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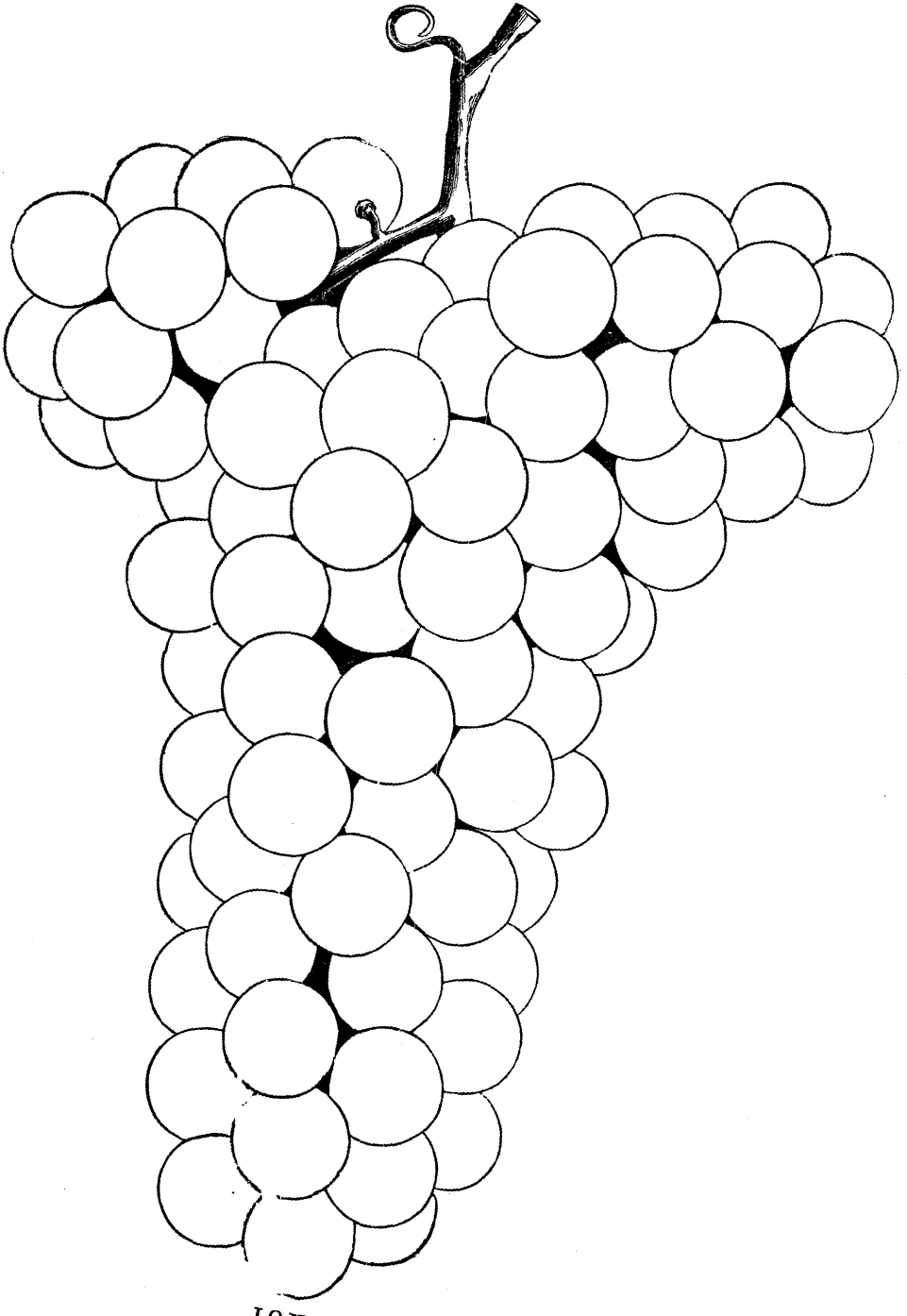

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NINTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

MAINE BOARD OF AGRICULTURE.

1864.

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BOARD OF AGRICULTURE...1864.

JOHN F. ANDERSON, PRESIDENT.
CALVIN CHAMBERLAIN, VICE PRESIDENT.
S. L. GOODALE, SECRETARY.

NAME.	COUNTY.	P. O. ADDRESS.
(TERM EXPIRES JANUARY, 1867.)		
J. C. WESTON,	Penobscot,	Bangor.
SAMUEL WASSON,	Hancock,	Ellsworth.
SEWARD DILL,	Franklin,	Phillips.
J. W. HAINES,	Aroostook,	Maple Grove.
LYMAN LEE,	Piscataquis,	Foxcroft.
W. R. WATERMAN,	Washington,	Robbinston.
(TERM EXPIRES JANUARY, 1866.)		
CALVIN CHAMBERLAIN,	Maine State Society,	Foxcroft.
HARRISON JAQUITH,	Kennebec,	China.
CYRUS M. PRATT,	Androscoggin,	Greene Corner.
SUMNER LEACH,	Lincoln,	Warren.
(TERM EXPIRES JANUARY, 1865.)		
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.

REPORT.

To the Senate and House of Representatives:

In accordance with the requirements of the organic act constituting the Board of Agriculture, I proceed, first, to lay before you a detailed account of its transactions at the last session.

The members assembled at the Agricultural Room in the Capitol, at Augusta, on the 20th of January, 1864. For purposes of organization, Mr. Rogers of Sagadahoc was appointed Chairman. A Committee on Credentials having reported a quorum present, the Board proceeded to the election of officers by the choice of

JOHN F. ANDERSON, *President.*
CALVIN CHAMBERLAIN, *Vice President.*
S. L. GOODALE, *Secretary.*

The rules of order prepared by a Committee of last year were adopted for use at the present session.

The President announced the Standing Committees as follows:

On Elections—Messrs. Lee, Leach and Pratt.

On Pay Roll—Messrs. Rogers, Dill and Waterman.

On Business—Messrs. Weston, Chamberlain and Wasson.

The Secretary read communications from Hon. Sidney Perham, M. C., and Hon. Isaac Newton, Commissioner of Agriculture, relating to copies of his Annual Report and also a quantity of seeds, for distribution to the members of the Board.

On motion of Mr. Anderson, the following resolves were adopted:

Resolved, That the thanks of the Maine Board of Agriculture be returned to the Hon. Sidney Perham and to the United States Commissioner of Agriculture for the seeds and Reports which have been received.

Resolved, That the Maine Board of Agriculture notice with satisfaction the improved character of the United States Agricultural

Report, compared with those that formerly emanated from the Patent Office Department.

The Secretary having presented and read a communication from Hon. George B. Loring of Massachusetts, in regard to the formation of a New England Agricultural Society, it was

Ordered, That a Committee of three be appointed, who are hereby authorized to act in behalf of the Board in relation to the proposition made by the Massachusetts Board of Agriculture relative to the formation of a New England Agricultural Society.

The President, Vice President and Secretary of the Board were constituted said Committee.

On motion of Mr. Chamberlain, it was

Ordered, That the Secretary be requested to communicate through the medium of the public press, the facts that the cattle disease known as Lung Murrain or Pleuro Pneumonia—contagious and incurable—exists at the present time in some parts of Massachusetts, and that there is eminent danger of its introduction hither, together with such suggestions as he may see fit to offer in connection therewith.

On motion of Mr. Wasson, it was

Ordered, That the Secretary of the Board of Agriculture be directed to call the attention of the Agricultural Committee of the Legislature to the fact that no standard of weight has been affixed by the statutes of Maine for parsnips, onions, turnips or beets; and also that the standard weight for beans, peas, ruta bagas, mangold wurtzel and sugar beets differs from that of Massachusetts, and to ask for such legislative action as necessity requires.

Dr. Weston presented some resolutions forwarded to him by the "Sheepkeepers' Association" of Penobscot County, as follows:

"*Resolved,* That the injury inflicted by dogs on sheep is severe and aggravated, and tends greatly to discourage the raising of these useful animals, and that in the opinion of this meeting the important interests of sheep husbandry demand of the Legislature the imposition of a tax of at least two dollars on each dog kept in the State.

Resolved, That the Legislature ought to enact a law requiring the owner of any dog to pay twice the value of each sheep injured or killed by him to its keeper, and when no owner can be found, or the fine is not paid within a specified time, that the life of the dog shall be forfeited."

Mr. Wasson said the law passed by the last Legislature for the taxation of dogs failed of effect simply because the enforcement of the law was left to the discretion of the towns. Some put it in force while others did not.

Dr. Weston believed we should ask for a tax of two dollars upon each dog.

Mr. Jaquith thought we should be apt to overdo the matter if we asked too much of the Legislature in this matter; thought we should recommend a tax of one dollar each on dogs—not leaving it with the towns—and that the money so raised should constitute a fund for the payment of the losses caused by the ravages of dogs to sheep.

Mr. Goodale said it was not the province of the Board to dictate laws; but he believed the Board should demand, in behalf of the farmers of the State, protection to sheep husbandry against dogs, and leave it to the Legislature to make such a law as was required.

Mr. Anderson thought the resolves should be amended by asking for a tax of one dollar instead of two, as the resolves asked for. The object of the tax was designed to remove a special hindrance to sheep husbandry, and not as a tax upon the dog as a revenue based upon the value of the animal.

Mr. Bigelow agreed with the remarks of Mr. Goodale, and made a few remarks in favor thereof, drawn from his own experience; believed the best means of getting rid of the dogs was to kill them.

The resolves were referred to a Committee, who subsequently reported for the adoption of the Board the following resolution:

Resolved, That in the opinion of the Board of Agriculture, the important interests of sheep husbandry demand of the Legislature the enactment of a law which shall impose a tax on all the dogs kept in the State, sufficiently large to afford adequate protection; and that the imposition of this tax should not be left to the discretion of the several cities and towns, but should be imperative.

The resolution was adopted, and the Secretary was instructed to lay the same before the Legislative Committee on Agriculture.

It may not be improper here to say that, *as usual*, no action was taken by the Legislature in this matter. One reason, and perhaps the most potent one, undoubtedly is because the leading politicians of the party dominant at *any time* are unwilling to incur the ridicule which may attach, however unjustly, to a so called *dog law*,

and which the opposition would use to their disadvantage. When the voters understand this, and will take care of the *ridicule*, they can have protection to sheep husbandry as easily as anything else they ask for.

At an informal meeting, the subject of sheep husbandry was discussed, and some of the statements are given below.

Mr. Haines desired information regarding a disease with which lambs are affected in Aroostook County, but which he had never known elsewhere. They have swelled necks when they are born, and usually die in about a week. (Scrofula?) From some of them he had cut out bunches half as large as an egg. In some cases one-fourth of the sheep died.

Best Time to Shear Sheep. Dr. Weston said the farmers in Penobscot County were beginning to shear their sheep in April, and thought the plan had much to recommend it.

Mr. Bigelow. Never shears his sheep until warm weather, if it is not until July. Washes before shearing. The wool would not be so clean by washing in April as it would to wash in June. Had never sheared earlier than the 15th of June. Keeps the Spanish Merino, and when selecting a buck pays particular attention to the form and build of the animal, regarding it as equal in importance to the quality of the wool. Invariably feeds his sheep upon the snow in cool weather. In moderate weather in winter prefers to have them in an open yard, rather than crowded together in an unventilated place. Feeds often, giving just what they will eat. Can winter six sheep upon the hay that would keep a cow. A mixture of grasses is preferred for sheep.

Hon. Mr. Hitchborn, in response to a call from the Chair, made some interesting remarks regarding the importance of sheep husbandry to our State; referred to the vast amount of money sent out for foreign wool, and which should be kept at home; and also of the great interests of agriculture as the leading pursuit of the people of Maine.

Mr. Haymer said that in Hancock County the subject of wool-growing was gaining in interest among the farmers. They have come to the conclusion that it is better to shear early—from the first to the middle of April—and as a reason, the sheep are at that season generally housed and protected from the cold rains of May.

Mr. Wasson. The practice of shearing early is gaining favor with our farmers. Some shear as early as March. He sheared

last year in April, but took a less number of pounds of wool from the same sheep than he did years before. Thought lambs should come early—as early as February—could put them in market by the first of July, and thereby saves an immense amount of hay. If lambs have eaten poison laurel, he gives the white of an egg and lard, which almost invariably proves an antidote—but if it does not, gives pennyroyal tea made pretty strong. Would not have sheep washed before shearing.

Mr. Dill. Usually washes sheep about the 10th of May; shears about the middle of June. He read the following statement from Franklin County:

The flock of Mr. J. M. Bass of East Wilton consisted last year of fifty-one ewes, two bucks, and one wether—total, fifty-four. His flock sheared 551 pounds 14 ounces of unwashed wool; raised two lambs, (lost one,) had twenty yearlings and thirty-three old ewes, and six had no lambs. Deducting one-fourth for unwashed wool, and the amount will stand thus:

Receipts.

551⅞ lbs. wool at 80 cents (20 per ct. out), 60 cents,	$332 92
Sold 12 buck lambs,	104 00
Kept 16 ewe lambs, value,	160 00
	$596 92

Expenses of Keeping.

Fifty-four sheep at $2 per head,	$108 00
Washing and shearing,	9 00
Interest on value of sheep,	48 60
Taxes, 1 per cent.,	8 10
Insurance, 1 per cent,	8 10
	$181 80
Giving a net gain of	$415 12

Mr. Leach. Within a year or two the farmers in Lincoln County have formed the practice of shearing sheep as early as April, and he had not known a sheep to die from the practice. For himself, he was fully convinced the plan was a good one.

Mr. Bigelow. It is not uncommon to have ewes shear eight pounds each in our section. He believed the Merinos to be the hardiest sheep raised in Maine. They are younger at eight years old than most other breeds are at six.

Rev. Mr. Ellis of Aroostook County gave some account of sheep husbandry in Aroostook County, and the improvements that have been made upon the coarse-wooled breeds in that section. He could not see the humanity or advantage of shearing sheep in April.

Mr. Jaquith. Does not wash his sheep until after the May rains are over, as a general thing, but if he does, he does not shear until after that time.

Mr. Rogers agreed with the remarks of the gentleman from Aroostook, and believed it to be a barbarous practice to shear sheep in April. It was his custom to shear about the middle of May. Had rather not have lambs come until sheep get out to pasture. Believed ten sheep could be kept as cheap as one cow.

In some further remarks made by Mr. Haymer concerning the keeping of sheep upon the outer islands along the coast of the State, he stated that although the plan had many advantages, it also possessed two serious difficulties. One was that on those islands where there was a ledge and bar covered by the tide, but exposed at ebb water, the sheep were apt to go out on the bar and get washed off by the tide; and the other was the depredations of thieves.

Dr. Weston, from the Business Committee, reported the following as a partial list of topics for discussion at the regular meetings—the Committees being appointed by the Chair:

1. "What effect would the increase of manufactures have upon agriculture?" Messrs. Weston, Pratt and Bigelow.

2. "What action should the Board of Agriculture advise in respect to an Agricultural College?" Messrs. Goodale, Weston and Chamberlain.

