into them, will, most likely, find himself egregiously mistaken.

To preserve from loss it is needful either that the night soil be immediately applied, which is practically out of the question, or else that it be mixed with some absorbent substance, which is easily done. For this purpose dry peat or muck is perhaps the best, and where easily available an abundant supply should always be at hand. A double advantage is obtained by its use, for besides the primary one of deodorizing the excrement, and preserving all its capabilities, the vegetable matter of the muck is itself converted into valuable and immediately available food for plants.

If peat or muck be not at hand, an equally effective substitute will be found in common dry earth or ordinary loam, and that which contains a fair proportion of clay should be preferred to what is mostly sand, for the reason that the absorptive power re-

sides in the clay, and were it not for the trouble of reducing stiff clay to a fine powder, this would be recommended instead of loam. The latter, however, usually answers well enough.

The method proposed is simply this :—First, to have in connection with every privy a sufficiently capacious reservoir of peat or loam, and to be sure that it is filled at a suitable season of the year with *fine dry* material.

Second, to arrange some simple contrivance whereby a proper quantity of this can be dropped, *daily*, upon the deposits left there ; and, lastly, to do so.

This method, proposed some years ago by a writer in the Journal of the Royal Agricultural Society of England, has been tried by the writer, and he testifies from experience that an amount of fertilizing matter altogether surprising has thus been saved. The testimony of many others is equally to the same point.

ADOPTION OF THE DECIMAL SYSTEM OF WEIGHTS AND MEASURES.

Congress having recently authorized the use, in the United States, of what is known as the Metric System, and as it is likely, before long, to be exclusively used, it seems well to employ all practicable means to diffuse an acquaintance with its merits and its methods. It may be of greater importance to the commercial than to the agricultural classes, but all are deeply interested, and I have thought some remarks here would be useful and well-timed.

Hitherto the States have prescribed their own standards, and as these are often unlike, we seem to be drifting towards a state of confusion like what prevails in some older countries. How serious such confusion might become is well shown by a few facts regarding what exists elsewhere. An English writer says: "If we buy a bushel of wheat at Bridgend, we get 168 pounds; at Darlington, 73½; at Worcester, 62; at Monmouth, 80; at Shrewsbury, 75; at Wolverhampton, 72; at Manchester, 60 or 70, according to whether we are dealing in English or American wheat; at Newcastle, 63; at Cærmarthen, 64."

A German measure, the *scheffel*, varies thus: in Bremen it is a trifle over two bushels; in Brunswick a little over eight and a half bushels; in Hamburg somewhat less than three; in Hesse Cassel two and a fifth; in Prussia one and a half; in Leipsic two and eight-tenths; in Wurtemburg four and nine-tenths. Other weights and measures also present great differences.

Our differences hitherto have been more in the way of enactments constituting different weights to be the equivalent of the bushel, but the *system* in use, is *in itself, complicated, arbitrary and destitute of order, harmony and useful relations among its parts.* Nothing keeps it in use except the fact that we have been taught and are accustomed to it.

The advantages of the Metric System over the one in common use are much greater than those of our decimal currency over the old one of pounds, shillings and pence; and when once the

simple, orderly, harmonious, decimal system of weights and measures is fairly in use, it will be matter of astonishment how an intelligent, progressive people ever came to endure so long such needless inconveniences. The fact is, that the Yankee nation is rather behind the age in this matter. The committee of Congress in their report say, "the simple order, beauty and convenience of the metric system have so commended it to universal acceptance that it has already been adopted exclusively or permissively by nearly all the nations of Christendom." Nearly all learned societies in this country and in Europe have advocated its adoption; it has worked its way into nearly all scientific books and periodicals, and its progress is urged forward by the combined intelligence of the civilized world.

The hindrances in the way of its exclusive adoption are not many nor great, but they require time to be overcome. The greatest, by far, is the difficulty of *un*learning and *dis*using what we learned in childhood and are accustomed to. We all remember how gradually the decimal currency took the place of a worse one, and how many, past middle age or of a particularly conservative turn, scarcely relinquished the old way while they lived. Another is the sacrifice of the value in the measures and scales now on hand. This, however, may be less than would be supposed at first. Platform scales would require only new beams and peas. Manufacturers of the more popular sorts, such as Howe's and Fairbanks' already make them for the metric system, and would doubtless soon offer new beams and peas at a moderate price to replace the old ones. Ordinary balances would only require new weights.

To learn the new system is not a difficult matter. It may be mastered and fully learned in an hour by almost any one, and many a boy in his teens would do it in half the time.

The first thing to be done is to learn the names and meanings of the four units:

Meter, the unit of length; (which is also the *fundamental* unit of the whole system, all the others being derived from it.)

Liter, the unit of capacity.

Gram, the unit of weight.

Are, the unit of surface.

Then it is necessary to learn four Greek numerals used for *multiples*, as follows:

Deka	10
Hecto	100
Kilo	1,000
Myria	10,000

Then three Latin numerals used for prefixes, to indicate *subdivisions* of the units. These are:

Deci	1-10th
Centi	1-100th
Milli	1-1,000th

It is a decimal system. There is a measure ten times the length of the meter, which is called the Dekameter; another, a hundred times the length, called a Hectometer; another, a thousand meters in length, called a Kilometer; and one 10,000 meters long, called a Myriameter. Then, to divide the meter, we have the Decimeter, which is one-tenth as long as a meter; the Centimeter, the one-hundredth of the meter; and the Millimeter, which is the one-thousandth of the meter. So with the other measures and weights; the same prefixes are used (so far as needful) to all the units; the Greek for multiples, and the Latin for the fractions or subdivisions. Altogether we need to learn eleven words and their meaning, and the whole system is mastered. It is well that all the terms be fully understood and perfectly familiar, although, in practice, it is found that not all come equally into common use. In this respect it is much as with our decimal currency. If we speak of the sum represented by the figures $65.43, we are apt to say, sixty-five dollars and forty-three cents, rather than six eagles, five dollars, four dimes, and three cents; and so in the metric system, some of the terms come into more frequent use than others.

As above remarked, the *meter* is the fundamental unit. This word is derived from the Greek word "metron," signifying measure. The meter is a measure of length, being a ten-millionth part of the distance from the equator to the pole, and is about thirty-nine and three-eighths inches—or, to give it more exactly, with a decimal of inconvenient length, 39.37079 inches. From the meter all the other measures and the weights are derived. Thus the unit of area or surface measure is called the *are*. This is the square of a dekameter—and of course equal to one hundred square meters—or about one hundred and nineteen and a half square yards. A surface of one hundred ares is called a hectare,

(which is the square of a hectometer,) about two and a half acres, (or more exactly, 2.471 acres.)

The one hundredth part of an are is called a centare, equal to one square meter, (or 1550 square inches.)

For measures of capacity, the *liter* is the unit. The liter is equal to the contents of a cube the edge of which is one-tenth of a meter. It is a little more than our wine quart, and less than our dry quart. One hundred liters constitute a hectoliter, (equivalent to one-tenth of a cubic meter,) and not far from 26½ gallons. The tenth of a liter, called a deciliter, is a trifle less than our gill of wine measure.

In weight, the unit is the *gram.* The gram is the weight of a cube of water, (at its greatest density,) each edge of which measures the one-hundredth of a meter. It is equivalent to nearly fifteen and a half grains (or more exactly 15.432 grains). One thousand grams constitute a kilogram, (about two and one-fifth pounds,) a denomination much used. A thousand kilograms make a millier, (twenty-two hundred and four and six-tenths pounds,) not very far from our old-fashioned "long ton" or "gross ton." The subdivisions of the gram, as the centigram and milligram, are already almost exclusively used by scientific men in all countries in such chemical and other researches as require delicacy and accuracy.

The State of Maine was one of the earliest to recommend Congressional action in this matter, as will appear from the following preamble and resolve passed by the Legislature:—

Whereas, there now exist throughout the civilized world incongruous and inconvenient systems of weights, measures and currencies, without a proper basis or any uniform ratio of divisions and multiples, thus subjecting the scholar, the teacher and the man of business to numerous and needless perplexities in computation and in trade, and making it a most difficult task to determine the absolute or the comparative value of many coins, quantities and admeasurements now in use; and whereas, a reform in regard to these inequalities and irregularities is demanded by the highest interests of education and commerce, therefore,

Resolved, That our Senators and Representatives in Congress be requested to use their influence to have that body consider the proposed subject, and establish a uniform decimal system of weights, measures, and currencies, fixing their standards or units

of each measure, with their subdivisions and multiples, in the most concise and simple manner; and that the more effectually to promote this desirable reform, an international commission be recommended for the purpose of producing an uniform system of metrology throughout the commercial world.

It is hoped, therefore, that the people of Maine will not, at the least, be more backward than others to familiarize themselves with the system, and that we and our children may enjoy its benefits at a comparatively early day.

A BILL to authorize the use of the metric system of weights and measures.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after the passage of this act, it shall be lawful throughout the United States of America to employ the weights and measures of the metric system, and no contract, or dealing, or pleading in any court, shall be deemed invalid, or liable to objection, because the weights or measures expressed or referred to therein are weights or measures of the metric system.

SEC. 2 *And be it further enacted,* That the tables in the schedule hereto annexed shall be recognized, in the construction of contracts, and in all legal proceedings, as establishing, in terms of the weights and measures now in use in the United States, the equivalents of the weights and measures expressed therein in terms of the metric system; and said tables may be lawfully used for computing, determining, and expressing in customary weights and measures the weights and measures of the metric system.

Measures of length.

METRIC DENOMINATIONS AND VALUES.		EQUIVALENTS IN DENOMINATIONS IN USE.
Myriameter	10,000 meters	6.2137 miles.
Kilometer	1,000 meters	0.62137 mile, or 3,280 feet and 10 inches.
Hectometer	100 meters	328 feet and one inch.
Dekameter	10 meters	393.7 inches.
Meter	1 meter	39.37 inches.
Decimeter	1-10th of a meter	3.937 inches.
Centimeter	1-100th of a meter	0.3937 inch.
Millimeter	1-1000th of a meter	0.0394 inch.

Measures of surface.

METRIC DENOMINATIONS AND VALUES.		EQUIVALENTS IN DENOMINATIONS IN USE.
Hectare	10,000 square meters	2.471 acres.
Are	100 square meters	119.6 square yards.
Centare	1 square meter	1,550 square inches.

Measures of capacity.

METRIC DENOMINATIONS AND VALUES.			EQUIVALENTS IN DENOMINATIONS IN USE.	
Names.	No. of liters.	Cubic measure.	Dry measure.	Liquid or wine measure.
Kiloliter or stere	1000	1 cubic meter	1.308 cubic yards	264.17 gallons.
Hectoliter	100	1-10 of a cubic meter	2 bus. & 3.35 pecks	26.417 gallons.
Dekaliter	10	10 cubic decimeters	9.08 quarts	2.6417 gallons.
Liter	1	1 cubic decimeter	0.908 quart	1.0567 quarts.
Deciliter	1-10	1-10 of a cubic decimeter	6.1022 cubic inches	0.845 gill.
Centiliter	1-100	10 cubic centimeters	0.6102 cubic inch	0.338 fluid ounce.
Milliliter	1-1000	1 cubic centimeter	0.061 cubic inch	0.27 fluid drachm.

Weights.

METRIC DENOMINATIONS AND VALUES.			EQUIVALENTS IN DENOMINATIONS IN USE.
Names.	Number of grams.	Weight of what quantity of water at maximum density.	Avoirdupois weight.
Millier or tonneau	1000000	1 cubic meter	2204.6 pounds.
Quintal	100000	1 hectoliter	220.46 pounds.
Myriagram	10000	10 liters	22.046 pounds.
Kilogram or kilo	1000	1 liter	2.2046 pounds.
Hectogram	100	1 deciliter	3.5274 ounces.
Dekagram	10	10 cubic centimeters	0.3527 ounce.
Gram	1	1 cubic centimeter	15.432 grains.
Decigram	1-10	1-10 of a cubic centimeter	1.5432 grains.
Centigram	1-100	10 cubic millimeters	0.1543 grain.
Milligram	1-1000	1 cubic millimeter	0.0154 grain.

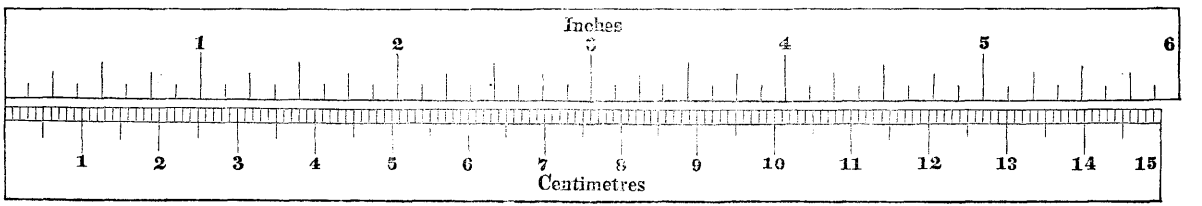
JOINT RESOLUTION to enable the Secretary of the Treasury to furnish to each State one set of the standard weights and measures of the metric system.

Be it resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury be, and he is hereby, authorized and directed to furnish to each State, to be delivered to the governor thereof, one set of the standard weights and measures of the metric system, for the use of the States respectively.

Scheme of the weights and measures of the metric system.

Ratios.	Lengths.	Surfaces.	Volumes	Weights.
1000000				Millier, or tonneau.
100000				Quintal.
10000	Myriameter.			Myriagram.
1000	Kilometer.		Kiloliter, or stere.	Kilogram, or kilo.
100	Hectometer.	Hectare.	Hectoliter.	Hectogram.
10	Dekameter.		Dekaliter.	Dekagram.
1	METER.	ARE.	LITER.	GRAM.
1-10	Decimeter.		Deciliter.	Decigram.
1-100	Centimeter.	Centare.	Centiliter.	Centigram.
1-1000	Millimeter.		Milliliter.	Milligram.

Scale representing a portion of the meter divided into centimeters and millimeters, together with a six-inch scale divided into eighths of an inch; one inch contains 25.4 millimeters.



JERUSALEM ARTICHOKE.

(*Helianthus Tuberosus.*)

Is it not possible that this tuber has fallen into unmerited neglect as an agricultural product?

On many farms in Maine it has been grown, or rather has been suffered to grow, to a limited extent, but in no case has it come to my knowledge that it has received treatment deserving the name of cultivation. Being unable therefore to collect data in relation to its worth or worthlessness from any facts of experience among us, I propose to gather and quote from various authorities what are asserted to be facts, with regard to the composition of its tubers, its productiveness, value as food for animals, and other related matters.

In the first place, it may be remarked that the common name is not accurately descriptive of the plant. One might suppose it to be a kind of artichoke which originated near Jerusalem, or was first disseminated from thence, whereas it is not an artichoke at all,* but a sunflower; and "Jerusalem" is only a corruption of the Italian "Girasole," which signifies sunflower. It somehow came to be called artichoke from a supposed resemblance in taste when cooked to the plant properly so named.

Like all the sunflowers it is a native of America, and this, although said to be indigenous to the warm climate of Brazil,† is capable of withstanding the utmost severity of a northern winter —the leaves and stems only perishing at the approach of frost.

* The proper Artichoke, or Globe Artichoke as it is usually called, *Cynara Scolymus*, is nearly related to the thistle family, and has a dense, close head, or fleshy receptacle, on which the flowers are based. These heads are boiled and constitute a very delicate dish. It is propagated by suckers or offshoots from old plants; the preparation of soil being much like that for asparagus.

† Boussingault remarks: "This plant is generally believed to be a native of South America, but Humboldt never met with it there, and according to M. Correa it does not exist in Brazil. The property which the tubers have of resisting the cold of our winters, and several botanico-geographical considerations, lead M. Brogniart to presume that the plant belongs to the more northern parts of Mexico."

In this respect it differs widely from the potato and yam, both natives of the same hot climate.

It was introduced into Europe about the same time as the potato, and for a long time it seemed doubtful which would gain the preference for cultivation; more than one old writer roundly asserting its decided superiority over the latter. Prof. Low, of Edinburgh, says of it, "This plant produces stems from 5 to 10 feet in height. It is propagated with the greatest ease from tubers, like the potato. It grows rapidly, and may be cultivated like the potato, but the intervals between the rows should be larger. The tubers are in clusters attached to the roots of the plant. As compared with the tubers of the potato they are watery, and may be believed to be inferior in nutritive properties. But the quantity is frequently very large; about 500 bushels per acre, it is said, having been produced without manure. The tubers do not seem to have great fattening properties, but they are eagerly eaten by animals. Taking into account the hardy qualities of the plant, its productiveness, and easy culture, it may be doubted whether it deserves the universal neglect into which it has fallen. Granting its inferiority as an article of food to other plants now cultivated for our domestic stock, it must be of some importance to have a plant that can be so easily raised, and on soils so low in the scale of fertility."

A writer in the Penny Cyclopædia says, "The tubers when cooked form a good substitute for potatoes, and are by some preferred. Many animals eat them with avidity, and they are especially recommended for sheep."

John Wilson, in his "British Farming," says, "This root, although decidedly inferior to the potato in flavor, is yet deserving of cultivation. It grows freely in inferior soils, is easily propagated and requires little attention in its cultivation. When once established in the soil it will produce abundant crops for successive years in the same spot. It is sometimes planted in woods to yield shelter for game, for which purpose it is admirably fitted, as it grows freely under the shade of trees and yields both food and covert. In properly fenced woods it might yield abundant and suitable food for hogs, which might there root it at their pleasure without damage to anything. Where they had mast along with these juicy tubers, they would undoubtedly thrive apace. After they had grubbed up what they could get, enough would be left

to reproduce a crop for successive seasons. Such a use of this esculent seems well deserving of careful trial."

In France, and yet more in Germany, this plant has been and still is cultivated to a much greater extent than it has ever been in England or Scotland, and is esteemed as a valuable crop, and a desirable food for animals. This estimation is based not only on theoretical data obtained from its analysis, but upon practical demonstrations in feeding experiments.

Boussingault, who seems to have given careful attention to the subject, says, "It is propagated by the tubers which it produces, and which are regarded for good reasons as most excellent food for cattle. In times when the potato was not very extensively known, it also entered pretty largely into the food of man; when boiled its taste brings to mind that of the artichoke, whence its name. * *

"There are few plants more hardy and so little nice about soil as the Jerusalem Artichoke; it succeeds everywhere with the single condition that the ground be not too wet. The tubers are planted exactly like those of the potato and nearly at the same time; but this is a process that is performed but rarely, inasmuch as the cultivation of the helianthus is incessant, being carried on for many years in the same piece; and after the harvest, in spite of every disposition to take up all the tubers, enough constantly escape detection to stock the land for the following year, so that the surface appears literally covered with the young plants on the return of spring, and it is necessary to thin them by hoeing. The impossibility of taking away the whole of the tubers, and their power of resisting the hardest frosts of winter, is an obstacle, almost insurmountable, to the introduction of this plant as one element in a regular rotation. Experience more and more confirms the propriety of setting aside a piece of land for the growth of this productive and very valuable vegetable root.

"Of all the plants that engage the husbandman the Jerusalem Artichoke is that which produces the most at the least expense of manure and of manual labor. Kade states that a square patch of Jerusalem Artichokes in a garden was still in full productive vigor at the end of 33 years, throwing out stems 7 to 10 feet in hight, although for a long time the plant had neither received any care nor any manure.

"I could quote many examples of the great reproductive powers of the helianthus; I can affirm, nevertheless, that in order to obtain

abundant crops, it is necessary to afford a little manure. I shall show in another chapter, however, that this is manure well bestowed.

"Like all vegetables having numerous and large leaves the helianthus requires light and air; it ought therefore to be properly spaced. The original planting of course takes place in lines, but in the succeeding crops and those which are derived from small tubers accidentally left in the ground, the order is, of course, lost; it is only necessary to destroy a sufficient number of the young sprouts which show themselves in the spring to leave those plants which are preserved with a sufficient space between them. When the plants are somewhat advanced the ground should be dug with the spade, and hoed to destroy weeds.

"The tubers are gathered as they are wanted; for, not dreading the frost, they may remain in the ground the whole winter. They do not require, like the potato, to be collected and pitted at a certain period; they require no particular situation, no particular care for their preservation. During winter the stems die and dry up; they may be burned or a better use is put them in the hogstye where the pith will absorb a large quantity of liquid manure. The average quantity of dry leaves and stems has been estimated at three tons per acre. The following quantities of tubers have actually been gathered in Alsace on one acre:

	Tons.	Cwts.	Qrs.	lbs.
"Sandy soils,	4	3	3	6
Soils of the best quality,	10	8	3	13
At Bechelbronn (mean),	10	16	0	8
Bechelbronn, crops of 1839–40,	14	8	2	27"

Space would fail, nor is it needful to present here the details of the experiments instituted and carried out by M. Boussingault to ascertain its comparative value as cattle food. His results may be briefly stated as follows—100 pounds of good hay were found to be equivalent to

280 pounds potatoes.
280 " Jerusalem artichokes.
400 " mangold.
400 " carrots.
400 " turnips.

The equivalent amount of artichokes was given in these trials in place of other articles named, for terms of from 11 to 16 days, and

at the end, the weight of the animals was found to be the same, or with a trifling gain, as at the beginning, the usual work also having been performed.

According to Mr. Flint's remarks* in his report of the operations in connexion with the agricultural school at Hohenheim in 1863, it would appear that the comparative estimate in which roots and hay are now held varies somewhat from the estimate of Boussingault. He says, "The winter fodder statement shows that 100 pounds of hay are equal in nutritive value to 275 pounds of beets, carrots and artichokes; to 200 pounds of straw, rape husks and potatoes; to 160 pounds chaff, to 125 pounds beer malt, to 60 oats; to 50 pounds crushed grain and oil cake." In his account of the institution at Grignon in France,† Mr. Flint says, "The artichoke served as a transition crop to improve poor calcareous soils, which it occupied for several years without receiving any manure. It has since been cultivated in the same conditions as other crops. It yields from 22,500 to 31,500 pounds of roots, on an average, per acre, and 2700 pounds of stalks which when cut are mixed with the residue of the distillery and fed to cattle."

Composition of the Tuber.—Old John Mortimer, in the Countryman's Kalendar, 1707, speaking of the potato, (which, by the way, can hardly be considered a field crop before A. D. 1750,) says: "The root is very near the nature of the Jerusalem Artichoke, but not so good or wholesome."

Whether better or worse, there is a marked contrast in the proportions of their most important proximate constituents, and one which readily accounts for their different appearance when cooked, one being wet and jellyish, the other dry and mealy. The mean of various analyses of the potato, show the proportion of starch contained in it to be near 15 per cent., and of sugar 3 per cent. While, according to M. Braconnot, in the artichoke there is 14.8 per cent. of (uncrystallizable) sugar and 3 per cent. of starch, or more properly of inuline.‡

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* Report Mass. Board of Agriculture, 1863, p. 187.

† Same, p. 227.

‡ The roots of many plants, among which are those of the dahlia, elecampane, colchicum, dandelion and chicory, contain a variety of starch to which the name of inuline has been given. It is a white tasteless powder sparingly soluble in cold water but readily so in boiling water, from which, unlike common starch, it is deposited again on cooling in pulverulent form. Like common starch it is readily converted into dextrine and grape sugar by being boiled with very dilute acids.

So far as we can judge of the feeding value of these two sorts without actual proof by feeding, there would seem to be very little choice between them.

Dr. Salisbury of New York, some years since made analyses of two varieties, the white and red, the latter being the smaller and richer of the two, and remarks, "The artichoke contains much less starch than the potato, but is richer in sugar, dextrine, albumen and casein. Its power for fattening, perhaps, would not equal that of the potato, but in muscle-forming products, or nitrogen bodies, its composition would place it quite equal to that of the potato. The analysis shows it to be even richer."

When, however, we come to examine the results of an ultimate analysis of the tuber of the helianthus, we find another difference, which, as I conceive, gives to it, in one aspect at least, a value beyond that of any other vegetable root usually fed to domestic animals. It is this: the root is found to be richer than others in the most valuable mineral constituents, phosphoric acid and potash—and as these would not be all appropriated by the animals feeding on the roots, so much as was not thus appropriated would be embraced in the excrements and consequently add greatly to the value of the manure—to the means of fertilization and increase of other crops.

Analysis of the ash of the tuber of the artichoke shows it to contains as follows:

Silica,	1.52
Phosphoric acid,	16.99
Sulphuric acid,	3.77
Carbonic acid,	11.80
Lime,	3.34
Magnesia,	1.30
Peroxide of iron,	0.45
Potash,	55.89
Chloride of potassium,	4.88
	94.94

Prof. Way says, "The mineral composition of the tuber of the Jerusalem Artichoke may be thus expressed—

Mineral matter (in pounds) in one ton of the tubers:

Silica,	0.61
Phosphoric acid,	6.81
Sulphuric acid,	1.51

Lime,	1.34
Magnesia,	0.52
Peroxide of iron,	0.18
Potash,	22.40
Chloride of potassium,	1.96
	35.33

Here it will be seen that, weight for weight, this vegetable contains nearly four times as much phosphoric acid, and three times as much alkali as turnips, beets or carrots. Taking into consideration the large produce of this plant, and the little manure or cultivation required by it, we are at a loss to see where it obtains alkaline phosphate, *unless it is possessed of superior powers of acquiring mineral sustenance."*

The above statements, it is believed, are all from good authorities, and may be relied upon as substantially correct. A brief recapitulation gives us the following facts:

1. The Helianthus tuberosus or Jerusalem artichoke will grow on almost any soil, no matter if it be poor, if it be not also too wet.

2. It will produce fair crops without manure and with little cultivation.

3. In nutritive qualities, for feeding to domestic animals, it compares favorably with the vegetable roots in common use.

4. After one crop is obtained, no further seeding of the land is required, and no cultivation beyond horse-hoeing between the rows—for thinning and weeding.

5. The tubers may be harvested in the fall, *or not;*—may be left in the ground without injury till spring.

6. It seems to possess the power of obtaining from the soil *an amount of the most valuable mineral constituents greater than any other root, and, consequently, by the manure it will furnish we can enrich in a corresponding degree other portions of the farm.*

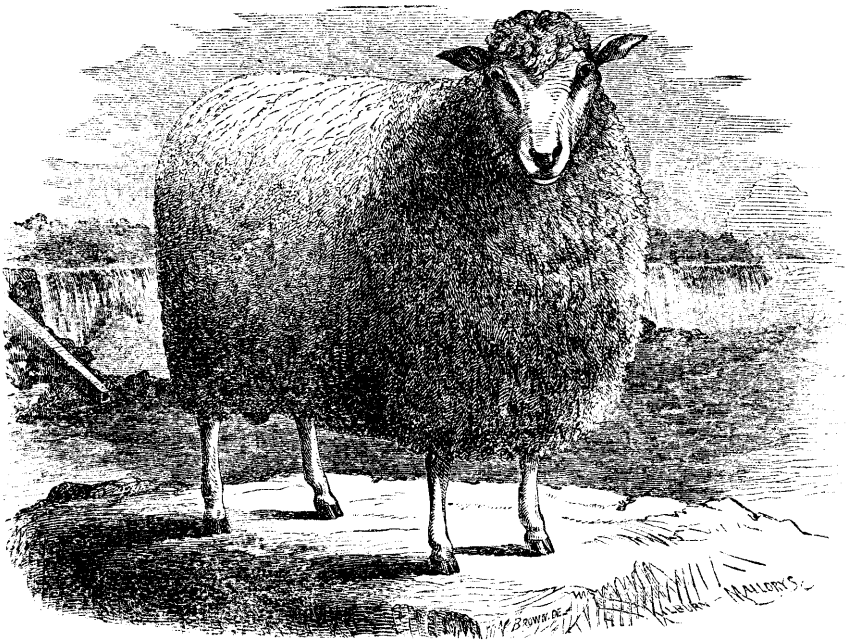
Now, then, if we have fair promise that, by appropriating to this vegetable a piece of poor land, part of a run out mowing field for instance, which now hardly pays for swinging a scythe or running a mower, with no expenditure of manure and little of labor, we can secure a respectable crop of roots which will help to nourish our stock, help furnish succulent food in winter and spring, and help manure the farm, it would seem worth a fair trial.

Let me suggest, if any one does try it, or if they do not, that, as a large portion of the potash and phosphoric acid contained in

food passes off in the urine, means should be used for their absorption and retention, and that the manure should be never allowed to lose its richest portions by needless washing and leaching.

I find very little regarding the culture of this root in any American agricultural periodicals. In one place it is said that Mr. Thomas Noble of Massillon, Ohio, planted the tubers in drills $2\frac{1}{2}$ to 3 feet apart, using a little more seed than for potatoes;—result, 1500 bushels per acre. A Mr. Smith of Erie county in the same State, recommends them for stock, and says "it yields from 800 to 1500 bushels per acre; the latter being grown on the best sandy loam and cultivated in the best manner."

Dr. Holmes once remarked of it: "In regard to a substitute for the potato as a cattle and pig feed, we have long had a favorable opinion of the common Jerusalem artichoke, as it is called. It does not contain so much farinaceous matter as a good potato. If roasted it will not 'crack open so mealy' as a first rate potato will, but otherwise its ingredients are very much like the potato, and we think it vastly better than soggy, half-diseased potatoes. The tubers will soon obtain complete possession of the ground where they are planted, and if planted on a piece of waste ground not needed for other purposes, become valuable on this account."



COTSWOLD BUCK NIAGARA.

The property of Elijah Wadsworth, Livermore Falls, Me. This buck was imported October, 1863, from the flock of F. W. Stone, "Moreton Lodge," Guelph, Canada West. The sire of "Niagara" won the first prize at the great "Provincial Exhibition" held in Toronto, Canada West, September, 1862, as the best yearling "Cotswold" buck, and the first prize at the county of "Wellington Agricultural Society's Show," held at Guelph, in October of the same year. At the free "Exhibition of Specimens of the Different Breeds of Sheep," held at Boston, Mass., in April, 1864, being then but one year old, he received much attention, and fully sustained the character of the "Cotswolds" in comparison with other breeds. Exhibited at the "Essex Agricultural Society's Show," held at Lawrence, Mass., in September of the same year, he won the premium offered by the Society for the best buck, over strong competition.

ON PLOWING AND MANURING IN AUTUMN.

By Phinehas Barnes, Esq., of Portland.

[The following paper is the substance of an address delivered before the Cumberland County Agricultural Society, at Gorham, October 5th, 1865, and before the Aroostook Agricultural Society, at Houlton, Sept. 27, 1866.]

The complaint of "short seasons" for agriculture, in this latitude is so common, and apparently so well founded, that every considerate person among us, whatever his own pursuit, is likely to have some sympathy with those, who are primarily affected by this difficulty. Reflecting much and often upon this hardship, which besets our New England farm-life, the writer has been led to think out, and now ventures to bring forward, a method of cultivation, which tends materially to prolong our season for the growth of useful crops, and to heighten the effect of all the agencies of production, during the whole period between seed-time and harvest. And it may awaken a specific interest in what is proposed, to declare beforehand, that the method recommended, is revolutionary in its character, whether its effect be more or less complete.

The question concerns the production of those annual plants, which furnish food for man, and for the domestic animals. By the very statement of the complaint about short seasons, we divide the year into two parts—that part of the year in which food-plants grow—and that part of the year in which they do *not* grow.

With respect to nearly all our annual crops, the period of non-growth is much the longer of the two parts of the year. No doctrine or theory can alter this established climatic fact. Our business is to make the most that is possible, of that shorter period, which is all we can have, between the shooting of the germ and the gathering of the harvest. If then, by any faulty practice, we lose any part of this briefer period of growth, if, for instance, when the seed ought to be sprouting in the ground, we have not yet prepared

the ground to receive the seed—this loss is irrecoverable. The sun does not wait for us, either in spring or in autumn. He fulfils his course, whether we are ready or not.

In what is called a "wet spring," so often the experience of New England life, our complaints almost assume the form—not that the sun is hastening too fast towards the summer—but that he delays and hides his genial influence. It is not merely that the seed cannot be put into the ground, but the common expression is, "We cannot get on to the land with a plough." This expression admits, that in the late wet spring, at the very time, when we would be glad to have the seed in its bed, the bed is still unprepared for it, and we must wait, and wait, for the rains to pass away, before a furrow can be turned. And when the clouds are gone, how many of the long sunny days of May are lost, before the land can be dried and ploughed, and harrowed and manured, so that the seed can be cast into the earth, and the plant commence its too short period of growth?

An illustrative lesson—though from the nature of the case, not a conclusive analogy—may be obtained from observation of the perennial plants, under the influence of spring. These do not wait for cloudless skies. The mild temperature of spring pushes them forward, whether it rains or not. In fact, they rejoice in spring rains. Who has not observed the flashing green of a well-dressed grass field in early spring! Who does not wonder at the vine, bursting with vitality at every joint! What farmer has not seen, with vexation, the rampant perennial weeds starting up with mischievous activity, long before he is ready to put a useful seed into the ground? One difference is, that these plants are ready beforehand. When spring comes, they are prepared for it; they begin to grow, precisely at the moment, when their growing season begins; they lose no time. Their lesson to us, is, that by every practical contrivance, and by all wise forecast, we should so adjust the conditions of the life of our annual food-plants, that they also shall begin to grow, at the earliest moment when the influences of spring are suited to their capacities, and lose not a day, nor an hour.

Considering, therefore, that under the ordinary New England practice, and for our usual crops, the preparation of the land to receive the seed takes place in spring, that the farmer must wait, sometimes many days, for the late spring rains to be over and the surface of the ground to be dried, before a plough or a cart can be

moved, and then, that other days of warm and genial sunshine must be expended in plowing, and manuring, and harrowing, too hastily and inefficiently perhaps, before a seed can be dropped,—the revolutionary change now proposed is, to turn our method of cultivation right about—end for end—to prepare in the autumn the seed-bed into which the seed is to be cast in the spring, and to deposit in the earth, in the fall beforehand, the fertilizers, which are to nourish the next year's crops So, nothing will remain to be done in spring, but to drop the seed and cover it, at the first moment when the earth is warm enough to quicken its germ.

Of course, it is not a thing unheard of, to plough and manure the land in autumn. Something of the kind is done on every well managed farm. But the proposition now urged is, to adopt this method of cultivation as the general and customary rule for all crops, that are raised under the plough—not merely to break up sward land in the late summer or early fall, but to plough, in the fall, the stubble lands also, which are to be planted or sowed in the following spring;—not merely to spread some top dressing in autumn, but to carry out and put *into* the ground all the fertiiizers intended for next year's plants, and to put this dressing, (if the supply is not enough for broad cast application,) into the very furrows and drills, where the seed is to be dropped at seed-time—the exceptional cases to this general practice being left to arise, only as required by special exceptional causes.

Such being the statement of the case, the following considerations are submitted, in explanation and advocacy of the method proposed.

The two processes of cultivation, which precede the act of planting or sowing, are, the preparation of the seed-bed, and the preparation and deposit of the plant-food, in the place where the plant is to grow.

What is the preparation of the seed-bed? By the action of the plough and the harrow, we undertake to break up the hardened surface of the earth, to crush and grind its clods, to pulverize its whole mass, so as to open it to the penetration of air and heat, so as to expose its comminuted particles to the dissolving influences of rain, so as to enable the roots and rootlets of the expected plants to push their way freely, in all directions, in search of the food, on which they are to live, whether it be the mineral food naturally pervading this pulverized soil, or the organic fertilizers to be furnished by art.

What do we mean—what should we mean—by the preparation and furnishing of plant-food? Confining the inquiry to the common fertilizer used on New England farms, is it a proper preparation of food for the young plant to put crude and green stable manure into the furrows and hills, at the same time that we drop the seed, so that the tender rootlets in a few days will be in direct contact with this rank and undissolved mass? Our highest authorities declare that young plants are actually poisoned by green manure. Is it not, on the contrary, the indication of common sense, that manure will be most effective when it is mixed with and distributed through the pulverized material of the seed-bed, as it is also the rule of the most familiar science, that no manure is useful, until it is dissolved?

In fact, we may almost say, that the whole object of these two primary steps in cultivation is, to put things into that condition, which shall effect at the right time the most complete dissolving and distribution of the fertilizers, which are to nourish the growth of plants.

We might endeavor to reach this object by costly and laborious contrivances of art. Liebig declares in one of his latest books, that ploughing should be so thoroughly done, and so many times repeated, that no harrowing will be needed, and the harrow will be a superfluous implement. The English use "clod-crushers" and other ponderous and expensive machines, to effect the complete pulverization of stiff soils. So with the problem of liquid manure. There are the minute and repulsive processes of Japanese and Chinese farming, and the expensive apparatus, by which the English cultivator, Huxtable, distributes fertilizers in this form, through iron pipes and hose. But these elaborate arrangements are all beyond the resources of New England farmers, and some of them, in fact, degrade the laborer, while exalting the art of cultivation.

But it is to be seen, whether nature will not help us, and whether natural agencies will not enable us to emulate the achievements of art, if we will only act in harmony with those simple and unexpensive laws by, which all natural forces are exerted. Our year is divided into the two periods, when plants grow, and when they do not grow. Is the non-growing period all a dead and useless blank? The later months of autumn, the winter, and the early months of spring, are these a mere barrier and hindrance in the farmer's way? When the farmer has cleared

the ripened crops from his fields, does nature then go to sleep, and utterly refuse him all help, between harvest and seed-time?

What are the phenomena, in fact? What would be the application and influence of the forces of nature at that period, if we had all things in readiness to receive their effects?