3. "By what methods might the usefulness of Agricultural Societies be increased?" Messrs. Chamberlain, Jaquith and Waterman.

4. "What has been the most profitable branch of husbandry the past year?" Messrs. Rogers, Haines and Lee.

5. "What is the relative value of meadow hay for feeding stock, in comparison with English grasses?" Messrs. Anderson, Haines and Bachelder.

6. "Ought the Geological Survey of the State to be resumed and completed?" Messrs. Anderson, Lee and Jaquith.

It having been customary for the members to investigate some

subjects during the interim, and to report thereon at the meeting of the Board, the following papers which had been thus prepared were read:

Mr. Chamberlain submitted the following paper

ON IMPROVED AGRICULTURE.

"Improved agriculture" is the embodiment of an idea for which we all have labored these many years—the topic on which we are supposed to think intently and should act vigorously. It is suggestive of a review of all we know of man's history, and our knowledge of the physical laws and conditions attendant on the race in the present.

Man, grouped in nationalities, exhibits growth, culmination and decline. National wealth and power means agriculture, social organization, intelligence, enterprise, commerce. Nations, civilizations, epochs and eras, move in cycles; each round of ages but a repetition on a variable scale. The principal civilizations of antiquity—Assyria, Egypt, Etruria, Greece and Rome, may have been separated by great gulfs of barbarism. Monumental evidence of a grandly-developed system of pre-historic civilization exists, not only from Britain to India, but also on this continent, from Canada to Peru. We are the heirs of long-buried generations, whose mighty labors and heroic deeds are left in monumental records. Judging by these, their minds must have been great, and their purposes grand.

The earth-works of America, the Cyclopean remains in Southern Europe, and later, the time-enduring pyramids of Egypt, are public works, that, for the resources at command, transcend anything that later ages have accomplished.

Not the least of monumental evidence of past civilization, is the stupendous remains of former systems of irrigation. The Assyrians, Babylonians, Egyptians, Etrurians, Indians, Chinese, and thousands of years later, the Saracens in Spain, constructed beautiful systems of irrigation, that contributed on a vast scale, to the agricultural capabilities of densely peopled countries, through long ages.

On this continent, in ancient Peru, the Spaniards found the most costly works for irrigating lands. Canals and aqueducts crossed the low lands in all directions, spreading over the country in a vast

network, diffusing fertility and beauty around. The Spaniards on their arrival in Mexico were astonished at the perfection to which horticulture was carried through the same means. The feudal eras of Europe were active periods of the canal system of irrigation—an age in which were reared the Gothic Cathedrals and the beautiful Abbeys—an age in which intellectual culture in its highest forms were blessings attendant only on the few. Learned men of the present age claim to have the evidence that of the arts, the ancients knew more about the manufacture of glass than we do. Telescopes, microscopes, and opera glasses, are said to have been used thousands of years before the time of Galileo. The ancients were our superiors in the manufacture of metals. According to some they had the steamboat and the canal, and could move building stones of three thousand tons each. They had iron railroads. They had, in some form, the balloon and the telegraph, the stereoscope and the mowing-machine. In the printing-press, the great discovery of modern times, we see hope for a higher and more enduring civilization than in the waves of the past.

An oriental ambassador, on visiting our country, made the sage remark that this was *a young country, but a very old people.* Had he been permitted to have explored farther and read the record of science aright, he might have modified his opinion in regard to the age of this Western Hemisphere—the "New World"—where stands individual specimens of growing vegetables where they have stood in security since their growth commenced, seven thousand years ago; and where the fossil remains of man prove him to have been an inhabitant of these vast plains prior to the last great change in the polarity of the earth. The remark that we are a very old people, should also be modified, the opinion having been based on an exhibition of our wondrous activity and energy in business, and our mechanical tact. Our family genealogy is nothing to boast of. Derived from a composite stock, we are a concrete people, and can look back on a dark wave of comparative barbarism from whence we have just emerged. England, our great prototype, has excelled in commerce and manufactures, rather than in agriculture. She has been an instance where a dense population has existed, measurably, on lands that have not afforded them sustenance. The talent of her people has not heretofore gone out in the direction of supplying the nation's bread from her own soil; else how could she now say that her agricultural products

have been doubled in the last thirty years? Circumstances effect more in the formation of character in the individual or the nation, than innate greatness or goodness.

Other nations affect to sneer at our conceit in having a certain "destiny" to work out on this continent. We certainly shall work it out, and it will be a noble destiny, unless we misapply the stupendous power that we already have accumulated. The men who settled these shores were made suitable for the task. Their immediate descendants wielded with tremendous physical force their rude implements. As population increased, cities were built, commerce, traffic, the mechanic arts, &c., divided the attention of the people, taking a constantly increasing proportion from the primary occupation—agriculture; thus creating a constant demand for increased production through improved facilities. For a long time the almost entire absence of internal trade, through the difficulties of transit, left each rural district dependent on its rude mechanics for articles of prime necessity. It is within our recollection that the country blacksmith made the farmer's plow, his hay and manure forks, &c. The very vastness of the country contributed to delay the time when agricultural operations should be conducted with thoroughness. New lands, and more attractive, enticed men westward from our rugged shore, dispersing our increased population over vast areas, and thus saving the first settled provinces from feeling anything akin to the discomforts of a crowded population. Improvements for inter-communication, to keep pace with the progress of the country in other respects, were entered upon with vigor, under the lead of the master minds of the age. The prosecution of these public works encouraged the immigration of vast numbers of laborers from the Eastern Continent. These thoroughfares when opened served as an additional escape-valve to the population of the Eastern States, and at the same time to bring to us the agricultural products of the West cheaper than we had learned to produce them at home.

This cursory view brings us down to a day not twenty years removed from the present. Agriculture had, through all that time, if not through the *force*, certainly through the *lead* of circumstances, been conducted on an exhaustive plan. The farms that had been kept at their original fertility, or been raised above it, were the exceptions—few and far between. Minds, observant and deep, were not wanting to warn the people against a course so destruc-

tive. Washington, Jefferson, the Adamses, Quincy, Buel, Clay, Webster, and other worthies, by precept and practice labored to stay the current running to swift destruction, but in vain. The temptation of present gain could not be withstood by those who knew better; but the masses knew no better way. We give man the credit of acting, in the main, in accordance with his highest light. The men who have cleared farms in Maine, reared families, exhausted their acres, sold their effects and "moved to Ohio," exhausted a farm there, again "pulled up stakes" and "gone out West," are not to be blamed for any mischief they may have done by over-cropping the lands they have occupied. They have acted their part as pioneers, and the world had need of them in that capacity.

It is far easier to find fault with the men who have cleared away the forests for us, and done battle with savages and wild beasts, than it is to so regulate our own actions and perform our labors with wisdom, that future generations may see no good cause to complain of us.

We in the present, have committed to us a goodly heritage, and if we fail to transmit it to our successors with improvements, we shall live in vain. In order to thus transmit it, we must look well to its present condition. Such has been the decline in agricultural products in all the older States, through the exhaustion of the soil, that an immediate and radical change in our husbandry is demanded. The last twenty years, we may hope, have witnessed the lowest ebb of the tide in this regard. Science has stepped in to relieve husbandry somewhat of its former monotony; and our agricultural literature from thousands of earnest men, has, through associated labors, and the mighty printing-press, been so liberally and generally diffused, that the tide may already have been turned in the right direction.

In this transition state, with comparatively little new lands to be added to our domain, and much to be renovated, the future success of the nation should be made dependent on the combined wisdom and talent of all, under the most favorable circumstances of peace and prosperity. But with a clouded horizon we must lean a little more on hope. The darkest political obscuration cannot obliterate physical facts. Here the beneficent hand of Nature, so divinely wise in all the vast planning, has been lavish of her gifts. We see here laid out a vast continent, accessible in every border

and boundary, interwoven with rivers, lakes and mountains, a climate diversified and harmoniously adapted to every want which the most extravagant imagination could desire. With a reasonable appreciation of so many and so rich blessings, the task would seem easy to perpetuate here a republic, where future generations could not fail to be recognized powerful among the nations of the earth.

In the last few years, the most notable change in our husbandry, has been in the increased substitution of new and improved machinery for human labor. This has been only the natural result of the pre-existing conditions in society, as we have attempted to show. Circumstances had made our people self-reliant, and they had accumulated a surpassing amount of latent thought and inventive ability.

It now becomes an interesting question, What are the conditions of continued progress and prosperity? On this point, the United States' Commissioner of Agriculture says: "1st, Peace; 2d, a continued and increasing demand for agricultural products, both at home and abroad; 3d, an increased respect for labor; 4th, a more thorough knowledge and practice of agriculture as an art and science; 5th, a more thorough education of our farmers in the physical sciences, in political economy, in taste, and general reading."

A state of war reduces the productive industry of a country, by the transfer of labor. But in our present case there are compensating circumstances of considerable moment, in the increased skill and energy taking the place of the old system, the inflow of agricultural labor from Europe, and the more extensive use of labor-saving machines.

It will take considerable time to eradicate the habit that has been formed in cultivating a primitive soil. But with a teachable disposition the wrong may be unlearned, and much of the right learned in valuable lessons now offered by the older nations. If China and Japan were to adopt our methods of tillage, famine would soon reduce their population by hundreds of millions. But their spade labor would not now do for us, neither would our mowers, reapers, or a steam-plow, do for them, on their terraced hills. But in their habit of prudently saving and applying manure, minute culture, rotation of crops, and irrigation wherever possible, we might take them for our teachers with advantage.

One of the most efficient means to rapid improvement in agriculture in modern times, as well as to the general progress of the

world in civilization, has been the grand series of international exhibitions, inaugurated in 1851. If any parties in these exhibitions were surprised in meeting facts that had not been disclosed through the ordinary road of commerce, they were the older nations, at the utilitarian inventions of these States.

We have hinted at the contributions of science to modern husbandry. The inductive philosophy of Lord Bacon, two hundred years ago, taught man to experiment, to question, and test nature as she is presented in soils, gases and phenomena—a philosophy, positive, progressive and eternal. From that time, numerous experiments were made in soils to ascertain the causes of fertility, and through them the way was prepared for much subsequent scientific research. At the beginning of the present century, Sir Humphrey Davy established agricultural chemistry as a department of science. He developed the principle, that the productions of the soil derive their component elements from the surrounding atmosphere, or from the soil. He showed that in the process of vegetation, there was a perpetual assimilation of various substances to the organs of plants, through the exertions of their life powers, and their chemical affinities, aided by light, heat and moisture. He analyzed soils and plants, and showed what properties and conditions would best furnish the elements needed in their cultivation. These ideas reduced to practice by some of the leading landholders of England, soon produced a marked effect on the agriculture of the kingdom, and has turned a fourth part of the area of England from an unproductive wild into a garden.

In this connection, Sir H. Davy remarked, that "Nothing is impossible to labor aided by science." It is such expressions indulged in by profound thinkers, and echoed by the enthusiastic, (and this hall has contributed its quota of glib talk,) that has magnified the subject of agricultural chemistry to unreal and fantastic proportions, and exposed the whole subject matter fairly to the charge of "science run mad." We have seen pretenders "making a very good living," canvassing our State, lecturing on Agricultural Chemistry, (and any other topic that the locality was specially hungry for,) taking from enterprising farmers a specimen of soil with a fee of five dollars in advance, under the promise of a full and reliable analysis for that sum. Our impression is, that all who have so invested for minute doses of science, have found both their *dirt* and *money* clean gone, with never a show of an equivalent.

We name these cases only to show how high the public expectation has been raised in this direction. It is now generally conceded that, although analysis may furnish useful hints for the improvement of the soil and the successful culture of many fruits and crops, yet it affords no sure guide to the farmer, and for all practical purposes has been abandoned. The extent of its use is to furnish a basis on which to found an opinion for correct treatment.

Dr. E. Pugh recently replied to an inquiry as to the value and cost of analyzing soil and plants, briefly, as follows: "It will afford the farmer no practical benefit to get either his soil or plant ashes analyzed; and this, if well done, will cost from $2000 to $5000 for one analysis." Having thus been let down rather abruptly from these inflated expectations, we have still an excellent road to progress over the plain; and as we advance we do not forget the real mission of chemistry with its stores of facts; and geology, botany and entomology at our every step open to our vision the rich gems of the physical world, while natural and mechanical philosophy must eventually reach to, and expand the mind of every farm laborer. This is the tendency and inevitable result of the use of improved machinery.

The history of all manufactures teaches that machinery is the best friend of the laborer. As improved agricultural machinery increases, the demand for farm labor increases also, wages rise, and what is more and better, the labor must be of a higher grade, not performed by mere brute force, but requiring education, ingenuity, skill—labor more elevating to the laborer.

We have thus treated our subject generally, but have not been forgetful of Maine as an integrant of the progressive family, and having a direct interest in it all. One physical fact is noticeable in this State, and it is probably equally true of all other places—that as the forests are cleared away, we are more subject to the casualty of summer drouth.

This law will compel the future culturist to take control of the water streams, and husband the surplus of one season for the supply of his crops through the other. This matter—the control of water—considered both as drainage and irrigation, is a vast matter, and under the heat of our clear, summer sky, will ultimately be wrought out into a grand system, equalling the achievements of former ages. As we pass over our State, one great, permanent want stands out unmistakably at every mile—the want of popula-

tion. We perceive "the aching void," made by the departure of our kindred to people other States. Alongside of well-made roads, good land, cleared of wood, producing next to nothing, for the want of a working population is the general aspect of much of the interior portion of the State. Who can say that these lands, in smaller farms, may not furnish homes as desirable as the small allotments sought for on the sands of Long Island or New Jersey? With an increased rural population, the burthens of society are lessened, and social privileges augmented.

But we may hope that present ills are only temporary, and that Maine, with recuperative force, appropriating to her wants from the general storehouse of knowledge and of good, with her inherent elements of wealth and power, physical and mental, may rise equal to the most favored country and people, and down the long vista of time be the kind mother of millions of progressive people who may never shun physical labor, but join thereto all science and art, and ever rely on a generous soil that never suffers to go unrewarded any favor that may be bestowed on her, under the operations of an *improved agriculture.*

The paper was accepted, and placed at the disposal of the Secretary.

Mr. Lee presented the following paper on

THE CULTURE OF WHEAT.

Wheat has been regarded as the most important of all the grain crops raised in Maine, as it is in its highest sense the staff of life. The farmers have had such continued experience in its yearly culture, that it would seem as if but little, if any, new light or profitable suggestions could be made upon the subject. The fact that it is a very uncertain crop in this State no one will deny, though some localities are more favorable than others. In the years 1861 and 1862 wheat did very well, the seasons being favorable to the filling out of the kernel. The returns in this State for 1861 show the number of bushels to be 210,850, and the year 1862 show 215,899, while about half of the towns made no returns at all, which would increase the above number of bushels as many thousands more. The yield for 1863, with a much larger breadth sown than the previous year, will fall much below that of 1862—nearly one-third in quantity and quality, with equal or better cultivation.