Suppose the land ploughed before the last of October, and left, it may be, in stiff furrows and rough clods—the fall rains, descending upon it for weeks afterwards, have the effect of softening, soaking, drenching, dissolving these hard masses, carrying into the open ground also, all the air fertilizers, which the rain sweeps from the atmosphere. Nor is any harm done, if the interstices between the clods are filled with water. Following the autumn rains come the irresistible energies of frost and ice, breaking and tearing asunder whatever lumps of earth the rains have not dissolved, and actually lifting up the soil, which the rains have tended to settle and depress. Add now the supposition, that the manure for next year's crop had been put *into* this ploughed land before the fall rains began, whether turned under from a broadcast spread, or placed in the actual, carefully made furrows and drills, where the plants are to grow. The same drenching rains of autumn, the same energies of winter's frost, will dissolve and distribute this manure with triumphant effect. The spring rains complete the result, both for the ground and the manure. The dissolving ice melts the clods, if any are left, melts the manure, if any is not yet subdued. There is no resisting these forces. Water is nature's universal solvent. In milder latitudes, they know it only in its liquid conditions. But in our agriculture, we may have its freezing and melting forces, besides.

For crop lands, thus ploughed and manured in autumn, what fears need there be of a wet spring? The late spring rains, under the growing warmth of the ascending sun, are only completing the preparation for the seed. No anxious waiting to get on to the land with the plough, no dragging of heavy dung carts over the soft furrows. As soon as the rains are over, as soon as the sun has dried the surface of the earth, the genial bed is ready for the seed, and—what is more—at the first moment, when the smallest rootlets of the young plants open their mouths for food, the food is there, and in the exact condition in which nature requires it to be.

It will not fail to be observed, that if the necessities of the farmer require him to use coarse manure, much mixed with straw, this material will have an excellent mechanical tendency to keep

the soil light and porous, while its soluble parts are under the full action of rain and frost.

So, also, it is evident, that if the farmer judges that any particular piece of ploughed land (manured broadcast) has become too much settled and stiffened under the influence of winter, the single ploughing or harrowing that may be required in spring to lighten it and loosen it again, will be a labor so easy and rapid, that the business of planting and sowing will scarcely be delayed a single day.

The obvious objection to this method of cultivation is, that in the fall there is no stock of manure on the farm. The manure is made in the winter, and therefore it must be applied in the spring.

If this objection states a difficulty, on the point of time for applying manure, it admits a greater difficulty, on the point of the fitness of the material. In the spring, the manure made the winter before, is still a crude, undissolved mass. It cannot become perfect plant-food until it has been reduced, mixed and dissolved. How long a time this may require will depend upon the season. If an early drought follows, after planting fields manured in spring, nothing can be more disheartening. We talk as though the plants themselves needed rain. In fact, it is the manure which requires water, so that it may be dissolved, and become fit to nourish the plant.

But the answer to the objection is equally obvious, if there is any soundness in the theory now under discussion. The theory, in fact, states the answer. We must revolutionize our methods. The farmer who has means, must buy one year's stock of manure, in advance, resorting, if necessary, for that first year, to the artificial fertilizers. He will turn his methods, end for end, at once. The farmer who has not means to purchase, must effect it gradually, by cropping a little less land for a time, by special contrivances and diligence in making manure, by scraping the roadsides, by more careful composting, and in whatever possible way, he must gain and save, at first, a fifth part, or a quarter part, of a year's stock—applying that much to a just proportion of his ploughed land in the fall—the next year, another fifth or quarter, and so on—every year, no doubt, increasing his capacity to gain more and more, until within three or four years, he also will complete the circuit, and find his manure heap, in September, ample for all his next year's crops.

We must meet, of course, the question of the summer management of manure. How the heaps shall be formed, where they

shall be placed, how much composting shall be done, whether or not the piles shall be overhauled and repacked—these are details, which every farmer will manage according to his facilities and his skill. But the success of the method requires, at all events, that the stock of manure, thus kept over from April till September, shall be sheltered from the sun. Farmers who have manure sheds or cellars, are supplied with what the case requires. But vast numbers of farmers have neither of these facilities. And if necessity of any kind requires a farmer to pile his manure in the open barn-yard, it is a plain and unexpensive method, to cover the heap with simple, common earth, carefully placed and packed, on the sides and top. If it is thought advisable to shovel over the heap in the course of the summer, no harm will result from mixing this covering with the manure. The mixture and division, in fact, will improve the mass. Repacking the heap, cover it again with earth, till it is needed for use. The manure will all be there, and in good condition, when it is wanted.

The question of ploughing and manuring in the fall, involves, of course, the question whether there is time for these operations, at that season of the year.

If it were common, in this part of the world, to keep very large breadths of land under the plough, the thing could not well be done, with the limited laboring force of New England farms. But our tillage lands are comparatively narrow in area, and, in fact, when we come to this problem, as a practical reality, we may be surprised to find that there is more time and better time for this work, in autumn, than in spring. Count the days in spring, from the time when the New England farmer is first able to "get on to the land" with his plough, to the time when all his seed, except turnips, is in, or ought to be. Hardly more than a month in all! But from the middle of August, when the hay-harvest is everywhere ended, to the first of November, when the fall rains and frost are likely to stop work on ploughed lands, there are more than seventy days. It is true. there are the other crops to be gathered, after haying is over, and the wise farmer will need to order his time skilfully to accomplish, within the same period, the harvesting of this year's crops, and the preparation of the land for the next. But there are intervals and alternations, of which the good manager will always take advantage. The ripened grain and Indian corn must be attended to, precisely when the best weather permits. Ploughing and manuring for next year, must then give

place, for some days. The last of September finds these crops all out of the way. The harvesting of the root crops is far less pressing. These can wait, and take their convenient turns, while the proper share of time is given to ploughing and manuring. In fact, the harvesting of turnips, mangolds and carrots can be put off to the very last, without possible harm. If they are gathered before the ground is inconveniently wet with November rains, it is enough.

It is to be considered also, that the seventy days after the middle of August, are the driest season of the whole year, when the land is ordinarily in the best condition to be worked, and when the temperature is best fitted to the comfort and the activity of all the working force, both men and animals. The days are shorter, it is true, but they are the most enjoyable days of all the year, for open-air life. Compare the wet days of early spring labor, and the hot days that follow, with the dry and cool September and October—which has the advantage in the amount of farm labor that can be accomplished, week in and week out?

This is the proper place to state an exception to the rule of ploughing and manuring in autumn. It is, however, but a half-exception. Where roots are not taken off the land until the very last thing before heavy fall rains and frost, it would, usually, not be practicable to plough this land, the same fall. But the digging or pulling of the roots is almost equal to a ploughing, and, assuming that the roots may not have been so heavily manured, themselves, as to supply the wants of the succeeding crop—assuming, also, that the reserved stock of manure is ample—it is submitted that, in such a case, it is only necessary to wait until the top of the ground is frozen, and then to take advantage of good working days in November, or even in December, to haul out and spread the manure on the surface, leaving it there for the action of rains and frost, and that it would be found in the spring to be nearly as well dissolved and distributed, as if it had been actually worked into the soil, in the fall.

In fact, whenever, for any reason, it is not practicable to plough in autumn, the spreading of manure, after the ground is frozen, may be continued quite until the time when the snow is too deep for the convenient moving of the loads, thus really lengthening out the farmer's working season by several weeks. And in the southern parts of New England, this might often be done, through the whole winter, provided always, that the farmer by revolu-

tionizing his methods of cultivation, had the stock of manure to haul.

It is kindred to this part of the subject, to remark here upon certain general improvements upon farm-lands, of acknowledged importance, but which are commonly not undertaken, or insufficiently carried out, because, according to the common round of ploughing and manuring, the farmer is in no condition to enter upon such improvements, at the proper time.

For instance—subsoil ploughing. If we may credit the unanimous voice of all the books and all the approved theoretical authorities, there is no treatment of land, which is more important and valuable than this. But where is the farmer—where is any considerable number of farmers, in this part of the country—who can show us any experience in the use of the subsoil plough? The writer of this paper has been accustomed, for a long, time to look with interest at what is going on among the farmers, over a somewhat wide extent of this State—but, in all that time, he has never seen a subsoil plough in the State of Maine—neither upon a farm, nor at an agricultural show, nor even in an agricultural warehouse. The reason for the omission to use this implement is obvious enough. It is certain that the theoretical authorities on this subject are right, and it is equally certain that intelligent farmers know it to be so. But what time is there, in the spring of the year, for subsoil ploughing, in this latitude? It is more than can well be done, to plough and harrow and dress the top soil, in the fleeting days that hurry along between frost and seed time! And in what condition is the ground for subsoil ploughing at that time? Obviously, as unfavorable as could well be, too wet and sticky, altogether, as a general fact.

And although the best results of subsoil ploughing are only realized, where the ground is thoroughly underdrained, yet it is plain, that in the dry season, which ordinarily comes after the middle of August, all our good tillage lands would admit of the adoption of this treatment, and a large part of its useful results would be attained. If it were a common and settled habit to do all the ploughing of the year at this period, it can hardly be doubted, that enterprising and skilful men would put in practice the theory which they all believe, in respect to loosening the under-soil, so as to develop its virgin fertility, and find new stores of plant-food, which the generations of their predecessors have never yet touched. The subsoil plough would then have a chance to *prove* its usefulness, and would become a common implement.

Another general improvement—the top-dressing of grass lands. Most farmers would be glad to do more of this than is now commonly attempted, and, perhaps, the first difficulty in the way, is that the stock of manure is usually not enough, in quantity, to dress the plough-lands and the grass-lands, in the same year. But if there were sufficient, what farmer would haul heavy loads of manure over the soft sward of his grass fields, in April or May? It would be suicidal to attempt it. Unquestionably, the best time for surface manuring of grass lands is after the hay is cut. The ground is then dry and hard, and would suffer little or no injury from the pressure of wheels. But, according to the usual practice, there is then no manure to be hauled. The barn-yard is empty—the manure heaps are not there. No supply has been preserved. The practice has become so inveterate, of using, in the spring, the stock which has been made in the winter, that, even where the supply might be ample, great numbers of farmers put it all into the plough-lands in spring, as matter of course, and the grass fields are left to go hungry, till they are worn out. But if manuring were done in autumn, the obvious sense of giving a part of it to the grass lands, when it could be done easily and without laceration of the sward, would be much more likely to be carried out in practice. It might be ascertained with much more certainty than is now generally allowed, that it is easier and cheaper, and far more pleasant, to keep up the productiveness of mowing lands by liberal top-dressing, at the right time of the year, than it is to wear them out, and then go through with laborious and expensive processes of ploughing and cropping, for their restoration. But there will be no liberal top-dressing of grass-lands, as a settled habit, until there is a settled habit of having a good stock of manure on hand for this purpose, at the right time of the year. And that time is *not* the spring.

Since the argument of this paper thus advocates the application of manure upon the surface of the ground, there to be exposed to whatever atmospheric violence may prevail between November and May, not only upon sward land, but upon stubble also, in these cases, where there is not time to plough it in before frost, it is likely to encounter the objection, so commonly heard in such discussions, that, in this way, much of the virtue of the manure will be wasted by evaporation or wash

Without attempting here to investigate fully such objection, and, laying out of view the case of tillage lands upon steep hill-

sides, which are exceptional merely from locality, the writer has the means of fortifying his positions by two interesting references to good authorities.

The first is from a very valuable article, by Judge French, on English Husbandry, contained in the Patent Office Report, for 1860, (p. 148,) in the following terms:

"Frequently the manure is spread and remains on the surface several weeks before it is ploughed in, exposed to the action of the atmosphere. This is one of the disputed points among agriculturists in America. The general notion has been, until quite recently, that such exposure of manure subjects it to great loss by the escape of ammonia and other volatile elements, and farmers have hastened to cover it by the plough as soon as possible. Of late, a different theory and practice has made progress, and it has been contended that this loss has been greatly overrated. In Lincolnshire and many other parts of England, the farmers prefer to spread even green manure several weeks on the surface. 'Theory,' say they, 'seems against us, for there must be some loss, and it is difficult to say how there can be any gain, but we KNOW, from uniform experience for years, that we get better wheat crops by this practice.' Upon our suggestion to a very intelligent farmer that the powerful odor from his manure thus spread, *indicated* great waste, he replied, 'I admit there may be some loss, but I think less than is usually supposed. What we smell, is partly sulphuretted hydrogen, which is of no value, and partly ammonia, which is of great value to agriculturists. The quantity of ammonia thus lost, however, is not great, and might be purchased at any shop for a few shillings.'"

The second citation is from an article in the same volume of Patent Office Reports, (p. 118,) by Mr. Bright, the well known writer on fruit culture. It is there extracted from the Gardener's Monthly:

"The practice of top-dressing, or of surface manuring, has long been the favorite method employed by all intelligent gardeners within the circle of my acquaintance. We have long ago learned that masses of rich, nitrogenous manures are not what plants require about their roots, but that manures are applied much more successfully (and less injuriously) by top-dressing, either in solid or liquid form. Nature never manures her plants with crude masses of concentrated fertilizing substances, but imparts her stimulating and mineral food in a state of most minute subdivision—almost infinitessimal—chiefly from the surface of the earth. * * * * *

The great objection to surface manuring is founded upon the probable loss of ammonia, caused by the exposure of decaying manure, upon the surface of the earth. But this loss has been shown by sound reasoning, and by facts deduced from practical experience, to be much less than is commonly appre-

hended; while the benefits arising from surface manuring, in other respects, more than counterbalance any possible loss of ammonia arising from this practice. * * * *

The soluble and valuable substances (of manure) are not lost to plants, by being carried into the soil before they are needed by growing plants. It has been conclusively shown by eminent scientific authorities, that any good soil, containing a fair proportion of clay and carbon, is capable of taking up and *retaining effectually* ammonia, lime, potash, soda, &c., in a soluble form, so that *little, if any, passes off in the under-drainage water of such soils.* These substances, it is true, may wash from the surface, but *they cannot pass through a good soil and go off in the drainage water.* * * * * *

When the surface manure decomposes, its elements are washed into the soil, in a state of solution precisely fitted to meet the wants of plants, and they become, themselves, active agents in promoting further decompositions and chemical changes in the entire body of the soil.

Manure then, I say, chiefly upon the surface. * * * * * * Top-dress your grass after mowing in July or August, under a burning summer sun; top-dress in the fall before and during the autumn rains; manure the surface, while snow is on the ground, while the March winds blow, and while the April rains fall. [?] Manure your grass instead of your corn and wheat, broadcast, at any time when you have manure and leisure, and I will guarantee that you will be abundantly satisfied with the result."

Skilful observers of the true principles of rotation will note the advice above given, "Manure your grass instead of your corn and wheat." Our too common practice of mowing grass lands, without manuring, until they are exhausted, and then resorting to laborious and expensive processes of ploughing and cropping with manure, until the land is brought to a condition to be seeded again—*this* is not "*rotation.*" It is merely restoration of the soil from a worn out and useless condition. A proper method of rotation requires that the land shall be in good condition, every year, for the crop of that year. The contrary method is almost, though not quite as bad, as if a laboring man should work four days and nights, without stopping, and then take medicine to renovate his system. If the grass land is kept in high condition, every year, by plentiful top-dressing, and avoidance of the ruinous practice of feeding, it is then in precisely the best condition for the plough-crops, which are required to follow. The sod of such land is itself a manure for the succeeding crop. Witness the clover, which, in the great wheat-growing districts, so commonly precedes the wheat. But, as before stated, it is not likely that grass-lands will be kept in that condition, unless there is a supply of manure for

top-dressing, at the right season of the year. If by a change in the habit of making and preserving manure, we should come to the habit of having our mowing lands, at all times, in the most productive condition, this, of itself, would be a revolution in the ordinary New England farming.

And it should not fail to be observed, that the broadcast top-dressing of grass lands, with well ripened manure, in the fall of the year, is the easiest and cheapest of all possible methods of manuring land. Other methods must also be used in their turn, but this is the least laborious and least expensive of all, and it is therefore an important problem to make it as fully available as may be.

Recurring to the case of stubble-fields—a part of these are designed for grain crops the succeeding year, and the manure, if any is applied, is of course broadcast. In the case of winter wheat and winter rye, we have a long settled experience upon the method of fall ploughing and manuring. No farmer ever hesitated to prepare his land in August or September for these crops, because he feared that the fall and winter would wash away or evaporate his manure, or that the soil would settle and harden, under the influence of rain and frost, to the injury of the plants.

As to the other stubble-fields, which are to bear crops the next year, in furrows or hills,—Indian corn and roots, sometimes called the "hoed crops,"—whether the manure, if applied in the fall, should be broadcast, or placed in furrows first opened for the purpose, and then covered over, to await the seed time in spring—this, perhaps, would primarily be, a question of the *quantity* of manure available. A farmer, who had at all times an ample abundance of fertilizers, and who was able and willing to employ the proper force to prevent weeds from stealing one-half the dressing, might, perhaps, adopt the economy of broadcast manuring in autumn, and in that case, the opening of furrows in spring, to receive the seed, would be merely a part of the process of planting. But, usually, the limited stock of manure at command seems to compel the method of placing in the furrows or hills, only enough for the plants which are to grow in those lines. And here, perhaps, is to be apprehended the chief practical difficulty in adopting the method of fall manuring for hoed crops. The labor appears to be increased. The land is to be ploughed, (probably harrowed,) the furrows to be opened, the manure to be deposited in them, and the furrows to be covered again—the dropping and covering of the seed to come afterwards, in the spring. This is precisely the

method, however, adopted by skilful growers of turnips, save only, that the whole or a part of the work is done at a different season of the year. Whether such a method of preparing and dressing the land, in the fall, for the Indian corn and potatoes of the next year is practicable, with due economy of time and labor, may be partly a question of contrivance, good management and ingenuity. Convenient apparatus both for opening and for covering furrows is now common enough, and since the well decomposed manure, kept over from April to September, and properly taken care of meanwhile, will be found to be in a comparatively dry and friable condition, it may not be too sanguine to anticipate that a manure cart will be devised, with an apparatus attached, to open and close the furrows, while the manure is dropped, intermediately, as the cart is drawn across the field.*

If some such method is practicable for these crops, then the business of planting, in the spring, may be the lightest farm-work of the year. The boys and girls of the farm can do it all.

If these views are, to any degree correct, a large part of their usefulness will be found in the help they suggest against what is really the greatest difficulty in New England agriculture. The most terrific enemy of the New England farmer is *drought.* Against all other climatic disadvantages, we have some compensating balances of gain, and can employ some sort of forecast. In a very wet season, grass will grow and forage roots will thrive, however corn and grain may suffer. A late frost in June, or an early frost in August, may cut off or diminish the yield of one or more crops, but something else will be saved. But in a severe drought, nothing is safe. Everything is liable to be destroyed.

Providentially, droughts of sweeping destructiveness are rare in our climate. But partial droughts of much severity are very common, and the New England farmer is exposed to suffer the diminution of some of his crops, very frequently, from this cause. A drought in spring or early summer is least common of all. It is in midsummer, or after that time, that they are most common and most severe. But if we could foresee a drought in May or June, in what condition would we desire to have our crop lands, at that

* A mechanical difficulty may appear to present itself—the traction of the furrowing and covering apparatus, in addition to the weight of the load. But the manure will be lighter, by a large per-centage, than that taken from heaps in the spring, and the cart may be much less cumbersome than such as are used in ordinary spring work. The ground, also, will be drier, usually.

time? In the condition of clods of earth, not yet broken and pulverized, with masses of manure, not yet decomposed and dissolved—both clods and manure drying and baking, harder and harder, every day, in contact with the rootlets of the struggling plants? Or, in the condition, in which these lands would certainly be, if they had been lifted by the plough, the fall before, to the disintegrating influences of rain and frost, and if the manure had been, by like influences, thoroughly dissolved and distributed through all the feeding-ground of the plants? We cannot foretell or foresee a June drought, but we *can* put our plough-lands into that condition, beforehand, which will give to the growing plants their only chance of living successfully, through such a visitation. And, in like manner, if the drought does not occur till after the beginning of July, it is easy to see that if the young plants of the year commence their growth, at the first moment of their proper growing season, and go on rapidly and vigorously, with an abundant supply of food from the start, all ready for them as soon as and as fast as they need it, they will have gained, by mid-summer, a strength and substance of root and stalk, which will give them a reasonable promise of holding out, and maintaining their ground through several weeks even, of such later drought.

It is precisely with young plants as with young animals. Both are nourished by food. Both must have their food at the moment they begin to live, and it must be of the right kind and in the right form. Wild plants have their food supplied by nature, and, accidents excepted, it is always suited to their condition. The annual crops of our agriculture must have their food furnished by the hand of man. If they begin to grow at the middle of May, but have no proper supply of food till the middle of June, their life is of doubtful utility. The farmer who puts into the ground by the side of the seed a quantity of material for plant-food, which he knows, nevertheless, will not be fit for food, until some weeks after the germ has put forth from that seed, might take a lesson from himself, as a cattle-grower, and consider the good sense of that practice, by which he aims, above all things, to secure a rapid and vigorous early growth of his young animals. It is *not* by compelling them to *wait* for their food.

The entire difference between profit and loss, both in the raising of crops and the growing of cattle, often depends upon the single question, whether or not the crop or the animal was *well fed*, at

the earliest periods of its growth? If it was, there is ground for a calculation of profits—if not, the result may be a laborious and expensive loss.

If these theories of fall cultivation are thought worthy of being subjected to the test of practical experiment, it is a fortunate circumstance that the test can be applied in a small way, without any elaborate preliminaries, and without material risk of loss. Any farmer can try the question. A few square rods of land, one-half ploughed and dressed in the fall, the other in the spring, both receiving the same treatment in the season of growth, will be likely to assist in forming a judgment upon the two methods.

It is an encouraging consideration, in offering these suggestions for a very material change in the order of our methods of cultivation, that this change promises to be, in reality, a direct recurrence to the laws of nature, and a reliance upon those laws. Much of the farmer's life appears to be a struggle against natural forces. His highest attainment will no doubt be, when he brings himself into the most harmonious and faithful coöperation with nature, and with the wisdom and energy of that Divine Providence, of which nature is only the manifestation.

The theories and suggestions advanced in the foregoing pages, as originally put in form for an agricultural address, (October, 1865,) were the result, merely, of the writer's *reflection*. He had had no experience in such matters, and was not then aware that such views had been adopted in practice, or put forward as theory, by any others.

Subsequently, the following instances of such practice, and allusions to it, came to his notice.

At the delivery of the address at Gorham, Friend Samuel Taylor of Fairfield in this State, who was present, took the occasion to state publicly, that his townsman, Mr. Daniel Bunker, an experienced farmer, made it a settled practice to prepare his land for Indian corn precisely in this method, and with a success, in which he was not surpassed by any grower of this crop, in Somerset county. Mr. Bunker's views and practice are stated more particularly, below, in his own words.

The author of the English book, "Chronicles of a Clay Farm," (4th edition, 1857,) treating of some points in vegetable chemistry, has, incidentally, one or two noticeable sentences, and an interest-

ing reference to an ancient practice. Speaking of the "labors of the dung-cart, as at present carried on," as objectionable and involving loss, he says, "but with autumn and winter manuring, it is different."

* * * "Rightly, then, so far as their knowledge went, did our *forefathers*, who knew nothing of turnip culture, *plough in their long manure before winter*." And in the same connection, he speaks of the "poor practice" of applying "to a green spring-crop under the burning sun of June, the treasures of the farm-yard, whose spirit is exhaled before the body is buried, and whose body is not rotted time enough to afford its remnant of inorganic food to the crop it is applied to."

"Who can wonder, then, that the 'artificials' should sometimes beat the long manure, for spring application? And who can doubt, that we wise moderns have left half our lesson unlearned, in having *changed the time of manuring*, without changing also the *condition* of the manure?"

In an article in the Edinburgh Review, for January, 1866, the title of which is "Corn and Cattle," the writer, undertaking to trace the improvements in English agriculture, which have succeeded the repeal of the Corn Laws, comes at length to the mention of the steam plough; and in proceeding to state a comparison between the work of such a plough and the labor of horses, he has these sentences:

"But it was discovered that the only method by which root crops could be grown with certainty and success, was by preparing the land for them in the autumn. No amount of mechanical trituration could equal what some writer terms 'nature's wayward team, *frost*, *snow*, *wind and rain*,' and, to avail himself of these gratuitous forces, the farmer must turn a deep furrow in the field reserved for his crop, before such forces began to work. * * * It was evident that horse labor would be economised, inasmuch as one ploughing, at the right time, surpassed in effect many at the wrong time; that an early seed-time would be secured; that a far better time for the cartage of manure would be attained; and that, instead of leaving the land virtually closed to the winter's rains and the chemical effects of the atmosphere, the rain, sinking where it fell, would leave its fertilizing properties in its passage downward, and invite the air to follow. But the farmer's horses were limited in number," &c.

In the proceedings of the Massachusetts State Board of Agriculture, for 1864, (Flint's 12th Report,) there appears, in a report of a meeting of the board held at Greenfield, in December, a discussion upon the "Corn Crop," from which the following extracts are made.

Dr. Hartwell, of Southbridge, was the principal speaker, and, amongst other things, made the following statements:

"I plough my land in the fall, smooth over the surface, and then apply my manure; and I usually work it in deep with a horse plough. I spread the manure from the cart, and do not tip it up in heaps, because it is impossible to spread it evenly in that way. * * * * I have tried spreading the manure on the ground in the fall and leaving it until spring, but I would not, as a general thing, advise it. If you put it on a westerly declivity, it will blow away; but, if you have a piece of land that is protected by woods, or that has an eastern or southeastern declivity, there is no harm in putting on your manure in the fall. There was a premium offered by our society for the best acre of corn. I measured off one acre, and weighed the crop after it was husked, and it averaged eighty pounds to the bushel in the cob, and the acre produced a fraction over one hundred bushels, for which they gave me the premium, $18.

Mr. Tidd, of New Braintree, asked, Was your land green-sward or old soil?

Dr. Hartwell. This last year, it was green-sward, that had been mowed some four years. It was turned over, thoroughly smoothed down, and the manure spread over it. To do this, it is necessary to keep a stock of manure one year ahead. I think manure grows better by keeping. I think it is better to plough in the fall, than in the spring.

Mr. Perkins. What time in the fall do you prefer to plough? Does it make any difference, whether it is the first of September or the latter part of November?

Dr. Hartwell. I think September is the best, but farmers must do as they can. They cannot always do the work of the farm at the time they ought to. If I had my choice, I should do it in September, but October or November will answer the purpose.

Mr. Garfield. If I wanted to raise an extraordinary crop of corn for one year, I should certainly pursue the same method that the doctor does; but it is a question in my mind whether manure put on in that way will serve the best interests of the farmer in a succession of years. * * * *

Dr. Hartwell. I can state one fact that will perhaps throw some light upon the question. Several years ago, I ploughed an acre and a half, in the fall, in the manner I have described; I proposed to make a nursery upon half of it, and I put on the manure and spread it upon the surface of the soil, but the frost followed so soon, that I was not able to work it in. I changed my mind in relation to planting a nursery, and in the spring I spread an equal quantity of manure over the remainder of the land and planted it all with corn. *Where the manure was put on in the fall*, THE CORN WAS A GREAT DEAL THE BEST. I could see it in the rows, contrary to my expectation, for I expected that I had lost something on my manure. The next year the land was sowed with oats, and *I could see the line* where that manure came, that I put on in the fall. Next year it was sown to grass, and *that line was seen three years afterwards.*

* * * * With regard to the system I have spoken of, the farmers are not in a situation to practise it. There are no farmers in our section, that I know of, who have retained a year's stock of manure. They would be under the necessity of losing one year's crop of corn to get into the system. [?] For that reason they usually put on, in the spring, the manure that has been made during the winter. But I certainly would recommend to every farmer, who raises corn, to have one year's stock of manure on hand, if he can possibly get into that situation."

The practical results of Dr. Hartwell's method of cultivation, appear to give assurance that it rests upon a sound theoretical basis. A very valuable and independent confirmation of this is afforded by the long experience of our own fellow-citizen, Mr. Bunker, of Fairfield, who adopted the practice of ploughing and manuring in the fall, nearly forty years ago, and continues it successfully to this time. In a letter from him to the writer, dated Oct. 12, 1866, the following statements are made:

"I am decidedly in favor of manuring lands in the fall, say about this time, or during the month of October. My practice from 1827 to about 1840 was to plough my ground at this season of the year, and haul out and spread my manure on the furrows and harrow the ground and mix the manure with the soil. Next, in the spring, as early as the ground would admit, harrow the same thoroughly, and plant or sow, as I thought best. I found in this practice that the land received all the strength and nutriment the manure possessed, and I produced better crops, and with much less labor. * * * I believe the principle is well settled, that vegetation will not take root and grow upon new, strong manures; therefore it must lie, and be reduced in some way, to be adapted to the growth of vegetation. * * * Lands dressed in the fall, with the full strength of the manure, will hold productive twice as long."

It is interesting to compare this last proposition with Dr. Hartwell's observation of the effect of one fall manuring, through several following years.

Mr. Bunker states further:

"Since about 1840, I have planted my corn as Friend Taylor stated. In the month of October, I plough my ground, and harrow it and furrow it out in the usual way, and drop out the manure in the same way as farmers do in the spring, and then cover the manure about the same as they do, when planting at that season. In the spring, say from the 10th to the 15th of May, I mix up, with a hoe, the soil, which is on the top of the manure, and at the same time mellow the manure well in the hill, and open the top of it very lightly, and drop the corn, and cover it as in the usual planting."

Referring to his crop of 1865, he states that it was the second crop of corn on the same piece, prepared and manured both years, in this way—the land being previously in quite a poor state of cultivation, and having no other dressing whatever, except this manuring in the hill, in the fall. He adds, "I had, when gathered, the second year, from about one and a quarter acres, 200 bushels of ears, and I think the handsomest corn I ever saw. I carried a trace of it to the fair at Waterville, and took the first premium."

The conclusions of the Massachusetts Board upon Dr. Hartwell's method of cultivating corn, appear not to have been determinate. Mr. Agassiz, the distinguished naturalist, who was present as a member of the Board, made some very valuable suggestive inquiries, respecting the depth and width, to which the rootlets of the corn extend, in seeking their nourishment from the earth and the manure. Dr. Loring proposed that a vote should be taken upon the two questions, Would you plough sward-land and put the manure on the surface, in autumn, for a corn crop? or, Would you plough sward-land in the spring, and turn under the manure, for a corn crop? Mr. Tidd said he thought the diversity of opinion in respect to this matter arose from the differences in soil. Dr. Loring expressed himself as of the same opinion, and said he was satisfied each gentleman would vote upon these questions according to the character of the soil he cultivates. Mr. Bull said the questions involved so many considerations of soil and climate, heat and moisture, and succeeding crops, that he would rather have it laid over for future consideration, than to take a vote upon it now. Dr. Hartwell himself, also, objected to the Board undertaking to decide as to the best method of applying manure, and have it circulated, for the farmers to follow. He thought they were not prepared, now, to make so important a decision.

The subject was then laid on the table, and does not appear to have been resumed.

At the meeting of the Board, the following year, an essay was read by Mr. Stedman, on "Manures and their Application," (Flint's 13th Report, p. 197,) in which occurs the following passage:

"At what time shall we apply manure? It may be thought this question is not worthy of notice. I cannot, however, think it is wholly immaterial, although admitting a somewhat wider range. As top-dressing for grass, I would apply in autumn, or in early winter, if the ground is free from snow.

For spring crops, much is said, of late, in favor of the same time of application. While I favor this theory, and have been satisfied with its results, so far as I have observed, yet I am not sure that we have sufficient data to sustain this as the best course. And beside, spring is the time, when we have at command the largest supply. Let it now be used for hoed crops."

And so, the question was dismissed—being left, unfortunately, to rest upon the merely accidental fact (as distinguished from an essential principle) that the accumulations of the winter happen to be in the barn-yard, in the following spring.

But, in the same volume, is a very valuable matter of fact testimony, well worth quoting. All readers of Mr. Flint's Reports are familiar with the splendid herds of cattle raised by the Messrs. Anderson, of Shelburne. At page 308, in a report upon "the principal agricultural features" of Franklin county, reference is made to their stock, and the writer adds:

"The Andersons cut a very fine quality of hay on their farm, getting four tons per acre from their best lands, mowing twice. *They keep all their manure over one year, and then, without composting, spread it on their grass lands in the fall.*"

At the meeting of the previous year—the same at which Dr. Hartwell's statements were made—one of the Messrs. Anderson was present, and took a leading part in a discussion upon the Improvement of Pasture Lands, in the course of which he said:

"The probability is that the value of the stock, when I went on to the farm, was not more than five hundred dollars. To-day, I would not take four thousand dollars for my stock. I have forty head, and I believe they would sell for that at auction.

Well, there has been no mystery about the matter. *I have let nature work.*"

The testimony respecting the grass-lands of the Messrs. Anderson is like "a nail in a sure place." Habitual top-dressing in autumn—a reserved stock of manure as the basis of the treatment—four tons of hay to the acre to show for it, and herds of cattle, among the finest in New England, to show along with it. This is no mystery, and needs no logic to support it. The practice, in itself, appears to be pure reason.

CROSS-BREEDING.

It will be recollected that a paper on the Principles of Breeding bearing upon the improvement of domestic animals occupied a large portion of my report for 1860. The favorable reception given to that paper in connexion with the deep interest now manifested by stock growers throughout the State, and the general desire to learn whatever is to be known on the subject, induce me here to present two papers written by W. C. Spooner, V. S., for the Journal of the Royal Agricultural Society on cross-breeding in sheep and horses.

On Cross-Breeding in Sheep.

It cannot be denied that the natural laws by which the preservation of animal species is effected are involved in considerable mystery, and though the subject is well worthy the attention and study of the practical man as well as of the physiologist, experience is yet fraught with so much contrariety that attempts to lay down any certain guide on it have for the most part been received with considerable distrust. No sooner does the inquirer imagine that he has discovered some particular principle which obtains universally, than he is met by circumstances which apparently upset his previous conclusions. The maxim "*like begets like,*" for example, is a rule having very extensive sway, yet, as propagation is the work of two parents, the respective influences of the one or the other is a matter involving considerable diversity of opinion, and prevents anything like a certain conclusion being arrived at. We cannot do better than consider, on the very threshold of our subject, the respective influence of either parent; for on this the merits of pure or cross-breeding must principally depend. The most probable supposition is, that propagation is done by halves, each parent giving to the offspring the shape of one-half of the body. Thus the back, loins, hind-quarters, general shape, skin, and size, follow one parent; and the fore-quarters, head, vital and nervous system, the other; and we may go so far

as to add, that the former in the great majority of cases go with the male parent, and the latter with the female. A corroboration of this fact is found in the common system of putting an ordinary mare to a thorough-bred horse; not only does the head of the offspring resemble the dam, but the forelegs likewise, and thus it is fortunately the case that the too-frequently faulty and tottering legs of the sire are not reproduced in the foal, whilst the full thighs and hind quarters which belong to the blood-horse are generally given to the offspring. There is, however, a minority of cases in which the opposite result obtains. That *size* is governed more by the male parent, there is no great difficulty in showing;—familiar examples may be found in the offspring of the pony-mare and the full-sized horse, which considerably exceed the dam in size. Again, in the first cross between the small indigenous ewe and the large ram of another improved breed—the offspring is found to approach in size and shape very much to the ram. The mule offspring of the mare also very much resembles both in size and appearance its donkey sire.

These are familiar examples of the preponderating influence of the male parent, so far as the external form is considered. To show, however, that size and height do not invariably follow the male, we need go no further for illustration than the human subject. How often do we find that in the by no means infrequent case of the union of a tall man with a short woman, the result in some instances is that all the children are tall and in others all short, or sometimes that some of the family are short and others tall. Within our own knowledge, in one case, where the father was tall and the mother short, the children, six in number, are all tall. In another instance, the father being short and the mother tall, the children, seven in number, are all of lofty stature. In a third instance, the mother being tall and the father short, the greater portion of the family are short. Such facts as these are sufficient to prove that height or growth does not exclusively follow either the one parent or the other. Although this is the case, it is also a striking fact that the union of tall and short parents rarely, if ever, produces offspring of a medium size—midway, as it were, between the two parents. Thus, in the breeding of animals, if the object be to modify certain defects, by using a male or female in which such defects may not exist, we cannot produce this desired alteration; or rather, it cannot be equally produced in all the offspring, but can only be attained by weeding

out those in whom the objectionable points are repeated. We are, however, of opinion that, in the majority of instances, the height in the human subject, and the size and *contour* in animals, is influenced *much more by the male* than the female parent; and, on the other hand, that the constitution, the chest, and vital organs, and the forehand generally, more frequently follow the female.

We have dwelt on this point the more because on it hinges the difficulty of effecting certain improvements in breeding by means of crossing, and the still greater difficulty of establishing a new breed by such means. So great is this difficulty that many breeders, finding their attempts at such improvements so frequently baffled, or observing this to be the case in the practice of others, cling with superstitious tenacity to the doctrine of *purity of blood*, believing it to be the *Ark* in which alone true safety is to be found.

Now *pure breeding*, which, when carried to an excess, is called in-and-in breeding, has its advantages as well as its disadvantages. Its friends observe with great force, that when we have in breeding reached great excellence, it is folly to risk the loss of such excellence by means of crossing; and the more so as the defects of a parent may disappear in a first or second, and re-appear in the third or fourth generation; "*breeding back*," as it is commonly termed. A friend of the writer's, Mr. John Clark, of Lockerly, a strenuous advocate of pure breeding, observes that a correspondent in Suffolk informs him, that he had seen the cross tried between the old Norfolk and Down sheep, and the first cross was admirable, but they soon became disproportioned and unsightly; also the Down and Leicester in some midland counties figured for a time, and then for the same reasons were given up, and such he thinks will be the fate of the New Oxfords, or the mixture of the Cotswold and the Down. He adds, that for the last four years he has used rams from the cross with Down ewes, and the offspring answered his purpose for *fatting* lambs, but one lamb in ten presents unmistakable evidence of its mongrel origin.

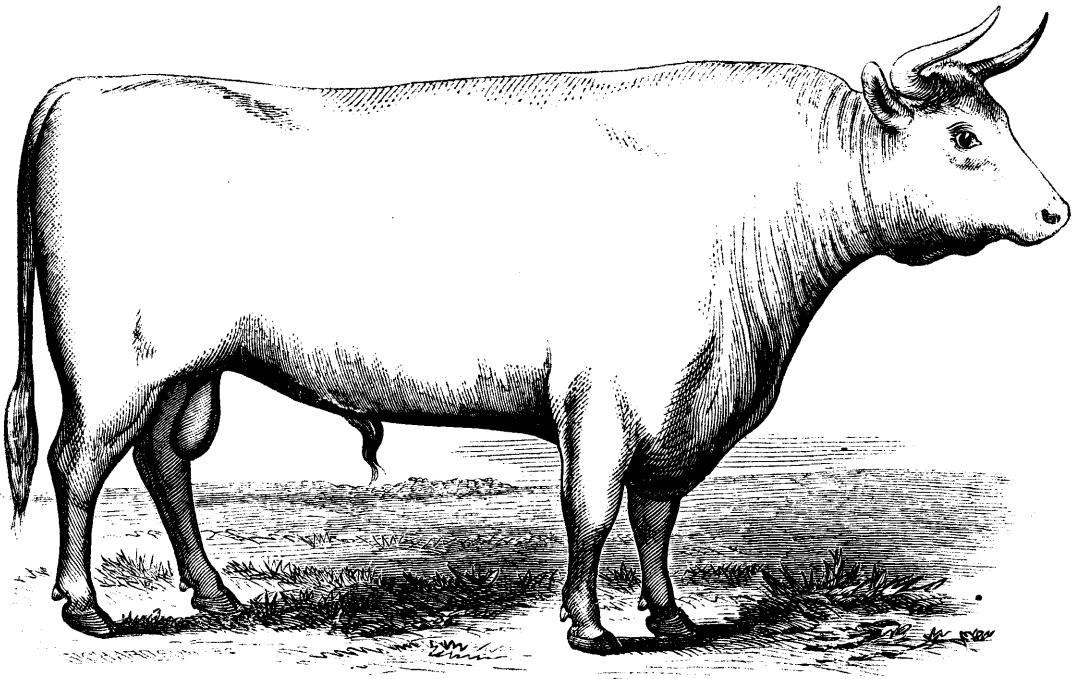
Again, it is urged that great excellences can only be perpetuated by union with similar excellences, and beyond all this that there is a certain amount of advantage from an unstained lineage —from the very possession of breed, as it is designated. The objectors to *in-and-in* breeding urge, that by so doing we engender weakness of constitution, diminution of size, hereditary diseases, and also a tendency to barrenness; but it is argued in reply to such objections, that they occur from want of sufficient

care in weeding out defective animals, whether as respects constitution or size. It is a well-established fact, that in the human subject too close affinity, such as the intermarriage of cousins, tends to mental diseases and consumption; and we can readily imagine that when there is a tendency to such diseases in a family, this tendency must be greatly increased by intermarrying with a member of the same family. Animals not being subject to mental diseases, the observation does not apply to them with the same force, but it is true in a lesser degree. At the same time, unless the choice is extremely confined, most of the evils of pure breeding can be avoided by careful selection and vigorous weeding. Examples of pure breeding are familiar to us in the admired race-horse, the first-class short-horn, and the Southdown sheep; but so far as purity of breed alone is considered, the mountain sheep of Wales, the Highland Scotch cattle, and the Shetland or Welch, are equally pure; but whilst the latter have been propagated without care or attention, the former have, by careful selection and vigorous weeding, been considerably enhanced in value. A striking example of long continued pure breeding is afforded by the Leicester flock of Mr. Valentine Barford, of Foscote near Towcester, who has the pedigree of his sheep from the day of Bakewell in 1783 to the present time, and since 1810 he has bred entirely from his own flock, sire and dam, without an interchange of male or female from any other flock. He observes, "that his flock being bred from the nearest affinities—commonly called in-and-breeding—has not experienced any of the ill effects ascribed to the practice." His flock is remarkably healthy, and his rams successful, but his sheep are small.

Let us pause for a few minutes to consider what constitutes *breed*, or rather what is meant by high breeding. We shall find that it refers to very different desiderata in different breeds. In the thorough-bred horse it signifies a very high development of the muscular and nervous systems, accompanied by such mechanical structure as when united with it constitutes the highest manifestation of speed and endurance. In the ox, however, it implies very different qualities, viz., early and rapid growth—the development of flesh or muscle on the parts most prized for food—a disposition to lay on fat; these, with the possession of the smallest amount of bone consistent with strength and health, are the principal characteristics of a well-bred animal. Instead of the highly-nervous temperament of the race-horse, we have here a quiet lazy

disposition; in fact, a lymphatic temperament, by the influence of which the digestive organs reign supreme, and convert for the public benefit a given quantity of food into the utmost amount of flesh and fat. The same observations apply with equal force to the sheep, and in a still stronger degree to the pig. A well-bred pig is the incarnation of everything indolent and lethargic, and the very antipodes of that high organization and nervous development which belong to a high-bred horse. Examples of pure breeding are probably to be found in greater perfection in cattle than in sheep. The *Devon* and *Hereford* cattle have descended through many generations in unbroken lines, and owe the perfection which they have attained to careful selection. The *Short-horns*, although considerably more modern in their origin, and moulded into their present form by a series of successful crosses, have yet been preserved pure with even more rigorous care than the other breeds which we have mentioned. The solid frame and great feeding properties of the Herefords—the quality of beef and richness of cream, as well as working properties of the Devons, are well known and generally appreciated; and yet these qualities are insufficient to resist successfully the encroachments of the Short-horns, whose early maturity and disposition to lay on both flesh and fat, joined with fair milking properties, are such that they outnumber both the other breeds combined. As, however, the leading purpose for which a breed of cattle is kept is generally well defined, whether for the purpose of the dairy, or for that and early fatting, or simply for beef or for working as well, and, as each of these purposes can be well attained by keeping a pure breed, there is not the same temptation or inducement to cross, which is often experienced in sheep-farming, in order to insure specific advantages which cannot otherwise be attained.

This being the case, we may most advantageously devote our remaining space to the practice of crossing, as illustrated in sheep-breeding. We may start, then, with this principle, that to cross for crossing sake is decidedly *wrong;* that, unless some specific purpose is sought for by crossing, it is far better to cultivate a pure breed. The country is, indeed, under great obligations to those gentlemen who carefully preserve their breed intact, and endeavor to improve it by weeding and selection. We can readily excuse their prejudices, if they have any, and have no wish to interfere with their creed. Let theirs be the office to preserve our fountains pure and undefiled, and to supply others with the best



NELSON 75.

Devon Bull, calved April, 1857. Bred by Messrs. S. & L. Hurlburt, Winchester, Connecticut. The property of John F. Anderson, Maplewood Farm, South Windham. Sire, Noscius (267). Grandsire, imported Albert (2). Dam, Strawberry (1061), by Bloomfield (148). Grandam, Strawberry, by Bloomfield (148). gr g dam, Strawberry, by Exchange (197). gr gr g dam, Strawberry (1062), by Taurus (320). gr gr gr g dam, Old Strawberry, "Coke Devon."

Nelson won first prize as a yearling, and first, as a two-years old, at the Connecticut State Show; also the first prize as a mature bull, at the same in 1862; the second prize, at the first New England Show, at Springfield in 1864; and the first prize at the second Exhibition of the same Society at Concord, in 1865. At 9 years of age, length exclusive of head and neck 5¼ feet, height at shoulder 4½ feet, girth 6 feet 10 inches, weight 1650 pounds, in working condition.

sources of improvement by crossing. And we do not confine our praise to those merely who, keeping in the high road of fashion, have succeded in securing, both by prizes and prices, a full and sufficient reward for their labors, but would award it to those also who, keeping perhaps in the second rank, have yet supplied their neighbors and the public with valuable pure-bred sheep at moderate prices.

History fails to supply us with the origin of our various breeds of sheep; but we doubt not that, for many centuries after the time of the Romans in this country, certain distinct breeds were perpetuated, with little improvement and little change. The progenitors of the present Southdown or Sussex breed, inferior as they were to their descendants, ranged probably, in the days of the Romans, over the Southdown hills; whilst another breed, now happily extinct, occupied for the most part the hills and downs of Wiltshire and Hampshire. A large, bony, narrow, but active sheep, with large head, Roman nose, and long curly horns, high in the withers and sharp in the spine, but yet the largest short-woolled breed in existence, were the denizens of these counties during the last century.

In Wiltshire, although they remained as a pure breed much longer than in Hampshire, yet, as far as can be learnt, they were supplanted by the Southdown, whose superior qualities displaced the old Wiltshire altogether; and we are not aware of any instances in which they were crossed, except for the purpose of crossing them out by using again and again the Sussex ram. Mr. James Rawlence of Bulbridge, near Wilton, whose large practical experience, both as sheep-breeder and land-agent, stamps his authority with considerable weight, observes in reply to the author's inquiry, "The last flock of this breed (old Wiltshire) disappeared about the year 1819, and the substitution of the Southdown commenced late in the last century. In many cases Southdown ewes as well as rams were brought out of Sussex to replace the horned flocks, but in numerous instances the two breeds of sheep were crossed, and by the continued use of the Southdown ram the chief characteristics of the horned breed were merged in the Downs. The cause of the very rapid substitution of the Down for the Old Wiltshire may be found in the fact of the large number of enclosures of common fields which then took place. The sturdy horned wether was thoroughly competent to take care of himself when the system of feeding in common prevailed, but when each farmer

could keep his flock separate, an animal of superior quality was preferred."

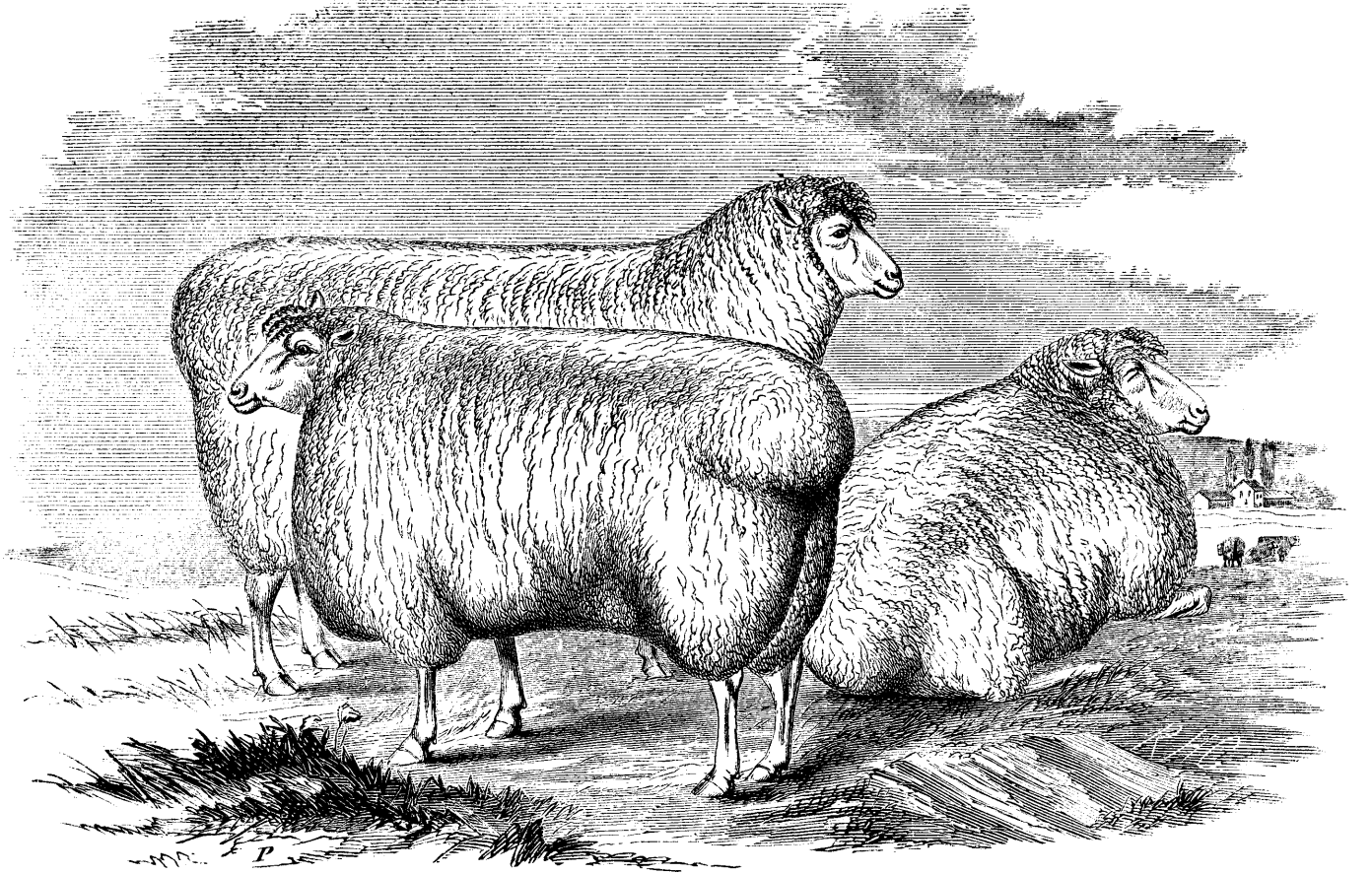
In Hampshire, on the other hand, where the same sheep prevailed and were valued for their hardihood, and their powers of travelling far, and folding hard—properties so valuable when the fertility of the light soils was mainly kept up by these useful manure-carriers—these sheep were extensively crossed. Previous to the close of the last century, the Southdown sheep had been greatly improved by careful selection, and the name of the late Mr. Ellman was well known for his eminent services in bringing out and improving the latent qualities of this valuable breed. About the beginning of the present century the sheep-breeders of North Hampshire began to bestir themselves, and a few enterprising farmers procured some rams from Sussex, of the Southdown breed. Finding the experiment successful, it was repeated again and again, care being taken to select the largest, coarsest, and *blackest*-faced rams, which it was thought would suit the coarse sheep with which they had to amalgamate. How many crosses with the pure Sussex were used we cannot ascertain, but enough materially to alter the character of the breed, to cause the horns to disappear, and to change the color of the face from white to black; and, with these changes, to impart a more compact frame, a broader back, rounder barrel, shorter legs, and superior quality altogether, and yet preserving the hardiness and the disposition to make early growth, which the original flock no doubt possessed, and with it the large head and Roman noses, which form so distinguishing a characteristic of the Hampshire Downs, and which are unquestionably derived from the original breed. Indeed, it is only necessary to inspect a drawing of the original Hampshire or Wiltshire sheep to become thoroughly satisfied as to the source from whence it derived the colossal head which some fifteen years since was regarded as, I will not say an ornament, but an indispensable appendage of the breed. Uniformity of color is also a great point with most Hampshire breeders, with what amount of advantage we cannot say, but black tips to the ears as well as black faces are deemed essential, and any crossing with speckled-faced sheep, such as the Shropshire, is in consequence viewed with dislike.

It was not until the Wiltshire sheep-breeders began to produce some large but more symmetrical animals that the Hampshire men began to consider whether it was not possible to reduce the size

of the heads, without losing the characteristics of the breed. By attention and careful selection this has been accomplished, and we have now a breed of sheep which is admirably adapted to the present system of fatting off at much earlier ages than formerly, and, for the most part, as tegs and two-teeth sheep. It is certainly not owing to any aristocratic patronage that the Hampshire sheep have forced their way into public estimation. They have neither been upheld by agricultural societies or agricultural writers, nor have they been launched into public favor as winners of prizes; on the contrary, they have been laughed at, criticised, and condemned; and yet they have not only held their own, but have spread far and near, so that the county in South England where none are to be found is probably the exception, and not the rule. The Hampshire sheep may, therefore, be instanced as an example of successful crossing, and as a proof of what can be done by the male parent, in changing, in very few generations, the character of the original, and yet retaining some of its good qualities, thus forming a breed more intrinsically valuable than either source from whence it is derived. It has been truly said that the public is wise though composed of fools; and undoubtedly, when the pocket is concerned, the decision of the public is, for the most part, correct. Thus at the various autumnal fairs large lambs are in the greatest request, and command the highest prices, which in itself is a sufficient proof that with a given amount of food they make a greater quantity of mutton. It was found, indeed, by Mr. Lawes, in his careful and valuable experiments, that the Hampshire sheep, although they were surpassed by the Cotswold, yet exceeded the Southdown in the amount of mutton raised from a given weight of food. The greater economy of fatting a young over an old animal may be readily explained by the fact, that whilst the latter increases in fat alone, the former does so both in flesh, fat, and bone, and thus the latter can assimilate a greater amount of the nutritious properties of the food, and is consequently a more profitable feeder.

We have no reason to suppose that after a few generations the Hampshire breeders continued to use the Sussex rams; as soon as the horns were gone, to which, perhaps, the Berkshire Notts contributed, and the face had become black, they employed their own cross-bred rams with the cross-bred ewes. If, then, we were asked what original blood predominated in the Hampshire sheep, we should unquestionably say the Sussex; but if the further ques-

tion were put, Is the present breed derived from the Sussex and the original Hampshire alone? we should express a doubt as to such a conclusion, as there is good reason to consider that some improved Cotswold blood has been infused. Some thirty years since a Hampshire farmer still living (Mr. John Twynam) used the improved Cotswold ram with his Hampshire ewes, and the first cross exhibited a remarkable proof of the preponderating effect of the male. The produce, in size, general appearance, and wool, partook far more of the ram than of the ewe, and it was thought that a most valuable breed had been obtained, which, with the increased size, and weight of fleece, and disposition to fatten of the Cotswold, would combine the hardiness and folding capabilities of the Hampshire. It was found, however, no easy task to perpetuate such a breed after the first cross—the defects of the one parent or the other would appear and re-appear in the second and third generation, and it was only by careful weeding that anything like uniformity could be attained. Mr. E. G. Young, of Broadchalk, Wilts, a close observer as well as an excellent farmer, informs the writer that he, as well as his brother, purchased Mr. Twynam's rams for several years, and has, he conceives, derived advantage from the cross. Mr. Rawlence observes, that the points he has arrived at have been to produce an animal yielding at an early age the largest possible amount of mutton and wool, which he considers the *sine qua non* of sheep breeding; and he adds, it is difficult to estimate the enormously increased production which has within the last few years been obtained by keeping this object steadily in view. Whilst he highly appreciates the high-bred Southdown, he is convinced that the present system of farming demands a larger description of sheep, and one which will produce a heavy weight of wool at an earlier age, and he is not quite sure whether a cross with the Cotswold would not produce a more profitable animal. The absurd fashion of drafting good sheep, if they have not black faces and ears, tends to retard the improvement of the carcase. After some few years a change of farm and other causes led to a discontinuance of the experiment, yet many of the cross-bred rams were sold and let to sheep-breeders both in Hampshire and Wiltshire; and although after dipping once or twice into this breed they then ceased to do so, yet they have continued breeding from descendants of the cross, and thus, in very many of the Hampshire and the Wiltshire flocks, there is still some improved Cots-



IMPORTED COTSWOLD EWES.

Bred by Robert Garne, Aldsworth, Northleach, England. Imported by and property of Burdett Loomis, Windsor Locks, Conn.
Winnners of 1st prize as best ewes that suckled their lambs.

wold, and, consequently, Leicester blood.* Probably an increase of wool has thus been obtained. Some say that on the borders of Berkshire the Berkshire Nott was also used, and others contend, although without proof, that a dip of the Leicester has been infused. Be this as it may, there is no doubt that, although for some years past the Hampshire sheep have, for the most part, been kept pure, yet they have been very extensively crossed with other breeds before this period.

We cannot do better than let Mr. Twyman speak for himself on a matter on which he has bestowed considerable attention during a period of ten or twelve years. In a paper he has recently read before a Farmers' Club—after some observations on the respective merits of the Cotswold, the Leicester, the Southdown, and the Old Wiltshire, or Hampshire, from all which sources the present breed is derived—he states his idea was to blend these various breeds together, which he did by using the improved Cotswold ram (Cotswold and Leicester) with the Hampshire Down ewe. As a proof of the value of the cross, he observes,—"I have the written documents of the feeder of one hundred tegs sold in 1836, the wool and carcases from which returned 400*l*." By using this cross an earlier maturity is gained than by either breed separately. He observes:—"The Leicester and Cotswold will become large, heavy and fat on the outside, but not inwardly, as yearlings; very few Downs will at that age be sufficiently advanced for slaughtering, from their known disposition to arrive more slowly at maturity." What, then, is wanted is young sheep, large, heavy, and well furnished at a year or fourteen months old, and this object is attained by the cross, as the testimony of the butchers who bought the sheep will show. He continues,—

"You must have observed an immense improvement in the character of the Hampshire sheep generally within the last fifteen or twenty years—an increase of size, a heavier fleece of a longer staple, with a kindlier touch, evidencing a greater aptitude to fatten. I have had my attention called to this fact frequently since I have ceased to be a breeder. How has this altered character been ob-

* It is, we believe, generally acknowledged that the Cotswold sheep have been improved by crosses from the Leicester ram; and although the origin of the latter is involved in some obscurity, yet it is generally supposed that Bakewell, the founder, whilst he used the original Leicester or the long-woolled breed, which prevailed mostly in the midland counties, as his foundation, crossed them with various other breeds until he succeeded in establishing the superiority of excellence which he afterwards sought to maintain by pure exclusive breeding.

tained? Can we recognize none of the Cotswold fleece or his more symmetrical proportions? And, when I tell you that, in the years 1835-36 and subsequent years, I sold very many half-bred rams, not only into Hampshire Down flocks generally, but into those of six or eight of our first ram-breeders whose names are at this day to be seen upon my books; when you must be aware that these breeders are in the constant annual habit of selling one to another in this and adjoining counties; I trust I may without presumption lay some little claim to having supplied a portion of the material from which our present flockmasters have worked up a better and more valuable fabric."

It is a curious fact that, whilst the system we have detailed has been followed in Hampshire, a very different plan has been adopted in the neighboring county of Wiltshire. Here the same large, flat-sided, uncouth horned sheep, whose ancestors were its denizens in the days of the Romans, ranged over the Wiltshire Downs, and, indeed, retained possession some years later than in Hampshire. They at length succumbed to the superior qualifications of the Sussex Downs which gradually displaced them, not by crossing them out so much as by being substituted in their place, and thus the imported Sussex became the West Country Down. At length a larger sheep and particularly a larger lamb was demanded, and then the Wiltshire breeders procured rams from Hampshire and greatly improved their flocks in size, and secured larger lambs. Beginning with Sussex ewes, they have increased the size of the frame without materially enlarging the heads, and thus a very valuable breed of sheep has been formed, the Wiltshire Down, whose more perfect symmetry frequently enables their owners to wrest the prizes from the Hampshire men, and to cause the latter, by the rivalry thus induced, to improve the symmetry of their sheep by careful selection. The Wiltshire Down breeders, therefore, began with the Sussex ewe, and crossed with the Hampshire ram, whilst the Hampshire breeders used the original horned ewe and the Sussex ram. The latter, therefore, have less of the Southdown than the former, and, though of greater size and producing somewhat larger lambs, have less symmetry.

Mr. Rawlence, whom we have before quoted, informs the writer:

"The original flock from which my present sheep are chiefly descended, was of the Sussex breed and of moderate quality. I commenced by drafting all the small and delicate ewes, and the remainder were crossed with rams of the Hampshire breed. I bred

from their produce for two or three years, and then had another cross with the Hampshire, still continuing to cull defective ewes. After I had obtained considerable size from the infusion of the Hampshire blood, I had recourse to some rams bred by Mr. Humphrey of Chaddleworth, Berks, which were the produce of the biggest and strongest Hampshire ewes by a sheep of Mr. Jonas Webb's. I use my own rams, and I also frequently purchase a few of the best Hampshire ewes I can get, put my own sheep to them and use their lambs. I also put a sheep of Mr. Humphrey's to some of the best of my ewes, and select rams from their produce, thus getting fresh blood without making an entire cross."

Our account of the Hampshire sheep would be by no means complete unless we noticed the sheep of Mr. William Humphrey, of Oak Ash, near Wantage, Berks, specimens from whose flock have so frequently been prize-winners, and their services generally acknowledged by other improvers.

Mr. Humphrey, in a communication to the writer, has furnished the following interesting history of his sheep, which shows that, although they may be correctly designated the Improved Hampshire Downs, they are yet *sui generis* and distinct from any others, and may be considered peculiarly his own:

"About twenty-five years since, in forming my flock, I purchased the best Hampshire or West-Country Down ewes I could meet with; some of them I obtained from the late Mr. G. Budd, Mr. William Pain, Mr. Digweed, and other eminent breeders, giving 40*s.* when ordinary ewes were making 33*s.* to 34*s.*, using the best rams I could get of the same kind until the Oxford show of the Royal Agricultural Society. On examining the different breeds exhibited there I found the Cotswolds were beautiful in form and of great size; and, on making inquiries as to how they were brought to such perfection, I was informed that a Leicester ram was coupled to some of the largest Cotswold ewes, and the most robust of the produce were selected for use. The thought then struck me that my best plan would be to obtain a first-rate Sussex Down sheep to put to my larger Hampshire Down ewe, both being of the short-woolled breed. I thus determined to try and improve the quality and form of my flesh, still retaining the size and hardihood so necessary for our dirty low lands and cold exposed hills. With this object I wrote to Mr. Jonas Webb to send me one of his best sheep, and he sent me a shearling by his favorite sheep Babraham, which made some good stock out of my large ewes. I

went down the next two years, and selected for myself; but the stock did not suit my taste as well as the one he sent me, and I did not use them. I then commissioned him to send me his sheep which obtained the first prize at Liverpool; and from these two sheep, the first and the last, by marking the lambs of each tribe as they fall, then coupling them together at the third and fourth generation, my present flock was made. Not having used any other blood on the male side for more than twenty years, I found some difficulty at first, when putting the first-produce ram to the first-produce ewe, the lambs coming too small to suit my customers. To obviate this difficulty I drafted out the finest and smallest-bred ewes, replacing them with the largest Hampshire Down ewes I could meet with that suited my fancy; still continuing to use the most masculine and robust of my rams to keep up my size. Some of my friends advised me to use a large coarse sheep to these small ewes to remedy the defect; but the larger ewe seemed to me the better way, and that course I pursued. I got rid of my smallest ewes and replaced them with large ones, which gave me what I thought to be an advantage—the using no male animal but of my own blood, the pedigree of which I am now acquainted with for more than twenty years. It has succeeded hitherto beyond what I could have expected. My object has been to produce a Down sheep of large size with good quality of flesh, and possessing sufficient strength and hardiness to retain its condition while exposed in rough and bad weather to consume the root-crops on our cold, dirty hills. Independently of the value of the Hampshire or West-Country Down in an agricultural point of view for such localities as ours, they produce when slaughtered a valuable carcase of mutton, giving the consumer a good proportion of flesh to the fat, which is a point that may be too much lost sight of. I will, in proof of it, relate an instance which a gentleman told me the other day. When residing in another county he sent to his butcher for 3 lbs. of mutton. The fat seemed so much out of proportion to the lean, that he had the curiosity to weigh the lean. After carefully cutting it out, he found it to weigh $\frac{3}{4}$ lb., or only one-fourth of the whole. This anecdote indicates to those who are attempting by crosses to establish a new breed, or to improve an old one, the importance of producing an animal in which the flesh forms a due and sufficient proportion of the whole."

In Dorsetshire the same system has been pursued as in Wiltshire, although more recently and to much less extent.

In the eastern part of the county the Wiltshire system of crossing has been followed with still greater latitude. The object being to secure size without coarseness, the rams of the Hampshire as well as the Sussex are each used, as the fancy of the breeder may direct. In one flock, well known to the writer, of very good repute—so much so, that an annual sale of rams and ram lambs takes place, and for several years past has been very successful—the owner, whose flock was originally Southdown, has increased the size of his sheep by means of the Hampshire ram, but does not hesitate to avail himself of the Sussex from time to time to counteract, as he says, any tendency to sourness, and also uses the choicest of his own breed as well. Here is an evident cross, carried to a considerable extent and with great success, as the high price realized by the sale of fat tegs sufficiently testifies. Other breeders in this county adhere firmly to the Southdown, which they seek to improve by using first-class rams; and the superior quality of their fleece, as compared with the Hampshire, forms no small part of their motives for so doing. Some years since the Southdown sheep in Dorsetshire received a cross from the Devon or Bampton Nott, a large long-woolled sheep, but with a good disposition to fatten. The cross was approved of, and the produce were used by other flock-masters, which circumstance has perhaps rendered the Dorsetshire Southdown somewhat larger than the Sussex.

The *Dorset horned* sheep, so valuable for their early lambs, some fifty or sixty years since reigned supreme over the Dorsetshire Downs. They were then in many instances supplanted by the Sussex, which were found better suited for folding, and were more esteemed for their mutton. Crossing was tried in many instances, but although the half-bred lamb from the Dorset ewe was and still is in great request for early lamb, yet the breeds did not assimilate well; they were as a flock inferior to their parents, and were consequently discontinued; and whilst the Dorset held their own in the west, the Southdown took their place in the eastern part of the county, and of late years have, in many instances, been crossed by the Hampshire ram.

The Dorset horned sheep is, however, a much superior animal to the old Wiltshire and Hampshire. Shorter on the legs, with a more compact frame and a rounder barrel, this sheep, besides its peculiar value for the production of early lamb and its remarkably prolific qualities, is by no means to be despised for its feeding properties. It is not unusual for these sheep—as well as the kindred

though somewhat larger Somersetshire—to be brought into market in March and April, together with their lambs and sometimes pairs of lambs, all fit for the butcher at the same time. The Dorsetshire and Somersetshire sheep are raised on tolerably good land, where they have been preserved pure and improved by selection.* It is usual, however, to put the ewes that are intended to be sold to the Southdown ram, which improves the quality and fatting predisposition of the lamb, and the ewes are usually sold at the Hampshire October fairs, by which time they are very forward in lamb. The buyers of the ewes, although the usual custom is to sell off the ewe and lamb the following spring, sometimes keep a portion of the ewes another year, putting them again to a black-faced ram. It is remarkable that these ewes are not only exceedingly prolific and rarely have any mishap in yeaning their lambs, but will carry on all the functions of maternity whilst almost fat themselves. In South Hampshire, which is celebrated for the excellent quality of its early lamb, this system is carried out to perfection, particularly with the Somersetshire ewe. The drawback to this breed of sheep, as compared with the Hampshire and Southdown, is the longer period required for their maturity, the richer food required, and the somewhat inferior character both of the mutton and the wool.

To return, however, to our proper subject, we may observe that various attempts were made some years since to introduce the Merino blood, with the idea that great benefit would be derived from the increased quantity and the superior fineness of the wool; and undoubtedly, if the carcase of the Southdown and the wool of the Merino could be united in the same animal, the acmé of sheep-breeding would be attained. It was found, however, that the quality of the wool was not a sufficient recompense for the want of early maturity and feeding properties; and at length, after many trials, the Merinos disappeared by the continued use of other rams. It is very pos-ible, however, that they may have left behind them some improvement of the fleece, for it is equally difficult in breeding to get rid of a virtue and to wash out a stain. We have confined our examples of cross breeding pretty much to the breeds of our own locality, but it must not be forgotten that other counties have also some noble specimens of cross-bred sheep. Shropshire is

* The Dorsetshire flocks have of late years been crossed and improved by the larger Somersets, so that pure flocks of the former are now rare, and the distinction of the two breeds by the color of the nose has almost disappeared.

celebrated for its breed of sheep, and under the new regulations they compete very successfully at our annual shows. At the Chester meeting they beat the Hampshire Down as old sheep, but in their turn were conquered by the latter in the younger classes. They present themselves to our notice in a more compact form; though shorter, they are wider, broader on the back and deeper through the heart.

This breed was first brought into national repute at the Shrewsbury meeting in 1845, when it was wisely held that it was no longer desirable to confine the honors of the Society to a few particular breeds. The new class "Shortwools not Southdowns," brought into competition with each other, the Hampshire, the Shropshire, and the West Country Down or Wiltshire; and thus, although the labors of the judges were rendered somewhat onerous, yet much good was effected, and the public have greatly appreciated and promoted the various breeds so brought into notice.

The Shropshire originally sprang from a breed called the Morfe Common sheep, and owe most of their great and improved qualities to careful selection. We imagine they would make a very good cross with the Hampshire Down, and might somewhat improve the carcase of the latter, as well as the quantity and quality of wool in the flocks of those breeders who do not attach too much importance to the color of the face.

The Shropshire speckled-faced sheep is undoubtedly a cross-bred animal, and indeed affords a striking example of the perfection that can be derived by a judicious mixture of various breeds. At a late meeting of a Farmers' Club in this county, Mr. J. Meire observed, "It is not attempted to be denied that the Shropshire is a cross-bred sheep; the original breed was horned, and the first attempt at improvement was to get rid of these incumbrances, and there is little doubt that this was effected by a cross of the Southdown. This sheep was well adapted for the downs, but for the enclosures of Shropshire something more docile was required, consequently, recourse was had to the Leicester." This crossing and recrossing at length gave place to the practice of careful selection, and thus uniformity was sought for and attained, and the present superior breed was established. It is now held that no further cross is required.

The New Oxfordshire sheep is a very valuable breed, originating from a cross between the improved Cotswold and the Hampshire or West Country Down. Their size being less than the Cotswold,

they are better adapted for the ordinary management of a light land farm. This breed is very similar to that first introduced by Mr. Twyman, to which allusion has been made, but probably the Southdown has been used as well as the Hampshire Down.

Although Mr. Twyman may perhaps have a claim to priority in crossing the Hampshire Down ewe with the Cotswold ram, yet from various causes, and probably because the Hampshire hills were scarcely adapted for such large sheep, they failed to establish themselves in this locality; whilst a very few years afterwards a similar experiment was tried in Oxfordshire, and, whether from a milder climate, more fertile pasturage, or other causes, the result was a complete success.

Mr. S. Druce, of Eynsham, Oxon., favors the writer with the following short communication on the subject:

"The foundation of this class of sheep was begun about the year 1833 (see vol. xiv, p. 211,* of the Journal of the R. A. S. E.), by using a well-made and neat Cotswold ram with Hampshire Down ewes. At the same period several breeders of sheep in this neighborhood also tried the experiment; consequently there has always been an opportunity of getting fresh blood by selecting sheep which suited different flocks, and thereby maintaining the uniform character which is now established.

"As to the result of this crossing, I would refer you to the names of the following, who usually exhibit at the "Smithfield Club" Show, viz: Messrs. John Hitchman, Little Milton, Oxon.; Wm. Gillett, Brize Norton, Witney, Oxon.; W. Hobbs, Minsey Hampton, Gloucestershire; A. Edmunds, Longworth, Berks; J. B. Twitchell, Wilby, Northamptonshire; C. Howard, Biddenham, Beds; William Hemming, of Caldecot, near Moreton-in-the-Marsh, Gloucestershire, &c., &c. And amongst ram breeders I would name J. Hitchman, J. Roberts, C. Gillett, W. Gillett, J. Bryan, His Grace the Duke of Marlborough, H. L. Gaskell, Esq., H. Barnett, Esq., all in this neighborhood, and who offer sheep by auction the second Wednesday in August annually at Oxford."

* In the communication referred to, Mr. Druce gives a table, showing his ideas of the comparative value of the different breeds of sheep, the result of which is in favor of the cross-bred. He adds, "With ordinary skill in sheep-farming, I find no difficulty in keeping the form and size of the animal as it should be; the wool of a valuable quality, and not deficient in quantity; and I maintain that the good qualities can be better secured by employing the cross-bred animals on both sides than by confining the practice to the first cross."

There are few districts in England in which some advantage has not been derived from the cross breeding of sheep. Even the little *mountain sheep* of Wales has been greatly improved by the *Cheviot* ram, a larger, superior, but still a mountain sheep. At the same time the Cheviots themselves have been improved for the butcher by crosses with the Leicester, the Cotswold, and the Down. The progeny have been increased in size, and fattened more readily. This breed has also been considerably improved by selection.

The *black-faced heath* breed, too, so well suited to mountainous districts in which heath abounds, whilst it has been supplanted in certain districts by the Cheviot, has, in other heathy localities, displaced the latter. Although very slow in reaching maturity, the mutton is much esteemed; and the lambs, from a first cross with the Leicester ram, fatten readily when removed to more favorable pasturage than the native habitat of the breed.

The testimony in favor of the advantages to be derived from the cross breeding of sheep when the purpose sought for is limited to the first cross is so strong that, however forcible may be the arguments of the advocates of pure breeding with reference to stock sheep, they sink altogether in weight when sheep for the butcher are concerned. We have noticed the advantageous custom of crossing the Dorset and Somersetshire ewes with the Down ram, thereby improving both the quality and the disposition to fatten of the lambs, whilst the early lambing and nursing qualities of the ewes are equally secured.