Now what is, and where can the reason be for the depreciation of the yield the past season? Is its failure to be attributed to the nature or condition of the soil mainly? No; for it is the practice among the farmers to sow wheat upon their best cultivated, enriched land, usually following Indian corn the previous year. There is but little difficulty in realizing a good growth of straw. Is the wheat midge then the principal fault? We say not; for the insect has been defeated somewhat by both early and late sowing. The greatest cause of the failure of the spring wheat crop in Maine, by careful investigation, is the rust or mildew upon the stalk, at the time of the maturing of the kernel, though this difficulty varies somewhat by the location, whether on high, hilly, or more level, plain lands. Wheat sown upon the elevated or hill farms has suffered but little from the ravages of the insect, compared with the injury done the crops in the valleys. The same is also true to some extent in regard to the rust, supposing the reason to be the greater prevalence of winds sweeping over the elevated lands, thus preventing somewhat the extensive operation of the winged insect that deposits within the husk enclosing the kernel, the egg of the so-called weevil. By keeping the grain in motion, it is difficult for the midge-fly to deposit its egg. It also requires a moist atmosphere to be successful in its operations, which is less favorable upon the hills where the wind has free circulation. So in regard to rust upon the straw. If the weather be warm and wet for several days in succession, while the kernel is maturing, the rust is very sure to strike the straw, and thus destroy the crop; whereas, if the weather be dry with cool nights, the crop matures, and a good harvest is the result. The great point, then, in raising wheat in Maine successfully, depends upon the state of the weather during the maturing of the kernel. So, as the farmers cannot foretell, at seed time, what will be the state of the weather at the time of harvest—whether wet or dry—they must act their judgment, and commit their seed to the soil, and trust to the weather as heretofore for the result, regarding it as an uncertain crop. Our farmers usually sow their wheat upon ground manured and planted to corn and potatoes the previous year. That grown after corn yields much the best, as wheat and potatoes both partake largely of potash, and this is doubtless the reason why wheat does not yield so well after those crops. Before sowing wheat it should be cleansed by sifting and washing it from all smut and foul seed—

for what kind a man sows, that shall he also reap. Smut can be prevented by soaking the seed twenty-four hours in blue vitriol water, two ounces to the bushel of seed. On land which is free from rocks and stumps, two bushels should be sown to the acre.

Therefore, considering the prices of the several cereals at the present time grown by our farmers, it will pay much better to sow barley than wheat, especially upon that portion of our soil lying upon the plains and valleys. Barley is a good crop to seed grass with, and does not draw from the soil so severely as oats, and is not liable to injury by the midge or rust.

At the opening of the ground in the spring it is the principal study of the farmer to decide, in his own mind, what kind of crop will be likely to pay him the largest returns for his labor; and taking into account the present ruling prices for farm products, it will at once be decided to raise barley, oats and potatoes, instead of wheat—and purchase our flour from the west.

This paper elicited considerable discussion.

Mr. Dill said wheat sowed the twentieth of May was injured so badly by the weevil that it was cut for fodder, but early sown wheat yielded well.

Mr. Jaquith had raised thirteen bushels from one bushel's sowing, which seemed to contradict the statement in the report that certain qualities in the soil necessary to the production of wheat were wanting in some fields. There were farmers in his town who always raised their own wheat, and they sow it whenever their land is ready—varying from middle of May to seventh of June.

Mr. Leach had raised one crop of wheat on land prepared in the fall and sown the first of April, but the weevil injured it badly. Wheat was injured more in his section last year by the blight than it was by the weevil. Always had a good growth of straw, unless in a very dry year.

The Chairman said in some parts of his county they were changing from spring wheat to winter, and seeding down to timothy, not so much for the wheat, but that they may get their lands to grass in good order. In the spring they sow clover, and cradle off the wheat—harvesting from eight to sixteen bushels per acre. Believed that a freer use of lime would be a great benefit in the growing of wheat and all other cereals. He had used oyster shell lime, and found it to be a great advantage. Applied it at the rate of from twenty to thirty bushels per acre. It makes the straw of the

grain stronger and the yield heavier, and its effect is seen in the better production of grass. Had seen no difference in the effect of Thomaston lime and oyster shell lime. Used the latter because cheaper.

He also remarked that he had the best success in seeding down land with fodder corn. It was sown broadcast, as thick as it could be grown. Last year had over an acre laid down in this way. The stubble of the corn did not interfere with the mowing of the grass. The high state of cultivation of the land caused a better catch of the grass seed.

Mr. Rogers said the farmers had been driven from the wheat field in his vicinity by the ravages of the midge, though an occasional good crop is often obtained.

Mr. Pratt. The culture of wheat has been abandoned in our vicinity, except upon the high land; but even there the wheat crop was much smaller last year than usual, probably from the occurrence of rust.

Mr. Haines said the farmers in his section had formerly got good crops by sowing early, but during a few years past it has failed, even if sown early. It has also failed on high ridges where wheat has always been grown before with good results. He said that Mr. Cary of Houlton, had succeeded well by preparing his ground in fall and sowing very early—sometimes on the snow. The kernels of wheat seemed to blight when it was just forming. Good growth of straw generally.

Mr. Bigelow remarked that while good crops were raised in the northern and newer portions of Somerset county, in his own section it was a general failure. Last year he had a crop sown on very high land, but it seemed to blight. The straw turned white, beginning at the top of the head first. It had a heavy growth of straw. Believed the Board should not recommend the cultivation of wheat to the farmers of this State.

Mr. Lee of Piscataquis, remarked that he had got tired of sowing his richest land to wheat and raising only a good crop of straw. The farmers sow their wheat very early in the spring. Winter wheat is not cultivated.

Mr. Dill. Farmers with us sow very early—having their land prepared in the fall—and on high land; it is seldom the crop fails. If the land is prepared in the fall it can be sown by first of April,

and as wheat likes a hard soil it is better to have the land prepared in the fall; the tooth of the harrow will lighten the soil enough.

Mr. Chamberlain said in his vicinity the wheat crop last year was very light, and the failure was caused by the weevil entirely; the straw was very bright in nearly all instances.

Mr. Haines stated that he had found weevils in a forty bushel crop of wheat;—that the Siberian tea wheat had succeeded best with him.

Mr. Wasson, at some length, reviewed the causes of the diminution of the wheat crop, the various opinions of farmers why it was not so successful as formerly, and of the opinions of scientific men in regard to the real cause of its failure.

The paper was accepted, and placed at the disposal of the Secretary.

Mr. Rogers presented the following paper

ON SALT AS A FERTILIZER.

Owing to a press of business this subject has not received that attention which it should have had, consequently, in reporting at this time, I am unable to do so with any degree of definiteness in regard to the matter.

It seems to be a very generally received opinion that salt acts beneficially as a fertilizer. Whether that conclusion has been arrived at as the result of experience, or whether it has been adopted by general consent, without regard to facts, the writer is unable to say. In presenting this article he does it with a view to elicit discussion, and thus to obtain something reliable, rather than as a report of facts in regard to the subject.

Boussingault remarks, that "the action of common salt as a fertilizer is very obscure. Many skilful husbandmen question its efficacy. Nevertheless, when moderately employed, it seems to do good."

Browne, in his American Muck Book, after stating that salt has been employed in all ages, and in all countries, for the purpose of promoting vegetation, says: "Yet it would be difficult to name any other substance in the catalogue of modern fertilizers, the powers of which have been subject to so much controversy, and even doubted and denied as exercising any beneficial effects to the

crops to which it has been applied." He, however, concludes that it does act beneficially as a manure, and cites an experiment conducted in England upon potatoes, and various kinds of garden produce, the yield of which appeared to be considerably increased by the application of salt.

He says further, that "applied to grain crops on light soils, at the rate of five hundred or six hundred pounds to the acre, salt increases the produce of seed and very much improves its weight and quality;" and with regard to the destruction of vermin by means of salt, he asserts that "there is no agricultural use of it more undoubted." This latter assertion, we think, is not in accordance with facts, unless it is applied in such quantities as not alone to destroy the vermin, but also all vegetation, and render the soil sterile and unfruitful, as was customary in olden time, in order to completely destroy a conquered city and rendered it uninhabitable. We read in scripture that Abimelech took the city of Shechem, "and beat down the city and sowed it salt," that the soil might be forever unfruitful.

Sir Humphrey Davy supposed that where salt acts as a manure, it is probably by entering into the composition of the plant. A mixture of salt and quick lime in the proportion of one part of the former dissolved in water, to three of the latter, is recommended as being a valuable auxiliary to muck and other matter in the compost heap. It is said to be an established fact, that salt when used in small quantities, instead of preserving animal or vegetable matter, hastens its decomposition. If such be the fact, a slight application of it may be beneficial to plants, by hastening the decomposition of vegetable and other matter in the soil. One member of this Board informs us that he has derived benefit from an application of salt to his pasture land. We have frequently thrown fish pickle and refuse salt upon parts of our garden, but failed to notice any perceptible benefit to crops resulting therefrom, excepting perhaps where it may have been applied about cabbages.

The last season, after having prepared a piece of ground for potatoes, and when planting, salt was applied at the rate of a handful to a hill, placed around the potato, generally at sufficient distance from the tuber as not to injure the sprout. There was no perceptible difference in the growth of these potatoes from those adjoining, where no salt was applied, excepting in a few instances where it was placed in too close proximity to the tuber, in which

case they either did not come at all, or if so, grew very feebly. It is well known that as a special manure for asparagus, cabbage, and plants of a similar nature, salt acts very beneficially, and possibly it may be used with good results as a manure for some particular soil, but that it can be used to advantage, in increasing the fertility of soil generally, in the mind of the writer is extremely doubtful, though he is not prepared to say that such is not the fact. I am well aware that marine manures, such as muscle bed, eel grass and rock weed, are successfully used by farmers along our sea coast and navigable rivers, but think their fertilizing effects are dependent upon other properties rather than the salt they contain.

Hoping that wiser and more experienced minds than mine will throw more light upon the subject, I cheerfully submit this report for the consideration of the Board.

Mr. Anderson thought salt would not show so good results in Mr. Rogers' locality as it would in his own. He had seen very marked effect on his barley crop by the application of salt; also upon his mangolds. He used it at the rate of from two to four bushels per acre for barley; and a table spoonful of salt and ashes to the hill for potatoes. Upon mangolds he used it at the rate of twenty bushels per acre sown broadcast.

Mr. Goodale referred to the use of salt in the culture of the mangold, and had known it to have the best results. Indeed he thought it almost indispensable to raising a good crop of mangolds at a distance from the sea shore. Should be applied at about the rate of twenty bushels per acre, unless it is applied near the time of sowing the seed, when it should be sown in smaller quantities. Refuse salt could sometimes be obtained cheaply, and used with considerable profit.

Mr. Jaquith stated his soil to be high, dry, slaty land, and had applied salt to his pastures with a good effect, as it caused the grasses to grow luxuriantly. Had also used brine about his plum trees and received a benefit from the application.

Mr. Leach. Sowed two bushels of salt on one-half acre sowed with barley; and also sowed one-half acre of barley without the application. The barley on the piece where salt was applied was much better than that where it was not applied. This experiment was performed in 1860. The grass on the salted portion has been better than that on the part of the field unsalted.

Mr. Bigelow had made some application of salt at different times but had seen no effect from its usage. Had used it some in compost heap.

Mr. Pratt had seen salt applied to gooseberry bushes at the rate of half a pint around each bush, for the purpose of killing insects, but it did not do it, nor was it of any benefit whatever.

Dr. Weston had used a mixture of spent lime and salt to his cabbages, and it had the effect of keeping off the worms. He had also used it in forming a compost of lime, muck, ashes, &c., and it had proved an excellent fertilizer. Had used it around plum trees with good effect.

Mr. Jaquith. Had never seen a black knot on any of his trees, where he had used salt. But neglecting to apply it for a year or two it came on.

Mr. Rogers' paper was accepted, and placed at the disposal of the Secretary.

Mr. Haines of Aroostook, submitted the following paper

On Farm Stock.

My attention has been given to the subject of live stock breeding for more than thirty years, and in offering this paper for your consideration, I do not desire to commit the Board of Agriculture to an expression in favor of any particular breed or race, but to present, for whatever they may be thought worth, the conclusions to which, after very considerable experience, a plain, practical farmer—ambitious for no other distinction—has arrived. These conclusions have been reached by no mere theorizing or fancy scheming, nor from the persuasions of other men, but through my own careful trials of the several breeds mentioned. I had no prejudices to combat that I am aware of. If I had predilections they certainly were in favor of the breeds first proved and rejected.

In neat stock, I bred Durhams or Short-Horns, Herefords and Devons, of pure blood, for many years respectively. I have also crossed these several breeds and bred crosses of almost every grade. I prefer either of the others to the Durham, because they will better stand the rigors of our cold winters, and the short pastures of our dry summers; because they are better travellers, are more easily matched as steers and make better working oxen—(a yoke of six and a half feet Herefords or Devons will, in my opinion, per-

form as much work as seven feet Durhams, and be kept at much less expense.) I consider the Devons much the best of the three, as they are equally hardy with the Herefords, full as good for labor and beef, and the cows are far better milkers,—the best milker I own or know of, for her size, is a full blood Devon ; her dam was the herd-book cow "Brunette II." (1825,) now on the farm of the State Reform School. Her sire was "old Winchester," got out of the herd-book cow "Fancy," (710,) by the herd-book bull "Bloomfield," (148.) This Devon cow of mine has had four calves and has been dry but eleven weeks altogether since she first came to milk. She would undoubtedly have yielded milk all the time if I had been willing to keep up her milking ; and she is a marked exception to the general rule that good milkers can hardly be kept in flesh, as she is always in fine condition. Devons are also of a much more docile and quiet disposition than either of the other breeds, and the steers are still more easily matched then the Herefords, and at the same size will command a higher price than any other breed.

In selecting neat stock, I seek for symmetry of form and fineness of bone in animals of medium size,—having invariably found these to be better feeders and to pay better every way than coarse beasts. Deep chests, broad backs and full flanks, are, in my estimation, the most important points. With these I would like to obtain a barrel-shaped body, well ribbed home, rather a straight belly, a clean head and a bright eye. If these last can be got the neck will always be well enough. An animal which is narrow along the back, slab-sided, with open ribs not carried well back, and a great sack of a belly swashing about, is not a promising animal for milk or anything else, in my opinion.

By selecting with care, and a little extra cost for males, any one of our farmers may, in two or three years, double the value of his live stock. And those who thus obtain grade animals, may derive greater profits from their herds, and perhaps realize more cash annually than those who, with ten times the capital invested, are scrupulously breeding from pure blood exclusively. The infusion of fresh blood, and especially that of the strongly marked character of the pure race of Devons, brings up their herds with a jump ; increasing the size and symmetry of their animals and giving them weight and beauty. It has been within my observation, that those who have these grades, obtain five dollars more a head for their

yearlings than others, who have not attempted this improvement in breeding, do for those they have to sell.