In Norfolk an intelligent and experienced correspondent assures us that cross breeding is of the utmost importance to the light land farmers, and that the crosses most esteemed are the Southdown and the Hampshire ewes crossed with the Leicester and the Cotswold ram, by which earlier maturity is secured, together with an increase both of wool and mutton. The cross between two comparatively pure breeds is most esteemed. Most of the graziers in the locality of the writer (Mr. Coleman) speak strongly in favor of the first cross, as possessing both early maturity and a propensity to fatten. The inconvenience of the system is the necessity induced either of selling out every year, or otherwise of keeping up a pure flock, in order to afford materials for crossing. It may be observed that although generally, for the purposes of the butcher, a ram of a large breed is necessary, this is not essential when a permanent improvement is sought for; improved shape and superior quality often follow the ram of a smaller breed. Many owners of

sheep, whose flocks were originally cross-bred, declaim very forcibly on the evils of crossing and the necessity of pure breeding.

We cannot do better, in concluding our paper, than gather up and arrange in a collected form the various points of our subject, which appear to be of sufficient importance to be again presented to the attention of our readers. We think, therefore, we are justified in coming to the conclusions:

1st. That there is a direct pecuniary advantage in judicious cross breeding; that increased size, a disposition to fatten, and early maturity are thereby induced.

2nd. That whilst this may be caused for the most part by the very fact of crossing, yet it is principally due to the superior influence of the male over the size and external appearance of the offspring; so that it is desirable, for the purposes of the butcher, that the male should be of a larger frame than the female, and should excel in those peculiarities we are desirous of reproducing. Let it be here, however, repeated as an exceptional truth, that though as a rule the male parent influences mostly the size and external form, and the female parent the constitution, general health, and vital powers, yet that the opposite result sometimes takes place.

3d. Certain peculiarities may be imparted to a breed by a single cross. Thus, the ponies of the New Forest exhibit characteristics of blood, although it is many years since a thorough-bred horse was turned into the forest for the purpose. So, likewise, we observe in the Hampshire sheep the Roman nose and large heads which formed so strong a feature in their maternal ancestors, although successive crosses of the Southdown were employed to change the character of the breed.

It has been asserted by some observers, that when a female breeds successively from several different males, the offspring often bear a strong resemblance to the first male; which is supposed to arise from certain impressions made on the imagination or nervous system of the female. Although this is sometimes or often the case, we doubt very much whether it is so frequent as to be considered as a rule.

4th. Although in the crossing of sheep for the purpose of the butcher, it is generally advisable to use males of a larger breed, provided they possess a disposition to fatten, yet, in such cases, it is of importance that the *pelvis* of the female should be wide and capacious, so that no injury should arise in lambing, in consequence of the increased size of the heads of the lambs. The shape of the

ram's head should be studied for the same reason. In crossing, however, for the purpose of establishing a new breed, the size of the male must give way to other more important considerations; although it will still be desirable to use a large female of the breed which we seek to improve. Thus the Southdowns have vastly improved the larger Hampshires, and the Leicester the huge Lincolns and the Cotswolds.

5th. Although the benefits are most evident in the first cross, after which, from pairing the cross-bred animals, the defects of one breed or the other, or the incongruities of both, are perpetually breaking out, yet, unless the characteristics and conformation of the two breeds are altogether averse to each other, nature opposes no barrier to their successful admixture; so that, in course of time, by the aid of selection and careful weeding, it is practicable to establish a new breed altogether. This, in fact, has been the history of our principal breeds. The Leicester was notoriously a cross of various breeds in the first instance, although the sources which supplied the cross is a secret buried in the "tomb of the Capulets." The Cotswold has been crossed and improved by the Leicester; the Lincoln, and indeed all the long-woolled breed, have been similarly treated. Most of the mountain breeds have received a dash of better blood, and the short-woolled sheep have been also generally so served. The Hampshire and the present Wiltshire Downs have been extensively crossed; the friends of the Shropshire cannot deny the "soft impeachment"; and the old black-faced Norfolks have been pretty well crossed out altogether. The Dorsets and Somersets remain pure as a breed, although they are continually crossed to improve their lambs. The Southdown is perhaps one of the purest breeds we have. No one asserts that the immense improvement of this breed by Ellman was due to any crossing; whether the increased size and further improvement which it has received in other counties have been effected in all cases without a cross of any kind, may be in the minds of some a matter of doubt; yet it is only right to give the arraigned, in the absence of any proof to the contrary, the benefit of such doubt, and consider them still as pure as ever.

We confess that we cannot entirely admit either of the antagonistic doctrines held by the rival advocates of crossing and pure breeding. The public have reason to be grateful to the exertions of either party; and still more have they respectively reason to be grateful to each other. We have seen that Mr. Humphrey cheer-

fully acknowledges the benefit he derived from Mr. Jonas Webb's rams. Had he grudged the expense of seeking his improvements from such a renowned flock, and been satisfied with inferior rams, he would not have achieved the success which has crowned his exertions. So likewise with the new Oxfordshire breed. What matters it whether the localities occupied by these sheep were divided between their ancestral breeds or occupied as now by their cross-bred descendants: the public is benefited by having better mutton than the Cotswold alone would furnish, and more valuable wool than the Downs could supply; whilst the breeders, finding their account in their balance-sheet, have very properly perpetuated the breed which has paid so well. Our purpose has been to hold the scales fairly between both systems, having no prejudices to serve. Thus, in defending the system of crossing from some of the objections that have been urged against it, we have no wish to be thought forgetful of the merits of a pure breed; on the contrary, we would instance with pleasure the remarkable success that has attended the careful selections which in the hands of Mr. Merson, of Brinsworthy, near North Molton, Devon, has brought out the capabilities of the little Exmoor sheep to an amount of excellence which no inspector of the ordinary breed would have believed them capable of attaining. But whilst this instance proves how much can be done by careful selection, vigorous weeding and pure breeding, and conveys a warning to any rash and heedless practitioner of crossing, yet, if we regard it as a bar against the system, we deprive by anticipation the spirited introducer of this great improvement of the fair reward for his labors which he has a reasonable prospect of obtaining from the proprietors and improvers of other mountain-breeds.

Although the term *mongrel* is probably correct as referring to a mixed breed, yet, as it is generally used as a term of reproach, it should not be fairly applied to those recognized breeds which, however mixed or mongrel might have been their origin, have yet by vigilance and skill become in the course of years almost as marked and vigorous and distinctive as the Anglo-Saxon race itself, whose name we are proud to bear, and whose mixed ancestry no one is anxious to deny.

Let us conclude by repeating the advice that, when equal advantages can be attained by keeping a pure breed of sheep, such pure breed should unquestionably be preferred; and that, although crossing for the purposes of the butcher may be practiced with im-

punity, and even with advantage, yet no one should do so for the purpose of establishing a new breed, unless he has clear and well-defined views of the object he seeks to accomplish, and has duly studied the principles on which it can be carried out, and is determined to bestow for the space of half a lifetime his constant and unremitting attention to the discovery and removal of defects.

On Cross-Breeding in Horses.

Some time since I discussed the subject of cross-breeding in the pages of this Journal, vol. xx., with more particular reference to the breeding of sheep; my paper excited some little attention, and I had no reason to complain of the criticism it received. In the meantime, I have seen no cause to doubt the truth of the principles then advocated, or the facts adduced in their support. I propose, therefore, at the present time, to show the applicability of those principles to the horse, more particularly to the saddle-horse, and I hope to illustrate this branch of the subject with equally strong examples. Among the points I sought to establish were the following: That the influence of the male or female parent is not capricious; but yet not always alike; in the majority of instances the male parent governs the size and external shape of the offspring (particularly in the back and hind-quarters), whilst the female influences the constitution, the nervous system, and often the head and fore-quarters—the case being, however, occasionally reversed. That this combination, which may be more of a mechanical than a chemical union, by no means implies such an equal division of influence, as the mingling of two fluids, in which case the offspring would be unlike either parent, but a *juste milieu* between the two, and there could be no handing down of type from one generation to another. It is rather such a fusion of two bodies into one that both defects and high qualifications are passed on from parent to offspring with a sort of regular irregularity, resembling the waves of the sea—each parent having the remarkable power of propagating ancestral peculiarities, though latent in itself. Thus it is that strong characteristics are handed from one generation to another; so that if we seek by careful selection to remove a defect or propagate a good quality, we may calculate that a large number, perhaps the majority of the offspring, will meet our wishes, and by weeding out the remainder and pursuing this course for several generations we

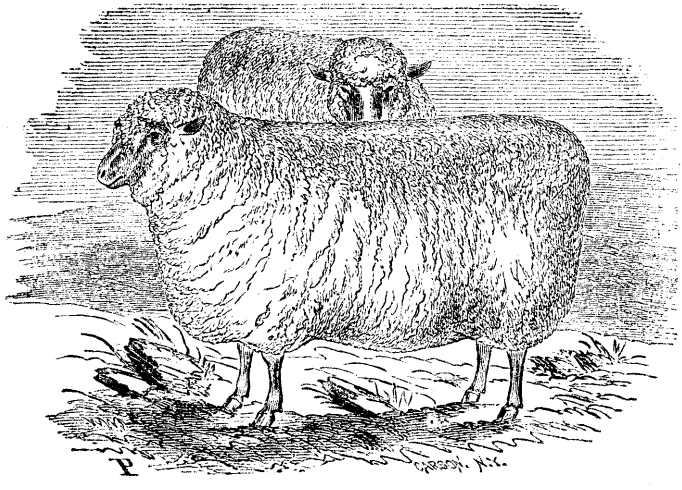
may accomplish our design. This view will further explain how it is that defects not seen in the first cross, being kept down as it were by the superior influence of the improving parent, re-appear in the next generation, and serve to deter timid breeders from continuing the experiment, or arm the opponents of crossing with strong but fallacious arguments against going beyond the first cross.

I pointed out that, owing to the superior influence of the male parent, the effect of the first cross in sheep was very considerable, bringing greater size, often longer wool, earlier maturity, and a propensity to fatten ; or, in other cases, superior quality of mutton. Many persons who go thus far are deterred from going any farther by the very numerous failures which result from pairing together animals of the first cross, and consider that pure breeds only should be perpetuated; I adduced, however, various examples to show that crossing might be carried much farther, even to the extent of establishing altogether a new breed, possessing qualifications which, although derived from them, yet neither of the parent breeds alone exhibited. I instanced the cases of the Improved Hampshire, the New Oxfordshire, and the Shropshire, and more particularly the flocks of Mr. Humphrey, as affording successful illustrations of the practice.

Special reference was made to Mr. Humphrey, who, starting with two of Mr. Jonas Webb's best prize Southdown rams, kept steadily to sires of his own stock, occasionally purchasing fresh Hampshire ewes, until in the course of 20 years he had established a first-rate breed, all of which were descended on one side from Mr. Jonas Webb's Southdowns. This example, as well as that of Mr. Rawlence of Wilton, who now scarcely ranks second to Mr. Humphrey, seems to show that the use of males and females possessing a similar amount of breeding is much more to be depended on than the system pursued by others who cross with the Sussex when their sheep are getting too strong or coarse, and with the old Hampshire when they are getting too small.

I now further propose to inquire whether this system, which is so successful with sheep, is one altogether to be condemned with *horses*; always assuming that cross-breeding, to be successful, must be undertaken with a distinct and defined object, and assigning the highest praise and the first rank to those who maintain intact the purity of our best established breeds.

An opinion is very commonly entertained that there are only two pure breeds of horses in this country (ponies excepted), viz :



SOUTH DOWN EWES.

The property of H. G. White, South Framingham, Mass.

SOUTH DOWN RAM, "SON OF ARCHBISHOP."

The property of H. G. White, South Framingham, Mass. Son of Archbishop was winner of the first prize as two-year-old, at the Show of the New England Agricultural Society, at Concord, N. H., in Sept., 1865. Sire, "Archbishop," bred by the late Jonas Webb, Babraham, England, and imported by Samuel Thorne, Duchess County, New York. Dam, an imported Webb ewe by "Reserve."

the thorough-bred and the heavy cart-horse,—all the rest being but modifications of these races in various degrees. It is, however, probable that long before either of these extremes were known among us there existed a native breed of a very useful kind, pure examples of which are now scarcely to be met with. The *pack*-horse with his drooping hind-quarters, good shoulders, strong fore-legs, and sure action, existed in England for centuries before the Barb and the Arab were imported for the chase or the race-course by the Stuarts, or the introduction of carriages had led to the use of Flanders mares, brought from the neighboring continent; these heavy horses, with their high action, slow but sure and staunch, being naturally much prized for helping the ponderous coach out of the deep ruts of the high roads or along the miry lanes. The heaviest of the race were greatly in demand not only for tilling the strong lands but for drawing the cumbrous road-wagon before even the six-mile-an-hour luggage-van was introduced as a novelty and an innovation. I have before me one of Morland's striking sketches which reminds me forcibly of my boyish days, when the slow but sure approach of one of these ponderous vehicles with its eight or twelve ton load, heralded perhaps by a cloud of dust ever stirred up by the heavy feet of the ten or twelve massive animals that moved it onward at the rate of some two miles an hour, never failed to command attention. It was a sight to behold these leviathans settle into their work after a short respite in the midst of a steep hill: the burly wagoner, too heavy to walk, and scorning to ride in his wagon, was mounted on one of those strong sure-footed ponies, usually white or pie-bald, which have long since disappeared. A crack from his long whip would send into the collar with a 20-horse power the ten hairy-legged but powerful brutes whose broad backs were rendered still broader in appearance by the absence of tails, for each horse was docked close to the stump, under the absurd idea that their strength would thereby be increased.

It is difficult to imagine that this wagon, which seemed to the people of the day to be one of the institutions of the country, was itself formerly looked on as a newfangled novelty, which superseded the once universal, now well-nigh forgotten pack-horse.

There are but few specimens remaining of the pure pack-horse breed which has been quite neglected and overlooked by agricultural societies; and, consequently, whilst the mares have for a while proved valuable for breeding half-bred hunters with the thorough-

bred horse, the males have been gelded and used up. This original or ancient race has no doubt been modified considerably in size, according to the fertility of the soil on which it might be raised; being sometimes developed into the strong upstanding harness-horse, and at others dwindling down to the plain but useful galloway, as seen in many remote districts, and particularly in the little horses used in the Irish cars. The Welsh pony and the Clydesdale cart-horse, the latter enlarged by rich pasturage and perhaps a cross, probably represent the opposite extremes of this same breed.

In less civilized ages the most useful horse was that which could most readily be adapted to all purposes; and there is no good reason why, even in modern days, the more ancient breed, equally pure and more serviceable than the blood-horse or dray-horse, should be altogether neglected, not only by our sporting men, but by the patrons of our agricultural societies; particularly since magnificent hunters have been the result of the cross between the thorough-bred horse and the old pack-horse mare. It will be useful to point out the peculiarities which distinguish the two breeds, with a few explanatory remarks on the component parts of the animal which by their varying proportions constitute these peculiarities.

The skeleton is formed of bone, which owes its solidity to the fact that it is composed of one-half or upwards of earthy matter, so deposited in cartilaginous cells as to render the bones strong and resisting, and adapted not only to support the weight of the animal, and to protect from injury the vital organs, but to serve as a framework for the attachment of muscles, sinews and ligaments. The bones of the limbs are for the most part cylindrical, and motion is effected by means of joints at the extremities of the bones, which are secured by powerful non-elastic ligaments. The bones are much smaller in the thorough-bred than in the cart and intermediate breeds, though generally more compact, and the joints also are by no means so wide, but admit of more longitudinal motion. With this diminished size there is, of course, less surface to sustain the weight of the body.

The sinews resemble the ligaments in appearance, and like them are non-elastic; they are attached to the bones, and serve to communicate motion to them from the muscles to which they are joined or from which they appear to spring. Both ligaments and sinews are smaller in the thorough-bred than in other horses. The

muscles and the flesh are the same, and are the seat of the motive power, motion being produced by the contraction of the fibres of which the muscles are composed. The strength is the result both of the size and the number of fibres, whilst the extent of motion depends on the length of the muscles and their fibres. Of course the length of the bones corresponds to that of the muscles, and although the joints in the thorough-bred have less surface, they admit of more motion.

The pack-horse may be thus described:—The prevailing colors of the breed were bay and brown, which, with the usual accompaniments of black legs, denoted a good and hardy constitution, yet other colors, such as greys and blacks, were to be found occasionally. Among the chief peculiarities were the good and flat fore-leg with its well-developed back sinew or flexor tendon, the good and sound foot, and capital shoulders and fore-hand. The neck muscular but not thick and heavy, was fairly arched, and the head, of moderate size, was well set on. This form was accompanied, as we might expect, with good and safe action in the walk and trot; the horse rarely stumbled, and only fell from overwork and exhaustion. While the heavier and coarser specimen of this breed was capable of carrying his five-hundredweight load throughout a long journey, the lighter and more active was used as the ordinary saddle-horse or even as the hunter of the day. Many of these animals were extraordinary trotters, and, as good trotters are generally good walkers likewise, the quality was greatly prized and encouraged; and thus a race of trotters was bred which, no doubt, were the ancestors of the celebrated American trotting-horses, such as the "Tom Thumbs" of later days. Although these horses were deep in the chest and ribs, the hips were often ragged, the tail set on low, and sometimes the hocks were rather too straight. The celebrated trotting-horses of Norfolk were evidently not true pack-horses, although perhaps allied to them; they had, no doubt, a touch of Spanish blood, and possibly of the thorough-bred.

Let us now, as a contrast, glance at the peculiarities of the thorough-bred horse. Racing, no doubt, existed in this country long before, but received a new impetus from the introduction of the Barb, the Arabian, and the Turk. The sires which were at first imported, quickly established the great superiority of the Eastern blood as regards speed, and when mares followed at a later date in

smaller numbers, they no doubt still further added to the speed of the English racehorse.

The modern blood-horse is of much greater average size than the Arab or the Barb either of the present or the past; and a doubt exists whether this is entirely due to selection and nurture, or in part to the early crossing with the native mare; in any case, it cannot be denied that every thorough-bred horse in the kingdom, from the highest to the lowest, is to the extent of more than nineteen-twentieths descended from the Eastern horse. This foreign influence was not, however, derived from one strain only, for the pedigree of 'Eclipse' himself shows that besides his descent from the Darby *Arabian* and Godolphin *Barb*, he had five or six crosses of the *Turk*; and we have a strong conviction that the improved native horse, made up of the ancient British, the Spanish, and the Barb, is entitled to some share in the honors of his parentage. Be this as it may, the present English thorough-bred horse has proved himself faster than any of the breeds from which he is sprung; and although many doubts have been cast of late on his powers of endurance in comparison with the smaller horse of some fifty years ago, and the practice of training and racing has been severely criticised, yet there is good reason to suppose that our first-class winners are as stout as most of those which have preceded them.

The thorough-bred English horse, in common with the Arabian, possesses no doubt more muscular vigor, as well as nervous energy, than other kind of horse.* In addition to this he has a deep chest capable of admitting the large amount of air which the demands of the system require under severe exertion. By natural conformation and by artificial training all superfluous weight is removed, and thus he is capable of covering more ground in his stride, and

* From time to time it has been suggested, with the view of improving our breed of thorough-bred horses, and particularly their staying qualities, to resort again to the original or parent breeds; but not to mention the ill-success of such attempts when made, it must be evident that the tendency of this cross would be to diminish the size and to shorten the stride, and probably to render the action too high; we can therefore scarcely expect breeders for the turf to adopt the advice. At the same time it must be acknowledged that the Arab has been more successful with half-bred and under-bred mares than the third class cast-off racer, inasmuch as with undeniable bottom there has been a hardier constitution, better forelegs, and higher action from this cross. Where the dam has been of sufficient bone and size, many good hunters and handsome harness-horses have been so bred, and still more frequently capital ponies and galloways; indeed, this is one of the best modes of improving the breed of ponies. Arabs have, in proportion to their size and weight, larger bone and sinew than the majority of our thorough-breds, and I have often observed their beneficial influence in the second and third generation both with hunters and other horses.

of repeating these strides more frequently than any other horse, as well as of continuing his extreme efforts for a longer period without tiring. The heart and the brain of such a horse are comparatively larger than in other breeds, the bones, though smaller, are more compact, the skin of a thinner and finer texture, and the blood-vessels more developed. These advantages, however, are not without certain drawbacks. The delicacy of the skin causes the animal to be extremely susceptible of cold; he is consequently less hardy and requires more food to keep up the animal temperature, so that is difficult to keep flesh on a thorough-bred horse unless he is kept warm; moreover, the carcass being smaller, the stomach and intestines are not so large, and consequently the food must be more concentrated and nutritious to keep up this supply of warmth.

The difference as respects hardiness is strikingly shown between the foal of the cart-mare and the thorough-bred. Whilst the former is strong, sturdy, and fleshy, the latter is comparatively puny, thin, and susceptible of the least cold; the former, by means of the dam's milk, can be kept in first-rate order, whilst the latter requires artificial assistance as soon as it can be rendered. The fact is that the digestive apparatus is more powerful in the one than in the other—it can assimilate more nutriment from nutritious food, and subsist on rough diet on which the other would starve. This it is which renders it so expensive to rear the blood-colt, and this distinction prevails throughout life, and extends in a lesser degree to the half-bred, as compared with the cart-horse. The thorough-bred horse has yet other faults; as a rule, he is slighter and weaker in the fore-legs, he goes closer to the ground, is often a bad walker and indifferent trotter, and is more liable to stumble and fall than the coarse-bred horse. How can it be otherwise? He is bred to win a race, from parents who have been winners; the elevated and rounded action that makes a good hack or charger, would shorten his stride and impair his chances; although if he has good legs and sufficient size and substance, the very fact of his being too slow for racing ought to be rather a recommendation as a hunting stallion than otherwise, yet who would give him credit for stoutness if he had never been fortunate enough to win a race; or what chance would he have for a prize at our agricultural shows when judged by those who can recognize at a glance a Derby favorite, or the winner of the St. Leger?

The term *stoutness* in racing phraseology means endurance con-

nected with speed; it has nothing to do with size and weight, as a tyro might suppose; a great horse is often speedy but a craven at heart, while most of the stoutest race-horses of the last century were little more than galloways in size, and such too are the untiring Arabs of the Desert. No judge, therefore, can tell a stout horse by his appearance—it is necessary to know his performances before this can be determined; for, however perfect the symmetry and powerful the frame, if he is only good for a mile he is not stout.

The improvement effected in the size and probably in the speed of the thorough-bred horse is no doubt very great, and every year produces some wonderful examples of first-class winners; yet I will venture to say that nowhere else throughout Nature where the same care and vigilance is bestowed on the rearing of animals, are the blanks so many and the prizes so few. To justify this perhaps startling assertion, let us endeavor to trace the career of the, say, fifteen hundred or more thorough-bred foals which are annually dropped. These foals are reared from mares of undeniable pedigree, and for the most part of good size, very many among them being winners. The majority are begotten by first-class horses, who have either been great winners themselves or have beat great winners before they have themselves broken down, or, better still, have proved themselves the sires of great winners as well as winners themselves. Both care and expense are lavishly bestowed on the fifty or sixty sires, the two thousand brood mares, and also on the foals themselves as soon as they are dropped. The dam's milk is sustained with the most nutritious food, and the foal is fed with the best as soon as it can masticate. It is an error to suppose that either the mare or the foal is pampered or enervated by undue care; the well-kept paddock affords every facility for taking exercise, and those who have witnessed the sprightly and incessant gambols of the young animal will acknowledge that the muscles and sinews of the thorough-bred foal are called into play much more than those of the cart-horse. Yet, with all this care, what becomes of these costly toys? The greater number go into training at two years old or earlier, no small percentage having previously disappeared from disease or accident, and very many succumb to the numerous maladies and mishaps that occur in the training stable. After this ordeal the trials begin; and then some are condemned as too slow and others as too small, some are mercifully shot out of the way, others submitted to the auctioneer's hammer, and many

a colt that has cost £200 to rear is sold for less than £10, and perhaps is dear at the price. The majority thus sold are colts and fillies that have never raced, many have given way in the joints or sinews, while some are rejected for their shortcomings in the actual race as two year olds, although many a horse which was unsuccessful at that age has proved a prize winner afterwards. It is difficult to say how many of those foaled actually make their appearance on the race course, but the difference in numbers between the entries and the starters for the Derby will afford some slight criterion. At all events, a little reflection will satisfy us that the number of first-class, or even second-class, horses annually brought to maturity is very small, and justify our assertion that the blanks far outnumber the prizes.

How can we explain such a falling off, that the offspring probably to the extent of 70 per cent., should prove inferior to both the sire and dam? The answer may be found in the fact that although our first-class race-horses are large and powerful animals, yet they are descended from ancestors considerably smaller than themselves, and Nature makes a constant effort to return to the original type. But for this natural law there is no telling what size our thoroughbred horses might reach, for the constant effort of the breeder is to raise large colts, and it is almost an axiom with many men that although a good *little* horse is all very well, a good *big* horse is a great deal better. In fact, the little horses, which are sometimes greater winners, are rather low than small, and usually have considerable length of muscle as well as depth of chest and substance, to compensate for their want of height. When, therefore, there are such constant efforts to outstep Nature, we cannot wonder that failure should be so frequent a result.

There is a striking contrast between Derby horses and their numerous relations who figure at country races, and when the short racing-career of these large colts is over and they are devoted to the stud it is astonishing how large they become and how much they girth.* They look the very incarnation of vigor and of strength, and it is probably their look that induces so many

* Although as a rule half-bred and threeparts-bred horses have more bone, and are larger in the girth than thorough-breds, yet the latter increase surprisingly in girth when thrown out of training and devoted to the stud. My friend Mr. Barrow, Veterinary Surgeon, of Newmarket, has kindly furnished me with the measurements of a number of first-class stud-horses now under his care at Newmarket. Amongst others "Longbow," "Toxopholite," "Thunderbolt," and "Muscovite," all of whom were upwards of

breeders to think that from such a sire any amount of substance can be secured which can reasonably be expected in the weight-carrying hunter. They forget, however, how large a percentage of their progeny are but "weeds," even when these sires are put to picked thorough-bred mares; and how very rarely the services of a horse of this stamp can be secured for half-bred mares. The great bulk of travelling thorough-bred stallions must necessarily be third-class horses, long in the carcass, long in the legs, weak in the sinews, unfit for any other purpose than the stud; and such are the horses that assist in deteriorating our breed of saddle-horses, and render horse-breeding so frequently unprofitable.

Let it not, however, be supposed that I undervalue the importance of "blood" in the hunter, the hack, and the harness-horse; I only dispute the doctrine that we should rely mainly or solely on the sire for its introduction, and then only for the first cross. It is a well-established fact, that the Eastern blood amalgamates with the native breeds of the country extremely well; it can be traced in the form, and still more in the courage and endurance, even in the third and fourth generation.

I must now call attention to the general principles of cross-breeding, viz., that while the male governs the size (not mere height,) the vital functions and the nervous system are influenced most by the female. If there be any truth in this doctrine, it must be as essential to attend to the pedigree of the mares as to that of the sire. But here all is left to chance; and whether she is taken from the plough-tail, the van, or the omnibus, no matter, so long as the sire is thorough-bred. Let us consider how the system works on some of our best mares. A farmer has a valuable mare that has been tested by many an arduous run. She is by a thorough-bred horse out of a half-bred mare, and, valuable as she is, she is a shade too light, or, at any rate, would be worth more money if she were equal to a little more weight. He is induced to put her to a thorough-bred horse, and the progeny is, of course, seven-eighths thorough-bred, but, according to my experience, mostly an unprofitable weed. We might go a step further back,

16 hands, and exceeded 6 feet in girth, and measured on the average 8 inches round between the knee and the fetlock. The chest of the thorough-bred is always comparatively deep and capacious. Mr. Barrow considers that the capacity of the chest increases after serving mares and from wearing no rollers, or anything to interfere with the proper expansion of the chest. It must be borne in mind that the horses here mentioned are peers of their order.

to the stronger half-bred mare, and trace the process of deterioration further; but the final issue is the same—the propagation of a race of weeds. This is the real root of the evil which is affecting our breeds of horses,—an evil not to be remedied by the abolition of two or three-year-old races, or by the substitution of longer distances, or by any of the many suggestions with which, when political intelligence flags, our daily papers teem. Races for two-year-olds may be objectionable or otherwise, and eight-mile gallops may be excellent or cruel; but, so long as racing is supported by the public as a pastime, the former will not be abolished nor the latter restored.*

Do away with the excitement of the struggle, and by greatly lengthening the race render its finish the slowest part of the contest, and people will be contented to read the result in the newspapers at home. Let us suppose that the racing of two-year-olds was altogether abolished, and that the Derby was contended for by four-year-olds, what would be the result? The expense of keeping race-horses would be enormously increased, perhaps to the extent of 100,000*l.* per annum. And after all, even if these innovations could be introduced, they would altogether fail in their professed object—that of improving the stoutness of the thoroughbred horse.†

We frequently hear of horses that are very speedy for a mile, but fail altogether in a longer race. Now, on what does this want of stamina or stoutness depend? and, secondly, can it be discovered or ascertained by the external conformation of the animal? The speed of the horse depends on the length of the stride, and the

* The system of racing at two years old, whilst it is always trying and often fatal to the fore-legs and joints of the young animals, does not appear to be injurious to the *constitution;* for we have numerous instances of famous stud-horses living to a good age, although they have raced thus early. That stout and successful sire the "British Yeoman," the winner of the first prize at the Royal Agricultural Society's Show at Chelmsford in 1856, fourteen years previously had won four large stakes as a two-year old, and the following year ran fourth for the Derby.

† If some of our stoutest thorough-breds have been discarded in consequence of their not being speedy enough to win short races, what has become of these horses, whose services would have been so valuable for half-bred mares? I rather believe that speed and stoutness are mostly combined in great winners, as in "Eclipse" and "King Herod" of old, and, at the present day, in "Stockwell" and "Blair Athol," the latter of whom unquestionably won his great races by his stoutness, for he was probably equalled in speed for half the race by several of his competitors. Surely the St. Leger, and other still longer races, must in nine years out of ten be won by stout horses, and as such horses are always used for the stud afterwards, they must have handed down to their posterity their stoutness as well as their speed.

frequency or rapidity with which these strides can be repeated, and in proportion to these efforts is the demand made on the organs of respiration and circulation and on the nervous system. Excessive speed is, therefore, in itself one cause of its short duration, inasmuch as it exhausts the vital powers. In many cases the locomotive and vital powers may not be well balanced: the former may be those of a first-class, and the latter those of a second-class animal. To a certain extent this want of bottom can be ascertained by the conformation, but to a certain extent only. If the horse is very leggy, light in the carcass, and narrow or deficient in depth of chest, the probability is that he is speedy, but not enduring. Sometimes, however, an animal shows none of these faults of form, and yet, though speedy for a mile, is unable to "stay." The cause is here, no doubt, beyond our ken; though it is, no doubt, due to deficiencies in the vital and nervous systems, and especially to the latter. To discover its existence, we presume, is the object of the advisers of four and eight mile races.

In the absence of proof, we much question whether the first-class race-horses of the present are inferior in endurance to those of former days. Why should they be so? They are descended from the best mares and the best horses, which have no doubt handed down with their speed that endurance and strength of constitution which contributes so much to make a winner. Want of endurance is not the defect of this race; put a feather-weight on the back of a weed, and in a light country he will probably beat the most valuable half-bred hunter, even in a long run; and yet with all this he is nearly valueless.

Next to the very first-class race-horses—the twenty prizes amongst a thousand blanks—there is no kind of horse of which this country has such reason to be proud as the half-bred, three-parts, and seven-eighths bred hunters, the highest combination in nature of strength and speed. Deriving speed and courage from their eastern progenitors, bone and substance from their northern ancestors, and action in all their paces from the blending of the two races, they are nearly perfect and decidedly most generally useful.

When a breed of sheep or of bullocks has reached this point, we seek to perpetuate their excellences by consorting parents who on both sides possess them, avoiding, of course, too great consanguinity. We do not resort, as a rule, again and again to the original breeds from whence the improvement has been built up.

Why, then, should horses be an exception to this rule? Why, although the mares of this stamp are considered well adapted for breeding, are the males condemned to be castrated, as unfit for that purpose? By such practice we not only lose the services of the males in transmitting their good qualities, but deprive one-half the mares of the opportunity of breeding animals as strong and valuable as themselves. The practice is, no doubt, in many respects a matter of convenience; for weight-carrying hunters are more tractable, and always, as geldings, command good prices; whilst it is hard to compete with the constant supply of ready-made stallions—good, bad, and indifferent—from racing stables, so long as their friends and owners can persuade breeders of horses and agricultural authorities that the goodness of the fore-legs is of little account, or that a bad thorough-bred stallion is better than a good half-bred.

Referring again to the general principles which have been laid down respecting the influence of either parent on the offspring and considering that the temper, nervous system, vital powers, and constitution, usually follow the dam, if the question be put, "Give a certain amount of breeding, which side would you prefer it to come from?" we unhesitatingly say, if it cannot be had from both sides, by all means let us have it from that of the dam, that her courage, nervous system, and vital powers may be, if possible, joined with the great bone and sinew of the coarser sire. If this system were more frequently pursued, we might breed weight-carrying horses from well-bred though rather light mares, and sometimes even from the best of the three and four year old mares cast out of the racing stable as not being good enough. By such means our cavalry would be far better mounted than at present, and we might, without difficulty, retain just as much breed as is requisite and desirable.* I do not, however, recommend such violent crosses as that of the cart-stallion with the thorough-bred

* An inspection of our cavalry regiments will strikingly illustrate the evils of the present system. I had an opportunity a twelvemonth since of looking over a rather large number of cast cavalry-horses offered for sale by auction in a garrison town, and found that nineteen out of twenty were extremely faulty. In most, although the carcasses were sufficient, the legs were totally unfit to carry the weight a cavalry horse is called upon to sustain. Crooked legs, weak sinews, deficient bone, small joints, sickle hocks, the evident result of the union of the two bodies of a thorough-bred horse and a coarse or cart mare, was almost the universal rule; and they presented a strong contrast to the animals that in my experience used to be cast some thirty years ago when half-bred stallions were far more numerous than at present, and horses were bred from parents possessing on both sides the qualifications sought to be perpetuated.

mare, though not unfrequently successful; or the reverse case, which, with a few noted exceptions, produces more failures.

As examples are always more telling than precepts, I propose to adduce a few instances of successful breeding with half-bred horses and well-bred mares.

To begin with my own experience. I rode a mare for some twelve years without her making a mistake; she was good in all her paces, a fair hunter, an excellent jumper, and a capital hack. She was bred by my father out of a three-parts-bred mare (a good hunter) by a young half-bred horse, pedigree unknown or forgotten. Her dam afterwards bred three other colts by thorough-bred sires, none of which proved of any value. They could not carry weight, and none of them paid the expense of breeding.

2. A rather heavy but active and useful cart-mare, belonging to the same owner, bred two colts by thorough-bred horses, neither of which repaid expenses: they had the bodies of the dam and the legs of their sires.

3. One of my friends had, some years since, a splendid trotting mare that he justly regarded as a pearl of great price, for she had substance, showed plenty of breed, and was good in all her other paces as well as the trot. After some years she was devoted to the stud, and bred five foals, the first by a good half-bred horse and the others by different thorough-bred horses. Her first foal showed much more substance than any of the others, made a good price, and is a valuable animal at the present day. Not one of the others repaid expenses; one proved a clever animal for a light weight, but none possessed sufficient substance to be anything like as valuable as the mare.

4. Another of my acquaintance some years since had a small but very neat mare almost thorough-bred. He put her to a large Yorkshire trotting stallion, and sold the produce at three years old for sixty pounds; when afterwards he put her to thorough bred stallions the stock were all deficient in substance, and consequently unprofitable.

5. A farming friend had a capital fast mare, somewhat small, and rather more than half-bred; he put her to the last named stallion, about onefourth-bred: the produce, a mare now in my possession, is very clever and somewhat larger than her dam. Though too hot for the hounds, she is a capital hack as well as an invaluable harness-mare. I consider this to be a successful example of breeding from two parents, both well, but neither thorough-

bred. The dam of my mare was next put to a thorough-bred horse, and produced a foal which had not nearly the value of the first, gave out in the fore-legs, and was last seen in a London cab. The sire referred to invariably got good animals when put to well-bred mares, and useful ones when coarser mares were employed.*

6. Another of my acquaintance some years since gave 50*l.* for a mare apparently threeparts-bred, which now in her old age is such a model of symmetry that she attracted my special attention when recently exhibited at a local show. She proved to be a good hunter for an average weight, but before she could establish her character, became lame, was devoted to the stud, and has bred many colts. One of these, by a thorough-bred horse, became a very clever and valuable hunter for a moderate weight; the other colts were mostly by a light and rather leggy but very active Suffolk cart-horse, with good flat fore-legs and good feet. The oldest of these, which promised to be a capital jumper and a good weight-carrying hunter, was bought by a farmer (a heavy weight in the hunting-field) for 50*l.*, and after exhibiting his qualifications in a good run, was resold for 100*l.* on the same day. The new owner, hearing afterwards that he was got by a cart-horse, felt somewhat disgusted and parted with the horse for 80*l.* to a dealer, who very soon disposed of him for double this sum. The other two colts by the same horse are very promising. Although such a strong cross as this is not to be recommended, it is worthy of note as an example of the powers of the mare to transmit her qualities of speed and endurance to her offspring, so as to render them good hunters.

7. A late master of hounds in a neighboring county rode for some years a threeparts-bred stallion, that besides being a first-rate hunter was also used somewhat extensively as a stud-horse. His stock was almost universally good and remunerative to the breeders.

8. To these examples may be added some strong cases, kindly

*This horse was the son of "Performer," and the grandson of "Old Pretender," by "Fireaway" (celebrated trotting stallions of their day), out of a threeparts-bred mare, having the strains of "Forester" and "Hambletonian." "Old Pretender" trotted 15 miles within the hour, with 15 stone on his back, whilst "Fireaway" did 2 miles in 5 minutes. It is matter of very great regret that this breed of horses has not been kept up in all its integrity, and that trotting-matches have been allowed to sink into disreputable and low hands. Probably the cruelty that was often connected with these time-matches, in which the same horse was backed to go, say, from London to York, or to Exeter, in some short time, led to their being discountenanced by the more respectable lovers of the horse.

communicated to me by Mr. H. Overman, of Weasenham, Norfolk :—

"H. K. S——, Esq., of W——, Norfolk, had two horses of extraordinary good qualities as weight-carrying hunters; they had great pace and endurance, and were good performers. He rode them in Norfolk, Northamptonshire and Leicestershire, and refused 700 guineas for the two. Their dam was a thorough-bred mare that ran well in the Oaks, and their sire was a half-bred cart-horse and hackney, with fine shoulders, good action, strong loin, deep girth, and good thighs and legs."

9. Mr. Overman adds: "I used the same horse to two mares of my own, one a well bred Irish mare. She threw a filly, which I sold for 100 guineas, and has since made nearly 200. The other mare was threequarter-bred, and she threw a colt which turned out one of the best performers I ever saw. I sold him to H. B——, Esq., of Norwich, for his brother in Surrey for 130 guineas, and 400 guineas have since been refused for him.

10. "One of the best horses now in Lord H——'s hunting-stables was by a Norfolk hackney out of a half-bred hunting dam. We find in Norfolk if we put our Norfolk hackney to a well-bred mare with size, she is sure to throw a good animal. 'Tom Moody,' the property of Mr. J——, of Hopton, was not thorough-bred, neither was Mr. Goold's 'Shackaback;' and these two horses are the sires of scores of good and valuable horses in this county."

He adds: "The late Mr. Theobald, of Stockwell, in Surry, always said that it was much better to put the hackney horse to the blood mare than to adopt the reverse plan; the former course being almost sure to bring a good animal. A blood mare, the property of an uncle of mine, bred seven foals by hackney and cross-bred horses, and all proved animals worth a good deal of money."

My purpose in adducing these examples is to show that useful horses almost always, and valuable ones very frequently, can be bred as hack, hunters, and carriages horses, by using the half or threeparts-bred stallion with well-bred mares, so as to secure a sufficient amount of substance to carry weight. Not that we can thus breed horses of greater value than by using the thorough-bred stallion with suitable mares, for we can scarcely have too much breed, provided we have sufficient substance; but by following the system recommended, if we do not succeed in getting higher prices, we shall at any rate have fewer failures.

We have seen that with regard to sheep at least three different and valuable breeds have been inaugurated by cross-breeding, careful selection, and constant weeding; and the prevailing opinion is, that these possess certain desirable qualifications which render them more profitable than their parent races. Still there are those who deny this, and contend that there are pure breeds of sheep that can supply every requisite.. Be that as it may, the case is much stronger with regard to the horse; for there is no one who would contend that the qualifications of a first-class weight-carrying hunter can be met with in any one pure or original breed, or that it can be otherwise secured than by the well-assorted alliance of blood and bone. Surely, then, if with sheep we can succeed in the course of twenty years in establishing a distinct breed, we can with equal or greater ease establish a breed of horses that will support with ease a six-foot guardsman with his heavy accoutrements, and dash into the charge with all the speed and spirit induced by the influence of a full equivalent of blood derived from both parents. The French are already trying this system; and if we are remiss, will in a few years surpass our cavalry in its most essential characteristic. There can be no reason why the defects which crop out after the first cross should not be as readily extinguished in the horse as in the sheep.

It is as well to notice, that valuable as is the Norfolk trotting stallion, when put to well-bred mares for breeding hacks, he is as a rule too deficient in size to get dragoon-horses, or those weight-carrying hunters which have been the glory of our land.

One argument adduced by the advocates of the universal employment of the full-blood sire is somewhat plausible, and has not perhaps been sufficiently disposed of. They say, it is desirable to have a pure-blood on one side at least, so that defects appertaining to the progenitors, but not apparent in the parents, may not, as in mixed pedigree, reappear in the offspring. This argument is good to a certain extent, but it applies equally to each parent, and if it can be dispensed with in the case of the mare in order to secure size and bone, it may also be given up for equal advantages in that of the sire, who would not have been devoted to the stud unless in addition to his pure lineage on one side, he had derived from the other some rare hunting qualifications and sterling merits which it would be most desirable to perpetuate.

Conclusions.

We have endeavored in our preceding remarks to establish the correctness of the following points:

(*a*) That the use of the thorough-bred horse or mare has greatly improved the coarser bred in speed and bottom. That the blood has amalgamated exceedingly well with other breeds, and that the good results of even one cross only has been seen in various degrees and for several generations.

(*b*) That the effect of crossing with the thorough-bred is to increase the supremacy of the nervous and the muscular systems, and is more particularly shown in the fuller development of the thighs, the hind-quarters, and the elongation of the muscles generally. But that with these advantages the bones, joints, ligaments, and sinews are smaller and less powerful, and the action, although quickened, is rendered lower and less safe. The ability for jumping and for carrying heavy weights without injury to the joints and sinews, is greatly diminished. The skin is also rendered thinner and more liable to abrasion, the carcass smaller, and there is a diminished capability for putting on flesh.

(*c*) That so long as suitable mares with sufficient substance can be procured, the breeder of hunters should, on the rare occasions when they are offered, avail himself of the services of a first-class thorough-bred stallion, or even one of the second class, provided he has hunting qualifications,—good substance, or good high action in the trot or walk.

(*d*) If, going a step further in the same direction, the breeder seeks to put the female progeny to the blood-horse, he will most frequently fail; the offspring becoming too light; whilst if he had availed himself of the half-bred or threeparts-bred stallion (the grandson of a great racehorse,) his stock having the same amount of breeding as the dam, would have afforded him a fair chance of realizing a high price, and failing this, a comparative certainty of a fair sale for the cavalry, or for the general market.

(*e*) Having duly recognized the claims of thorough-bred horses of the first and second class, we can only advise, with regard to the third and inferior classes, that their services be altogether dispensed with, their place being taken by three-fourths, or half-bred stallions, possessing bone, substance, and good hunting qualifications. And it is such animals as these that deserve encouragement from our great Agricultural Societies.

For the encouragement of horses of this stamp we should be

glad to see prizes offered for the best seven-eights, three-fourths, and half-bred stallions, so that the owners of promising horses might be induced to delay the operation of castration until the animals had undergone the ordeal of the show-yard, and the prize-winners might be launched into the world with the Society's approval. Some of the prizes for ponies might well be dispensed with to provide money, if it be wanting, for this more important purpose. At any rate, it may be hoped that the Council of the Royal Agricultural Society will remove the impediments which shut out such a horse as "British Statesman," the first-prize winner at Battersea, and the second at Leeds, from competing at Newcastle among the stallions for breeding-hunters. The flaw in his pedigree, one-eighth, gave him, no doubt, more bone, sinew, and substance generally, and rendered him fit to carry an extra stone in weight, qualifications which doubtless gained him the prize of 20*l.*, offered by the gentlemen hunting the North Staffordshire hounds, for the best stallion for hunting horses.

This suggestion is not meant to imply that prizes for thorough-bred stallions should be dispensed with: on the contrary, if the state of the Society's funds permit, separate prizes should be offered for thorough-bred sires, adapted—

1. For getting Hunters;
2. For Carriage Horses;
3. For Park Horses, Chargers, or Hacks.

Prizes in each of these classes would then be assigned to animals differing much in character, but no longer, as at present, to the best race horse, or according to the rather puzzling and peculiar condition of the prize-sheet, "to the horse best calculated to perpetuate the breed of the sound and stout thorough-bred horse for general stud-purposes." Such a horse must unquestionably be neither more nor less than the sire of the greatest race-horses of the day.

But if this is too wide range for an Agricultural Society, the Managers of the Islington horse show may take this hint into consideration.

Those of our readers who were present at the splendid exhibition of thorough-bred stallions in the Agricultural Hall last summer, must have been struck with the great variety that obtains in the shape and action of the thorough-breds then exhibited, and might, without any assistance from the judges, point out the particular horses with suitable characteristics for each of the several purposes

above mentioned. "Caractacus" and "Nutborne" may be taken as correct examples of the true *race-horse*. The sprightly "Neville," with his splendid knee-action, may be regarded as the proper sire of the charger and the park-hack, whilst the powerful "Warlike," with his compact frame, is the very type of a weight-carrying hunter, so far as a blood-horse can be one. "Newcastle," the favorite of the judges, might put in a claim either as a hunting-sire for a moderate weight, or, with his fine action and good legs, as the sire of a charger or park-hack; and he probably gained his honors because he was thought to combine best in his own person the several and diverse qualifications required by the conditions of the prize-sheet. There were also some showy animals, with long arching necks and grand action, that might properly be considered as suitable sires for high-bred carriage-horses.

THE. HORSE.

HIS NATURE AND TREATMENT.

(Found among the papers of the late M. A. Cuming, V. S.)

[The following paper appears to have been prepared for delivery in New Brunswick as a Lecture. It bears evidence of that intimate acquaintance with his profession, and the strong practical common sense so apparent in his other written productions. The slight variations which he might have made to adapt it to the latitude of Maine, will readily suggest themselves to the reader, while the valuable practical hints with which it abounds may be as useful here as in the adjoining Province. Those who remember the valuable contributions of Dr. Cuming to our reports for 1857 and 1859, will need no prompting to give this a hearty greeting.]

In directing attention specially to any subject or object, it is always well, I think, to have clearly in our mind's eye the precise place in the world of *thought* or *being* which that subject or object occupies; as by so doing, we can not only confine our attention the more strictly to the matter itself under consideration, but we can also the more easily apprehend the connections and relations which exist between it and others of like kind with which it may chance to be associated or have to be compared.

The subject of the remarks I bring before you is "The Horse, his Nature and Treatment," with special reference to things as they exist in this country. The subject is a wide one,—would be more easy to make into six or a dozen lectures, than into one, and consequently you can only expect an outline of what might be said upon it; an indication as it were, of the ideas it suggests, rather than a full discussion of the points it involves.

In order to make the most of the limited time at my disposal when I began to put together these remarks, I proposed to myself the following arrangement:

1st. The natural history of the horse and his natural condition.

2d. The rationale of domestication and the changes it produces.

3d. The treatment of the animal, or what we should do for him.

4th. The working of him, or what we expect him to do for us.

I have made a diagram showing the place in the animal kingdom

which the horse occupies; and should this introduction of a thread of general natural history tend in any degree to promote the study of this interesting department of science, I trust you will excuse me for bringing it in.

Naturalists for the purpose of classification and identification, have divided the whole animated world,—all that live, move and feel,—into four well-marked divisions or sub-kingdoms, beginning with the lowest in the scale of organization, viz:

1st. The Radiata, of which the star-fish and a great many similarly constituted animals are examples.

2d. The Mollusca, of which the shrimp and common snail are familiar examples.

3d. The Articulata, embracing insects, crustaceous shell-fish and many others.

4th. The Vertebrata, or all those animals having an internal bony skeleton, its parts connected together by a back bone, spine, or vertebral column.

The Vertebrated sub-kingdom naturally divides itself also into four well-defined classes, still ascending in the scale of organization and intelligence, viz: the fishes; the Reptilia or serpent tribes; the Aves or birds; and lastly the Mammalia, or those animals that bring forth their young alive and nourish them with milk secreted by Mammæ or teats. To this last named class belongs the horse.

The Mammalia are again divided into two well-marked sub-classes, each consisting of several orders. These sub-classes are, the *Unguiculated* or clawed, those animals having the extremities divided into toes or claws, as in the cat, dog, mouse, lion and many others, and the *Ungulated* or hoofed animals, among which again is the horse.

Of hoofed animals there are two recognized orders, viz: the *Ruminantia*, or those that in the language of the Old Testament "part the hoof and chew the cud," and of which the cow, sheep and deer are well known examples; and the *Pachydermata*, or those hoofed animals that do not ruminate. The Pachydermatose order as you will see marked on the diagram, consists of three groups: the *Proboscida*, to which belongs the elephant and some other animals now extinct; the *Suidæ* or pig tribe, of which also there are some extinct species; and the *Solidungula* or solipeds, those animals having the hoof or foot in one solid piece or toe. According to our present knowledge, the solipeds consist of but one genus or

PLACE OF THE HORSE IN THE ANIMAL KINGDOM.

Sub-Kingdoms.	*Classes.*	*Sub-Classes.*	*Orders.*	*Groups.*	*Genus.*	*Species.*
Radiata,						
Mollusca,						
Articulata,						
Vertebrata,	Fishes,					
	Reptiles,					
	Birds,					
	Mammals,	Unguiculata, (i. e. clawed)				
		Ungulata, (i. e. hoofed)	Ruminantia,			
			Pachydermata,	Proboscidea,		
				Suidæ,		
				Solidungula,	Equidæ,	Caballus.

Equus Caballus,
THE HORSE.

family, the *Equidæ*, to which belongs the horse, ass, zebra and some others, and of this family the horse forms the species *Caballus*. Thus you see among animals the horse belongs to the *Vertebrated*, or *boned division*; to the *Mammiferous*, or milk-giving *class*; to one of the two *Ungulated* or *hoofed orders*; to the *solid-footed group*; and in the language of the naturalist is known as *Equus caballus*. You will see also from this classification that setting aside his individual qualities, the horse is nearly related in organization to almost all those animals that are most useful to man as giving him their services in the shape of labor, of food, or of clothing. Thus man has as his servants the camel and dromedary, hoofed animals, specially fitted by nature for the African deserts, and the elephant equally so for the jungles of the East. Then the horse, the ass and mule for service in more temperate regions, while even the Laplander in his land of snow, has his faithful and useful servant the reindeer. And then for clothing and for food, we have the sheep, the ox, the pig and the goat, all animals of the *Ungulated* or *hoofed* kind, and if we were to compare more minutely the *structural peculiarities* of these animals, we would find about them evidences of design and creative contrivance admirably adapting them for the ends they were intended by nature to serve. It is to one of them only, however, that we must confine our attention.

The natural condition of the horse is that of entire freedom; freedom to choose his food, his drink, his lodgings, and his associates. The anatomy and physiology of the covering of his body show him to be a native of a warm or at least a temperate climate. The furnishings of his mane and tail are defences given him by nature against the numerous insects with which such climates abound. The structure of his teeth, and digestive system, show his food to be both herbs and seeds. The smallness of his stomach, and the rapidity with which food passes through it, indicates him a continuous eater, and left to himself he feeds twenty hours out of the twenty-four. His organs of circulation and respiration mark him as capable of severe and sustained exertion; but at the same time as requiring a constant supply of pure, free air. The development of his organs of smell shows this faculty to be peculiarly acute, and the formation of his eye tells us that he is a nocturnal feeder and traveler, and can distinguish objects placed before and below him nearly as well by night as by day. The nervous sensibility of the bristles about his muzzle and eyebrows tell his acuteness at detect-

ing "a snake in the grass," if such should be; and his acute and ever open ear, capable of direction to every point of the compass, mark his aptitude at observing danger. The hardness of his hoofs and the power of his jaws show the means of offence and defence which he possesses; while the suppleness and fleetness of his limbs afford him in emergency the speady means of retreat. He is highly social, and gregarious in his habits, fond of company, a protector of his friends and a terror to his enemies.

Such are a few of the means by which nature has adapted the horse for taking care of himself and for making his condition comfortable; we will find a benefit in keeping them in view when we come to consider the domestic condition of the animal.

There is nothing which theoretical writers and imaginative artists have troubled themselves so much about in regard to the horse as to make out the picture of a perfect animal, and there is nothing on which, one with another, they have so much differed. Some would have one, some another part of his body to be large and well-developed for the sake of strength; others would have the same to be small and fine for the sake of beauty. One would have certain of his bones to be long to give him speed; another would have the same to be short to make his motions easy. One would have him to excel in this respect, and another in that, and coming to particulars there is no end to the variety of forms and proportions that have been put forward, all as parts of the *perfect horse.* The reason of all this diversity is, that the thing sought for does not exist. In domestication there is no such thing as a perfect horse, any more than there is a perfect man. Take him as he roams wild in the desert and we find him in every respect *perfect, suited* and *designed* for the kind of life he leads; but bring him into the service of man and immediately the case is changed The animal is the same in all his parts, but the purpose is changed to which these parts are applied, and that which before was perfection may now be either a superfluity or a defect.

The *rationale* of domestication is this: we take the animal from the state in which nature has planted him, and we inflict upon him certain artificial conditions at variance with his natural habits; in doing this we subject him to undoubted injury. But then in compensation we provide him advantages which in nature he could not obtain, and the good or ill of domestication, so far as the animal himself is concerned, lies in the balance between the injury thus inflicted and the equivalent compensation. For instance, we deprive him of

his freedom to roam where he lists, but we can if we will compensate for this by providing him a safe and comfortable lodging and shelter. We deprive him of the power to select his food, and take it when and how he will, but we can compensate by providing it of better quality and with less labor in the gathering than he could otherwise have. And so on with other things that I need not name. And then again with his work we put him to tasks which in the state of nature he never has to perform; we can only compensate for this by cultivating and developing from generation to generation those parts of his mechanical structure which being in excess of strength renders it the easier for him to perform the labors we assign. Thus if we wish him to draw we cultivate the points upon which the power of drawing well depends, till we produce a *breed* suitable for hauling only. Then if we wish him for the saddle we select and cultivate other points essential to speedy progression and the bearing of weight, and we produce the *road horse* or the *hunter*, and if we want him to race with we must develop parts different from either, for it must be borne in mind that it is not a matter of accident, nor from fancy, that we select one form of horse for one kind of work and another for another; but that there are certain definite mechanical arangements in the structure of the animal, the deviations from which in one way may increase his usefulness in one respect while in another way it may do the reverse. And that in regard to certain of his powers and these not the least important, the horse is as much a machine and as much depends upon the mechanical adjustment of his parts as does the watch or the steam engine; and that if we put him to purposes for which he is by conformation unfitted, we are as sure to be disappointed in the result as if we set a locomotive to do the work of a time-piece, or expected the town's clock to drive a sawmill. When, therefore, a horse gets into any unusual condition, or when anything out of the common course requires to be done for him, we are apt to ask "is the thing natural?" And in so judging we think we have a guide as to whether it be advisable, and so far well. But in reasoning thus it is necessary always to keep in view that the nature of the animal is modified and changed by his domestication, in neglect of which we are prone to go into error rather than out of it. For instance, it is not natural for the horse to eat cooked food, to wear shoes nailed to his feet, nor to pass his time inside a close house. But in domesticating him we find these variations from nature necessary, and to compensate we must see that his food be

properly cooked; that it be neither hot nor stale. That his shoes be *suitably fitted* to his feet, his size, and his work, and that the cleanliness and ventilation of his lodgings be attended to. And so on with every possible variation that may occur, always keeping in mind that the *rationale* of profitable domestication is not adherence to nature, but compensation for our deviations from it.

On the treatment of the horse, I would notice the following points, viz: his feeding, his lodging, his shoeing, and his harnessing.

The natural food of the horse I have already mentioned is herbs, grasses and seeds. In his free state I am not aware that he ever feeds on roots. It may be that the roots of wild plants are distasteful to him. It is more likely that few of them ever come within his reach. Be this as it may, it is one of the modifications of his constitution which domestication has produced, that certain roots are not only agreeable to his palate so as to be highly relished, but they are also exceedingly nutritive to his system. We take him from those temperate regions of the earth where vegetation every day furnishes him with something fresh and succulent, and we tie him up eight months of the year on dry and often ill-preserved provision. It is the least we can do in compensation to give him every day a portion of food as near as may be in composition and condition, to those vegetable juices for the digestion of which his stomach was made. Whenever therefore we put a horse on dry hay and grain we should always give him, once a day at least, a portion of root-feed; and without entering into the chemical composition of the different root crops of this country, which present time does not permit, and without disparagement to others, I think the preference is to be given to the carrot and Swedish turnip, and in ordinary cases they may be fed raw, with full as much benefit as cooked; a statement which does not apply to the potato when similarly used. Horses fed for a special purpose, as preparing for a race, for instance, may be kept for some time almost on grain alone, but as a general rule no horse can long sustain health without a considerable proportion of fibrous food, hay or stalks of some kind. In this country hay seems the favorite, but taking it in its general quality as we see it brought to the St John market, I question much if it deserves the preference, even for its feeding qualities, while as an article of agricultural produce it is decidedly inferior to others that might be raised.

Of grains, oats have been preferred wherever the Saxon tongue

is spoken, ever since Dr. Johnson characterized them as "food for *Scotchmen* and *English horses*"—how long before it is hard to say, nor I think is the preference unmerited; no other grain of ordinary growth, given alone, will sustain the horse so long in health and enable him to do the same amount of work as oats will. Barley or linseed will fat him faster, and peas or beans will enable him for a time, to sustain a greater amount of muscular exertion, but either of these grains if alone used, will soon tell to disadvantage on the digestion and constitution of the animal; mixed in limited proportion with oats they may be used with great advantage. Speaking of oats, allow me to notice an idea commonly prevalent, that any quality of the grain is equally good to feed a horse with, if he just get a little more weight; but such is far from being the case. If you take a light oat, and a heavy, and steep or boil them, the heavy, well filled one swells, softens and bursts in the process; the light, lanky grain remains as it was. The same occurs in the stomach; the good grain is digested, the inferior is rejected and fails to give up even the small amount of nutriment it has. When a provincial exhibition has to be got up, New Brunswick produces her oats forty-eight and fifty pounds a bushel, but when her horses are only to be fed, thirty to thirty-five is more the mark. Now to say the least of it this is sad waste of capability. When the soil and climate of the Province can produce the superlative samples of oats that were shown at Frederickton in October last, why should it ever do less? Or why should your horses have but harsh and shriveled husks to feed upon, when a better system would afford them plump and nutritious grain? Perhaps by these remarks I may be doing injustice to this part of the country. But I can assure you that in St. John, in the best stables public and private, I see oats in daily use that the poorest hill farmer in Scotland would think a shame to see on his barn floor, and which if a Scotch ploughman were told to take and feed his horses with, he would turn up his nose, and tell his master that he could not expect above half work to be done. While speaking of grain, there are two other kinds grown in the Province that I may be expected to notice, namely, the Indian corn and the buckwheat. Of the first, I hear various reports, some recommending it, and some the reverse. Its chemical composition would indicate that it was, like barley and linseed, better adapted for fattening than for working on, but in my own experience I have not seen enough of its use to be able to pronounce an opinion. Of the buckwheat I can speak even less; all I know being that it belongs to a family of plants (the *Polygonum*)

which in their wild state, and the horse left to himself, he avoids to touch, a fact which does not speak in its favor.

One remark more must dismiss for the present the qualities of the horse's food. Recent chemical and physiological researches have shown in all feeding substances, two notably different elements serving widely different purposes in the economy of the animal fed. The purposes served are the supply of muscular waste, as produced by labor, and the keeping up of the animal heat. To promote the first, those substances are most useful that contain the largest amount of glutinous or albuminous matter, such as peas and beans; for the second, sugary, starchy and oily food, such as barley, linseed and corn, are best adapted. And the reason why oats are so *generally* useful, may be, that they hold a place intermediate in chemical composition between the one and the other, but the practical hint to be derived from science as regards this country, is that the grain food of the horse *should differ with the season of the year.* In the heat of summer, when fat is a burden, the muscle forming elements in the food should prevail; while in winter, with an atmosphere eighty or a hundred degrees below the temperature of the blood, and every hair standing at its own particular angle, we require to feed, not only to fit the horse for his work, but also to keep him warm; then the oily, saccharine and starchy grains should be more largely allowed.

In addition to the food of the horse being suitable in quality, something at times depends on the condition it is given in, and *much upon the timing of it.* His masticating apparatus is a peculiarly efficient one, and when he has little to do, and his food is of good quality, no preparation of it is needed. But if he be overwrought, if his grain be light and of inferior quality, or if old age has begun to impair his grinding organs, then the case is different, and anything that we can do to lessen the expenditure of muscular and nervous energy in the digestion of his food, is a positive advantage, a compensation in some measure for the labor that we exact. With barley, beans and peas, boiling is the best preparation. With oats or linseed it is different. Boiling does not render either of these digestible unless the seed be plump enough to burst the husk, but it often leads the animal to swallow with a less amount of mastication, and as a consequence, if the grain be light evil is done instead of good. With oats, such as I see in common use in this country, I would say do not boil, but if you wish your horses to thrive, bruise, grind or crush them.

As to the feeding of the horse with regard to time, I have already noticed the smallness of his stomach and the continuance with which he eats. Two or three things are to be learned from this. One is that he is particularly ill-adapted for long fasting. Another that he should have his feed put before him at intervals of time, and in moderate quantities. And a third that he should never be suffered to gorge himself with food on an empty stomach, after a long fast. These points I can only stop to indicate; to go into the rationale of them, and of the evils arising from a neglect of them, would require a chapter to themselves. But I must pass on to the next point of our treatment, the lodging of the horse.

The structure of his skin and hair I have already noticed, show him to be the native of a warm or at least a temperate climate, and bespeak for him a dry, moderately warm, and equably temperatured habitation. The large expansion, delicate structure, and important functions of his lungs, tell the necessity of pure free air and adequate ventilation. His love of freedom, social disposition, and more than either, the structure of his feet and pasterns plead for the loose box in preference to the stall; and his eye, better suited to a subdued than a glaring light, indicates the color of the walls of his dwelling and the manner in which it should be lighted.

If we bring the ordinary plan of stable structure in this country to the test of these rules, we will find a good many things to modify and amend. At first, after arriving in the Province, I was a good deal troubled at people always calling the stable *the barn*. On better acquaintance, however, I began to find that "*barn*" was, after all, the more appropriate name, as the erections in question had few or any of the requisites of stables about them. To prevent the products of respiration, transpiration, and the fumes from the floor from escaping in the natural way, that is, upward, there is usually close over head a well packed mow of hay, straw or litter; and lest he should become too warm about the legs and body, a free current of cold air is circulated below the floor and through a hundred crevices in the lower part of the walls; making ventilation where it should not be, and preventing it where it should. And then the stalls, short, dark, and sloping backwards; no wonder that we find the horse often hanging back in his halter and seeking to get into a better position and light. The trouble is, how is this ruinous system of housing to be remedied? for ruinous it is both to the health and usefulness of the animal; not easily, so long as the present style of structures are retained, but

with little trouble when new ones have to be built. All I can reach at present, however, is to indicate general principles, leaving details to be otherwise filled up; and first as to the temperature. The climate is by all allowed to be prone to extremes, heat in summer and cold in winter, and one use of our stables is to equalize this. If we wish to preserve vegetables from fading, or water from becoming hot and vapid in summer, we put them into an underground cellar; if we wish to preserve the same things from freezing in winter, we do the same. And we do so, and are justified in our doing it, on the principle that the range and variation of the temperature of the earth is very much less than that of the air. Now I am not going to advise you to put your horses into cellars, far from it, but I am going to say that instead of raising the floor of the stable *one, two, three,* and sometimes *six* feet above the ground, as we commonly see them, if they were as far sunk into it, *care being had by sufficient drainage to make the bottom dry,* it would be very much to the advantage of the animal for health, comfort, and usefulness. The farther the floor was sunk, dryness being provided for, the warmer and more uniform would the temperature be, and the less would the limbs and body of the animal be exposed to those draughts and cross-currents which are the cause of half his ails. But some will say, if you close the house up at the bottom this way how are you to get it ventilated? Simply, I reply, by having it more open above. There is a very erroneous notion about ventilation,—prevalent even with many who should know better—that it cannot be properly effected without through draughts. But such is not the case. The laws which nature has established for the dispersion and diffusion of gases, if left free play, require no such adventitious aid. Nature has given to every kind of gas and vapor a tendency to distribute and equalize itself through every other with which it may be in contact. This can be best shown by the following simple experiment. You are aware that some gases are light and others heavy, some colored and others transparent. Take two pieces of thin glass tube such as this, but close at one end, fill the one with hydrogen, a colorless gas and the lightest of all known substances, fill the other with chlorine, a green colored gas distinguishable to the eye and thirty-five times as heavy as the other. Then connect the two tubes together so as to exclude all external air, but leave free communication between themselves; turn the tube with the light gas uppermost and mark the result. Were it two liquids so placed the heavy one

would remain at the bottom and the light one above, for any length of time; not so with two gases; in a very short time one-half the heavy gas has ascended into the upper tube, displacing a portion of the light one, which has descended to the lower; in fact the two have become equally mixed and diffused. Now this law of diffusion holds equally good in the extended sphere of the stable, as in the limited one of the glass tube; and to have the benefit of pure air there without its disadvantages our through draughts should be made above the horse's head, instead of below his heels. Give plenty of height and establish a supply of pure air above the animal, and let the matters below look to themselves, nor fear for their escape. This would do away with the convenience of the spare room above the horse for the stowage of his winter provender, and the sooner the better, for although the hay-mow forbids the free *diffusion* of the foul vapors continually rising to it from below it is peculiarly apt at their absorption, and the poor animal has the fetid emanations from his lungs, his skin, and even worse, dried and daily laid before him in his food, forming, I see great reason to believe, one of the causes why broken wind is so notoriously prevalent in this country beyond what it is in places where a better system of stabling exists.

I have only time, in regard to the shoeing of the horse, as a part of our treatment of him to notice one or two of the leading principles as they bear upon errors in the plan of shoeing that I see common in the country. One of the most obvious errors to be noticed is the cultivation of *long toes*. Here is an example of a fore foot picked up the other day, not by any means the worst that could be found, but carried sufficiently far to illustrate the plan pursued, and show the form of foot that the blacksmith makes. Here are the bones of the foot as nature makes them; compare the two. The one has its greatest dimension longitudinally, the other transverse; the one projects forward and downward, the other is turned up and notched back; now which of these forms is likely to be best, nature's or the blacksmith's? When the foot is unshod and the horse at liberty, the growth of the hoof is barely sufficient to provide for the constant wear and tear of the sole and toe, and consequently no part is superabundant. But the shoe prevents this tear and wear without materially checking the growth of the hoof, and in compensation, every time the shoe is off, the foot should be brought as near as possible to the shape that nature gives. The sole should be thinned, the lower edge of the crust

cut down, the toe shortened, and rather turned up than pointed downwards; and the frog and bars, parts that are exposed to the wear of the road, left entire. The reverse of this, however, is commonly done; the *frog, bars* and *heels,* the whole back part of the foot is cut away, and the toe is left long. Look for a moment at the effects of this upon the horse. The function of the fore leg is mainly that of supporting the weight of the body, neck and head, and of transferring that weight forward from point to point, the time the animal is in motion. In performance of this, its mechanical action is near akin to that of a spoke in a carriage wheel, it is in fact a lever, but one of the third class, in which to give increased speed the power acts at a disadvantage, the fulcrum or fixed point being at the long end of the lever; this long part is the leg from the elbow to the ground, the toe being the fixed point over which the body is raised, and any addition made to the length of the toe is just the same as placing a block before the wheel of a carriage; it acts against the muscular power of the horse as used in the carrying forward of his body. Nor is this the only evil, every addition made to the length of the toe, (especially if the horse be made to stand as he commonly is most of his time in a stall with the floor sloping backwards,) every such addition throws an additional strain upon the tendons and ligaments that support the back part of the leg; and the horse to relieve himself stands either with the foot pointed or the knee flexed, both positions known to horse fanciers as signs of something going wrong. It would be well when such symptoms show themselves, and save the usefulness of many a good horse, if the true cause were understood and the evil remedied.

Another of the evils arising from the long toe is all I can at present notice. It very often leads to brushing and interfering. The horse finding the long projection in front as so much leverage acting to his disadvantage, gradually gets into a habit of raising himself from one or the other of the quarters. If he rise from the inside he throws the thick part of his pastern into the way of being struck by the upper part of the hoof of the other foot. If he rise from the outside, he throws round the edge of the shoe and runs the risk of cutting with it the opposite leg. So much for the long toe; if it were made of as pliable material as we find our boots to be in this wet weather, the first few steps would knock it out of the way, but to prevent this we hoop it with iron and make the infliction sure.

Another evil in shoeing that I have had to complain of almost daily since I came to St. John, is the want of a clip or projection turned up in front, to form an abutment against the point of the toe. I have already noticed the way in which the fore leg transfers the weight of the body forward from point to point. In doing this a considerable degree of concussion is inflicted upon the foot every time it strikes the ground. The direction of this concussion is neither forward nor downward, but between the two. It partakes of the horizontal motion of the body of the animal along the road, and of the perpendicular direction of the descent of his weight. The hoof of the horse is composed of an infinite number of dense fibres strongly agglutinated together; and to meet and support the concussion these fibres are every one of them so placed as to receive the shock directly on their ends. In addition to this, the front part of the hoof, where the force of the concussion is greatest, is twice or thrice as thick and strong as the sides and heels. Now the design of all this extra strengthening is very obvious; and by turning up a clip on the shoe as an abutment for the toe to press against when the foot comes to the ground we make both shoe and foot to act together in harmony. We save the shoe from being knocked off and at the same time we promote the natural action of the foot. In shoeing without this simple improvement the nails have not only to support the weight of the shoe, but they have also to bear the force of the foot striking the ground; and the shoe being found from these two causes more inclined to come off than is wished, recourse is had to nailing, not only at the toe, where from the thickness of the hoof it is harmless, but round the quarters and even to the heels. Here is a shoe made in the capital of the Province, that well exemplifies the system. I do not know if it be one of those that took the premium at the exhibition, but I know it is one of a set, all of the same form, that came down to St. John a few weeks ago, the unfortunate wearer being lame on all four feet at once, and showing more forcibly than I can describe, the evils of fettering with iron bands the foot in its most elastic and expansive parts. Time does not allow me to enter into the subject of shoeing farther, but there are two or three rules which it may be worth keeping in mind. At every shoeing have the toe shortened and the crust and sole taken down to the condition of the unshod colt. Give an even bearing to the shoe upon the hoof all round, and the toe a solid abutment against the shoe, and never allow a nail further back than the widest part of the hoof. Attention to these

rules, though it cannot remove, will in some measure compensate for the wholesale evils of nailing one of nature's finest structures to an insensible iron ring.*

On the harnessing of the horse I will only trouble you with one remark; it is in correction of an error that is frequently fallen into of placing the draught too low down upon the shoulders. I have already mentioned the use of the fore limbs to be the support of the weight of the body and the transference of it forward; that of the hind ones is the propulsion of the whole onward, and often in addition a heavy load to boot. We only need to glance at the skeleton to see the way in which this propulsion is effected. Tracing the outline of the bones from the hind feet to the onset of the neck they are a section of an arch, the upper and forward part of which in drawing, presses against the weight to be moved, that is if the point of draught be sufficiently high, but bring it down to the bottom of the shoulder, and you change the arch into a form much less capable of resisting pressure. This, however, is not the evil most to be complained of. The shoulder blade is the bone against some part of which the pressure of the collar must be made; and it is of importance that this pressure should be upon that part of the bone that has least separate motion of its own, in order to avoid the gnawing and wringing of soft parts, between the hard bone within, and the often equally hard collar without. The attachment of the shoulder blade and fore leg all together, to the body is by muscle or flesh only; there is no bony connection between them as in man and many other animals, and the attachment of the great bulk of these muscles is inside the bone about its mid-length. This, therefore is the part of the bone that has least independent motion of its own, and as if to mark it out unmistakably as the point of draught, nature has placed on it a strong and prominent bony ridge, against which the collar should abut. If it always did so, cases of shoulder bruise and shoulder lameness would be much rarer than they are. There is one remark, however, in connection with this to be made. The collar will never wear fair unless the line of the draught be about at right angles to the shoulder blade. In horses with very slanting shoulders, unless

* Those desirous to learn the writer's views on this subject more fully, are referred to the report for 1857, which contains a paper of nearly thirty pages from the same pen, and which is illustrated by engravings. There is reason to believe that it has already served to yield untold relief to the horses of Maine, and this connected with great pecuniary advantages to their owners. S. L. G.

the line of traction be proportionally depressed, if the point of draught be held high up, the collar is apt to jerk upwards and confine the breathing of the windpipe beneath. This, however, does not show that the principle of fitting the draught is wrong, but that we are using a wrong kind of horse for that purpose, and this brings me to the concluding portion of my observations, namely, the "working of the horse."

One of the chief purposes for which this useful servant of man is wanted is to draw. It may be to draw heavy loads upon the road, or to plough the land to a useful depth, or perhaps to haul timber in the woods—it is all the same, if it be draught that is wanted—there are certain forms and proportions of parts more suited to this than others. In the first place he must have weight, that as the body to be moved is heavy we may oppose weight to weight. But then the weight must be of the right kind. As the bones are the levers, by means of which all the motions of the body are effected, the bones should be short, strong, and heavy. And the muscles and tendons being the cords by which these levers are moved, should be strong and heavy also. As a rule therefore, the horse that is to be used for draught if suitably proportioned cannot have too much bone and muscle.

I can fancy an objection to this that a horse may lose in activity more than he gains in strength, but such is not the case. It has been proved by experiments, on all kinds of horses, with all sizes of loads, and on every kind of road, that the power of the horse to draw is greatest when walking about three miles an hour, and that for every addition of speed beyond this the load has to be lessened in a much greater ratio than the speed can be increased. That is if a horse be able to walk three miles an hour with a certain weight of load, and if we double this speed to *six* we require to take off *more,* considerably more, than half the load that he may do so; so that instead of the *running with nothing* way in which the draught horses in this country are commonly worked being a gain, it is a positive loss; both *immediately* of labor, and *permanently* in the destruction of horseflesh.