In sheep, I have bred the coarse and middle wooled varieties, desiring to unite, as far as practicable, the product of wool with mutton. I have had but little experience with the finest wooled sort. Though I began with a flock of grade Merinos, and crossed thereon the Dishley or Leicester, and afterwards the South Down, which last cross made such a decided improvement that I have continued in this breed, and for some years have procured the best South Down bucks which I could find. I have proved this sort of sheep to be hardy, prolific, and excellent nurses, with mutton as well as fleeces of superior quality. More pounds of wool and mutton can be obtained from them than any I have met with. My bucks shear from eight to ten pounds, and my ewes from six to eight pounds of very nice wool, even, elastic, and of medium grade of fineness. In our section of the State (Aroostook) quite an amount of business is transacted in selling sheep to drovers. And it is found that these South Downs drive more quietly and stand their journey better than any others. Grades of this breed will dress from five to ten pounds a carcass heavier than others of the same size live weight, while the mutton is worth more a pound. In fact, as a general rule, the grade South Down lambs bring a half dollar more, and the sheep one dollar more a head than others of the same size.

In choosing breeding sheep stock I pursue the same general course as in the selection of neat stock; and am very careful to take those which have most wool on their bellies and legs; and if at any time I observe one of my sheep disposed to shed her wool, or to have bare legs and belly, I at once turn her off for mutton.

Of swine, I have during my thirty years experience bred pure blood—Mackey, Bedford, Berkshire—(of each of these two last breeds I had the first boar brought to Maine)—White, Berkshire, Newbury White, Suffolk, Essex and Chester. All these have been good breeds, and of great value in improving the swine of our State."

Mr. Anderson agreed with the reporter in many of his points, but not in all. His experience and practice had been to select animals for breeding that are more open than those described in the report. His animals had the recommendation of an eminent Short-Horn breeder of being the best herd of Devons, for dairy

purposes, he had ever seen. He referred to the smallness of the bone of the animals, and considered them the best meat animals. Believed the Chester to be a better breed of swine than the Suffolk.

Mr. Haines never saw any advantage of a large belly in a cow for milk, or an ox for working. As a general thing he liked to see a straight-bellied animal with a broad back. Regarded a cross between the Chester and Suffolk as the best grade of swine for general farm purposes. Finds some difficulty in making a perfect cross between them. Preferred the Suffolk as the best breed to cross from.

Mr. Bigelow. The farmers in my section do not like the Chesters. They have too much bone and do not take on fat readily. Find it difficult to cross them perfectly—some will be all of one kind. Regards the old Newbury White as the best breed ever imported into Somerset county. Wherever they are found you will find good hogs.

Mr. Pratt did not like the Chester Whites. Preferred a cross of the Suffolks for a hog that is to be slaughtered when eight months old.

Mr. Rogers spoke favorably of the old Newbury Whites, and concurred with the gentleman from Somerset.

Mr. Haines gave an account of the old Newbury White breed. They were introduced by Dr. Vaughan of Hallowell, under the name of "Byfield." They were the only pair of pure Newbury Whites ever brought into Maine to his knowledge. They had small ears, short legs, and long bodies.

Mr. Bigelow said the Newbury Whites were introduced into Somerset county by Mr. Coburn, father of Ex-Governor Coburn, he obtaining them of Dr. Vaughan. The "Bedfords" were introduced by Dr. James Bates, formerly of Norridgewock.

After some further discussion, the paper was accepted, and left at the disposal of the Secretary.

In this connection, is submitted a memorandum furnished by Hon. S. F. Perley, regarding the gain in weight of several animals, while at pasture, only during the past season:

"Ayrshire bull, 12 months old, from May 2d to Nov. 11, 200 days, gain, 328 lbs.
" heifer, 13 " " " " " 280 "
Heifer, cross of Jersey and Ayrshire, 16 months old, from May 2d to Nov. 11, 200 days, gain, ... 275 "
Grade Devon heifer, 12½ months old, from May 2d to Nov. 11, 200 days, gain, 151 "
Average of the four, 258½ lbs.

Grade Devon steer, 2 years old, during same time, 200 days, . . 140 lbs.
" " " " " " 177 "

Average, 158½ lbs.

Pastures rather bushy, and feed rather short."

Mr Pratt presented the following paper

ON THE CULTURE OF SMALL FRUIT.

As a people we are so much engaged in the accumulation of wealth that we are constantly looking out for the main chance; and to such an extent has this become the case that we sometimes overlook some of the smaller things that would not only help us to secure the desired object, but contribute more to our happiness than the mere acquisition of wealth. Among all the pursuits in which we are engaged, and which contribute to our wealth and happiness, none, we think, is less appreciated than horticulture. And a comparison of this with other industrial pursuits will prove the position. In the year 1847 estimates were made by Mr. Burke, the Commissioner of Patents, showing this interest to be of more importance than has been generally supposed. A comparative statement of the different interests in this place, may not be wholly uninteresting. The whole products of the soil, in round numbers, were $1,144,982,240, while all other pursuits produced but $593,-797,735.

The following are some of the leading products, viz: Corn, $215,740,000; wheat, $137,094,600; hay, $106,559,200; cotton, $72,905,000; dairy, $41,220,149; horticultural productions, including orchards, nurseries and gardens, $54,577,533, divided as follows, viz: orchards, $8,853,422; nurseries, $724,111; gardens, $45,000,000. It will thus be seen that horticulture, in its various branches, produces more than the dairy, two-thirds as much as the cotton, and more than one-half as much as the hay crop. The Commissioner estimates five persons to a family, and three gardens to every four families, producing fifteen dollars each, which would give in the aggregate, $45,000,000. Maine, according to this estimate, would have 120,000 families, 90,000 gardens, producing $1,350,000, giving two dollars twenty cents per head for garden products, which amount we think would be consumed if raised in sufficient quantities; and no one we presume will doubt that we can and ought to raise this, or even more, with but little interference with other pursuits. But suppose we estimate the gardens

of Maine at one-half of this number, or three for every eight families, we shall have $675,000, or one dollar and ten cents per head, to consume of garden products. If the estimates of Mr. Burke are correct, that as a nation we consume two dollars and twenty cents per head of these products, and as a State we are producing but half of this amount, then we are sustaining a loss which we cannot well afford.

How this amount should be divided between the vegetable and fruit garden, we are unable to say, but are inclined to believe that one-sixth part of this amount given to small fruits would be a fair estimate, which would give in the aggregate $112,000, or about eighteen and three-quarter cents per head, which amount may be doubled, or even quadrupled, and still leave us unsupplied with these fruits.

In the early settlement of Maine the cultivation of fruit was confined principally to the apple, pear, plum, cherry and currant, from the fact that our pastures and fields produced the strawberry, raspberry, blackberry, and some of the other small fruits, in such abundance that any effort in that direction became wholly unnecessary. But a change has come over us. Our soil has become so impoverished that it neither produces them to such an extent or of such fine quality as formerly, (except in the newly settled portions of the State,) and not only that, but hosts of enemies have arisen up to destroy and devour. The cherry and plum have been given up in a great measure, in consequence of the black-knot and curculio; and the currant and gooseberry are suffering to considerable extent from the currant worm and other insects. Thirty years since, the cherry was produced so easily in Androscoggin county that many farmers raised not only enough for their own families, but in sufficient quantities to supply nearly all of their more unfortunate neighbors.

The plum was also raised to considerable extent. We even now obtain the strawberry, raspberry and blackberry, in considerable quantities from our pastures and fields, but as a general rule at a greater cost than we should incur by their cultivation; besides we lose the pleasure which can only be derived from eating one's own productions. Every man who owns one-half acre of ground can supply a family of five or six persons with nearly all the fruits adapted to our climate, besides having sufficient room for a vegetable and flower garden, and unless his buildings are of unusual size, if we except the apple, a much smaller space will

suffice; to prove which I will cite an instance which has come under my own observation. I refer to Mr. E. P. Tobie of Lewiston, who owns thirty square rods of ground, about one-half of which is occupied by buildings and flower garden, from which he furnishes a family of three or four persons with all they need during their season, and a good supply for winter's use, of strawberries, raspberries, currants, gooseberries, grapes and plums, besides tomatoes, beans, melons, rhubarb, lettuce, &c. He has also some half dozen dwarf pear trees, which have nearly recovered from the effects of the winters of 1856 and 1857, from which he may reasonably expect several bushels of pears yearly. Mr. T. sells from this small spot of ground, with the aid of a small hot-house, more than one hundred dollars' worth annually. Some years he has sold twenty-five dollars worth of grapes, with only three of the most approved sorts of vines in cultivation, and those quite young. The inquiry then arises, if the small fruits are so easily cultivated, why they are not more generally produced, not only by *all* our farmers in the older portions of our State, but by every person who owns a few rods of ground, no matter what his calling may be, especially clergymen, mechanics and merchants, who so much need the exercise it would give them, to say nothing of the satisfaction they would derive from eating fresh fruit of their own raising—a pleasure that no one can properly appreciate unless he has experienced it. Farmers should cultivate them not only because they can do so as cheap or cheaper than they can obtain them in the usual way, but because they will contribute to the health of their families, and give the younger members a pleasant change from the more arduous and less pleasing labors of the farm. If it was the rule, instead of the exception, to have well managed flower, fruit and vegetable gardens, I think we should see less disposition on the part of our young men to leave agriculture and its kindred pursuits, for less laborious, and perhaps more lucrative employments, but which are far more dangerous in their moral tendencies. If the small fruits can be cultivated with advantage to our health, purse and happiness, then a few general hints as to the manner of their cultivation, &c., may not be wholly unprofitable.

Strawberries. Strawberries are, perhaps, the most popular of all our small fruits, being the first to make their appearance in the spring after a long winter, during which we have been deprived,

in a great measure, of all the small fruits, we are apt to look forward to their appearance with the greatest pleasure. After enjoying their delicious flavor for a few weeks, our appetites become, in a measure, satiated, so that perhaps we do not appreciate some of the other small fruits so highly as they deserve. It seems strange that the cultivation of a fruit which is generally esteemed so healthy, so easily raised, and commanding so high a price in our markets, should not be better understood and more generally practised. That it is highly esteemed, needs no better proof than the demand for it in all our large towns and cities, not only in our own State but throughout the country. The market of Philadelphia alone requires fifteen thousand bushels or more.

Mr. Downing says of it, that it is the most wholesome of all fruits, being easy of digestion, never growing acid by fermentation as most other fruits do. I believe any individual who owns three or four rods of ground on which the sun shines, and who knows enough to raise a hill of corn or potatoes, may raise enough, at an expense not exceeding six cents per quart, to give a family of five or six persons not a stinted allowance, but as many as they will generally desire during their season, and as many as will be usually wanted for winter.

The most common method of cultivation is to set the plants, allowing the runners to take root, which will almost preclude the use of the hoe, and the consequence is, that the bed is so soon overrun with plants and weeds that it is about impossible to clear it out, and there it remains until the patience of the cultivator is so exhausted that he becomes disgusted with his own efforts and strawberry culture in general. In such cases one full crop and a half is as much as is usually obtained. The best method that I have seen recommended, and one that corresponds with my own experience, is to take any good soil and spade in a good coat of well rotted manure and ashes, and if it is a compost of stable manure and leaves or muck properly prepared, so much the better. Three plats of ground should be laid out of sufficient size for the use of a family, in beds five feet wide, with alleys two feet wide. A row of plants should be set in the middle of the bed, and one on each side six or eight inches from the paths, setting the plants eighteen inches apart in the rows. The plants can then be taken care of and the fruit picked from the alleys. The runners should be cut three or four times during the summer. Strawberries culti-

vated in this way need to be mulched not only to ensure them moisture enough during the season of fruiting, but to protect the roots from the ill effects of freezing and thawing, but care should be used not to give the crown of the plant too much covering during the winter, as there is nearly as much danger from over-protecting the crown as from a lack of protection. The finest fruit may be expected from this mode of cultivation, as the energies of the plant are not exhausted in the production of runners, and it affords a plenty of light and heat both, which are so essential to insure the best of fruit. It is a mistaken idea that our wild strawberries are of finer quality than cultivated, and no one who has eaten a good ripe Hooker or Triomphe de Gand will dispute the assertion. By pursuing the above plan, planting one-third yearly, an individual will obtain two crops from his plants before they need renewing. Some assert that by this method the plants may be kept in bearing five or six years. If this, on trial, should prove to be the case, they will not need to be renewed so often. Various lists have been recommended for cultivation, but none can be strictly relied upon for this State, unless they are made by one who has had some experience, and then they may not be adapted to every locality, and what is now considered best may not be so a few years hence. No one who knows the improvements which have been made in the strawberry within the past few years, will hardly dare to predict how far this improvement may be carried. Wilson's Albany is probably the best for general cultivation in this State, being an excellent bearer, and is of good quality if allowed to ripen sufficiently. I have raised eighty quarts from a piece of ground one and a half rods square. I regard the Jenny Lind as second only to Wilson's as a bearer, and of better quality. My experience with the Triomphe de Gand is too limited to speak with any degree of certainty as to its merits; but with what I have had I would place it third on the list for general cultivation. It is superior to the others in quality, and if it should prove as good a bearer,* will take a higher stand than either of them. The Jenny Lind will ripen first, Wilson's next, and the Triomphe de Gand last, which will prolong the season as long as any list of good strawberries that I know of now in cultivation, and will give as many kinds as will be desirable for garden culture.

* It has generally, in this State, proved very unproductive. S. L. G.

Raspberries.—No fruit, except the currant and perhaps the gooseberry, can be so cheaply raised as the raspberry, and yet no fruit adapted to our climate and garden culture is so much neglected. Comparatively few attempts have been made to cultivate them for market in our State, or at least few have come within my knowledge, our supply coming principally from the pastures and fields, which supply is somewhat precarious; besides, for home consumption it is procured at too great a cost. I have raised this year from less than four rods of ground four bushels of fruit, which did not cost me one-third of the value of the fruit. The raspberry, like most of our small fruits, has been much improved within a few years. Dr. Brinckle of Philadelphia, has done more, perhaps, than any other man, to improve this fruit, having given us some of the best varieties now in cultivation, if not the very best, and what has been said of the strawberry may also be said of this, that it is difficult to tell how far this improvement may be carried.

Raspberries will grow on almost any good soil, but flourish best on a moist soil containing considerable vegetable mold. For garden culture, after spading in a good coat of well rotted manure and ashes, mark off your rows four feet apart, and if you have plenty of room, five is better, setting the plants two or three feet apart in the rows; in either case they will, if well mulched (which I consider almost indispensable), soon fill all the intermediate space. A plantation of raspberries will need but little care for five or six years, except thinning out, so that the plants shall stand about a foot apart — tying up and heading in about one third the length of the canes in the spring; laying down and covering in the fall with evergreens, leaves, or anything that will shield them from the effects of the sun when they are not covered with snow. If kept well mulched they will produce much better fruit and require but little weeding, and that can and ought to be done with the hands, on account of the roots running near the surface of the ground.