I plead not for the pampered pleasure horse, to whom it is a relief to be allowed to run away; nor for the more useful hack, the nature of whose work necessitates a given space within a limited time. To him the best compensation we can give is to shorten his stages. But for the horse whose regular daily labor is draught; I do maintain that he is entitled to that amount of time to do his

work in, for which nature has intended him, and that when we go beyond this, although it be to his hurt in the first place, it is to our ultimate loss.

In addition to wanting the horse for draught, we want him also to run in our stage wagons, to go to market, or to church with, or it may be to show off a little on a jaunt or a holiday. And now we must have an active, smart and good-looking horse. Then again, many people want a horse for the saddle, and as the plodding pace of the heavy horse and the nimble-namble of the light one are neither of them safe nor easy for the rider, we want a horse with strength to carry sufficient to make him safe to ride, and springiness of motion to make him easy to sit upon, and having these we care but little in this case whether he can draw or not. In addition to these uses some people want horses to run swiftly, the faster the better. Now it is very evident that these different purposes will require very different forms of animal to carry them out, and no man in his senses would think of putting the heavy draught horse in training for a racer, nor the fine limbed bit of blood to haul in the plough or the wood; yet the people of this country, those of them who have had the breeding of the horses at least, seem to have been striving after something equally unreasonable, because unattainable. That is, they have been trying to get one breed of horses to answer all these different purposes; and mark the result. They have got one, with few exceptions, not fit for any of them, a nondescript race, fitted neither to draw, to run, nor to carry.

When urging the evils of this state of things on different individuals since I came to this country, I have been repeatedly met by the answer that this is a young country yet and the kind of horses in it are the best suited to all its circumstances. We want a horse, say they, that can do a little of everything. Now I do not deny but a new country may to some extent require to tax its horses in this way, just as it does its men. The first settlers in a new country require not only to be their own hewers of wood and tillers of land, but they also often require to be their own tailors and shoemakers, their own carpenters and blacksmiths, and sometimes even their own doctors, lawyers and ministers. But then the question is, is it good for the progress of the country that this state of things should continue? Surely not. The division of labor is not only one of the main elements of civilization and social advancement in a country, but it is the very thing itself. No number of inhabitants, however many in a country, each doing a little

of everything for himself, without any regular division of employments, would ever make a country great or prosperous, and if this holds good in regard to the labor of man, it holds good in a much greater degree in regard to that of the horse, because the horse has less power of adapting himself to circumstances. While granting, therefore, that in the infancy of the Province a certain amount of *make-shift* in this respect might be allowable, I maintain that for the material advancement of the country the sooner it is got rid of the better. It is just as necessary for the profitable cultivation of the soil, for the cheap conveyance of produce from place to place, and for celerity of travelling, that there should be distinct breeds of horses for these purposes, as it is for the comfort of the person and the good government of society, that there should be different men to make the clothes, shoes and houses and to practice the professions of law, physic and divinity.

The cultivation of distinct breeds of horses for the different purposes for which this valuable servant is used, is therefore, I consider, our chief means of compensating him for the many laborious tasks we exact. In holding this opinion I am aware that I differ from a great many in this country, but I have stated it from an honest conviction, that *here*, as elsewhere, it will ultimately have to be adopted, and that the sooner it is acknowledged and acted upon by those who have the power, the better. If in any of the other remarks that I have made I have been too free with things as they are, I can only say that I have spoken of them as they strike a stranger. Familiarity will no doubt remove much of their seeming unsuitability, but if the things do not stand to reason in themselves, our being accustomed to them does not make them, in the least, less objectionable.

I have only been able, as I mentioned at the beginning, to indicate, to glance at, rather than to discuss, the various topics that the subject suggests. If I have failed to interest you, the fault is mine. The subject is one the more we would study it, the more it would open up to us, and the more we know, the more we would find we had to learn. In this respect the works of the Creator are unlike those of man. In the most perfect piece of human mechanism there is always something to desiderate, and the ultimatum of the design is soon seen through, but in material nature the farther we investigate, the greater are the evidences of design that we meet, and the more do we find to excite our curiosity, our admiration and our praise.

CATTLE DISEASE.

In previous reports, allusion has been frequently made to the lack of educated veterinary surgeons among us, and in fact, of any persons who are familiar with veterinary medicine and surgery, whether practitioners or not. Whenever our Agricultural College shall have been in efficient working condition for a sufficient length of time, it is hoped that this "plentiful lack" may be abated. The need of competent veterinary skill within reach, I have never felt more strongly than in connection with the circumstances about to be related.

It will be recollected that in March, 1862, a law was passed by the Legislature of this State in relation to contagious diseases in cattle. It was enacted with special, and I may also say, with almost sole reference to the Lung Murrain or Contagious Pleuro-pneumonia, then prevailing to some extent in Massachusetts, and which was imported from Europe; no other contagious disease of a serious character having threatened us at that time. Although several times reported to exist here, I have never had any proof of a single case of the *contagious* pleuro-pneumonia having occurred in Maine. There have been at times, for many years, cases occasionally occurring of inflammation of the lungs, and pleura, properly called pleuro-pneumonia, but never a case of the imported contagious disease which passes under that name, and there seems no probability that we ever shall have it, *unless it be brought in from abroad*;—the conditions here being such as to render it highly improbable that it will ever *originate* among us.

During more than a year past, a fatal contagious disease has prevailed in England, known as rinderpest, which originated in Russia and was imported into England from the continent. This disease proved fatal in many thousands of cases, and the percentage of recoveries where cattle were attacked, was very small. It seems for some months past to be greatly on the decline there, and hopes are entertained that they may be wholly rid of it before very long. The rinderpest differs very materially from pleuro-pneu-

monia, *being a disease of the mucous membranes, and chiefly affecting the abdominal viscera,* and not the lungs; although cases have occurred where both diseases affected the same animal, or at least, cases of rinderpest occurred where the lungs were found to be diseased, but it also appeared plainly that the subjects had been first attacked by pleuro-pneumonia. It is not known that rinderpest has ever appeared in America, but in one instance, a disease has occurred here which bore considerable resemblance to it in its symptoms and post-mortem appearances, as well as in being fatal, although no proof exists of its having been contagious.

I feel it to be a duty to call attention to the case, and to suggest a possible preventive in case it should again appear.

During the latter half of April, a disease appeared in the herd of Mr. Henry Freethy of York, York County. His herd consisted of ten. After several had died, a man, reputed a farrier, was called in from Berwick, who pronounced the disease to be pleuro-pneumonia, as he had seen it in Massachusetts some years ago. The selectmen then notified the governor and myself of the existence of a disease suspected to be contagious. I received the letter on the 11th of May, and the next day about noon was in York, but found the last sick one had died the day previous, making six. The remaining four appeared perfectly well. Inquiries regarding the symptoms and the post mortem appearances of two which had been examined by physicians of the place, satisfied me at once and fully, that it bore no resemblance to pleuro-pneumonia. One might as well mistake dysentery for asthma, as this for that. But they painfully suggested the possibility of rinderpest. Fortunately, the cattle had been kept close at the barn from the first, and as soon as infection was suspected, a rigid isolation was intentionally and judiciously kept up.

As nothing more then appeared needful to be done, I directed the premises to be disinfected and complete isolation to be continued for some weeks. Returning home, I read what my library furnished regarding the peculiarities of rinderpest, the effect of which was to increase my anxiety.

On the 16th, information was received of two more cases, and the herd was again visited. On seeing the cattle, I recognized or fancied that I saw characteristic symptoms of rinderpest additional to what had been reported to me on the first visit, and little was found distinctively different. The animals were both killed. The

morbid appearances corresponded substantially with those reported abroad; the differences not being greater than between the accounts lately from England and those given by Prof. Simonds in his report several years since of observations made on the continent.

Briefly, the symptoms were as follows:—The first which was noticed was described as "tremblings." What I saw was a continuous twitching of the muscles of the fore-shoulders, occasionally extending to the flank, with now and then a tremor. These twitchings grew fainter as the disease progressed, and nearly or quite ceased before death. Watery eyes appeared very early, and before long, in most cases, they had a heavy look, with swollen and drooping lids. In one case a film appeared at a late stage. At first the dejections were natural, then diarrhœa set in which soon passed into dysentery, with fluid and very dark discharges, not very offensive, and some blood. Tenesmus frequent. Urine very deep colored and passed with difficulty. Temperature variable; at first feverish, especially about the horns, then colder. Coat staring. Rumination irregular and soon suspended. Some appetite for a day or two but not later; water was freely taken at all times. Pulse feeble and quick; after two days could hardly be felt. Respiration short and quick. In more than half there was a thick discharge from the nose. With several a sickly smell was noticed. In no case was there any moaning, violent motions, or any other indication of acute suffering, but in all a rapid prostration of strength and loss of vitality. Death ensued in from three to six days, one living until the ninth day.

The morbid appearances were: windpipe inflamed (this was noticed equally in one which showed no discharge from the nostrils); lungs and heart healthy; liver, spleen and kidneys but little affected; rumen (paunch) healthy and ingesta natural; contents of omasum (manifold) rather hard and dry, but not very much so. The passage from this to the abomasum (or fourth stomach) was highly inflamed, as well as the lining membrane of the whole of the fourth stomach and of all the remainder of the alimentary canal. The gall bladder was distended to unusual size, and its mucous membrane much inflamed. The lining membrane of the bladder exhibited a high degree of inflammation, and its color was rather darker than of the others. The chief seat of the disease appeared to be the fourth stomach and intestines. The lining membrane of these showed an unusual lilac or pale purplish hue.

Now these symptoms and morbid appearances correspond almost exactly with those described by Prof. Simonds in his elaborate report, to which reference was made, and from which extracts were given in my last report, (see page 106 et seq.) the principal difference being the absence, in the cases of York, of pimples or ulceration in the mouth, which occur in many cases of rinderpest. A description of the disease having been submitted to one of the best veterinary surgeons in the country, Dr. E. S. Thayer of Boston, he said it closely resembled rinderpest as reported, and was unlike any which had fallen under his observation, and he expressed a desire to be advised of the fact should other cases occur, as would probably be the case should it prove to be the veritable rinderpest.

Now in regard to the suggestion of a possible preventive. In Prof. Simonds' report occurs the following:—"It is evident that the morbific matter on which it depends having entered the system .... soon acts upon the blood, by converting some of the constituents of that fluid into its own elements," &c. If this be so, rinderpest belongs to the class known as "zymotic" diseases;—in which progress is made by healthy atoms being converted into diseased ones by catalytic action, in a manner analogous to the changes which take place in fermentation. Now it is well known that the alkaline sulphites will immediately arrest fermentation, and, according to a late alleged discovery of Prof. Polli, of Italy, they also arrest morbid action of the sort above indicated. It occurred to me that here might be an opportunity to test their efficacy. Accordingly, on my second visit, I took a quantity of sulphite of soda and requested the owner to administer small doses twice daily to the remaining beasts, which he did—and the plague stayed—whether in consequence of giving a harmless salt, or merely coincident with it, I cannot tell.

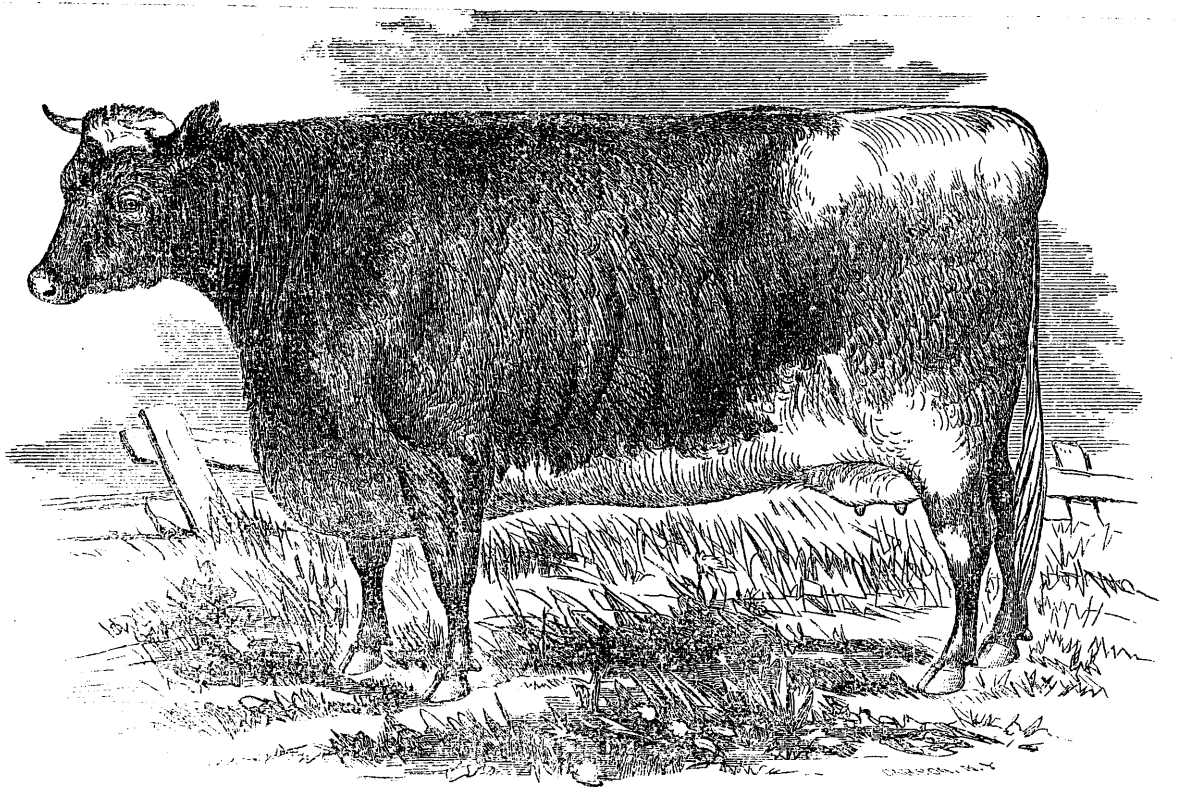
I heard nothing more of the case until the 7th of August, or ten weeks subsequent to the last case in May, when notice was received of another and I went again and found one of the two remaining, (out of the ten first named,) to have died the day previous to my arrival. Mr. Freethy expressed much confidence that had the supply of sulphite first left been sufficient to allow its having been given a little longer, the case would not have occurred. More was procured and given to the one left, as well as to what he had meanwhile purchased, and I have heard nothing further up to the present writing, (the second week in December.)

It appears from recent advices from England that the sulphite of soda was used by several parties in England during the past season, and no case is known to have occurred where it was administered *as a preventive.* When given after the disease had made some progress, it failed to save the animal.

STRUCTURE, FUNCTIONS AND DISEASES OF THE UDDER OF THE COW.

When one calls to mind the great benefit derived by mankind in almost every stage of civilization, from the milk of the cow, he can not fail to admit that a knowledge of the structure and diseases of the organ by which that wholesome and nutritious fluid is secreted, is a subject of much importance. Inflammation of the udder, commonly called garget, frequently occurs, and is often injudiciously treated, and attended with very serious results. With the hope that it may contribute to a more successful management, I quote below, from an essay read before the Edinburgh Veterinary Medical Association by R. D. Brotherton. After some preliminary remarks, he thus describes the lactiferous organ of the cow, considered in relation to its structure and functions:

"The mammæ or udders (commonly called the bag), are those large glandular bodies that are pendulous under the postero-inferior part of the abdomen, between the thighs, in their distended state reaching anteriorly within a few inches of the umbilicus, and posteriorly as far back as to be almost on a level with the tendons of the gastrocnemii muscles. The aptitude of this situation is sufficiently evident to us all as being most convenient for the calf, offering the least hindrance to progression, and being most securely protected from external injury. Of all the animals in the class "mammalia," none are possessed of mammiferous glands of such an immense magnitude (in proportion to the size of the animal) as the cow. I am not prepared to say whether or not the domestication of the cow, and the apparent perversion of lacteal secretion from the use for which it was originally intended, may not in a great measure have contributed to the large size of this organ. One fact, however, would appear to contradict this opinion, and to prove rather that nature has not only intended them in this animal to furnish elementary food for the support and continuation of the mother's offspring, but also to answer other purposes, by supplying man with a highly nutritive and pleasant beverage—from the



BERTHA.

Roan ;—bred by Samuel Thorne, Thorndale, Washington Hollow, N. Y.—the property of Burdett Loomis, Windsor Locks, Conn. Calved March 5th, 1859. Got by Duke of Thorndale (2787.) Dam, Gloster's Bloom, by imported Duke of Gloster (11382.) g dam, Bloom, by Sir Leonard (10827.) gr g dam, Elvira, by Æolus (3743.) gr gr g Dam, Golden Pippin, by Belvedere 2d (3126.) gr gr gr g dam, by Alive, O ! (2995.) gr gr gr gr g dam, by Eclipse (236.) gr gr gr gr gr g dam, by Mr. Charge's Gray Bull (872.) gr gr gr gr gr gr g dam, by the Paddock Bull (477.) gr gr gr gr gr gr gr g dam, by Brown's Red Bull (97.) Bertha received first prize and sweepstake medal as a three-year-old cow at New York State Fair in 1862, also first prize as two-year-old, at Duchess Co. Fair, in 1861.

well-known fact, that although the lactiferous secretion in most other animals very soon ceases after the withdrawal of their young, and along with them the maternal sympathy, yet, in the cow, the functions of this gland are not for a considerable time interfered with, even if it may *never* have been subjected to the great exciting cause of the secretion—the presence and suckling of its offspring. I may also mention that the size of the organ is various, depending upon the age, breed, and time of parturition, and also in a great measure upon the frequency of the demands made upon it for a supply of milk; the health of the animal, and the nutritious quality of the food, combined with other circumstances, will have a tendency to augment or lessen its volume. The period also at which this lacteal secretion for the first time commences, is dependent upon circumstances—some breeds, as the French, Alderney, and others, being generally put to the bull from ten months to two years old. There is also, as is well known, a variety in the composition of the milk—some abounding in the butyrous, and others in the caseous principle—what some are short in quantity, is made up by its superiority in richness of quality. This may be accounted for by constitutional peculiarities, or by the greater energy of the functions of assimilation. The chemical analysis of milk furnishes us with the following contents, according to Berzelius:—

Water,	928.75
Curd, with some cream,	28.00
Sugar of milk,	35.00
Muriate of potash,	1.70
Phosphate of potash,	0.25
Lactic acid, acetate of potash, with a trace of lactate of iron,	6.00
Earthy Phosphates,	0.30
	1000.00

"Thus, we perceive that milk is a compound fluid of an aqueous, caseous, and oleaginous nature, a fact easily proved by the spontaneous decomposition which it undergoes when allowed to stand in a vessel. From the fact, also, of its containing substances which are found in the chyle and not in the blood, many physiologists (among whom we may mention the immortal Haller,) have been led to infer, that the materials of which it is composed are

supplied to the mammæ from the chyle *by the absorbant system.* The resemblance, also, between the milk and the chyle may appear to favor this opinion. Many other hypothetical arguments are advanced in favor of this theory, but I think that the following statements are sufficient to prove it erroneous, and to establish the fact that the blood itself furnishes this (as well as all the other glands) with the requisite material for secretion:—1st, No anatomist has as yet discovered or described any lacteal vessels coming from the mesentery to the udder; 2d, Purgation of the suckling cannot be produced by any medicine administered to the mother, *unless this medicine is quickly absorbed into the circulation;* 3d, The fact of injections passing from the arteries into the excretory ducts of the glands; 4th, When the secerning powers of the gland have been exhausted, *blood* has been drawn from the teat; 5th, From analogical reasoning or deductions, we may infer that as nature does not frequently deviate from her usual laws for trifles, the mammæ, with every other gland (the liver excepted), is furnished with material for secretion by the *arteries.*

"Previous to making any remarks on the function of secretion, it will be requisite to glance at the general anatomical structure of the udder; and, beginning from without, notice first what we find *externally.* In common with the other parts of the body, the udder receives a covering of the common integument, but of such a character as to be able to adapt itself to the changes in size which the organ undergoes, being soft, pliable, elastic, and but partially covered by long and soft hair. In shape it is imperfectly hemispherical, and artificially divided (externally) by the skin into four quarters, and to each quarter hangs an appendix called the papilla or teat, giving it very much the appearance of a round-surfaced funnel. If the quarters differ any in size, the two anterior are generally the larger.

"The teat is an inverted cone, formed from a continuation of the covering of the udder, but having more cuticle on its surface, to prevent the effects of friction to which it is exposed from suckling or milking. Its dependent portion is contracted, and each teat is perforated by an opening that communicates with the interior of the gland. Some few muscular fibres also are found in its substance, which, together with a kind of valvular apparatus in its internal part, formed by the cuticle being continued up the sides of the perforation and then terminating in an abrupt or corrugated manner, where the contraction ceases, will assist in preventing the

column of milk escaping spontaneously, which we sometimes have witnessed in large and full udders, the weight of the fluid overcoming this provision. Thus we perceive by what a simple and easily-formed contrivance *nature* manages to overcome what would to us be great obstacles, and what perhaps would have puzzled some of our best mechanics to have discovered—so simple, yet so effectual in its design.

"Proceeding inwardly, and immediately under the skin, we find an intervening cellular tissue, uniting loosely but firmly the skin to an expansion of elastic fascia, by which the gland is enveloped, rendering it stronger and more compact. This fascia and cellular membrane also detach several portions into the interior of the glandular structure for the same purpose. In this glandular structure, as in other secerning organs, we find arteries, veins, absorbents, excretory ducts, a small portion of fatty matter, and cellular tissue; but of the intimate arrangement and disposition of these various tissues, but little is as yet known. The udder being a conglomerate gland is formed of numerous lobules united together by cellular membrane. Each of these lobules is principally constituted of arteries, veins and ducts, and though almost too small for demonstration, yet we infer that each lobule is a small gland that performs as perfect a secretion as the whole accumulated glandular mass. The minute structure and disposition of these lobules has given rise to as much anatomical disquisition as that of the arrangemement of the air cells in the lungs. Neither can we admit that microscopic investigation has placed us on a surer footing in this respect; in fact, the primary and essential modes in which all bodies are composed and arranged, is a subject beyond the grasp of the human intellect, however laborious, inquisitive, or penetrative its researches may be; and whatever unwillingness may be manifested by an interrogative aspirer prior to his subscribing an assent to the declaration—"thus far shalt thou go, but no farther"—still the simplest and most uncomplicated structure in the field of nature presents us with something inexplicable, if our inquiries are pushed to their furthest extent.

"The question has frequently been put to me, where or in what is the milk contained previous to its abstraction from the udder by the teat? The plebeian will tell us in the *milk veins!* And, to be candid, how many of us are there who did not in former years harbor this opinion, having (no doubt) received it by *tradition* in our youth? But when "philosophy throws away the veil that

exists between nature and the ignorant," then false notions, however closely they may be clung to, must give way to those ideas obtained from our own examination and judgment of structure and function.

"But lest you should charge me with flying off from my subject at a tangent, let me proceed to make some few remarks on those canals in the interior of the udder which contain the milk. No doubt you will recognize them under the name of *excretory ducts*, and it must at once strike you that they must be very numerous and capacious, in order to hold from six to eighteen quarts of fluid.

"These ducts are supposed by some to be continuous with the minute ramified terminations of the arteries that supply them with fluid; by others, that between those terminations and the commencement of the ducts some structure is interposed, through which the blood is infiltrated and changed; whilst it is the most general, and I think the most probable opinion, that in the substance of the organ are many areolæ or cells, in the interior of which the arteries ramify and deposit the milk, which is conveyed by the excretory ducts into larger receptacles, with which the gland is furnished, whilst the superabundance of blood and the "residuum of secretion," are carried again into the circulation, the former by the veins, the latter by the lymphatic vessels. The shape and disposition of these excretory ducts are not unworthy of our notice. In shape they bear considerable analogy to the papillæ or teats. We previously noticed that the teat is so formed as to prevent the loss of milk by gravitation, but if there were no other provision against this, the weight of the accumulated fluid must inevitably overcome it. But nature always adapts her means to the desired end, and has in the interior so formed the canals as to resist the pressure from above, by the converging terminations of smaller into larger ducts, being, like the teat, contracted, and provided with a valvular fold of the lining membrane. The same law is also observed throughout, to the communication of the ducts with the teat. The canals do not, in an uniform manner, keep growing from a smaller to a larger size, but in various parts of their course are considerably dilated. These dilatations or sacs answer the purpose of reservoirs, have their inferior portions contracted, and are placed in an oblique direction, are provided with valves, thus preventing the accidental loss of milk, and also its retrogression. On this account it is necessary that the teat should be elevated, and the udder gently pushed upwards in the operation

of milking, in order to open the valve, and dislodge the milk. Were some of our dairymaids to take a lesson from the calf or colt on this subject, and mark how they instinctively, and with pleasure to the mother, obtain the milk from the gland, we should not have so many vicious cows, so many diseased udders, or sore teats."

He then goes on to speak of the Symptoms and Treatment of Inflammation of the Udder of the Cow, as follows:

"Having briefly run over the general anatomy of the udder, we shall be better prepared to consider it when in a morbid condition. Although there are few organs in the body more liable to disease than glands, yet how few pages in our veterinary pathological works do we find devoted to their consideration? The reason why we do not see a larger number of these cases, may arise from glands being but low in the scale of sensibility, not receiving a large supply of sensitive nerves, thus preventing the animal from manifesting symtoms of pain. We have frequently seen the liver, spleen, and other glands almost disorganized in consequence of previous disease, and yet the animal has never been noticed to evince the effects of pain. Inflammation of the udder (or, as it is commonly designated, *'garget,'*) is a disease of frequent occurrence in milch cows, most commonly sudden in its attack, rapid in its progress, and often productive of irreparable injury. It may have its seat in the glandular or cellular structure, but frequently involves both these, as well as their cutaneous covering. The symptoms are these ordinarily produced by inflammatory action, and are so palpable as scarcely to require mentioning. We shall find heat, swelling and pain, with derangement of function in the gland, and not unfrequently more or less constitutional disturbance. The disease generally commences in one quarter of the udder, which becomes hot, enlarged, and has a peculiar hard and knotty feel. But as inflammation is very apt to spread where there is continuity or contiguity of membrane, the other quarter, or perhaps the whole udder, becomes involved. The milk is considerably reduced in quantity, and of a yellowish color, by the admixture of serum and lymph, which becomes coagulated, and gives it that curdled appearance so often witnessed in these cases. As the disease advances, we shall find that the secretion of milk is entirely suspended, and that in its place blood, lymph, or pus, is effused in the interior of the lactiferous tubes. When the cellular texture is chiefly involved, we shall find considerable tension of the skin, in consequence of effusion having taken place in the cells, and very

often in these cases there is puffiness of one or both of the posterior extremities. In other cases, the skin will exhibit indications of erysipelatous inflammation, appearing red, and the redness temporarily disappearing on pressure being applied to the surface by the finger. The swelling and consequent tension are not to a great degree prior to the vessels unloading themselves by effusion, which they may do on both surfaces. After this has taken place, the redness and acute inflammatory action ceases, and then the skin assumes a yellowish tint. But when the internal structure of the gland is affected, it is by far the most dangerous in its consequences, and the most difficult to treat. With the local inflammation we have always more or less constitutional or sympathetic fever, varying in intensity according to the degree of nervous and vascular excitement caused by the local irritation. We may also notice that the subcutaneous abdominal or milk veins are generally distended, the return of the venous blood being impeded in consequence of the swelling.

"It may be observed that the cows yielding a large supply of milk are most liable to this disease, and it has taken place in heifers, from being in too high condition, even previous to their ever having given any milk, and cows whose udders have been dry for months are not exempt. The causes of this complaint are numerous, and it is very often complicated with the epizoötics that prevail in some seasons of the year, and in certain localities. We shall divide the causes into those that place the organ in a state of susceptibility for the attack, and hence called the *predisposing*, and those that are the immediate agents in its production, generally called the *exciting*.

"I have seen the disease attack cows from being put into too luxuriant a pasture, either soon after the suspension of lactation, or when near the time of parturition, and particularly those that are unaccustomed to the climate. Neglect of abstracting the milk, or the operation being performed in an improper manner, may also be included. The sudden commencement of the secretion, or what is called the 'springing' of the milk, calling for a large influx of blood into the vessels, or badly drying up the gland, and leaving portions of milk to be absorbed into the system, are frequent causes. Exposure to cold and wet in the field, cold currents of air coming in contact with the animal in the cow-house,—the animals standing with their legs or udder in a pit when drinking, may also induce the disease. The exciting causes are external injuries,

such as the viscus being gored by another cow's horn; being kicked or trodden upon when standing or lying in the cow-house; bruising the udder by lying carelessly upon it; having too little straw under it, or by lying out in the autumn, amongst cold and wet grass. Permitting the udder to be loaded and distended by an accumulation of milk, and the practice of 'heifting,' are frequent causes. I once saw the disease produced by a youth being in the habit of inserting straws in the teat to draw off the milk. Professor Dick also mentions that it may result from cow-pox. Disease of the teat and obstruction of its perforation, by not allowing the milk to flow, but to lodge in the ducts, which will act as an irritant, and produce inflammation, in the same manner as retention of urine causes cystitis. From the well-marked sympathy between the udder and the uterus, the irritation caused in the latter by the retention of the placenta, will frequently extend to and involve the former in disease. Derangement of the maniples and abomasum, or of any portion of the alimentary canal, will frequently cause disease of the udder. In fact, it appears to me that the causes inducing an inflamed state of this important viscus, are far more numerous than have generally been supposed by what few authors have written on the subject.

"Garget assumes both an acute and a chronic character, and this distinction will, to a certain extent, modify the nature and application of our remedies. It may terminate in resolution, suppuration, obliteration by condensation and induration of the glandular structure, and in gangrene. But, properly speaking, these cannot be called its ultimate terminations (with the exception of the first,) but rather its consequences—as the inflammatory action may still be existent in some of the surrounding portions of the gland, whilst there is suppuration and mortification in the other. Restoration and death, in my opinion, are the only two ultimate terminations of disease.

"The *treatment* must at all times be moderated by the nature and intensity of the symptoms exhibited, and will in a great degree be influenced by the cause that originated them. We must first endeavor to discover whether there is any immediate exciting cause still in operation, as the lodging of thorns, or of splinters of wood, accumulations of milk, or obstructions to its flow, and our first indication will be to remove these. If the udder be distended with milk, let it be withdrawn either by gentle manual operation, by permitting the calf to suckle, or if these give the animal much

pain, by the introduction of a mechanical apparatus in the form of the teat canula, or the tabular portion of a common quill, into the teat, through which the milk will gradually gravitate. The removal of these exciting causes simply, will very speedily produce a mitigation of the symptoms, and afford the animal considerable relief. In some parts, from some popular *belief*, or perhaps *disbelief*, the farmer refuses to draw off the secretion before the parturition of the cow, although the udder may some time previously have been distended, almost to bursting; but this must be insisted upon, or bad consequences are likely to follow its neglect; and if the function of secretion is very vigorous, let the fluid be more frequently abstracted. On the same principle, any offensive or irritative matter in the uterus must be removed; and if the stomach or digestive canal be suspected, let them be regulated by cathartics, tonics, or stimulants, as circumstances may require. If after having got rid of the exciting cause, or if its removal cannot be effected, the inflammatory action proceeds unabated, we must have recourse to decided antiphlogistic measures. Of these the ancient practice of bloodletting stands the foremost, and is absolutely necessary when the local inflammation and the constitutional disturbance are great. In this case we shall probably find the animal with a quick pulse, laborious respiration, anxious countenance, costive bowels, diminished appetite, suspended rumination and lactation, and manifesting general nervous excitement and great pain.

"According to the violence of these symptoms must be the energy and extent of our general treatment, in order to check their rapid progress, and to prevent their fatal consequences. No law can be laid down as to the exact quantity of blood that circumstances may render it necessary to abstract,—the general symptoms, the state of the *pulse*, the general plethora of the system, the age, strength, &c., &., of our patient, must be considered as guides on this point. It is the effect, and not the quantity of blood that we wish to obtain. From four to eight quarts may be stated as the general quantity required, taking care that it is abstracted in a full and free stream, in order that we may make an impression on the force and activity of the circulation, by giving it a sudden check, and prevent the vascular system accommodating itself to the gradual loss of blood drawn by a small orifice, which reduces the bodily strength, while it does not alleviate or prevent the determination of blood to the suffering organ. It is of no importance which vessel we chose for this purpose, the jugular

or the subcutaneous abdominal vein; but I give a preference to the former, having in many instances found a difficulty in pinning up the latter after the operation, and also, from the looseness of the integument, the cellular membrane under the abdomen is very liable to sanguineous infiltration from the orifice of the vein. As there is congestion or determination of blood in an inflamed part, it would be advisable, if *practicable*, to detract blood locally from its immediate vicinity. This is generally done by leeches, scarifications, or incisions; but unless in those cases where the inflammation is superficial, as in the cellular membrane or skin, I do not see the propriety of their use. Incisions through the integument in a longitudinal direction have been of service where the skin is principally involved, when there is much tension and subcutaneous serous effusion. By this means the distended vessels are unloaded, the serous effusion evacuated, the tension relieved, and the disease is gradually drained away by the suppurative process which follows. But we would only recommend incisions after other local and constitutional remedies have failed. Blood-letting must be followed by the administration of a cathartic, the importance of which in cattle practice is well known. The following is the formula we generally adopt: Epsom salts, from half a pound to a pound; sulphur, quarter of a pound; caraway seed and ginger, two ounces of each, mixed in a quart of warm water, to which may be added a little molasses, to render the drench less irritating to the superior part of the air passage. By these means we shall not only cause evacuation of the fœcal contents of the intestines, but also get rid of a large portion of the thinner part of the blood by secretion and excretion, stimulating the functions of the liver and skin, restoring the balance of the circulation by determining blood from that organ which already possesses too much, to other parts of the body, and will be an important adjunct with blood-letting in lessening the morbid susceptibility of the diseased part, and in promoting a healthy state of the organ.

In the subsequent treatment, sedatives, tonics, or diuretics may be given, according to the degree of fever or debility that may supervene; but it will seldom be found requisite to do more than keep the bowels in a regular state by small aperient doses. Muriate of soda (common salt) is objectionable as a medicine in this disease, as it has a greater tendency than other *cathartics* to retard the secretion of milk.

"After having combated the constitutional symptoms (if any,) our next object must be to remove the local inflammation, for which purpose we use direct applications to the part itself. Amongst these, hot fomentation is perhaps the most *beneficial*, where the inflammation is established in its most acute form. It may be with water as hot as a person can bear his hand in, and the temperature kept up, or the water may be medicated to suit the fancy of the proprietor,—as it is the heat and moisture which are of utility in allaying the irritation, by relieving the deeper seated nerves from pressure, causing cutaneous transpiration, relaxing the vessels, and promoting effusion. If that benefit does not arise from this remedy which is expected, it is frequently because the fomentation is not persisted in a sufficient length of time, or for want of water of sufficient heat. Four times in the course of the day, and an hour each time should the application be made,—having a large vessel, continually supplied with water of a proper heat, placed under the cow, and a person on each side of the udder, who, with a large woollen cloth dipped into the water at intervals, and applied to the udder, so as not only to foment, but to suspend it. A poultice of bran or linseed may then be applied, but are rather objectionable on account of their weight. The udder may also be suspended by a broad bandage passing from beneath it to the loins, with a slip posteriorly between the hind legs, to meet the other at an angle. This will assist in relieving the pain, and prevent the weight of the udder causing such an increased determination of blood to the part. I would not recommend any stimulating application until the violent inflammatory action has somewhat abated by the preceding treatment, which may be repeated, or carried to its fullest extent, as circumstances may require. After the more active stage has been somewhat subdued, a cooling liniment may be rubbed on the udder after the fomentations. Any of the following may answer:—Acetate of lead, 2 drachms; water, 1 pint; neat's foot or olive oil, 1 pint;—shake, when a saponaceous fluid will be formed. This I have found to answer well in many cases. Solutions of the acetate of lead, of nitre, or of sal ammoniac, in water, with vinegar or spirits of wine added, are often made use of, according as a cooling, evaporating, or discutient lotion may be wanted. Ointments are also recommended by some practitioners, but are more applicable to a chronic stage, as the friction necessary for inunction will tend to irritate a glandular swelling in its acute form. They

may be used where stimulants are required, in order to remove the stagnated blood, by rousing the dilated vessels into action. Camphorated elder ointment, with a little mercurial ointment added, is recommended by Mr. Youatt. Camphorated spirits, with oil of origanum, or olive oil, turpentine, and camphor, or lime water, linseed oil, and spirits of turpentine, in varied proportions, will form liniments that may be well rubbed in, when the tenderness of the part is removed, but swelling remains. As I live on the sea coast, I have been in the habit of using decoctions of sea-weed (commonly called tang) in sea water, and have found it of use in removing the swelling left after an acute attack. Perhaps it may act on the absorbents, from the portion of iodine that the sea-weed contains. Iodine ointment is a good application.