Brinckle's French I consider the best for all purposes. It is hardy, productive, and the best flavored berry that I have ever seen. No garden should be without it. Brinckle's Orange stands next in point of flavor, is productive and hardy, is not a good market berry, but is the best I have seen for preserving in the old way of using equal weights of fruit and sugar. The Franconia is an excellent market berry, a superior bearer, very hardy, and if of

as good flavor should prefer it before the Orange. The Black Cap is an excellent bearer, hardy and one of the best for cooking, and is not so highly prized by cultivators as it ought to be. It requires a great deal of pruning to obtain the best of fruit. I have picked from one bush between six and seven quarts for three years in succession.

I have tested the above list together with some other varieties for six years, and have never failed of a good crop or lost a single cane by winter-killing.

Grapes.—Such rapid improvement has been made in the grape within the past fifteen or twenty years, that we confidently look forward to the time (and that not far distant) when the grape shall be as sure a crop and as generally cultivated as any of our small fruits.

Within the period mentioned, the Isabella was considered our best grape, but it would scarcely ripen in the very best situation. Years after the introduction of the Isabella came the Diana, Concord and some others which were perhaps a little earlier. Next came the Muscadine and Hartford Prolific, which were decidedly in advance of either of the others in point of ripening, but not in quality. The last grape introduced which has gone into cultivation to much extent, is the Delaware, and, all things considered, it is the best grape for out-door culture, which we have tried in Maine. With the experience and observation I have had, I should recommend for out-door culture in this State, the Delaware, the Hartford Prolific, and Northern Muscadine. The next most important point after securing good varieties, is location, which should be such as to protect them from the north and west winds, and secure the rays of the sun all day if possible, or at least two-thirds of the fore part of it. The best Clinton grapes I ever saw were grown in a deep gully, the vine being allowed to run up on the bank without any care at all. But this course will not do for garden culture. I think most cultivators allow their vines to run over too much surface. Vines should be pruned immediately after the fall of the leaf, as they are sometimes apt to bleed if pruned very late. It will also be found necessary to lay them down during the winter, covering them with evergreens, forest leaves, or something of the kind.

Gooseberry.—Our climate is as well adapted to the cultivation of this fruit, perhaps, as any portion of our country, it being found

wild in nearly all our low lands, is perfectly hardy, and bears well when the fruit is not destroyed by insects or mildew. Many foreign kinds have been introduced, but all, or nearly all, have had to give place to Houghton's Seedling, on account of their liability to mildew, this being almost entirely free from that defect. Its origin is interesting, and we copy the following account of it from the *American Agriculturist:*

"Some thirty years ago, Mr. Abel Houghton, then of Lynn, Mass., set out in his garden four of the best English sorts, in a circle, with a native variety in the centre. They all flowered and fruited the second year. He sowed the seeds indiscriminately; when the seeds came up, he transplanted them by the hundred into rows. In five years they came into bearing, but nearly every one suffered from mildew. He saved the best, and threw away the worst, and finally the kind known as Houghton's Seedling was the only one that proved worth saving and propagating. For his trouble he got nothing but the honor of having introduced the best gooseberry in cultivation."

As a grower and bearer it excels all other kinds which have come under my observation. Large crops may be expected from this fruit on rich, moist soil, if properly pruned, which will be almost indispensable to secure the best quality of fruit. This berry suffers from the currant worm to a large extent in some localities.

Currant.—The currant has been more generally cultivated than any of the small fruits, for the reason that it has had but few enemies, is perfectly hardy, and bears some fruit under almost any treatment. Yet it pays as well as almost any other fruit for good cultivation.

Currants may be trained in almost any form, either as a bush or tree; in either case generous manuring and thorough pruning will pay. Those individuals who have now an unsightly mass of bushes will find it greatly to their advantage to cut from one-third to one-half of the oldest stalks, and all of the small sprouts, leaving some of the large ones to take the place of those that will be cut out from year to year.

The varieties I have grown are White Dutch, Victoria, and Knight's Large Red. The first is a slow grower, but produces a good crop of first rate fruit. The Victoria is a vigorous grower, a good bearer, fruit hangs on late and is of fair quality. Knight's Large Red is a remarkably good grower, and produces an abundance of large fruit, of fair quality, but is apt to fall soon after ripening.

The currant worm is so destructive in some localities that cultivators have become almost discouraged in trying to raise this fruit.

Blackberry.—This fruit on newly cleared lands grows wild in abundance, and is really one of the best of our small fruits, but it is doubtful if it can be cultivated with profit for market or with pleasure in our gardens, unless one has plenty of room and an abundance of patience which he is willing to sacrifice to this really disagreeable bush but delicious fruit. It requires about the same treatment as the raspberry, except that the plants should never stand nearer than five or six feet. The best kinds in cultivation are Dorchester high-bush and Lawton.

Plum.—The plum has been very much improved in quality, but is little cultivated in this State, owing to the black knot and curculio. In the vicinity of Bangor it seems to flourish, and perhaps some other places, but is considered an uncertain crop.

Cherry.—The cherry does not flourish now as formerly; very few efforts are made in the vicinity of Androscoggin County to raise this fruit, owing chiefly to the black knot and curculio. Within a few years some have been raised for market, but to a very limited extent.

Cranberry.—The cranberry may be raised on our bogs and meadows to a large extent when their cultivation is better understood and farmers have a little more courage to enter into a paying enterprise. Some have cultivated them on upland, but to a limited extent. The Agricultural Society of Androscoggin County have paid premiums almost every year since the society was organized for cranberries raised in this way."

Mr. Rogers inquired regarding the experience of other members with grapes for open culture.

Dr. Weston in reply said that some kinds were attempted to be grown here which were too late to ripen well. This was the case with the Isabella in his vicinity, unless it had a very sunny exposure, protected and judiciously pruned. The Delaware, although small both in the size of the berry and bunch, had proved successful in Bangor. The Hartford Prolific would grow anywhere and ripen its fruit, if judiciously cared for. The Rebecca is not so hardy as the others, but is a good berry. The ends of the shoots are apt to winter kill. The Diana has also ripened, but he could

not recommend it for general cultivation; should be trained against the wall of a house on the sunny side. In regard to pruning, much depends upon the space they are to occupy. In a small space they should be pruned so as to form a simple cane. Prune the laterals in autumn to within three buds of the cane, and in spring leave the one nearest the main cane, rubbing off the other two. An error is often made in cutting off the foliage to ripen the grape. It is a wrong practice. Should not let vines grow higher than six or seven feet; should not let more than one or two bunches of fruit grow upon one spur; thin out the remainder; cut off all runners when thinning out the fruit. Manures for the grape should be composted before being applied. Regards three hours of morning sun worth all the afternoon sun, consequently prefers eastern rather than a western exposure.

The Secretary remarked that the Delaware, Hartford Prolific, and Northern Muscadine had proved to be the three best grapes for out-door culture in Maine which had yet been fully tested.

Doubtless we should some day obtain better grapes than any now known. The way to get them was to grow seedlings from the best and earliest we have. A very small proportion of the seedlings would be good for any thing, but perhaps one in a thousand would be a great prize and worth all the trouble attending the growth of ten thousand worthless ones. A grape as handsome and hardy as the Concord, as good as the Delaware, and as early as the Old Colony, would be worth hundreds of thousands of dollars to Maine. Did not think so highly of the Diana as formerly. It had been subject to dry rot of late. Uses animal manure but sparingly, and only when well composted. Ground bones and ground oyster shells form a good application for vines. The great secret of grape growing in our climate is to get well ripened shoots and to thin out the bunches sufficiently as soon as well formed.

Mr. Dill found the Hartford Prolific to ripen well as far north as Phillips, and had proved the best of any yet tested with him.

In this connexion it is deemed proper to report some remarks made regarding orchard fruits by various cultivators at an informal meeting; and chiefly such as give facts additional to, or views differing from those presented in the Secretary's report of the past year on the same subject.

Blue Pearmain.—Dr. Weston said it succeeded well near Bangor with rich culture. Tree hardy and productive.

Mr. Chamberlain said it was a good bearer in Piscataquis County.

Mr. Foster. A light bearer in Kennebec County and unprofitable.

Mr. Pratt. A sly bearer in Androscoggin.

Mr. Jaquith of Kennebec. Would not recommend it for orchard culture. It succeeds well in gardens.

Mr. Dill. On high farms in the northern part of Franklin County is a very good bearer and very hardy.

Mr. Russ. It sells better than any other in Farmington. Is a good bearer and keeps late.

Northern Spy.—Dr. Weston. About Bangor this variety bears at an earlier age than in some other parts of the State; remarkably hardy; bears every year; fruit keeps late, and is one of the best sorts for Maine.

Mr. Foster. With me this tree contradicts its general character; is a good bearer; needs high culture.

Mr. Jaquith. Succeeds well in Albion; keeping qualities inferior to Rhode Island Greening.

Mr. Pratt. Late in coming into bearing.

Mr. Gilbert of Greene. Did not dare to recommend it for extensive culture; requires a fine, deep, moist soil and high culture; keeps until August and holds flavor well.

Old Nonsuch or Red Canada.—Dr. Weston. Tree healthy, good bearer; fruit nice and sells well; not spotted.

Mr. Goodale. Is not profitable for general culture. In some parts of Penobscot County the soil and climate seem to suit it; in the western part of the State the tree is unhealthy and fruit liable to blight.

Mr. Chamberlain. With me the tree is hardy.

Mr. Wingate of Hallowell. Entirely worthless with us.

Mr. Foster. Will keep fair until July; tree is liable to canker; not of much value.

American Golden Russet.—Mr. Foster. Tree hardy, good bearer and good grower; liable to overbear.

Mr. Rogers. Produces abundantly in the vicinity of Topsham.

Fameuse, or Snow Apple.—Dr. Weston. This apple originated in Canada; it exhibits the same good qualities here that it has in Canada.

Mr. Goodale. Is worthy of more general culture in Maine;

tree very hardy; will grow as far north as any sort; abundant bearer; is not of large size, but very juicy.

Mr. Jaquith. Is very hardy, very productive, and very uniform in size.

Mr. Haines of Aroostook. The tree bears every year with us; at Fort Fairfield it succeeds well.

Black Oxford.—Dr. Weston. Is not extensively grown in Penobscot County; keeping qualities superior; valuable for cooking.

Mr. Pratt. Tree hardy; liable to overbear.

Mr. Chamberlain. Hardy; good bearer.

Mr. Foster. Is not much esteemed with us; keeping qualities superior.

Mr. Gilbert of Greene. This apple originated in Paris, Oxford County; is not first class; will not keep better than the Greening.

Yellow Bellflower.—Mr. Foster. With good culture is a good bearer; would recommend it for high or garden culture.

Mr. Anderson of Windham. It bears wonderfully with me, and the trees much neglected.

Mr. Foster. The tree is inclined to send out too many limbs.

Mr. Goodale said the tree might be considered a capricious one as it often failed or succeeded from causes not obvious.

Mr. Wingate. Tree requires a rich, deep, sheltered soil; is liable to split down.

Mr. Pratt. Tree a shy bearer; is liable to split down; fruit needs to be handled with great care.

Gravenstein.—The Secretary inquired of those present whether their trees of this sort suffered from a canker in the wood, to which he had alluded in describing this fruit in his Report. None had seen it. Messrs. Weston, Pratt, Jaquith and others said it was healthy and unexceptionable in every respect.

Mr. Nickerson of Readfield, being called upon to give an account of his seedling pear, said it was grown from seed first planted by Ex-Governor Hunton in his garden in Readfield, and from thence transplated to his own. It had little care taken of it, but grew well, and in 1860, being about seven inches in diameter, bore three barrels, which sold for $12,50 per barrel. It was very hardy. Of hundreds of scions set he never knew one hurt. It unites with the Thorn and with the Mountain Ash.

Mr. Foster said it grew well with him on the quince stock, but he had not yet fruited it.

The Secretary read the following communication from S. F. Perley, Esq., Ex-President of the Board, which is valuable and interesting from the *facts* stated both regarding the profits of orchard culture and the effects of sheep-grazing:

The following is a current account with Field No. 9, an apple orchard of four acres. The trees were set about fifty years ago, twenty-five feet apart; (they are too close by ten feet.) There are now 280 trees in bearing condition. Pastured with sheep eight years past:

1862.	Dec. 31.	Field No. 9 by 475 bus. hand-picked apples, 40 cts.,	$190 00	
		" " 230 " windfall " 20 "	46 00	
		" " pasturage of sheep,	10 00	
			———	$246 00
		To labor pruning, &c., - - - -	$2 30	
		" gathering fruit, - - -	27 65	
		" interest and taxes on $400, 8 per ct., -	32 00	
		Net profit, - - - - -	184 05	
			———	$246 00
		Field No. 9 Creditor.		
1863.	Dec. 31.	By 600 bushels gathered fruit, at 75 cents, -	$450 00	
		By 425 " windfalls, at 35 cents, - -	148 75	
		By pasturage of 20 sheep, - - -	10 00	
			———	$608 75
		Same Debtor.		
		To expense of pruning, grafting, &c., - -	$8 80	
		" gathering fruit, - - -	39 35	
		To interest and taxes on $500, 8 per cent., -	40 00	
		Net profit, - - - - -	520 60	
			———	$608 75

The price of apples in 1863 was favorable and the quality of the fruit unusually good. The proportion of windfalls in this year was large, owing to my absence just at the "nick o' time," and to the heavy fall gales. The orchard is manifestly improving under the treatment, *sheep-grazing*. Eight years ago it would carry but eight or ten sheep, and last year about twenty; *then* it bore about 100 bushels apples of poor quality—*now* from 700 to 1000 bushels of fine fruit.

If the above will do you any good in your discussions, use it at your discretion. There is no guess-work about it, but taken from my farm journal as kept from day to day.

At another informal meeting, the subject of Marine Manures was discussed, and some important facts being elicited, it is deemed proper here to introduce a report of the same.

Hon. Mr. Merrow of the Senate being called upon to preside, took the chair and submitted some general remarks on the use of Marine Manures. Farming was not his leading business, but he did something at it, and had found that plenty of manure was indispensable to success.

Wm. D. Dana Esq. of Perry, being called upon for his experience, said: "About all I know of marine manures is this: Rock weed, muscle bed and pogy chum will make grass grow. Our seaside farmers do not appreciate their privileges, and there is not half the use made of marine manures there might be. The best use we can make of herring after they have been pressed for the oil is to pass them through the bodies of sheep. The sheep get fat on them, a good growth of wool is produced, hay is saved, and the manure is in an excellent state for the land."

Dr. Weston read the following communication which had been given him by Mr. Dana:

FEEDING FISH OFFAL TO SHEEP.