"We must not forget to have the udder emptied of its contents two or three times in the day, by being milked, if there is no obstruction, or much tenderness in the teat. If the latter be the case, the tube already mentioned had better be used, as the disease may be increased by the irritation of milking by the hand, caused in the diseased teat. It will sometimes be found necessary to make a longitudinal incision into the teat, in order to remove the coagulated milk or blood from the termination of the ducts, which may be done by the introduction of a probe. The animal should be kept as quiet as possible, and have thin gruel, malt, or bran mashes, with a little sweet hay, and chilled water. If, however, all the means to which we have resorted should fail in producing what is most to be desired—resolution of the inflammation—the attack may proceed unsubdued, and produce suppuration, abscess, gangrene, or even death itself, by the violence of the symptomatic fever. If the swelling, fever, and pain increase, the bleeding and purging may be renewed, and the fomentations continued, if the animal can bear further depletion. In some cases large effusions of serum will take place, and form dropsical tumors in the vicinity of the udder, or immediately under the integument enveloping it. These must be evacuated by the lancet, and treated by emollients in order to induce suppuration. Setons, also, may be inserted in the surrounding parts, which may cause revulsion, and act as drains. If the discharge from the udder be great, debility may be the consequence, when recourse must be had to gruel, port wine, and the vegetable tonics, or if there is no debility, diuretics may be of service.

Suppuration frequently takes place either in the subcutaneous

cellular tissue, or more commonly in the interior of the glandular structure, at the central part of the consolidated lymphous deposit from the vessels, which causes that hard and knotty feel of the udder under inflammation. When superficially seated, the presence of pus may soon be detected by its naturally tending to the surface; we must not permit its spontaneous evacuation, but give free vent by a dependent incision with the lancet or bistoury, and thus leave a clean-edged wound, which may afterwards be treated by astringent washes or injections. But when suppuration takes place in the interior structure, it is often productive of serious results; being deeper seated, pus does not readily reach the surface, but burrows in various directions, by means of the lymph forming canals around the circumference of the pus, called sinuses. These sinuses may be numerous, and ramify in various directions through the inner structure, and three or four empty themselves into one, which, on attaining the surface, bursts and discharges a purulent unhealthy matter. The existence of these sinuses, and the constant discharge (which must be great from many of them) soon weakens the animal and disorganizes the udder. The fistulous ulcers thus formed, or those formed by the bursting of the abscesses, are difficult to heal, and should if possible be prevented by allowing previous evacuation to the matter by the lancet at that point in which it is preparing to burst. If, however, the case has been neglected, if abscess, sinuses, and ulcers have formed, from the danger of gangrene, and from the weakening of the constitution, we must have recourse to antiseptics and tonics, and endeavor to obtain a healthy action of the parts by the application of a solution of the chloride of soda or lime. We may insert a piece of caustic potash in the sinuses, or inject them with a solution of corrosive sublimate, in order to obliterate their canals and suppress the unhealthy secretion. Should this treatment succeed, it invariably leaves the gland in an indurated state, and stops further secretion from the quarter which was affected. In some cases, where the intensity of the inflammation is such as to cause a complete stagnation of blood, and consequent stoppage of circulation through the vessels, the part, from want of nutrition, loses its vitality or mortifies. The affected parts will become cold, black, insensible, and have a fœtid smell. Incisions may be made into it with a sharp instrument, but no blood flows, and the animal evinces no pain. Large sloughs are occasionally detached and fall off, while the surrounding parts are soon all involved if its

progress is not immediately checked. This can only be done by the removal of the dead and dying portions by a surgical operation. In performing this operation the principal objects to be borne in mind are—1st. To remove every portion of the dead part. 2d. To leave a sufficient quantity of integument so as to allow the edges to be brought together by suture. 3d. Properly to prevent bleeding by securing the mammary arteries by ligature, and some other smaller branches by ligature or torsion. The nature of the incision will depend upon the extent of disease, and the after treatment will consist in supporting the parts by a bandage, and in keeping up the strength of the animal as much as possible by the means we have already mentioned, keeping the wound clean by simple dressing, and promoting adhesion or granulation according to the indications presented. This is the only means, under these circumstances, of saving the animal's life, and of giving the owner time to make her serviceable by feeding for the knife. This operation has been successfully performed by Professor Dick and by Mr. Bowie, and by other veterinary surgeons.

"We have now but a few remarks to make on chronic inflammation of the udder, and on one of the consequences of the acute, viz., induration of the gland. The chronic inflammation is but a sequel of the acute; there is little or no pain, generally swelling and hardness, but no heat. The milk is lessened in its quantity, the animal's appetite diminished, but little or no constitutional disturbance is present. If not removed, the secretion of milk gradually and slowly ceases, and the affected portion is called a 'blind pap.' It is often very difficult to restore it from this chronic and indolent state to its wonted vigor, although much success has attended the use of iodine and its compounds. It is a very useful application to glandular enlargements when of long standing, and is the most to be depended upon in induration of the udder. It is used both internally and externally. For external use, 2 ounces of the tinct. iodine mixed with 2 ounces of soap liniment will form an embrocation, or 1 ounce of the iodine to an ounce of lard will form an ointment, which, if well rubbed on the diseased part, with plenty of friction, will frequently succeed in causing absorption of the tumors. The iodine in half-dram doses may be given internally. A respectable authority recommends the internal administration of hydriodate of potash. I have given it both to the cow and the horse in 4-drachm doses, without any other than a diuretic effect. If this is the effect that is wanted, we have better and

cheaper diuretics in our pharmacopeia. I also think (and that from experience) that the ointment of hydriodate of potash is far inferior to those made from iodine itself, or from some of its compounds with mercury. In chronic garget the use of these remedies must be continued twice in the day, and often for a considerable time, before any benefit is derived, taking care that we do not cause absorption of the gland itself.

The induration of the affected quarter or quarters is a very frequent consequence of garget, in which case we have obliteration of the functions of the gland, with the restoration of the animal's health. This is produced by a cessation of the inflammation, and a subsequent consolidation of the cellular and secreting textures of the gland. It is seldom of a malignant nature, like cancer, but remains stationary and indolent throughout the animal's life, producing no irritation in the surrounding tissues. When this is the case, no treatment is necessary, as it cannot be cured. If the tumor, however, should put on a malignant character, which it sometimes does, in consequence of being roused by external injury, in which case renewed inflammation is set up in the surrounding parts of the adventitious deposit, that which had hitherto been harmless now spreads with rapidity and involves the other structures, which become converted into a substance like itself. Ulceration and suppuration frequently supervene; and if the whole malignant substance is not removed by operation, death must inevitably result from the great excitement of the system. But as this is not a common result, we look upon induration as that consequence of inflammation most to be desired after resolution. It detracts from the value of the animal as a milch cow in proportion as one or more of the quarters are thus affected, but it does not prevent her from being consigned as a feeder. I may also mention that numerous instances are known of those quarters of the udder, thought to have been thus obliterated, again secreting after a succeeding parturition; but I think that another quarter more frequently becomes dry, than that one in this state again resumes its function."

THE COLLEGES FOR THE INDUSTRIAL CLASSES. CONTEMPLATED BY THE ACT OF CONGRESS OF 1862.

During the past year, several communications appeared in the Maine Farmer, which comprise the results of a more thorough and exhaustive examination of their subject matter, than had before fallen under my observation. Desirous to give them a wider circulation and a more permanent form, they are, with permission of the author, embodied in the State Agricultural Document of the year.

"AGRICULTURAL SCHOOLS."

MESSRS. EDITORS:—You copy, in the last FARMER, an article under this title, from the newspaper called *The Nation*. As you thus give currency, if not approval,* to the views put forth in that article, I respectfully submit, that those views are entirely incomplete, and therefore unserviceable, in their supposed application to the new question of "the liberal and practical education of the *industrial* classes" in *this* country, and especially in this part of it.

The chief assertions of the writer in the *Nation* are to the effect, that the agricultural schools of Germany, after the experience of fifty years, are now regarded with less favor than heretofore,—that "strong objections" to them are developed—that it is now coming to be thought better to establish agricultural chairs or professorships, at the great universities—that, at Halle, such a professorship was established three years ago, and that this new department has many students—that a similar professorship was established at Leipzig last year—that the "richer universities" have collections, apparatus, libraries and cabinets superior to the agricultural schools—that there is no need of large farms to teach the practical details of the farmer's business—that it is enough to teach the general *principles* of the sciences at these splendid universities, and that agricultural *practice* may be learnt at home, &c.

* The editors of the "Farmer" expressly disclaimed such approval.

How much of this may be new and true, as regards Germany, I have not the means of knowing—but precisely similar assertions, put into the form of general argument, are, unfortunately, not new here. Ever since the Congressional endowment was granted in 1862, the air has been full of this kind of appeal in favor of the existing universities and colleges, as against separate "practical" schools for the "industrial classes."

But there is a broad and deep question, which the writer in the *Nation* leaves wholly untouched—one which controls the whole problem in Germany, as it does also, though in another direction, in the Northern States of America. To what sort of population is it, that the German universities are adapted? Are the populations of the German States homogeneous, and all substantially of one grade, like ours in Maine? Or are they deeply and unchangably divided by distinctions of rank, and class, and *caste?* Is there not there, the widest and most impassable distance, between their superior, educated classes, and the actual hand-workers in the fields?

I am not personally familiar with German life, but I suppose that generally, in Europe, the hand-workers—*the peasantry and mechanics, especially the agricultural peasantry*—are not supposed to need any except the most humble education—in some parts of Europe, not any at all. They are not expected to rise in the world, or to improve or even to change their condition. It is looked upon as a matter of course, that they shall be hand-workers all their lives, even to old age. In many European countries they never own land—do not in fact own anything, but their bodily strength, and the only profit they get from that possession, is a bare subsistence.

This class is very numerous, and many of the countries, in which they live, are populous and rich. It follows, of course, that the labor of this humble class must be directed by a superior class. The landed proprietors, by themselves, or by their stewards and overseers, employ this labor, and wish to employ it profitably. Hence it follows, that the superior classes, who are wise for themselves, desire the advantages of superior education, and, for centuries, they have had the most liberal provision and abundant means for their own general education; and now, if the statements of the *Nation* are correct, they are adding improved courses and professorships of modern science, including agriculture, to the curriculum of their ancient universities. Beyond all question,

it is from these superior grades of their society, that the new departments of agriculture, in the German universities, draw their attendants. When we hear that the German *peasants*, are leaving their fields to attend lectures at Leipzig and Halle, *expecting to return and resume their peasant life*, we shall then have a German example, that will give us something interesting and wonderful, if not something useful.

In fact, long ago, the difficulty of this great problem of *caste* was encountered even in the "agricultural schools" themselves, in Europe. In some of the most distinguished and most useful of them, they have attempted to carry them along, with two sets of pupils—one from the higher ranks, destined to be proprietors and overseers, who are not instructed in any actual work, and who pay tuition—the others, from the humbler classes, who receive a lower training, a part of which is labor, and who pay little or no fees. The difficulties of such a system are obvious enough, but they are unavoidable, in their existing social condition. A remarkable instance occurred at Cirencester in England, one of the most splendidly endowed and most promising agricultural schools in Europe. [One or two statements of detail were here made, in the original article, which were found to be erroneous. The correction appears in the second article.] This really fine institution, with admirable appointments of every kind, including very distinguished professors, whose names are seen, every day, in our agricultural books and journals, is, in fact, and has been, for a long time, in a languishing condition. But let an agricultural chair be established (if such a thing can be conceived) at Oxford! or Cambridge! and filled by a man of note as well as ability, and without doubt, a very respectable number of the sons of noblemen and gentlemen, would enter their names as attendants upon the lectures.

I would not say, that it is precisely the same sort of feeling, that gives popularity to the new agricultural departments at Leipzig and Halle—for the Germans are vastly more sensible, and more in earnest about such a matter, than the English are—but, to come back to the point before stated, it will be many years, I think, before the laboring peasantry of the German States will be found flocking to the lectures of Professor Kuhn or Professor Knop.

We can make an illustration close at home. Suppose, that at any time, in the Southern States, it had been under consultation, among their public enterprises, to provide a special and higher education in sciences relating to agriculture, and that some one had

proposed to do this, by separate agricultural schools, in which the actual field laborers—the hand workers—the *peasantry* of the South, should receive superior training both in the sciences and in the practical details of agriculture—is it necessary to imagine what would have been the answer to such a proposal? Everybody can supply it. Everybody sees that the proposal would have been repelled as the grossest absurdity. The counter proposition would have rushed swift to the lips of everybody else in the consultation—"That is not suited to our condition of society; what we need is to educate our own sons—the young men of the superior race—who are hereafter to be our planters, and managers of estates, so that they can profitably direct the labor of our working class. It is not necessary that *our* young men should be trained in practical labor, and in the application of principles, by their own hands. Our object will be sufficiently subserved, by establishing agricultural chairs and scientific departments, in our present colleges and universities. This will do all that we need for gentlemen's sons, who are to be the *directors* of our agricultural labor," &c., &c.

Perhaps we may, at some time, obtain from the writer in the *Nation*, his view of what the difference is, essentially, between the arrangements of *caste* in a Southern State, and those in a German kingdom—Wurtemburg for example. And since a part of his argument is drawn from the case of the farmers' school of Hohenheim, in that kingdom, where he would have us believe that things are not working well, I have gathered a few statements about that school from Flint's very minute and recent account of it.

He tells us that, besides a "school of forestry" it was originally established, and still subsists, under the form of "distinct schools."

"1st. The Institute or School of Agriculture for *young gentlemen*.

3d. The school of practical farming, *for the sons of peasants*.

Pupils in the higher paid (at first) $164 for tuition, lodging and board; afterwards $41 for tuition and room, getting board where they pleased.

The School of Practical Farming was begun with boys from *the orphans of Stuttgart* and other cities. These boys had but one instructor, who had to keep them at work, and train them to the greatest possible activity.

This practical school was modified—and, instead of taking orphans, the sons of peasants especially, were to be admitted.

The students of the *higher* institute are admitted without examination, are held to no very rigid discipline, they employ their time as they choose. Many sons of wealthy families are no doubt attracted there, by the beauty of the institution for an agreeable temporary residence.

It may be proper to remark that there is a sort of impassable, aristocratic barrier between the institute pupils, and those of the school of practical agriculture."

Every word above is quoted from Flint, who was on the spot, less than three years ago; and I submit, that the writer in the *Nation*, has no just ground for urging upon us the example of Hohenheim, (upon this fundamental question, *who* is to be educated, and *how* are they to be educated?) whether Hohenheim is working well or ill—gaining in favor or losing. If it is doing well, it is according to the Wurtemburg standard of social conditions, and class populations. If it is doing ill, the chances are more than equal, that one great reason is the fatal curse of *caste*, from which the New England populations are free.

Let Hohenheim only drop out her lower school for the sons of peasants, and then she would be exactly suited for one of our Southern States. And I submit, whether the alleged favor shown to the new agricultural departments at Leipzig and Halle, may not be simply an indication that the tyranny of caste is working the other way, and the "sons of gentlemen and wealthy families" are finding it more agreeable to go to the universities than to Hohenheim.

I had intended to carry out in this article, the other side of the question—our own side—but time and space prevent. I will resume it at another time.

P. Barnes.

Portland, Feb. 22, 1866.

Agricultural Schools—No. 2.

What I wrote, in my former paper, respecting the Agricultural College at Cirencester, in England, was set down, at the time, from memory of the accounts given by Mr. Henry Colman, President Hitchcock, Mr. Flint, and others. Referring in fact, to some of these authorities, I find that a part of my statement of detail was erroneous, but the general facts are fully confirmed, and the object for which I adduced this example, is most significantly made out.

President Hitchcock, who was there in 1850, says:

"Those residing in the building, pay $355 annually; those who board elsewhere, $175. Formerly, the school was open for the sons of the smaller

farmers, but could not find support on that plan, and it was found that *if these attended, the wealthier classes would not send their sons.* The price accordingly has been raised, and *none but the sons of gentlemen*, such as clergymen and wealthy laymen, now attend. None of the *nobility* send their children."

Mr. Flint visited the college in 1862, twelve years later, at a moment, when the professors were resigning, and the institution was in a crisis of difficulty. He says:

"A mistake appears to have been made at the outset, by fixing the charges too low. It was designed to meet the wants of those young men, sons of farmers, who *wished to prepare themselves for stewards or bailiffs*, and who could ill afford to pay even the £30 (say $150) which was the amount fixed, including board and tuition. *Small farmers could not send their sons, and rich ones would not.*"

Under a new management, he says:

"They raised the charges. The institution still lives, with about sixty students, now consisting of the *sons of the rich.* The charges now are £90, $450. The farm appeared to be under a good state of cultivation. *All the labor is hired*, the regular farm wages being *seven shillings a week*, the laborers finding themselves. That is twenty eight cents a day."

These last statements tell the whole story. Compare the young *gentlemen*, who are the *students* of this college, and pay $450 a year for their board and education, with the *peasant laborers* on the college farm, who are paid twenty-eight cents a day!

The object of adducing these examples in this discussion is, to show how inapplicable are any supposed analogies drawn from the European institutions, to the questions now before the American people, relating to "industrial colleges." And by so much the more, as we see and feel, clearly, the degradations of low *caste* in European society, shall we apprehend, the more distinctly, the peculiar and original problem now under discussion among ourselves, where we have no *permanent* class distinctions at all, and where, in respect to the temporary diversities of fortune and pursuit, the very precise object before us is, not—to educate the *gentlemen classes*, but—the "*industrial classes.*"

Before renewing the discussion of the argument used by the writer in the New York *Nation*—that it may not be well for *us* to have separate agricultural schools, because, as he says, in Germany, such schools are now in less favor than heretofore, and it is thought better to have professorships of agriculture adjoined to their classical universities—it is proper to say, that no such ques-

tion as that of purely agricultural schools, is presented to the American public by the act of Congress of 1862. That act does not contemplate nor provide for institutions designed to teach only the sciences of agriculture, and the art of farming. It embraces a great deal more. True it is, that on account of the great prominence of agriculture in our American life, and, especially because enlightened farmers and persons attached to the agricultural interest, have taken a more notable hold of this matter than anybody else, it is usual to think of these new institutions, chiefly in their connection with agriculture; and, in common parlance, and for a convenient appellation, we speak of the "agricultural college" of Maine, or of Massachusetts, when we refer to the institutions founded under the act of Congress. But this name is only partly correct, and the writer in the *Nation* is entirely in error, when he seeks to draw from the alleged case of Hohenheim—a strictly agricultural school—an argument for merging our "*industrial colleges*" in the existing universities and literary colleges of this country.

To resume the discussion of the great problems which lie underneath all this comparison of the classical university and the proper industrial college,—namely—for what sort of populations, are these different means of training properly designed? *Who* are to be educated in the industrial college, and *how* are they to be educated, and with *what ends* in view?—the examples of the argument must be drawn, in *our* case, from the actual ranks of the actual persons, who compose the industrial, or hand-working class of our own communities, and who necessarilly compose the immense majority of every State, in the northern parts of our country.

For the strong lesson of absolute contrast, we have instanced the European peasant, for whom there is no future, except the simple continuance of his peasant life to the end of his days, and who is not only himself ignorant that he needs any better culture, but who is surrounded by those who are equally ignorant, or wickedly indifferent, as to any improvement of his lot. We have instanced the negro field-laborer of the South, for whom, though a great light has dawned upon him, it is still a matter of struggle, what his future is to be, and a matter of doubt, how long that struggle may last.

But nobler and more hopeful specimens of young manhood engage our attention in the Northern States, and especially in New

England. Here, in the State of Maine alone, we have more than forty thousand young men who are the sons of farmers (in the American sense,) who are the sons of mechanics—who are devoted, of whatever parentage, to the labor of a seaman's life—including also the sons of our numerous class of small traders, and including also a large number of day-laborers, not attached to any particular art or trade.

These are the young men of *our* industrial classes—these are the persons, whom the act of Congress designs to aid in obtaining a "liberal and practical education." Of these young men, from sixteen to twenty years of age, or thereabouts, who are now working daily with their hands, it becomes us to think, when we are studying the form, and plans, and objects, of the "industrial college." They are of divers pursuits, and therefore we are not to have a college for one object alone. They are not all to be farmers, and therefore we do not want a purely agricultural school, like Hohenheim or Cirencester; they are not all to be mechanics, and therefore we do not want instruction merely in mechanical science and art. But we want for them all, "*practical*" education, because the vast majority of them are to be practical men, and we want for them all, as "*liberal*" an education as we can reasonably give them, so as to develope their best powers, and give them as many means of usefulness, and as many sources of happiness, as we possibly can.

Look at the real case—at the positive actualities in the life and condition of these young men, as they live to-day, and as their future lives will be. The great majority of them now live in homes of actual labor. They are the sons of working men. They were bred to work, they are content to be working men, they expect to continue to be hand-workers, during at least the early part of their manhood, until, by prosperous industry, they can come to be directors of other men's labor, or until their sons shall take their work from their hands. But every one of these young men has a future—every one of them (not involved in indolence or vice) has hopeful and just aspirations to improve his condition—every one of them has an assurance, that friendly hands, on every side, will help him, if he tries to help himself, and that his efforts and his merits will be recognized by every sensible man and woman of whatever pursuit, in all the community, in every part of the State.

In our communities, from the necessity of the case, as well as under the active and generous force of our institutions, it is from

the ranks of precisely these young men, that we are to draw for almost every kind of public service, and to fill an indefinite variety of useful and honorable stations. They are hand-workers now, and most of them will continue to be so, for various periods in their future. But, in a very few years, they will also be town officers—selectmen, town treasurers, highway surveyors—they will be jurors and sheriffs and county commissioners—they will be representatives and senators—such men compose a majority of the Legislature every year, continually—some of them (by doubtful good fortune) will go to Congress. If we cannot, in the State of Maine, say that any such man, while still belonging to the industrial classes, has been made Governor of the State, yet certainly, most honorable examples of the kind have occurred elsewhere in New England. And even though they may go into no public station whatever, yet in their middle and maturer life, they will be the controlling strength and influence in every inland town. In the career of a strictly private life, every one of them has a right to expect—great numbers of them *do* expect—to attain to conditions of independent comfort and happiness. European peasants, and Southern negroes, scarcely know what is meant by a home, in its rudest form. But the son of the New England working-man, taking for his own lot, also, the life of a working-man, expects to be a "forehanded" owner, in fee, of house and land. He expects to have a wife, who will be proud of him, he expects to have sons and daughters, who will be the ornaments of his home, in his active days, and who will be his strength in his declining years.

We should not forget, because it is among the most important of the future services, to which these young men will be called, that they will always compose a large majority of the four or five thousand schoolmasters, annually employed in this State. So also, out of the number of them who are seamen in early life, we shall make—we shall be obliged to make—our shipmasters, the captains of our important coasting navigation, and the commanders of our ships in foreign trade.

Between these young men, who have such a future, and such opportunities, still belonging to the industrial classes, and that other portion of our young men, who are expecting to embark in what are called the learned professions, there needs now to be made only this comparison—that the latter are, at any given time, only a very few hundred in number—the former are more than forty thousand at all times, even after allowing for that very con-

siderable proportion, who are designing to engage in the business of merchandise.

The working young men of New England, have always had better means of education, than any similar class in the world. Their facilities for mental improvement are good, to-day. The common schools and the academies have wrought most excellent results. The simple question is, how to give them a mental training still better, more varied and more complete, so as to open for them a wider and higher usefulness, and give them the command of richer sources of happiness? and—how to do it in the most effective way? and—to touch the matter in its very sharpest point—*how to do it, so that, though educated much more completely than they now are, they shall still continue to be hand-working men—still continue to belong to the "industrial classes?"*

For, in these high northern latitudes, unless a very large majority of our people are actual hand-workers, we cannot live here. If we should educate all our young men and young women, in such manner and after such notions, that they should, thenceforth, cease to be hand workers, and think to get a genteel living by their educated wits, our entire population would be obliged to migrate into some climate, which permits a softer life, and abandon these fields and valleys, to be covered once more with forest, and occupied again by the more sensible beavers and Indians and red deer. Was *that* the design of the Providence which planted us here?

In this way of putting the case, I am touching upon a course of facts, now current and patent, before the eyes of us all. Very considerable numbers of young men and young women, obtaining here, in this State, the best education open to them, and then assuming, alas! that *because* they are educated, they are *therefore* no longer to be hand-workers, and, finding but few and scanty chances of gaining their bread by merely intellectual pursuits, in this State, are migrating annually, and seeming to themselves to be obliged to migrate to other States, for employments suited to their educated capacities. And at the same time, some wise men among us are talking, or were recently, of importing Norwegians into Maine to increase our working population!

We have come to a point in the discussion, where we stand and behold, unmistakably, the great line of distinction, that separates the ordinary literary college and university, from the proper "industrial college" contemplated by the act of Congress. The ex-

isting colleges, of the ordinary type, were never designed nor expected to educate laboring young men *as such, and with a view that they should continue to be such*, after obtaining their education. They take a great proportion of their students from pursuits of hand-labor, but, in every instance, with scarcely a possible exception to be found or heard of, they educate them *out* of their labor, fully and utterly, and with express intent so to do. Great numbers of young men have gone to the colleges from the families of farmers, and from the families of mechanics, but not one in a hundred ever went back to the farm—not one in ten thousand ever went back to the mechanic's shop. From the very nature of the case, it must be so. The whole idea of the common university and college is, and has been for hundreds of years, in Europe and America, to educate young men with a view to life in the learned professions, so called.

The sum of the matter is this—in two parts:

1. In European communities, and wherever distinctions of caste are permanently fixed, there is not, and never will be, any thorough, public provision to give superior education to the young men of the laboring classes. Scientific chairs and agricultural professorships may be established at Halle and Leipzig, at Cambridge and Oxford, in whatever number, and with whatever profusion of endowment, but they will draw no peasant from the field, no artizan from his bench.

2. In the American States, we have a thousand colleges and universities, (as we call them) and, in accordance with the genius of our institutions, and the supposed demands of a new country, they educate great numbers of young men, who come from the ranks of actual laboring life. But of all these colleges, not one has ever made provision, so to educate a laboring man, that he will, by design and of choice, continue to be a laborer; not one of them sends out a graduate, with the purpose to be an educated man and a hand-laboring man, at the same time. Nor is there any probability that the existing colleges will ever try to do this.

Is it impossible? Is it inconceivable, that, in a college of a different stamp and aim, there can be a place of discipline and training, by which American young men shall be led to choose and love a life of labor, and, at the same time, be fitted to attain to that higher usefulness and happiness, which come from superior mental culture?

That is the problem before us at this hour—a problem forced

upon us, I submit, by every fair interpretation of the act of 1862, and one, which, here in the State of Maine, with our 45,000 working young men, we ought not to leave untried any longer.

March 8, 1866.

Scientific Schools.

Having, in two preceding papers, attempted to show what, I think, is a wide and unavoidable diversity, between the methods of public education, which are resorted to, in those communities where deep and permanent distinctions of caste exclude the actual working classes from all benefit of superior mental culture, and the methods, which *ought* to be adopted, in those of our American States, where the "industrial classes" compose the immense majority of the population, and not only hold so much power and influence, but have within their reach, so many resources of comfort and happiness, if they are taught to know their good fortune—I place, at the head of this paper, not the title "Agricultural Schools," which I found, inaptly and erroneously employed, in the article from the New York *Nation*, but the title "Scientific Schools"—for the purpose, if you will permit me to occupy your columns a little futher, of showing how, and to what extent (within certain limits) the public opinion has been led away from a just observation of the distinctions I have pointed out, and how a mischievous delusion has obscured the aim of many good men, who really desired that the "industrial classes," might have the best benefits of education.

What are called in this country, and particularly in New England, "scientific schools" are, in fact, a compromise between the forms of education for the so-called learned professions, and the demand of the times for the education of practical men, for practical life. This compromise, like most others, has been somewhat at the expense of principle, and though it has effected some very good results, it has caused a great mass of notorious facts to be wholly ignored, and many great duties of the governing power, in the Free States, to be wholly neglected.

The history of this compromise is curious and instructive. For a time almost beyond history—for hundreds of years at least—universities and colleges, in Europe and America, were devoted, as repeated so many times, to the education of young men for the

learned professions—either to their general preparatory culture, or to their special training in the attached, professional schools of law, divinity and medicine, or to both. For a long, long time, the world was satisfied with this, and thought it all right and all sufficient. Within a half century past, the great and rapid advancement of the material sciences and the useful arts, particularly in this country, created a demand for a body, or class of men, who should have such training in early life, that they could carry forward those sciences and arts, to the highly important and valuable results, called for by the peculiar civilization of the age, and by the new necessities of practical life. This demand was pressed, in various forms, by practical men, upon the colleges and universities. They were the seats of learning; they were in possession of the apparatus of education; they had the public endowments; they professed to be taking care of this great public interest. It was insisted that they should do something more than they had been accustomed to, and that they should enlarge, or modify in some way, their courses of instruction, so that young men, who desired to become engineers, and architects, and naturalists, and geologists, and mining overseers, and chemists, or to devote themselves, under whatever appellation, to the higher uses of the improved practical life of the time, could obtain, within their walls and classes, the necessary general and special culture, as well as the future ministers, and lawyers, and physicians.

To my knowledge, and within my recollection, no one of the ordinary colleges in this country, ever responded to this demand, in manner and form, as made. True it is, the colleges were not insensible to the scientific progress of the times. They taught more science, and better science, and more of the principles of the practical arts, than they had done before. But only, as a part of the same continued curriculum, which embraced the training of the embryo lawyers and divines. No pressure of practical science, induced them to give up their elaborate routine of dead languages, or whatever other studies had usually been thought needful, for a career in the *learned* professions. No college, distinctively and designedly, introduced *into* its calendar, a course of study for the express purpose of preparing young men for such walks of practical life as are above stated. Precisely now, as forty years ago, the great majority of young men, who spend four years in college, are expected to be ministers, lawyers or physicians. The courses

were made for them, and are adhered to for them. *That* is the regular college course.

Within a few weeks, I have seen a newspaper advertisement of Tufts College in Massachusetts,—not now at hand—where it is stated that certain courses of study, for practical life, as distinguished from the learned professions, are introduced into the regular college course, and form an integral part of the proper college routine. I know of no other such case.* Very imperfect attempts were made some years ago, in a few colleges, to make some provision of the kind, *outside* of the regular courses, and the pupils that came into these arrangements—few enough, to be sure —were called *partial* students, or students in the *partial* course!

The public demand I have mentioned, was met in another way. The earliest response to it, that I remember, and a most laudable one, too, was the school for practical education in science and useful arts, founded by the noble-minded Stephen Van Rensellaer, about forty years ago, at Troy, New York, and long and well known by the energy and skill of its first instructor, Professor Amos Eaton. It flourishes to this day, as one of the best scientific schools in America.

One such school, of course, was not enough. Not many years later, Abbott Lawrence made his liberal donation for founding the "Scientific School" at Cambridge, which bears his name, and which has been, very nearly, the model for several others since established. But at Cambridge, at Yale College, and at Dartmouth College, these new undertakings are not brought *inside* of the regular college course, as integral parts—they remain on the *outside*, as adjunct schools, nominally attached to the colleges, which, of and by themselves, are hedged round with Latin and Greek, as of old.

This is only another way of stating the fact, obvious enough also in the nature of the case, that these establishments for training young men in practical sciences and arts, are merely profes-

* Shortly after writing these sentences, I was applied to by a young friend, whose contemplated college education had been interrupted by three or four years' service in the army, to advise him as to a place, where he might still obtain a superior general education, for practical life, without Greek and Latin or the higher mathematics, for which he now had not time. I mentioned to him the college above named, but, on obtaining a catalogue, had the regret to find, that, although a tolerably satisfactory programme was there laid down, for such general and practical education, yet the Faculty had distinctly inserted, along with it, their recommendation, that young men should NOT adopt that course, but rather, the full classical curriculum of dead languages and mathematics!

sional schools, adjoined to the college or university, just as, in some cases, the schools of law and divinity and medicine are. Harvard College and Yale College have them all.

The result is simply this: that we now have an enlarged variety of educated professions. Formerly we had but three—called the *learned*—now, by means of the scientific schools, we have the *scientific* professions; we have professional engineers, professional architects, professional chemists, professsional geologists, professional mining engineers, &c., &c. All this is a very great and fruitful advance beyond that former barrenness, where, even in these free and intelligent States, it was not thought necessary for anybody to be an "*educated*" man, except the lawyer, the minister, and the doctor. The difference is very great. Its effect upon the aspirations of many ingenuous young men is most excellent. It has opened most honorable and useful careers to very considerable numbers of them, who had not the time or the taste to go through the courses of dead languages and other such discipline, by which only, in former times, a professional position could be gained.

It is now a very respectable thing for a college to have a "Scientific School" attached to it. It is thought to add to the dignity of the central institution; it gratifies the governing and managing aspirations of trustees and overseers, and is supposed to increase the importance of presidents and professors, besides adding to the patronage and custom of people who live in college towns. Hence arose, undoubtedly, that very eager, and by some thought not altogether generous rush, that was made, throughout New England, to seize the endowments granted by Congress in 1862, for the education of the "industrial classes." On the showing of their hands, it was evident that these claimants had made up their minds, that the "scientific school." after such models as the Lawrence, with a little agricultural chemistry and veterinary surgery superadded, would answer all the purposes of the act of Congress; and such schools, they would be most happy to "annex" to their respective colleges, "*provided that*" (as members of Congress say) they could also be allowed to *annex* the Congressional endowment to their college treasuries. In some cases, these claims have been consented to—in others, they have been resisted. Results are in the future.

Now it is a simple question of the interpretation of a plain statute law, whether a scientific school, such as those we have, attached

to some New England colleges, designed for the training of a very limited number of young men to be professional engineers, architects, chemists, geologists, naturalists and miners, meets that clause, which requires the endowment to be applied "in order to promote the liberal and practical education of *the industrial classes?*"

Towards an answer to this question, two or three observations may be made:

1. Congress does not undertake to provide for the education of persons, to oversee and manage, certain departments of business, in which the "industrial classes" are interested, such as road-making, and the construction of edifices, and the manufacturing of chemicals, and the working of factories and boring for oil, but it provides, explicitly, for the education of the "industrial classes" themselves.

2. It is perfectly obvious, that, here, in the State of Maine, for instance, if we should turn out from a scientific school, in a year, half a dozen professional engineers, and three or four professional architects, and two or three professional chemists, we should simply glut the market. We have not employment for half that number. They would have to starve or migrate. But the young men of this State, who belong to the "industrial classes," and who are of college age, are more than forty thousand in number.

3. Nor is this observation met by saying, that our "scientific school" would educate certain of our young men for scientific professions, who could then, in default of employment here, remove to the Western or Southern States, and find positions there, because, in the first place, we need our educated young men *here;* and secondly, because Congress has granted this endowment to every State, and therefore, there is not the opening for our young men, that the case supposes

4. Since the greatest of all industries, in Maine, is agriculture, it is a fact to be observed, that the general model of the "scientific school" as heretofore established, makes little or no provision for any instruction, which will be serviceable in practical agriculture. Yale College is inaugurating an attempted exception, which will be noticed below. I should say, it is well understood, throughout the community, that these schools are not usually designed for the education of farmers. The catalogue of the Lawrence School always places against the name of every pupil, the branch, which he is pursuing. But, in a series of years, not a name can be found,

against which appears any indication that the student ever had, or intended to have, anything to do with farming. The Rensellaer School publishes, with its annual catalogue, a list of all its graduates, showing, as far as practicable, what are, or were, their pursuits in life. Of course, there is no account of the number, who left the school without graduating. But of the actual graduates, 367 in number, I find that only sixteen are designated as "agriculturists," and these are all in the earlier years of the school—for the last eighteen or twenty years, not one. The graduates are engineers, architects, superintendents of public works, and such professions.

5. The comprehensive observation of all—as partly indicated already—is, that the common scientific school, like the common college, though it may, like the college, draw many of its students from the ranks of laboring life, returns few or none to those ranks. If it educates the young man who was a hand-worker, it educates him *out of* his labor—it does not usually so educate him that he will go back and belong to the "industrial classes." It makes of him a professional man—an honorable and a useful one, it may be—but by the very act of his education, in *that* form, he ceases to be one of the class, which the congressional endowment was designed to benefit and improve, as a class by themselves.

I cannot believe, therefore, that the "scientific school" as now in fact known in New England, answers the requisitions of the act of Congress; and although it is an admirable compromise between the old college forms and the new scientific and practical demands of this century, yet it is not a compromise, which reaches to the accomplishment of the end prescribed in the act—the liberal and practical education of the industrial classes.

To bring forward here such a matter as details of *expense*, in procuring an education, would not, of itself, control the interpretation of the statute, nor modify the essential reasons of the subject in hand. But it is well known, that the question of obtaining or not obtaining a superior education, is very often controlled and decided by the question of what it will cost. From the nature of the case, it is evident that, as a general rule, the cost of training in a scientific school, attached to a college, will be just about the same, as in the other professional schools, and just about the same, year by year, as in the college proper. It is the last, which makes the standard on the whole. Many of the college students are the sons of men of means. To a certain extent, they control the style

of living and the scale of expenditure. There are few facilities in any of the colleges, and fewer in the professional schools, for self-subsistence. College towns are apt to be expensive places, and notwithstanding their public endowments, the colleges and professional schools expect to derive an income from their students. I have before me the year's bills of a young man, who was a pupil in the scientific school at Cambridge. The amount, embracing only the established catalogue charges, and board, omitting all extras and merely personal expenses, was over five hundred and thirty dollars for the year. In some other places, it would not cost so much, but, whatever the amount, it is, as we say, *all cash*, and is a burden, which only a very few of *our* young men can bear.

To the scientific school of Yale College, there was added last year a "Course of Agriculture"—two courses in fact, a full course and a shorter course. The full course is three years, and the charges, in the school bills alone, are stated to be about one hundred and seventy-five dollars a year. Add the cost of board, in a town like New Haven, and the result is an expense, such as could be borne only by a few of our young men. The shorter course differs from this, as to cost only, in leaving out one term in each year.