"Necessity is the mother of invention," and sometimes of discovery also. Farmers in the eastern part of the State have for the last two years had need to apply this saying in devising ways and means to save their flocks and herds. The hay crop of 1862 was less than half a fair average crop, and that of 1863 still less than its predecessor; and the problem to be solved very generally was how to winter such stock as must be wintered. The usual substitutes, roots and grain, were as scarce and high in proportion as hay, and to buy either hay, grain or roots at present prices, for feeding stock, would cost more than the animals would sell for in the spring. This state of things has caused almost an indiscriminate slaughter of old and young. Most farmers have reduced their dairy stock to the lowest number necessary for their own supply, sent their young steers and heifers to the butcher, and their working oxen and milch cows, with their swine, to the sausage mill. Sheep have gone in droves to Brighton, and the bales of pelts seen on the steamers testify to the necessity of the region in regard to forage. Now out of this necessity comes the knowledge that the sheep is an omniverous animal, living not upon vegetables alone, (and the same probably will be found true of other animals besides the sheep and hog,) but greedily eating and thriving upon animal food as part of its diet: and the statement sometimes made, that farmers on the coast send their cows out fishing and feed them on what they catch, comes nearer to the truth than many suppose. Some farmers or sheep-owners on the coast and islands leave their flocks to provide for themselves—and they live through our winters on such fodder as the seashore furnishes—and other farmers

at a distance from the shore go there to seek food for their cattle as well as for themselves.

Fish pomace or the residuum of herrings after the oil is pressed out, is greedily eaten by sheep, hogs and fowl. Probably pogy chum would be eaten as well. Smoked alewives and frost fish also furnish a food palatable to cattle. The fact of animals eating fish being established by ample trials, the question comes next, what is the effect of such food upon the system? In the region alluded to, the seaboard towns of Maine, large quantities of this fish pomace and refuse fish are used as manure, usually as top dressing for grass, and flocks of turkeys that feed upon these fields get fat and *fishy*. Pork, so fed, will grow and get fat and be very nice, for those who like train oil. Sheep also thrive well, get fat and yield heavier fleeces than when fed on anything else produced in that region. Probably linseed or cotton seed oil cake itself is not more rich in the elements of wool and flesh than this *animal* oil cake. What its effect may be upon the flavor of mutton, is among the things yet to be determined—as also its comparative value as an article of food. Careful and close observing farmers who have fed it assert that it is of equal value with good hay, ton for ton, and that its value for manure is in no degree diminished by passing it through the living mill, and thus reducing it to a much more convenient state for applying.

An objection to its use on a large scale is found in the fact that it soon gets "rank and smells to heaven," or at all events over a considerable portion of one's little share of earth. But sheep seem to be no way fastidious, and ask no questions about the freshness of the fish. For manure it is dried and mixed with other ingredients. If it could be sufficiently dried, without other substances, to prevent putrification, it would form a valuable article of cattle feed in regions from which it is now excluded by the expense of transportation and its own odoriferous nature."

The Secretary remarked at some length upon the importance of the fact communicated by Mr. Dana. By this method we get a threefold return from the fish instead of a single one as formerly. First, there is the oil, a valuable article of commerce, for which alone the manufacture was long and profitably carried on, and now we are informed that the pomace is an acceptable food for sheep; and it is very certain that after the product of meat and wool is

obtained, we have a most excellent remainder of manure. Our seaside farmers have not yet learned the value of fish, and do not sufficiently appreciate or avail themselves of their manurial resources. At Treat's Island, near Eastport, some 150 or 200 tons of fish guano is made annually, but it nearly all finds a market among the farmers of Connecticut.

If sheep eat the fish pomace freely, doubtless much poor hay or straw can be used with it to good advantage, thus allowing the farmer to use all his good hay in keeping other stock. Mutton fed in this way might be too high flavored to be agreeable, but he could not see that it would injure the wool; nor the meat either, if other food was substituted for a proper length of time before slaughtering.

The effects of marine manures vary in different localities and soils, and much also depends on the season. After using sea weed on the same land for a number of years, not so much effect is seen as at first. In dry seasons muscle bed does but little good; in wet seasons its effects are more marked, and it generally gives good satisfaction. He had seen the effects of an application of muscle bed to soil a distance of fifteen miles from the coast, and after an interval of twenty-eight years, a marked difference was to be observed in the amount of grass growing upon the land in wet seasons.

Mr. Thompson of Stockton, had used rockweed, but had seen no beneficial results therefrom. He had also bought fish pomace and used it, but thought he did not get his money back. Had applied fish to land as a top-dressing at the rate of 10 barrels upon one third of an acre, raked in among the grass roots, and next year the grass was of a very rank growth. Last year he cut about three tons to the acre from this land. The price per barrel in his section was 37½ cents. Would recommend about fifteen barrels per acre as a top-dressing. Had noticed cattle loved the grass as a fall feed, upon which fish guano had been applied. His soil was a stiff clay; would bake when thrown up wet.

Col. Chapman, Land Agent, said that in the town of Bristol little use was made of muscle bed, and its use had not been very satisfactory. In Newcastle Centre there was a ridge of land of fine loamy soil free from rocks, between the marshes, which had been settled since 1630, upon which marsh mud had been used with very decided results. It was hauled upon the fields in the fall,

and also placed in barn yards. Farmers kept their stock on salt hay, selling their fresh hay, and keeping up the fertility of their farms by using marsh mud. He stated an instance of the use of a compost made of marsh mud, unslacked lime, swamp muck, rock weed, &c., applied to a field, (the soil of which was a gravelly loam) in the spring upon the furrows, and harrowed in, the field being sowed with barley, and an excellent crop was the result. At Wiscasset, farmers make considerable use of rockweed with good effect.

Mr. Pratt gave the results of an experiment with sea weed in manuring potatoes that showed very marked results. He obtained two barrels from Mr. A. Johnston of Wiscasset, and applied it in comparison with ashes upon soil that had not been plowed for sixteen years. Spread on stable manure at rate of 20 cords per acre, and plowed it under eight or ten inches deep, planting with potatoes three feet apart in the row, and eighteen or twenty inches distant in the hill, with the following result:

Row No. 1.	No manure in hill	produced	133 lbs.—71	bushels.
" No. 2.	Ashes	"	152 lbs.—81	"
" No. 3.	Rockweed	"	184 lbs.—98	"
" No. 4.	Ashes and Rockweed	"	183 lbs.—97½	"

It was not a favorable season. An application of six hundred pounds of rockweed per acre gave an increase of fifty bushels. The rockweed was applied in a finely pulverized state.

Hon. Mr. Noyes of Hancock County. Had used muscle bed upon a limited scale. Always plowed it in, and had not failed in a single instance to get a good crop. It is better and cheaper procuring it in summer by boats, than in winter on the ice. Had tried it as a top-dressing on grass land, but saw no effect from it upon clayey soil or clay loam. Believed it should be composted with muck, loam and stable manure before using it.

Mr. Wasson of Hancock, mentioned an instance where muscle bed had been applied to a clay loam in Surry for ten or fifteen years, and had produced great crops of hay during that time, but for the last five or six years it has not been used. It formerly cut from three to three and a half tons per acre, but last year nothing grew on the field where it had been applied but rattle-weed. Where it had been applied on the surface nothing would grow; but if plowed under it produced good crops of hay. It had proved of no value unless it had been frozen. In one instance it was applied to a field where no herdsgrass had been seen for years, and

after its application the herdsgrass grew largely. He spoke of the value of the water expressed from the fish in the process of extracting the oil. This is commonly thrown away, but it is a valuable fertilizer. It demanded more attention than had been given it.

The Secretary said it was not uncommon to hear people assert confidently that a large application of fish, or of guano or other active, special manure, eventually damaged the land to which it was applied, when the fact was, that the large crops which followed the application exhausted the soil by drawing from it a good deal not in the manure applied, and which another dose of the same manure would not make good. It was not what was put on, but what was taken off, that exhausted land. With plenty of marine manures it was easy to put land into a highly productive state, but to keep it so the manure made by consuming the crops should be given back to it.

The Secretary read a communication from Mr. Roberts of Cumberland County, as follows:

Muscle Bed as a Fertilizer.

Muscle bed is deposited in the bays and inlets on the coast of Maine. There are large quantities of it in Casco Bay; and many of the farmers on the coast depend upon that and other marine manures as a fertilizer for their farms. The high price of land, and the facilities for shipping hay to Boston and other markets, make this a valuable privilege, and if carefully collected and intelligently used, will give the coast farmers of Maine a great influence on the hay markets of New England. It enables them to put a much larger proportion of their land into mowing than can be done on stock farms; and although muscle bed is not equal, in all cases, to stable manures, the privilege is great to have such a *bank* in the vicinity of the farm for the farmer to *draw* from at his leisure.

The methods of getting it are two—by gondolas or flat bottomed boats in the summer, and by cutting through the ice in winter and hauling it directly to the field. This is considered by many the cheapest way of procuring it; but the time it is frozen sufficiently hard to bear the teams is so short in each year that it is an uncertain way of getting it, as some winters they cannot go on with teams at all. The best mud lays at extreme low water mark and cannot be got only at the high run of tides at the new and full

moon. Large loads can be drawn on the ice to the shore, where the load is usually divided, making two or three loads to the farm. Some farmers, living on the shore near the muscle beds, load four or five sleds at a tide, draw them to the shore before the tide rises much, when they can take them to the field at their leisure.

The gondolas carry from four to six cords. Three men will load and unload them at a tide. The mud is brought in them to the landings on the farms, or to wharfs as near to them as the boats can get. The usual price for boating it is from one dollar and fifty cents to two dollars per cord. Its weight—six tons per cord—forbids its being carried inland very far. I have usually paid one dollar per cord for drawing it from the wharf to my field, a little over half a mile, and that is as cheap as it can be done under the most favorable circumstances.

The method of using it is as a top dressing for grass and grain. It is never worked in deeper than with the harrow or cultivator, and the farmers who have had the most experience with it consider that the nearer it is kept to the surface the better; and even prefer to put it on to the stubble where the land was seeded to grass in the spring, to harrowing it in with the grain, notwithstanding its excellency for the grain crop.

I have seen instances where it had been applied on old greensward, and a year or two after the land was broken up. In the crops that followed no difference could be perceived where the muscles were put and the other parts where no manure whatever had been used; the land all receiving an equal quantity of stable manure after ploughing. But as soon as the muscles were brought to the surface again by the plough, their efficiency was readily perceived.

When first taken out muscle bed is adhesive, somewhat like blue clay, and *must* be frozen before it can be spread on the land; otherwise it remains in lumps, will bake very hard, and be of no use to vegetation; but it slacks up fine after being frozen, when it can be spread as readily as any manure.

It is on moist, clayey loams where the greatest benefit is derived from it. It does well on *all* clayey soils, and on sandy loams if not too dry and light. But on dry, sandy plains, or gravelly knolls—so far as my experience and observation go—it is not worth carting forty rods. On such land a small benefit would be derived from it to a crop of grain, and it might be perceptible also after a first crop of grass, after which no effects would be seen at all.

The quantity used per acre varies from eight to twelve cords. The general opinion is, that more than twelve cords per acre at one application is injurious rather than beneficial for the first two or three years after it is put on. Ten cords per acre on clayey loam land which has been run out, as it is termed, will usually produce a *good* crop of grain, and from one and a half to two tons of hay per acre for several years, provided the seasons are favorable. I make this proviso, for there is no manure with which I am acquainted, that the seasons make so much difference with, as with this. The most remarkable proofs of this which I have known occurred on the farm of Capt. J. M. Bucknam of Yarmouth, whose farm lies very near the muscle bed, and on which it had been used in large quantities for many years. A few years since, his hay crop was reduced in one year by the drouth, from seventy-five tons to twenty-eight tons. And again in 1859, or 1860,* the hay on the same farm was reduced from sixty tons to eighteen tons, and the grass roots very badly killed. In such fields where the grass roots suffer so much, they do not recover and resward the land so readily as on fields dressed with stable manures. All farms that are dressed principally with muscle bed suffer great diminution of crops in dry seasons; much greater than those manured from stables. The last three years have been so dry, that many who first began to use muscles at that time are getting somewhat discouraged, as they have received but little benefit from it; but the wet weather of last July set its principles in action, and the fields looked better last fall than they have done for four years. I do not think the mud loses its virtue materially while lying dormant in the dry seasons, for fields which have had it applied to parts of them will show it in wet seasons for twenty years afterward. Its durability on flat, moist, what are termed heavy clay lands, I think, is greater than stable manures, while on dry clayey loams I should prefer the latter for its greater retention of moisture in dry seasons.

The action of muscle bed is much greater on lands to which it has not been applied before, than it is in after applications. It will continue to act for many years without a change of dressing, but it requires larger quantities to produce the same results. On some lands near the shore it has been used in such large quantities as to

* I do not recollect which of these years was the first in this last series of dry seasons, and I write from memory.

spoil the land, as it is termed—that is, it makes the land fall heavy; it bakes and cracks very much in the summer; is very susceptible to a drouth; muscle bed fails to do any good, and the crops will be light notwithstanding the land is not deficient of the elements necessary to produce the crop.

In such cases the land can be restored by dressing with vegetable matter, such as swamp or salt marsh muck composted, or the eel grass and sea weed which drifts to the shore, or barn manures, after which the muscles will act favorably again. I think if a farm was manured alternately from the stables and muscle beds no such trouble would occur, neither will it be likely to occur on farms two or three miles from the shore, as they will not be likely to use it too abundantly.

One farmer near here applied nearly one hundred cords to five acres of land. It was put on three years ago, but has not produced much hay since; whether this is owing to the dry seasons we have had, or from "too much of a good thing" I cannot say, but another year may prove it.

It varies in quality. That is considered the best which contains the most shells. Many think the lime from the shells, and the salt, are the chief fertilizers; but a part of the shells contain fish, and the empty shells denote decomposed fish in the mass, which are valuable fertilizers; but a large proportion of the animal matter must evaporate when it is applied to the surface.

But few if any well-directed experiments have been made in this vicinity to ascertain its comparative value with other manures. We are satisfied to know that it *pays* to get it, and we get it when we can.

There is one field in this town that was heavily dressed with it thirty years ago. It continues to produce a good crop of hay now, and I understand it has had no manure of any kind applied since. Another piece of two acres was dressed very heavily thirty-five years since. So much was put on that it produced but very little for three or four years, after which it bore very heavy crops of grass for several years. It was then turned out to pasture, and has continued to pasture two cows per season ever since. It is the best manure for wheat and barley that we have. In a prize essay on the culture of onions, written for one of the agricultural societies in Massachusetts, the writer stated that he considered muscle bed indispensable to the production of a good crop

of onions. He applied four cords per acre, for two or three years, with grain-fed stable manures. I have never known it tried on the onion bed by any persons around here.

I have here written you a plain statement of my observations and experience in *one* of our valuable marine manures, and after summing them up I think you will agree with me that it *is* a privilege to the coast farmers; but the privilege is not used to the extent that it ought to be, or we should not see so many *hungry* looking fields in the vicinity of such valuable deposits.

Respectfully yours,

WM. ROBERTS.

Yarmouth, Jan. 20, 1864.

S. L. Goodale, Esq., Saco, Me., Secretary of the Maine Board of Agriculture.

The regular session being resumed, Dr. Weston, for the Committee on the first topic submitted by the Business Committee at this session, presented the following

REPORT ON THE INFLUENCE OF MANUFACTURES ON AGRICULTURE.

If we pass in review all ancient, mediæval and modern times; if we trace effects to causes to discover the sources of power, we shall find that those countries whose citizens engage in the most diversified pursuits ascend the highest in the scale of prosperity and independence.

Agriculture, Manufactures, and Commerce comprehend all the multiform branches of industry prosecuted among mankind. Their varied interests are one and inseparable, now and forever. "They are not antagonistic, but so entirely intertwined and dependent upon each other, that it is impossible to benefit either without advancing the interests of each, or to injure one without embarrassing all.

Agriculture imparts to manufactures food and raw materials, and to commerce food and freights; manufactures furnish to agriculture clothing, tools, and a home market, and to commerce ships, railways, cars, tools, clothing and business; and commerce, both foreign and domestic, animates and vivifies the production and interchange of commodities for both and for all. Without either, the others languish and die. And when all act harmoniously, side by side, and the *nearer together the better*, then and only then do nations rise to the highest attainable point of independence, wealth and power."

A State exclusively agricultural must send its productions, both cumbersome and light, to a foreign market, and exchange them for fabrics which command a high price, because there is no home competition; besides if the foreign nation has the monopoly of commerce, the transportation would absorb a large share of the profit, so that comparatively little would be realized after defraying the expenses of freight; then cattle, hay and grain would be removed, consequently valuable manure would be lost, the land would gradually be impoverished, and fail to support its inhabitants, and thus would it be ascertained by sad experience that the nation which begins by exporting only raw material must end by exporting or starving its population.

But if the farmer and the artizan are located side by side, if manufactures are encouraged and protected by a wise national policy, then home markets are everywhere provided, then there is a demand for all the various products of the fields, the gardens, the pastures, the orchards; their prices improve, the cost of transportation is diminished, commerce is developed and employed as an agent to go and come at the beck and call of each, real estate is enhanced in value, capital is augmented, both population and wealth increase, and the prosperity of one great interest reacts upon the other in never-ceasing progression.

Our own State is fortunately well adapted for Agriculture, Commerce and Manufactures. Among its agricultural resources are a great variety of soils from sandy loam to stiff clays, some of which are rarely surpassed in fertility by any lands in the temperate zone, and both land and sea can yield inexhaustible supplies of fertilizing materials such as lime, muck and marine manures to renovate impoverished and barren fields. Its surface is usefully diversified by plains, hills, valleys and mountains; and it is abundantly watered by springs, brooks, rivers and lakes, which are equably distributed.

Fat cattle, strong and swift steeds can everywhere be raised. Its rich pastures are adapted to the portly short horts, its hills to the hardier breeds, such as the Devons and Ayrshires, and its islands, hilltops and mountains may be covered with myriads of sheep, so that beef, mutton, milk, butter and cheese may abound to feed all the inhabitants and afford a surplus for exportation.

Our climate is not only favorable to the development of a healthy, muscular, enterprising people, but is of such a nature that they can engage in long protracted labor without that fatigue and ener-

vation which those of more southern climates experience. It is one of the best working climates in the world. Even its extremes of heat and cold are beneficial. The frosts of winter permeate, pulverize and ameliorate our soils. Its snows protect our grasses and grains, give easy access to our forests, and enable us the more easily and successfully to harvest our lumber. The abundant, timely rain "watereth the earth and maketh it bring forth and bud, that it may give seed to the sower and bread to the eater;" and the long unclouded days of summer can bring to perfection and ripen in profusion crops of corn, grains, vegetables and fruits sufficient for a dense population of industrious citizens.

Its facilities for navigation are unrivalled by any other State. It is estimated that its coast line, including the various indentations into coves, harbors, bays and rivers, measures three thousand miles; and the water along the whole Atlantic border is so deep that ships of the largest class can approach at numerous points for refuge and for traffic.

The general direction of its rivers is at right angles to the ocean, and they occur at convenient distances from each other; and when winter imposes an effectual embargo upon the rivers, even then they contribute to the welfare of commerce, and become sources of wealth by yielding an abundant harvest of ice, which may be gathered and stored to furnish freight to a numerous fleet of vessels when the warm, moist breath of spring shall have melted and removed the solid barrier.

For the purposes of internal commerce, railroads have already been completed between important points, and the country is such that they can be multiplied and extended as necessity requires.

Common roads of the most solid and permanent character, in addition to those already in existence, can be constructed in all directions, of the best materials. Hundreds of miles of telegraphs, like so many nerves, stretch across the State, from New Hampshire to New Brunswick, from the sea to Canada, and all these may become most useful auxiliaries in the transaction of business. However great the demand in coming ages for foreign commerce and internal transportation, that want can be supplied by our own citizens everywhere throughout our domains, from centre to circumference, without crowding, without confusion.

Maine has remarkable capabilities for manufactures. It has many a wild, fleet stream which may be caught as it is about to leap down some precipice and harnessed to useful machinery and

made entirely subservient to some skilful controlling mind, under whose guidance it may convert the raw material into a valuable textile fabric, or mould it into a thing of beauty or utility. All its rivers abound in rapids and cascades, and when arrested in their course by suitable dams, they furnish an unfailing supply of water for manufacturing purposes, both during the droughts of summer and the congealing cold of winter.

All experience demonstrates that water, when available, supplies the cheapest, most profitable power; but in certain localities which are destitute of it, where villages and cities have grown up whose inhabitants have engaged in industrial pursuits, which have ceased to be remunerative, and desire to turn their labor into new and more lucrative channels, to such steam power offers the required desideratum. It is also indicated in those particular localities where the elements of manufactures are abundant, and where it is desirable to congregate communities of artisans to develop the natural resources of the country, and provide home markets for the neighboring agriculturists. For the nearer the consumers are brought to the producers, the greater the profits realized. A bushel of grain or a ton of hay within a mile of a market, will command the same price as one raised twenty or fifty miles distant, while the cost of transportation is much less; hence the more numerous and nearer the markets, the more agriculture is stimulated and wealth diffused.

The steam engine is a voracious devourer of fuel. It demands new and constant supplies, without which it cannot work, but however greedy, we have the ability to satisfy its wants. Our extensive forests can furnish the material required, or our lumber can be exchanged for the easily accessible coal of other States, the one giving freight to our coasters, the other supplying them with ballast to return.

The most ample materials to be subjected to the cunning transforming hand of the artisan or manufacturer can easily be obtained.

Even cotton, ere long, will be provided without stint, when the war shall have closed, and the blighting mildew of slavery shall have ceased to exert its baneful influence; when a free, enterprising, industrious, christian people shall cultivate with their own hands the fertile fields of the sunny South, then their capacity to produce this useful and necessary material will be developed to

the fullest extent, and henceforth more than enough will be raised to tax the ability of all the machinery in the country.

Maine need not be indebted to any other State for wool, flax and leather. It possesses iron of the best quality, only waiting to be wrought to furnish all its tools, its engines, its machines, its various utensils. Its timber is ample for naval and domestic architecture, for furniture and other purposes. Its banks of clay will discount any amount of bricks for buildings. Its quarries of granite, slate and lime, are inexhaustible. The mere mention of our resources suggests their use and value, and it only remains for us to avail ourselves of the means which God has so bountifully placed in our hands.

Notwithstanding our manifest natural advantages, Maine has not kept pace with her sister States. She has prosecuted agriculture and commerce to a very considerable extent, but has comparatively neglected manufactures.

More than twenty years ago, when Congress had imposed such a tariff of duties on merchandise imported from foreign countries as would yield a liberal revenue to government, and would at the same time favor and protect home industry, many capitalists abroad, discerning the excellence of our unappropriated water power, desired to invest their money in available sites, and applied to our Legislature for acts of incorporation; but our farmers then entertained an unwise prejudice against all corporations. They hated monopolies, and were bitterly opposed to granting particular privileges to any class of men, or exempting their property from taxation, until their mills could go into successful operation. Blinded by jealousy, they did not see that this capital would be a most desirable acquisition, that it would build up flourishing villages, create a home demand for farm products, and enhance the value of real estate.

Politicians and demagogues took advantage of this prejudice to advance the interests of themselves and party. They mounted this hobby, and flaunting their banners to the breeze, inscribed with the mottos, "Free Trade and Sailors' Rights," "No Monopolies," they rode into power. Their legislation was consequently illiberal and repelling; and hence they prevented the investment of millions of dollars in the State. Still, in spite of opposition, a few cotton mills were erected in the most favorable localities, enriching their stockholders and contributing to the wealth of the

whole neighborhood; and the antipathy to capitalists and corporations has gradually vanished, for the farmers in their vicinity have sagacity enough to comprehend that property has increased in value simply because all their products find a near and good market, and command better prices.

If a different and more far-sighted policy had formerly been adopted, we might now have scores of Sacos and Lewistons, and might have travelled far on the high road to prosperity.

Look at England, a country but little larger than our own State. Being destitute of water power, she is obliged to manufacture by steam, and so she has added engine to engine, until it is estimated that their aggregate power is equal to the united forces of 600,000,000 men, or each man in Great Britain has one hundred willing slaves to do his work who are entirely subservient to their overseers; slaves who never know fatigue, or experience sickness, or suffer from hunger, for they eat only fire and water; and forty thousand laborers delving in the coal mines can supply all their wants. And now see the effects. In consequence of this mighty power, directly and indirectly stimulating agriculture and commerce, she has piled up her vast wealth of $30,000,000,000.

By the invention and introduction of the spinning jenny and power loom, cotton fabrics, instead of being imported from India, at great cost, were made at home; hence the population of the country was no longer stationary; wages rose in every kind of employment, and the demand for agricultural products increased to such an extent that England became an importer instead of an exporter of grain.

Great Britain adopted a highly protective system until her ingenious mechanics had invented labor-saving machinery, and her cotton fabrics could be made cheaper than elsewhere, then she preached free trade to other nations, and would fain persuade them to attend exclusively to agriculture, and allow her to transport their cotton and wool and other raw materials to her own mills to be greatly augmented in value by the process of converting them into calico prints and other cloths, to be returned to them in exchange at her own prices. But there was no free trade in the machinery for spinning cotton, or in any other machinery. The exportation of that was expressly prohibited, and no drawings of it could pass through her custom houses, for her lynx-eyed officials were ever on the alert to prevent, and every possible obstacle was

thrown in the way of the emigration of her artisans; yet, Samuel Slater, in 1789, succeeded in eluding their vigilance.

He had qualified himself expressly to remove to the United States by laboring in the cotton mills in various capacities up to general superintendent. He made drawings of the machinery on the tablets of his memory, which he afterwards secretly transferred to paper, and finally he left his native country in a clandestine manner, and came to America to establish here the cotton manufacture by Arkwright's processes.

His practical eye selected as the sphere of his future operations, the Blackstone River, which between Worcester and Pawtucket, in a distance of thirty-five miles, falls about one thousand feet, and affords the amplest water power. He first erected a cotton factory at Pawtucket, and afterwards others at Slatersville. He also engaged in the woolen and iron manufactures, and no seeker of fortune among the golden sands or mines of California was ever more successful in acquiring wealth than this manufacturer on the banks of the Blackstone.

His example was contagious, and now on that river and branches at least fifty villages are engaged in the same profitable business, and thus numerous markets are brought to the very doors of the farmers, so that everything they can produce is in active demand. All the provisions they can supply are required by the busy operatives. All their wool is needed by the hungry mills, all their leather for belting, all their woods for machinery, bobbins, spools and fuel, and even the barren superannuated apple-tree is the only wood used for shuttles. So all the fragments are gathered up, nothing is lost; and the more each class prospers, the more they react upon and benefit each other.

Thus this rapid stream, which formerly ran to waste, has enticed genius and capital to its banks, through whose joint efforts it has been harnessed to useful machinery and made to labor with giant energy and ceaseless industry for the welfare of mankind; and so fast did business here increase, that first a canal and then a railroad was made expressly for its accommodation. To these causes, the city of Providence and all the surrounding country is largely indebted for their noted prosperity.

Look, also, at Connecticut, dotted all over with workshops, where the water power of every stream is occupied and used repeatedly; where steam and every other power is making every-

thing, so that the whole country is inundated with its machinery, wares of all kinds, and an infinite variety of useful articles, and see how agriculture is stimulated to the utmost degree to supply the home demand for farm products.

The manufacturer takes comparatively worthless materials, and after subjecting them to the labor of skilful hands and intelligent brains greatly augments their value; he associates others with him, and liberally invests capital in his business. From cotton he weaves the most useful prints; from wool, the finest broadcloths, carpets, and Gobelin tapestry; from feldspar he moulds the costly china and Sevres porcelain; from the precious metals he makes the most valuable ware; from the iron ore he forms the most potent engines, machines and tools; and from quartz, or the sand we tread under our feet, and potash from the ash-heap, he makes the beautiful transparent glass.

The greater the skill and genius with which he performs his work, the larger the sum he obtains for his merchandise and increases his ability to buy what he needs. Becoming rich and intelligent, he has more wants, both physical and mental. He buys in greater quantity and variety; he buys a better quality of goods and food, and thus becomes a better customer to the agriculturist, for the farmer not only needs customers, but he derives the greatest profit from those that have the most wealth and can pay the highest prices for the best products.

The National Government hereafter must necessarily afford adequate encouragement and protection to home industry, either directly or incidentally, by the imposition of duties on foreign merchandise to raise a revenue sufficiently large to pay the interest of the debt contracted by the present war, and so this debt, instead of crushing us, may, like the keystone of an arch, only serve to compact and unite us more firmly together; and even the war, besides being a rod of affliction and chastisement, may prove in its results a diviner's rod to discover and develop our own resources.

During the past half of the present century, the cotton manufacture has been one of the principal agents in extending the growth and prosperity of New England. It has opened new avenues to wealth, supplied new incentives to energy and activity, encouraged immigration, increased the current value of the lands, timber, mines and water-power, and has given steady employment to commerce. Although but a small portion of the cotton crop of the

country has been used in these Northern States, yet ample statistics show that they have received more benefit from it, than the whole crop afforded to the States where it was raised.

In this profit, Maine participated in a less degree than many of her sister States; but instructed by past errors, and by the experience of others, she has lately adopted a different policy. Becoming convinced that *capital* was the great want to set the wheels of busy machinery in motion and provide home markets, her Legislature wisely exempted the mills at Lewiston from taxation, and although they yield no direct revenue to the State, they more than pay indirectly. This is a step forward in the right direction. Feeling the impetus of this new policy, the cotton manufacture increased in Maine, from 1850 to 1860, 152.3 per cent., and the number of spindles 163.3 per cent., exceeding that of any other State during the last decade. And henceforth let capital and artisans and mechanics be enticed among us until we can make nearly everything we need for home consumption, and a surplus for exportation.

There are some special manufactures, the materials for which may be furnished by our own agriculturists, which consequently to them are of greater relative importance. Among these the woolen is second to none. The manufacture of wool is of great antiquity. All its varied processes were once laboriously performed by hand labor, but now the great majority are executed by ingenious machinery, under the superintendence of skilful artisans, producing a greater abundance and better quality of fabrics.