The experiment at Yale College is an interesting one, and, if good results can be obtained anywhere in this country, by attaching a course of agricultural instruction to an attached scientific school, in a college town, without a farm, and without practical discipline in the field, they may be expected to be reached there. But however successful the experiment may be, with the few students, with whom it is possible to bear such expenditure, the question will still remain, demanding its answer, What is to be done for the thirty or forty thousand young men in Maine who stay at home, and who must stay there, until methods of education are provided, suited to their present and expected condition in life, and within their means to obtain?

March 19th, 1866.

AGRICULTURAL SCHOOLS—No. 4.

The College for the Industrial Classes—What should be Taught?

If then, the attempt ought to be made, to offer to the young men of our large and constant class of hand-workers, such man-

ner of education, as that, while abiding, through their early manhood, in the ranks and pursuits of actual labor, they shall also command, for their life time, the happiness and the usefulness of superior mental culture, it is impossible not to see that we meet here, unavoidably, the next great question in the case,—What course of study and discipline is most likely to answer their specific necessities? This question, it is plain, lies at the very foundation of the matter, side by side with that first problem—*Who* are to be taught?

No one ought to attempt a complete answer to this question, until after some honest and wise experience has been gained in this now untried field of effort. And I hold, without hesitation, that the best persons to devise the particular plans of study and discipline for such pupils, in such a college, are the very persons, who are to work out and execute the actual details of the daily life of the institution. If the managing overseers of such a college, at the very outset, after determining to aim at some such object as I have brought to view, were then asking for some one to help them, about plans and subjects of study, and methods of internal policy and discipline, I know not what better advice could be given, than simply this: First of all, find the men who are to administer the internal life of the college,—make sure that they are the right men, sound and clear upon the essential principles of the business in hand—men, who heartily desire, and fully believe in, the personal union of skilful head-work, and skilful hand-work, and let *them* devise the courses of study and discipline, which they themselves are to carry out. So I trust, there would be less danger of slipping into the ruts of old routine, and the pernicious facility of doing as other people do.

Waiving, therefore, all pretension of laying down any scheme of particular studies—some of the departments, also, being quite beyond any province of mine to advise about—I venture, nevertheless, upon a few general suggestions, as to some parts of the educating influences and means of influence, which I hope such a college may exert upon our working young men of New England —attempting, at the same time, to show how plainly and distinctly the act of Congress sustains the views I have advanced.

1. We must bear in mind the element of *time*, as affecting and controlling to some extent, the study and the life of the college. The seven or eight years required for such education as is obtained by the graduates of the other colleges, is wholly out of the ques-

tion here. The young men could not submit to it, and there is no reason in the world why they should.

2. Since the Industrial Colleges are founded upon a public endowment, faithful recurrence is necessary to the specific terms employed in the act of Congress, so that we may observe both the range and the limits of the training contemplated. Congress has not established merely "agricultural schools," and nothing more, nor mere schools for instruction in principles of mechanic arts. Reflecting persons ought to be on their guard against settling down into the habit of calling the institution "the Agricultural College," lest, by the mere force of a name, they should come to think that it is designed only for farmers, and will teach nothing but agricultural science and art.

It will be seen, also, that in the corps of instructors and directors, there are to be other faculties besides those of teaching agriculture and mechanics. General education is specifically provided for, as well as training in the rules and methods of practical working life.

3. The act of Congress is very plain. It declares that in the college thus endowed "the leading object shall be * * * * to teach such branches of learning as are related to agriculture and the mechanic arts." Evidently, therefore, students who are intending to engage in mechanical pursuits, must be provided for in the course of theoretical study, as completely as those who are to be farmers, although, from the nature of the case, there cannot be an equally full opportunity for practical demonstrations and applications of what is taught. Conceding then, as we must, that the future mechanics and the future farmers are alike within the provisions of the act, I now recur to one of the clauses omitted in the above extract, which, although it is negative in form, I understand to be full of affirmative meaning and direction. The clause is—"without excluding other scientific and classical studies." It is hardly necessary to remark here, that the term "classical" is not to be taken in the narrow sense, that would confine it to the study of Greek and Latin. It is plainly a broader term, as here used. Precisely as the adjoining word "scientific," may include natural science, or metaphysical, or political, or ethical, or some other kinds, and it is left to the judgment of those in charge to determine which, and how much, of these scientific studies may be undertaken, so, out of all that other group of literary studies, which pertain to what has commonly been called a classical educa-

tion,—in which our mother English is most surely entitled to a place—it is provided that those, who plan and administer the courses of study, may select and teach such parts as they find practicable and servicable for their pupils. All this I take to be equivalent to an affirmative declaration by the act, that, while the leading object is to train young men to be farmers and mechanics, they are also to receive as good a general education, and as comprehensive a culture as is reasonably practicable, within the means at command, and the time, which these classes of young men can devote to early, formal education. Thus it will result, that the young man, who has gone well through these courses, will not only be able to say to himself, with just and honorable satisfaction, "I am now well trained to be a farmer;" or, "I am now educated to be a mechanic," but also, and in both cases, "*I am now an educated man*," and not only say so, but prove it, by his life.

This view of the problem before us, cannot be too carefully and deeply considered. We shall belittle and enfeeble the whole enterprise, if we suffer it to settle down into mere specialities of farming and mechanics. There is no need of it, at all. If the students are wisely directed, they can gain most excellent proficiency in the elemental principles of those pursuits, and in much of the practice, and, at the same time, can acquire a good general education—one that will put them, intellectually, on an equal footing, at least, with the majority of our professional men, and one which, dignified, as it may be, by the manifestation of thorough skill in practical arts, and by the energy of a useful practical life, will secure to them respectful appreciation by the most cultivated persons in society.

And I cannot doubt that the act of Congress intended to indicate just such a result, in its declaration, that such and such things are prescribed, "*in order* to promote the *liberal* and practical education of the industrial classes." The term "liberal" appears to be employed, as if with design, to show that general culture, intellectual development, and some degree of literary refinement, are to be aimed at, as well as proficiency in useful arts of hand-labor.

4. Having spoken so distinctively in the preceding paragraphs, of farmers and mechanics, I wish not to be understood as leaving out of view that very large class of young men in Maine, who are more or less devoted to a seafaring life. Sailors are not usually

called mechanics, but it is evident, that much of their art rests upon those mathematical truths, which are the foundation of so great a part of mechanical teaching, and that, in plying their trade, they are constantly dealing with machines, which involve scientific principles, and which they will use in the best manner, when they are trained to the best understanding of them, For them, therefore, the college will furnish a large part of the elemental training so necessary for their highest usefulness, and for their best personal improvement. Of course, I am not now referring to that class of seamen, gathered out of the seaports of all the world, whose only life is from the boarding-house to the ship, and from the ship, back again—from whom nothing is expected but manual dexterity and unthinking obedience—the "old salts," whose career, begun by accident or necessity, is pursued without aspiration, and without hope or thought of self-improvement or independence. But I am referring to the native-born, young sailors of Maine, whose actual homes are here, on all our hundreds of bays and rivers, so many of whom enter upon that career, with definite purpose and expectation to improve their condition—great numbers of them becoming, as we know, commanders of vessels—and for whom a sensible, skillful, and systematic education in early life, with the influences of a New England home to help, will tend to make them, when they reach the quarter deck, not only thorough seamen, but also well educated men. And such an opportunity for their early training seems to be the more desirable, because so many of the sailors of Maine lead a double life. It is very common for them to be both farmers and sailors, and the college will open to them means of improvement in both capacities.

5. I cannot form, and have never attempted to form, any idea of the institution, which does not include, in a large and controlling degree, the essential feature of a common *home* for all its inmates—teachers or directors and students—where the sympathies and intimacies will be far closer than they are in the ordinary college or university. If I supposed that teachers and students were to live altogether apart, save only as called together, twice or thrice a day, by tap of bell, for formal recitations, I should abandon all hope of any results worthy of the labor and cost of the enterprise. But since the design seems to be, to make the training of the college bear directly upon actual life, and since the handling of practical subjects, by practical demonstrations, is to form so large a part of the discipline, and the students, coming from homes of actual labor,

are to be trained and educated as and for laboring men—and so ought not to intermit labor altogether, while in their training—and are to go from the college, into a life of just such labor as has formed a part of their education, it seems probable that teachers and students will be brought into near and frequent intimacies.

And I suppose it scarcely possible, in this age of the world, that any instructor in such a practical college, will fail to see the indispensableness of teaching by the observation of facts and things, as well as by the theories and statements of books. The laws of nature will be shown by the facts of nature, and by natural objects. Students must be taught about these things, in the open world of nature. Teachers and students together, must see and handle the actual things, which are the subjects of instruction—plants, and rocks, and soils, and fruits, and crops, and machines and apparatus, and horses and cattle. In a word, the life of the college, and the instruction of the college, will be, to a large extent, one and the same thing.

I should count it, therefore, as one of the most beneficent and fruitful influences of the college, that these young men, with but limited opportunities, before, for intellectual culture, would be brought into so direct and constant intimacy with the cultivated men, who compose the corps of instructors. From these men, as models of learning and manners, so often and familiarly with them and among them, they will receive refining and liberalizing influences, quite beyond the effect of the formal hearing of lessons in the class room. It is impossible to over-estimate the value of *learning by models*, where these models are high-minded, sensible, well-behaved, cultivated men,—sympathizing, affable, generous and kind.

6. I should hope that, foremost among the means employed in the colleges, to wake up the minds of the working young men, would be a large and good library. I do not refer now to the apparatus of scientific books; I mean a library of all kinds of good books, in their mother tongue, which would amuse, entertain, enlighten and instruct these students, by the knowledge of a thousand things, not before open to them, serving to excite their curiosity, and to create an appetite for intellectual improvement. Many a young man would wake up in such a library, who was never intellectually awake before, and, once aroused, his mind would never go to sleep again. Experience would show too, most interesting examples of young persons, who, though they never saw but few

books before, had, in reality, a keen zest for the delight of reading, and whose introduction to such a library, would open to them a world of wonder and pleasure. Such a library should be so large and so good, that the students should see and feel it to be a most prominent and important part of the institution. And I know of no better way of placing and using such a library, in such a college, than simply this—to put it in the most central and conveniently accessible part of the whole establishment, with its doors never locked, and with the fullest liberty and encouragement to every student, to resort to it, at any hour of day or evening, when free from prescribed duties elsewhere, and read at his pleasure, only under such advice as a judicious superior would give, in the way of helping and not of hindering, and—subject to such advice—absolutely without any other restriction, than that his hands should be clean. If, in resorting to and enjoying such a library, the student should, there, also frequently meet his instructors, engaged like himself, in making intellectual research, or seeking intellectual entertainment, this would be another sympathy of their common life, and would draw the pupil into still nearer, pleasant and courteous intimacy with his cultivated superiors.

7. As an attainment specially desirable for these young men, I should reckon a thorough training in the knowledge and use of their mother tongue, and a liberal acquaintance with the lessons of truth and wisdom contained in its literature. Other languages may, perhaps, also be taught, for the sake of scientific enlightenment, but as a resource of general culture, and as an instrument of an educated man's power, a good mastery of the English language, would be, to all these young men, a discipline of primary importance. I do not refer to the mere technicalities of linguistic study. I should hope the persons in charge would not yield to the detestable and accursed superstition of teaching the grammatical science of a language, instead of teaching the language itself. To our young men, already trained by school and home influence, to a comparatively accurate use of their native language, it may well be further taught by its models, rather than by its rules. These models, skilfully and abundantly placed before them, not only in books of classical English, but in the refined speech and style of their instructors, to whom they listen, and with whom they converse in the daily and hourly intimacies of their common life, will unavoidably tend to form, in them also, the habit of speaking and writing, in their mother tongue, with accuracy, readiness and force.

Direct instruction, of course, will not be omitted, but that may well be, upon the actual and practical use of the language itself, and not, mere drill upon its forms.

How important it is, that our working young men should be trained to this faculty of speaking well and writing well, in their own language, cannot fail to be observed, when we see how often, in common life, and how unfortunately, this distinction has to be drawn, between our practical men, and those who are called the educated men of the community—that one class has the command of language, the other has not. The practical men are not, unfrequently, the complete equals of the other class, in good sense, in the understanding of the subject matter, and in devotion to the object in hand,—often, are really superior in these particulars—but they are compelled to be silent, while an unjust, and sometimes unprofitable prominence has to be given to the few, who have been educated to the faculty of speaking or writing, on public occasions. In a thousand instances of constant occurrence, the practical men, the working men, are obliged to ask of the educated men—the lawyers, the ministers, or some other such person—to prepare for them written statements, reports, and documents, or to make addresses and speeches, because, as a result of our usual method of education, these latter commonly have, or are supposed to have, a superior faculty for such purposes. This inferior and subservient position of the practical men is wholly needless, if only, they can have that "liberal and practical education," which the act of Congress intends to give to the "industrial classes." Of course, to speak well, or to write well, one must also have the faculty of thinking sensibly and reasoning justly—and this faculty, no intelligent educator of our working young men, will fail to train and develope—but it is just as certain, that a diligent, well-disposed and ambitious student of an industrial college, can be taught to speak well and write well in his mother tongue, as it is that he can be taught to swim or to skate. Not that our young men should be trained into a foolish and vain habit of making speeches for pride and show. I only urge that they should be so educated, that they will be able to speak or write, with acceptance and conviction, whenever a just duty to themselves or others may reasonably require it.

8. In my citation of the terms of the Act, I omitted the clause, "including military tactics." This is affirmative and directory, and indicates that Congress thought such instruction to be not

only desirable and important, but practicable also. Undoubtedly, by a careful distribution and economy of time, the students can be made familiar with the manual of arms, and the evolutions of small bodies of men. If suitable instructors are to be obtained, they can also be taught a good deal of the general principles of the military art, and of the history of warfare, especially as illustrating the history of their own country, and as inculcating, withal, the greatest lesson of war, a true love of peace. But without attempting here to go into any particulars of this part of the instruction, I submit, that under this provision of the Act, a most excellent general influence might be exerted, over and through the whole institution, by the enforcement of habits of order, and habits of obedience to regulated authority. Not, by any means, that all the discipline should be of military strictness, but that, throughout the whole life of the college, and affecting all its members, officers as well as students, it should be as well settled, as in the "tactics" of a camp or a garrison, that there is to be no disorder, no confusion, no recklessness, and no permitted disregard of reasonable regulations. To teach a young man the manual of arms, and yet allow him to be a sloven in his personal habits, to require him to observe the word of military command, and yet be contemptuous of all other lawful authority, would be simply nonsense, and the most unthinking student would feel it to be so. A proper observance, therefore, of this clause of the Act, would tend to make the young men orderly, neat, and justly deferential to wholesome rules of personal conduct. How important these habits would be to them in after life, in plying their vocations, in managing their property, and in training their children, needs no argument.

And not least important, I should suppose, among the effects of this clause of the Act, upon the whole internal policy of the institution, would be the observance of that indispensable part of military arrangement, *frequent and rigorous* INSPECTION. Not mere espionage of the students—not mere examination of their dress or their arms, when drawn up in line—but comprehensive, systematic, regular and peremptory inspection of every body and every thing belonging to the institution—from the highest officer and the most prominent service, down to the lower details of the farm and the workshop. By such means, all would cultivate an eye for order, and a sense of propriety and fitness. And one great object of such inspection is, to reach the conduct and conscience of superiors as well as of subordinates. The highest must bear inspec-

tion as well as the humblest, and where this discipline is faithfully applied, it sometimes happens, that, although a subordinate may be immediately and actually in fault, yet it is the superior, who is justly cashiered, for allowing indifference and neglect of regulations.

This method of management is not common in colleges, any more than it is on railroads. But there are few departments of human affairs, where it would work better.

There is but one thing in the Act of Congress, which I regret—and that is, that the Act employs the term "*college*" to designate the institution contemplated. The danger is, that the *name* will suggest and encourage pernicious imitation of old and inapplicable forms, and methods, and habits. One of the hardest things to be done, in the course and management of human affairs, is to *keep the wheels out of old ruts.*

April 23, 1866.

The Industrial College—No. 5.

Questions of Cost.

The question of the cost of educating the young men of the "industrial classes," is one, which lies as near the foundation of the subject as any other, and is, if possible, more indispensable to be met, than all others.

To attempt to manage this question by the mere dullness of imitation, and leave these young men to pay their bills, as young men do in other colleges, is a simple dodging of the whole case, and will be fatal to any of the colleges, that shall slip into that rut.

A cash expenditure, to pay college bills and board, of from three or four hundred to six or eight hundred dollars a year, is a simple impossibility, when the question concerns the mass of working young men, in this part of the world.

The whole question is in two parts—the cost and character of the public structures, fixtures and apparatus of the institution, and the private expenditure to be borne by the individual student. By unfortunate arrangements about the first branch of expenditure, the second may be deeply affected. Pretentious buildings may give pretentiousness to the whole establishment and to all its life, and may force out of practice, and out of view, that pure simplicity, which is the warp and woof of all true economy. How far

and how wisely the dangers of this part of the question will be avoided, in these new establishments, a few years' time will disclose. All experience shows how great is the chance of mistakes under this head. The managing authorities of such public institutions are regularly victimized, in a great many cases—sometimes by themselves, through the obsequiousness of doing as other people do, or the ambition to make a special show of their own—sometimes by the partisanship of local dignitaries, who wish for buildings that will glorify the neighborhood—sometimes (and that too often) by architects, who wish rather to display themselves, than to do the true duty of their art, and, not unfrequently, by actual builders, who think it not their business to be troubled about cost, if the bills are paid, somehow or other.

Restricted, as the colleges are, by the act of Congress, rigorously and wisely, from spending any part of the endowment upon buildings, if the managers of the institutions lavish the means they obtain from other sources upon ostentatious edifices, and fixtures, they will thereby, in the majority of instances, convert themselves into public beggars. And as these institutions may not, for some time to come, command the favor of the present influential classes, such beggary will be as hard, as it will be degrading.

In such a position towards the public, the institution can hardly be attractive to its expected inmates, or in a condition to impress upon its students, that form and force of independence, which, next after simplicity, is the best element of economy, and among the best influences that promote a useful and cheerful life.

To the students, the college will be a place of home-life for some of their best years; to the officers and teachers, it may be a permanent dwelling-place. And for both of them, therefore, the utmost care is required, that no architectural caprices impose upon them, a life of discomfort. He needs to be a wise and cautious man, who builds houses, in which *other* people, not criminals, are to be *forced* to live.

The strictest regard to the fitness of things—the adaptation of forms to purposes, and of means to ends, will be the best rule of architecture and the best rule of finance, for the colleges now contemplated—original and peculiar in their character, as they are—having, as their sole design, to do what never was attempted before, in all the tide of time, on such a scale,—"to promote the liberal and practical education" of the young men, who belong to

the working classes, and, who are to continue to belong to them, after they are educated.

It is assumed, of course, that there is to be a domain of tillage, grass-land, pasturage and forest, with buildings for the crops and the domestic animals, and workshops and laboratories to some practicable extent. If any persons assume, that the students are to be housed in dormitory buildings, with separate rooms, as in the old colleges, a difficulty of the most serious nature presents itself, in the charge of such buildings upon the common funds, and the rent, which, on such a plan, would have to be exacted from the students. It might be interesting to anticipate, how, after some period of experience and prosperity, it would be practicable to afford larger accommodations, but in the first experiments, with very narrow means, it is far safer and easier, to go upon the plan of large common rooms—one or more, as the case might require—for study and for social life. This would comport with the idea of household arrangements. So also, large common chambers for lodging. Such arrangements are perfectly practicable. It is not necessary to think of the forecastle of a ship, or the barracks of a garrison. These may be places of confusion, ill-manners and discomfort. The wards of a well-managed hospital give an example of another kind, where, by thorough regulation and discipline, the utmost order and neatness are secured. The pupils of the Girard College—some years ago, at least—all slept in large common rooms—each one, with a separate bed. The same kind of arrangement, I have been told, is strictly maintained at the Friends' Boarding School in Rhode Island. Both these institutions are affluent in resources, but they have not thought it necessary to impose upon their funds or their students, the cost of separate dormitory buildings and rooms,—which, besides their cost, have the pernicious effect of obliterating all idea of household, or domestic life.

How are the students to be subsisted?

Our own legislative act for the industrial college, contemplates that the *tuition* is to be, without charge to the student. But in all colleges, the charge for tuition is very light, compared with the cost of subsistence. This is the great difficulty and barrier, which has shut out vast numbers of young persons, of both sexes, from such institutions of learning as we now have. Oftentimes, a father, or a widowed mother would gladly have paid the twenty or thirty dollars, or twice or thrice these sums for the instruction of their children—but the moment that *home* is to be left, comes up the

question of subsistence, in another town, in another family. A cost of one hundred, two hundred, three hundred dollars a year—*all cash*—credit is impossible—this is not a difficulty,—it is an absolute bar against entrance to the places of education, for thousands and tens of thousands of every generation, here, in our own State.

Is this a necessity? Is there no ingenuity or pains-taking, that can devise a better way?

Assuming that the site of the college is to be a farm of adequate extent, of at least average fertility, reasonably divided into ploughland, meadow, pasturage, forest, and orchard ground—assuming also that the sons of "the industrial classes" can be provided, by themselves, or by their friends, with books and clothing and bedding, and with means to defray the cost of washing and the other small personal expenses—I propose, without hesitation for myself, but with due deference to all better judgments, as a solution of the problem of subsistence, that the students be trained to produce their own food, or, as much of it as may be practicable, and, if practicable, a sufficient surplus to pay for the cost of cooking it.

Such production of their own food, by the students, would, of course, include the raising of forage crops for the requisite number of domestic animals.

Be it observed, that I do not use the word "*earn*," but the word "*produce*." To earn a subsistence is one thing; to produce it is another. Manual labor schools of the old pattern, were places, where the pupils undertook to pay their bills, by *earning money*,—usually, by workshop labor. But that involved dependence upon markets. The student had to *sell* the product of his labor, and was therefore exposed to the chances of merchandising. Usually, he could make but a limited variety of fabrics, and these might be what the market did not want. Unable to sell his products, he was forced to omit his work, and, being idle, could not pay his bills. Sometimes it was arranged, that the institution gave the student credit for his work, and took upon itself, the sale of his wares. But that soon made a bad matter worse. As a general fact, such plans wholly failed.

But in the industrial college, with productive farm lands, there are means to solve the problem, or to *try* to solve it, in another way. If the student can produce enough wheat and Indian corn, for his own bread, and enough more to pay toll to the miller, and wages to the cook, it will be as wholesome as if raised by other

men's labor, and loaded with other men's profits, and it will be the bread of independence, which he can eat with thankfulness, while enjoying the means, which the college affords, for his scientific enlightenment and literary culture.

Precisely here will come in, the ready objection of those, who doubt, if they do not contemn, the idea of the industrial college. "Students," they will say in the first place, "are persons, whose business is, to study, not to work at hand-work"; and, secondly, "there is not *time* enough for proper study, and for the amount of hand-labor, that you propose." The first part of the objection goes merely upon old habit and routine, and therefore may be dismissed without answer. As to the second, can any one inform us, how much time is usually spent by college students, in actual study, and how much, in that, which is neither study nor productive work? Will any one make the investigation, and give us the real figures? What is the meaning of the present fashion to have a gymnasium at every college, and why is the humblest college in New England now looking round for a benefactor (?) to make them a present of a gymnastic building and apparatus? Why do the officers and friends of the colleges encourage Ball Clubs, and Boat Clubs, and contests and races, as a part of college life? What are all these, but physical labor, and very hard labor, too?

The answer is obvious. The world is coming to find out again, what was well known to the best part of the world, thousands of years ago, but was buried for some centuries, in the cells and cloisters of monasteries—out of which the modern universities and colleges grew, by imitation—that the mind is best developed, best disciplined and best refined, where there is an even, thoroughly sustained balance of bodily vigor, and an equal exercise of the physical powers. The body and the mind, so far as the present question is concerned, are the man. These two parts of his being were made for each other. To balance them rightly, to make each one of them serve the highest uses of the other, is the highest duty that the man owes to himself, and the most fruitful cause of his mere individual enjoyment. There are the moral faculties, it is true, but if any one thinks that these, also, do not indispensably demand the equilibrium of physical vigor, let him read the history of the disease called *hypocondriasis*, for information.

Amply sufficient medical authority declares, that much more than the usual measure of actual muscular exercise should be practised by students and persons of sedentary pursuits, and that too, in the

open air. Dr. Hubbard, of our own State, says: "Of the whole amount of time devoted both to study and to physical exercise, a full half should be given to the latter."

This topic is a most fruitful one, but it cannot be further pursued here. Only, let it be set down, that they, who maintain the truth of this proposition, do not admit, that, by such practice, there will be any diminution of good results of intellectual labor. On the contrary, they hold, that, with an even half of time given to bodily labor, the intellectual results will be actually larger, clearer, more original, spirited, sensible, effective and better in every way.

Regarding, therefore, the extent of the field of study, which the students of the industrial college, will usually attempt to go over, regarding also, the facility with which, by the conditions of the case, they will distribute their time between study and labor—it being the fundamental order of their life, that it is to be a life of both combined, and all things being arranged agreeably thereto—considering also, the amount of labor usually performed on New England farms, to the extent of procuring subsistence only, I see not what need there is for hesitation upon the question, whether or not these young men, under skilful leadership, and with a view to an honorable independence, can produce their own food, during their student-life! If the way is ever opened for the trial, I believe they will show that they can do it, and still achieve the most creditable intellectual attainment, with ample time for recreation and sport, besides.

To attempt here, to go into particular statements of *how* this thing can be done, might be only to imagine the details of an untried experiment. The treatment of such practical details, is not now of so much consequence, as it is, to secure attention to the *reasons* of the thing, It is precisely one of the cases, where it is well to spend some time upon ideas and principles, postponing the verification of them by facts, until we have tried to get at the essential logic, which lies under all facts. But there are several considerations, which may be briefly stated, as aids to reflection, upon the general case.

1. It is a prevalent custom, with most New England colleges, to have a long vacation in winter, chiefly for the purpose of enabling some of the students to spend that time, and a portion of the adjoining terms—two to four months or more—in school-keeping—that is, in *labor*, so that they may earn money to pay their college bills, the heaviest of which, is the board bill. School-keep-

ing is the only kind of productive labor, which is open to the student of the ordinary college. Here is a pregnant concession, that a young man may obtain a fair college education, and graduate with credit, notwithstanding that he takes out, absolutely, from his college life, one sixth to one third or more, of every college year, and spends it in labor. Be it observed, also, that it is the *poor* students, who do this—rarely, the gentlemen's sons—and the college systems are not without fault, that keep up such distinctions. School-keeping, it is true, has some advantages, besides the money it yields, but they are advantages that are heavily, and often unseasonably, won by young men, at *that* stage of their career. But, in the arrangements of the industrial college, why not, instead of sending the student *away* from his education, to *earn money*, to pay his board—why not let him remain, at the college, as a pleasant home, with its social and intellectual influences, producing his subsistence, then and there, by healthful labor, during some reasonable hours of every day, and save his vacation time, for its proper use?

2. In this latitude, all agricultural labor in the field, is comprised, very nearly, within the six months from the first of May to the first of November. In that half of the year, the hundreds of thousands of New England farmers, do all the field work, by which they subsist their families. For the students of the industrial college, there remains the full half year from November to May, within which, all requisite time could be obtained for that study, which, it may be supposed, should be solid and continuous, with hardly any greater amount of *indispensable* hand-labor, than what is performed by farmers' sons, who attend the winter school. Nor is it necessary to imagine that this student-life is to be six months labor, and six months study. That would be unwise and unacceptable. In the pressure of seed-time, and the pressure of harvest, some whole days might be required for continuous field-work,—although even then, as at all other seasons, it would be practicable to conduct the labor by such a system of relays, divisions and classes, that no student would be obliged to spend the whole of even a single day in the field. By the case supposed, these students are the subjects of military drill. There would be no mark or sign of military management in this field labor, but there would be the influences of order, regularity, promptitude, and the advantage of every one knowing his place. But, certainly, except at seed time and at harvest, with well disposed and well managed

young men, few days would need to be passed, in the growing season, without a share of time for study and lectures and recitations—it being observed, that for the pupils who study agriculture, specifically, a considerable part of the instruction itself will be in the field. In the winter half year, it might even be more difficult, in our latitude, to get the due amount of labor, than the due share of time for study. But there would be, the preparation of fuel, the care of the domestic animals, the fabrication and repair of implements, and all that part of the household management, not attended to by hired servants.

3. Agricultural labor, everywhere, requires, before all things else, an adequate number of *hands*. It is a hard fact in the ordinary farmer's life, that he has to work so much *alone*, or to pay wages, which exhaust his returns. But here is to be a collection of sound and vigorous workers—young men—boys, it may be, some of them—but so *many*, that if—as must always be understood—they are well directed, they can go over scores of acres, where the single-handed farmer, hardly gets over one. Well furnished with implements and animals, they could gather the whole hay crop in three days of sunshine. Whether in the infancy of the industrial college, in its days of experiment and struggle, it could afford a full equipment of labor-saving and *time-saving* machinery, may be uncertain. But the economy of many hands, would be an established fact, in the case, at any rate.

In due time, no doubt, they would have the aid of the improved agricultural machinery, by which so vast a difference is made between field work now, and what it used to be; and these young men would thus be masters of the situation, and would be at no loss to find time for intellectual pursuits, nearly every day, in the intervals of the light and rapid labor, performed with the aid of such machines.

4. It would, probably, follow, as a necessary arrangement, where there is a collective subsistence out of a common stock, that some rules of uniformity, such as the principle of the ration, and the principle of the mess, should be observed, with more or less strictness—an arrangement, also, of commissaries and stewards—in which capacities, the students themselves should be trained,—all which methods, would tend to promote economy, effectiveness and contentment.

5. It is not to be assumed, that the food department would be like the arrangements of a hotel, or of a six or seven dollar board-

ing-house. As a matter of course, the food of the students must be plain, but there is no reason why it should not be perfectly good, wholesome and palatable, and well cured and well cooked. As to quality, it would be very much within their own control. They would soon learn—what so many are ignorant of—that it does not require any more labor—if only a skilful intelligence directs the work—to produce a good material for food, than it does to produce the inferior. Nor would their table need to be without some luxuries. What hindrance would there be in the way of supplying such a commissariat, with choice fruits of the garden and the orchard, without any money cost, after the trees, and fruit-bearing shrubs and plants are once procured, and begin to yield?

6. Such a system would, of course, require a stock of provisions, or some kind of subsistence fund to begin with—an object, which might be attained in various ways. One method might be, an advance of a certain sum of money, by every student on entering, to cover the first several weeks. But the advantages of simplicity and ultimate uniformity would justify the attempt to provide this preliminary resource, out of some general fund or means.

The casualty of unfavorable years would have to be considered in all calculations. If it should be found practicable, in an average season, to produce *enough*, reasonable effort and skill would take advantage of all favoring opportunities to produce something more. And since some of the food-crops cannot be kept over, surpluses of that kind, would, naturally be disposed of, for money or its equivalent, thus laying the foundation for a subsistence fund. Specific and distinct accounts of such a fund would require to be kept, with rigorous care, and the whole gains reserved for the necessities of unfavorable years. If it is worth while to imagine that this fund might become unduly large, it is equally easy to anticipate methods, by which it might be restored to a proper measure.

7. No such result as the self subsistence of the students of an industrial college can, by any possibility, be accomplished, without a peculiar degree of administrative ability in the governing power of the college. Every other kind of ability, every other form of learning and culture, every other shape of official authority and dignity, would be useless, to *this* end, without a special and superior executive aptitude, inventiveness, firmness and per-

severance. If, under such direction, the experiment should succeed, how great would be the influence of such faculties and forces, in shaping the habits and developing the resources of ingenuous young men! Such influences would not only help them to procure their bread, for the time, but would be like wells of water, nourishing all their future lives.

One or two explanatory statements may be advisable, to guard against misunderstanding.

1. The productive agricultural labor, of which I have been treating, belongs to the economics of the industrial college—not to the department of scientific instruction. The experimental work upon the land, for the purpose of discovering the scientific laws of production, and the best application of scientific principles to practice, is another matter. That is a business of instruction, and belongs to the same department with text-books and lectures and recitations. Scientific experiments upon land often produce nothing but scientific truths, or merely expose theoretical errors. And yet, I suppose, that a young man, working one part of the day, in one field, to produce a crop for his own subsistence, and watching and studying at another hour, in another plat, the progress and details of a scientific experiment, from which he might hope to learn how to produce the same crop, the next year, with less labor, or with richer yield, would find his two pursuits agreeably blending together, and each adding interest and satisfaction to the other.

2. I have not forgotten, that the students of the industrial college, are not all to be farmers. Mechanics also, and persons of other industries, besides agriculture, are to be educated. The purely scientific study of cultivation, whether in the class-room, or in the field, is the business only of that part of the students, who are devoting themselves to agricultural life. But the young mechanics, and the young sailors, must have their food, while getting their education, as well as the young farmer. One of them is quite as likely to be without cash means to pay for his board, as the other, and all of them, will have equal intervals of time, not requiring to be occupied in mere study. All will be members, also, in the same household arrangements, and share together, in a common social life, during their career of education. The problem, therefore, of self-subsistence, is the same for all of them, and I see no reason, why they should not work it out together. Working together for their food, they will divide, in their study hours,

into their several departments, and courses of scientific enlightenment, yet coming together, again, constantly, in those general studies, which tend to promote the liberal culture of all of them alike.

Nor can I see, that any one of them, whatever his ultimate pursuit, will have suffered any loss, by devoting such a part of his college life, to the cultivation of the ground. They will have settled their habits of industry, they will the more surely have gained the all-important knowledge of the value of productive labor, they will have learned, it is to be hoped, the vast difference between labor, which is skilful, and that which is mere drudgery, and, if successful, they will have won the life-long satisfaction of independence and self-respect.

In the rapidly shifting forms and fortunes of life, in communities like ours, and in a new country, where every possible industry is in demand, and where individual or social needs induce constant changes of pursuit, and require so many combinations of faculties, it never can be an injury or a loss to a mechanic, that, in his early life, he had some good, practical training in agriculture.

The proposition may be stated in far wider and bolder terms. Among all the multitudes of men, not devoted to agriculture, there does not live upon the face of the earth, a single man, physically sound, from kings and emperors, down to the lazzaroni in the gutters, to whom it would not have been an advantage, if, at some time in his life, he had practised the art of producing his own bread, out of the earth, by the labor of his own hands.

P. BARNES.

Portland, Dec. 6, 1866.

Until very recently, a confident expectation has been entertained of being able to present here a report of the progress of the State College of Agriculture and the Mechanic Arts from the pen of the President of the Board of its Trustees.

Although circumstances prevent its completion in time to appear in these pages, such a report may yet be expected during the early part of the session of the Legislature, and such being the case, there appears an obvious impropriety in any attempt on my part to anticipate its statements, views and recommendations.

No one who has followed the very able writer of the next preceding article in his presentation of the subject, can fail to perceive in some good degree, the novelty, the magnitude and the difficulty of the problem, the working out of which is put in charge of this Board of Trustees. To those who are impatient of delay, and desire speedy results, we respectfully suggest that the class of institutions called into existence by the act of Congress is wholly unique, that there are no precedents by which to be instructed, and that great danger exists of falling into errors more or less injurious; consequently it is the part of wisdom to exercise great caution and deliberation in the adoption of the means to be used to carry out the trust.

I will merely remark that in the early part of the past year the location at Orono, in Penobscot county, was decided upon, and that progress has been made on other points connected with the establishment of the Institution.

The operations of the County Agricultural Societies during the present year, have exhibited considerably more of energy and activity than was manifested during some years previous. This was naturally to be expected, for during the four or five preceding years the attention of all was so deeply engrossed by the tremendous struggle for self-preservation and liberty through which our beloved country was passing, so much of anxious thought and care was compelled to be given to matters related thereto, so much of sacrifice in varied forms was imperatively called for, that whatever else could, for the moment, be laid aside, must needs give place to the urgent demands of the hour.

Those years, however, have left a deep and broad mark upon agricultural progress in Maine. The necessity of obtaining food

for man and beast and means to meet the numberless calls, and this too with a diminished expenditure of human labor, led to the introduction and extensive employment of time-saving and labor-saving implements and machinery, and to greater skill in the numerous operations of husbandry.

Especially may the influence of these years be seen in the rapid extension and increase of sheep husbandry, and in the improvement of breeds of this invaluable domestic animal. This extension and improvement received great encouragement from the probability, and I may say, confident expectation, that the national requirements for revenue would insure a tariff upon wool which would yield a steady and sufficient protection to the home grower, so as to enable him to compete with production in those more favored foreign countries where neither shelter nor harvesting and housing of food for half the year are required. I regret to learn that doubts are entertained whether such a tariff may be adopted; and this not merely because the failure to secure a protective duty upon foreign wool would result in the sinking of a large amount of capital invested by the farmers of Maine; but also, because sheep husbandry is so valuable an agency for the elevation of agriculture in a country of moderate natural fertility like ours, that it can hardly be dispensed with and success attained by other means.

By the agency of the sheep, a great amount of herbage, of a quality which would serve but poorly for any other domestic animal, is readily converted into good meat and wool and manure; and thus we are at once furnished with food and the material for raiment, and with means of fertilization which will insure an increase of food in years to come.

Let the price of wool be so reduced that the farmer becomes constrained to discard the sheep, and it is easy to see that great loss, both direct and indirect, must ensue. What can be more reasonable than the demand, that, in levying the burdens which must be borne, they be so adjusted as to yield all the advantages which the nature of the case admits? I cannot relinquish the hope that such will be the fact, and that adequate protection will be steadily continued for many years to come.

S. L. GOODALE,
Secretary of the Board of Agriculture.

JANUARY, 1867.

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