Wool is one of the most valuable gifts ever conferred by a bountiful Providence upon mankind. It can be converted into a great variety of clothing which is indispensable in our climate during the rigorous cold of winter, and which may also be adapted to summer use. Being a non-conductor of heat it prevents the escape of caloric and helps to keep the temperature of the body constantly at ninety-eight degrees at one season, while during the other, from its peculiar characteristics, it absorbs perspiration and obviates the deleterious effects of heat.

The short, stapled fleeced wools, as a general rule, are used in the making of broadcloths, cassimeres, doeskins, felts, &c., and the long fleeced and pulled wools are worked into those fabrics that require neither fulling or felting, such as flannels, muslin de laines, hosiery, carpets, lastings, &c. The mere mention of these

goods indicates their diversified use as articles of apparel for the whole person, and for other purposes. They require a great variety of wools, from the fine soft texture of the Merino down through the coarser grades of Southdowns, Leicesters, Cotswolds, to the hardy acclimated natives.

Broadcloths have not been extensively manufactured in this country, chiefly because they could not successfully compete with the foreign commodity, which could command an abundance of the best Saxon, French and Spanish Merino wool, but the improved Spanish Merinos of Vermont are not surpassed in the excellence of their wool by the best in Europe. These have already been introduced into this State, and may be multiplied to any desirable extent, so that enough broadcloth, equal to the best German, may hereafter be made for home consumption and thus retain among us the money now sent abroad.

The general prosecution of woolen and worsted manufactures would powerfully stimulate sheep husbandry. It would cover our thousand hill slopes with valuable improved flocks. The best wool and mutton would be produced, furnishing that clothing and meat most conducive to health, and blessing alike both buyer and seller.

Flax is another material which can be abundantly produced in the State. During the last session of Congress, (1862-3,) an appropriation of $20,000 was made, and three Commissioners were appointed to investigate to what extent flax and hemp could be profitably manufactured and substituted for cotton. Much is hoped and anticipated from their researches.

Science and ingenuity have already coöperated to diminish the labor required to produce linen fabrics from the raw material, and it is not chimerical to expect in this age of progress, that some new chemical processes for releasing the flax from its glutinous envelope, and improved machinery for effectually separating it from the brittle woody substance with which it is united, may soon be discovered, so that linen tissues of every description, from strong cloth to the costly lace can be so cheaply made as to compete successfully with cotton goods.

Then the farmer, being relieved from the laborious and tedious work of rotting, drying, breaking, scutching, hackling, &c., would more generally cultivate flax and leave the subsequent manipulations of the crop to those who provide at convenient points special establishments for the purpose with the necessary fixtures and

appliances, and whose capital and skill can be more economically and profitably employed. Thus a ready market would be provided to which the straw in any quantity required could be sent as soon as harvested.

The production of leather has most intimate relation to the interests of the farmer, stock raiser, manufacturer and merchant. It employs abundant capital and numerous agents. It consumes every skin of flocks and herds at home and sends ships to foreign lands for hides, and strips the bark from oaks and hemlocks to tan them. Every member of the human family, unless outside the pale of civilization, needs to be constantly shod with leather. It is essential, also, for gloves, harnesses, book-binding, and other purposes. No other substitute so useful, so valuable, has yet been discovered.

The total value of the leather produced in the United States for 1860 was $63,090,750, of which New York produced twenty millions; Massachusetts, ten millions; Maine, two millions, and all the Southern States but four millions.

Its manufacture into boots and shoes in the country employs a larger number of operatives than any other single branch of industry, not even excepting cotton, all of whom must be fed, and clothed, and housed. Massachusetts has derived a large share of her prosperity from this business, having made boots and shoes in 1860 worth $46,000,000, equal in value to more than a third of all the cotton ever exported in any past year. The largest production of any one town was that of Lynn, amounting to $4,867,399. In Haverhill it was valued at $4,130,500; and one company of proprietors in North Brookfield made, in a single establishment, boots and shoes worth $750,000, and in all five of their establishments, over a million pairs valued at more than $1,300,000.

In 1859, the shipments and sales of Boston dealers amounted to more than 750,000 cases, for which they received $43,120,000. Thriving villages have sprung up, population and capital have increased, the ingenuity of her mechanics has manufactured an article of the highest perfection ever attained. Whatever their cunning Midas fingers has touched, handled, wrought, has turned to gold.

These statistics and facts convey important instruction. Maine may well sit at the feet of the mother State and learn useful lessons. If we profit by her teachings and example, we shall intro-

duce the same lucrative manufacture throughout the length and breadth of the State: then no longer shall our flocks and herds be driven every autumn across the borders and sold abroad, but their skins and meat will find a ready market at home, the one being converted into leather and made into useful fabrics, the other contributing food to those engaged in their manufacture, and thus both shoemaker and stock raiser will be mutually enriched.

The manufactures of iron are of great importance and furnish many useful articles of prime necessity to every individual in the community, We cannot well build houses or warm them, cook food or partake of it without them. Upon iron we are mainly dependent for tools and implements, without which we could not properly till the soil, sow the seed, cultivate the growing crops, and gather the ripened harvests. For utility it is more valuable than gold, and worth more to mankind than all the metals termed precious. Of this useful metal Great Britain furnishes more than one-half of all produced in the world, yet the United States has more in quantity lying dormant and undisturbed, awaiting the application of capital and labor to prepare it for widely diversified purposes. Maine has an abundance to supply the smelting furnaces in many localities where the necessary fuel can be cheaply furnished and the means of transportation provided.

Among the most promising ores is that in Wade plantation, Aroostook County. This iron has remarkable strength and tenacity, and like its counterpart in Woodstock, N. B., is the best for sheathing our iron gunboats, and hence it is of national importance. Great Britain has used plates manufactured from the Woodstock ore in the construction of the Black Prince, having ascertained, by experiment, that while plates made from other iron were shattered by projectiles from an Armstrong gun, these were only slightly indented. If our Government, convinced of its superiority and value for naval architecture, shall engage in its manufacture, and furnish the best means of transportation, it will thus indirectly promote the interests of agriculture in that whole region.

The most important bog iron ore is at Katahdin Iron Works. The metal is easily and cheaply reduced, but it costs from five to six dollars a ton to convey it to Bangor. A railroad in that direction would very materially diminish the expense of transportation, and render its manufacture profitable. It would also make the

slate quarries at Brownville and vicinity easily accessible, where may be procured any quantity of roofing slates and slabs, which in quality are equal to the best productions of Wales. And were both mine and quarry wrought to the fultest extent, villages would grow up and afford markets to a surrounding population.

A large amount of iron produced and used in any country is a guage of its progress in agriculture, manufactures, commerce and civilization. It tells of better agricultural implements, of improved husbandry, of an increased demand for food and other supplies for thousands of miners, machinists, and makers of nails, cutlery and hardware. It tells of the construction of railroads, telegraphs, steam engines, locomotives, machines for sewing, spinning, weaving, mowing, reaping, threshing, all the various instruments of science and the arts, of peace and war. It calls into requisition, steamboats, ships, cars, and every kind of transportation, and employs numerous merchants and capitalists.

In the fabrication of these implements, the different kinds of wood are essential, of which the State contains an unlimited supply. And when winter has planked over every stream, and its snows have opened a passable highway to every tree, and our farmers can no longer work their fields, then it is practicable for them to remove even the giants of the forest, and convey them where they may be manufactured, not only into all those structures requiring the joint use of iron, but also into furniture, wooden ware, casks and boxes. And these lumbering operations give employment to many agriculturists and their teams during a leisure season, and require their surplus hay and provisions. And so the capitalists, easily obtaining the necessary iron and wood, have already erected shops for making machines, plows, scythes, axes and shovels, and it is hoped that these are but harbingers of many others which shall dot the whole State and employ numerous operatives.

During the past year, the first glass works ever erected in the State have been established at Portland, and are now in the full tide of successful operation ; and it is confidently expected that they will prove a source of profit to the stockholders, and add much to the business prosperity of that city. Maine furnishes the bricks and lime for the necessary buildings, the materials to be manufactured, and the engine to crush the quartz.

The clay is moulded into crucibles which are arranged in the

furnace and filled with a fixed alkali, silex and other ingredients which enter into the composition of glass. Heat is applied, and the different articles are fused together. The molten mass is without form and void, but the skilled artisan breathes upon it, and it forthwith crystalizes into things of beauty and utility, and henceforth gives light and cheerfulness to our dwellings, and ministers to our necessities, or he pours it into carefully constructed moulds, and it assumes shape according to his will, and becomes a chosen vessel of usefulness and honor.

The manufacture of straw is also a source of great profit. It involves the expenditure of considerable capital on the part of the principal dealers in the fabric, and when shrewdly and wisely managed, has yielded them great wealth. It enables a comparatively poor country to support a large population. Massachusetts employs 10,000 persons in this branch of industry, who make 6,000,000 hats and bonnets annually.

Were a traveller in that State to pass through Foxboro', Mansfield, and other towns in the vicinity, he would see an active, industrious people, houses manifesting good taste, and everything indicating general thrift and prosperity, nevertheless he would observe that the country was comparatively flat and barren, yet producing a flourishing crop of rye, but on inquiry he would learn that the foundation of all this wealth was straw, that "Foxboro' was built of straw."

The material employed in the manufacture of bonnets is rye straw, and the imported Florence braid made of a species of grass. Formerly the material was mostly foreign, now the domestic is principally used. This rye straw is first whitened or bleached with the fumes of burning sulphur; it is then drawn over a comb-like instrument having sharp teeth which penetrate the stalk and divide it into strips. In the subsequent processes are employed men, women and children, who receive a liberal remuneration for their labor. The more ingenious make the necessary ornaments from it. The children braid, the women sew, and the men press the bonnets on blocks, principally in factories constructed for the purpose. Sewers are paid according to the amount of braid, and an experienced person can sew enough to make from three to six bonnets, earning, on an average, fifty cents a day.

The style of bonnets changes three or four times in a season, requiring alteration in blocks to correspond to change in fashion.

They are chiefly made for the New York market, and when sent at the right time, or as soon as possible after the fashion is received from Europe, a great profit is realized.

A flat country is best adapted for the straw manufacture, a hilly, on account of its water power, for other manufactures ; hence the one is the natural complement of the other.

Maine has an abundance of sandy soils, abounding in silex, well adapted for the cultivation of rye, and ought, at least, to make bonnets, hats and straw carpets enough for home consumption, then her sandy plains shall wave with golden grain, and many now idle fingers shall engage in a healthy, lucrative employment.

The cultivation and manufacture of the osier willow would doubtless be profitable to the agriculturist and beneficial to the State. The value of this willow in its crude and manufactured state, annually imported into the country, amounts to $5,000,000.

The price of the canes is from $100 to $130 a ton in weight. The cost of raising them is found to be from $30 to $50 a ton, and an acre will yield from one to four tons.

The best situation for an osier plantation is a low, level tract of land, which can be drained and also overflowed during a drought, though the flowing is not absolutely essential, with soil deep and moist, but which can be thoroughly worked with plough or spade.

Maine has many rich meadows and valleys adapted to its cultivation, where it is believed it can be produced as cheaply, and of as good quality, as in any other country, and to any extent the market may demand.

The osier is propagated by cuttings from one to three feet in length. These can readily be procured from the Patent Office at Washington, from thrifty plantations in Vermont, and from nurseries in this State. They are set diagonally two-thirds of their length in the soil, one foot apart and in rows three feet apart. In the season of growth they are judiciously thinned by breaking out superfluous buds or shoots ; the ground is ploughed between the rows twice a year, or if this is impracticable, the grass is extirpated by hoe and spade, or cut with a sickle.

The shoots are cut every year within an inch of the stump, and tied into large bundles, the lower ends of which are thrust into water until they are peeled. The bark is removed by drawing them through an iron-edged instrument called a brake, or by means of a labor-saving machine invented by Mr. George H. Colby of

Vermont, which does the work cheaply and effectually. They are then exposed to the air and sun until they are properly dried, and afterward interwoven into baskets of various form and size, carriages for children, coverings for demijohns, &c.

The manufacture of broom corn into brooms is an important branch of business in many parts of the country, from which very considerable profits are derived. The demand for them is very general and constant. Every tidy, industrious housewife needs several of these useful instruments every year.

To Dr. Franklin, that distinguished advocate of domestic economy, is the United States indebted for the introduction of broom corn as an agricultural product. It can be raised in almost any soil where Indian corn can be produced, though rich alluvial lands are best adapted for it. Its terminating brush furnishes the material from which brooms of the best character are made ; its seeds will often more than pay the expense of cultivation and preparing the crop for market, as they are excellent for fattening sheep, and for feeding cattle when ground with grain ; its broad leaves afford forage, and its long stalks contribute to the value of the compost heap.

An acre, on an average, will produce five hundred pounds, worth $30, (a ton of the best quality will now sell for about $200,) while the cost of cultivating, harvesting and cleaning of seed by horse-power scraping machines, amounts to only $10.75.

The entire cost of a broom is but ten cents, including the price of brush, handle, wire, twine, labor and use of requisite machinery. It has been ascertained that the capital invested by the Shakers in the business has yielded a net profit of from five to twenty-five per cent., and there is no good reason why any section or class should have a monopoly. Competition is open to all who may incline to engage in this employment and participate in the advantages. Were this manufacture introduced into the State, our farmers would be stimulated to cultivate this crop, so beautiful in appearance, and enough brooms might easily be made for home use and a surplus for our neighbors in the British Provinces, where it cannot be profitably raised.

Many other small manufactures might be appropriately mentioned, which are nevertheless great in their aggregate results, but the object of this paper is now accomplished, if it shall simply direct attention to a subject second to none in importance.

That the more general prosecution of manufactures in the State would powerfully stimulate and benefit agriculture and kindred interests, would seem to be a self-evident proposition, requiring neither argument nor demonstration, yet the plainest truths are often latent. They are like seeds which long lie dormant in the earth until favoring circumstances cause them to germinate and grow and bear fruit; so these truths may need line upon line, and precept upon precept for their elucidation, that they may be fully comprehended and believed, and that faith may manifest itself in works.

All the avenues to wealth and independence are wide open, the goal is in full view, and it depends upon the present generation to determine whether Maine shall enter zealously upon the race of progress; whether manufactures, agriculture and commerce shall harmoniously advance with even strides, each keeping step to the music of the other, and all powerfully contributing to a common prosperity.

Let educated intelligence, discriminating capital, and skilful labor, vie with each other to discover and develop all our resources, all the capabilities of steam, caloric, electricity and all other elemental forces with their applications to the useful arts. Let a wise governmental policy encourage them by every feasible method, and give them all full play. Then shall the State, throughout its whole area, teem with industrious millions of enterprising inhabitants, and become a seat of power and influence commensurate with its natural advantages and resources.

We respectfully submit the following resolution for adoption by the Board.

J. C. WESTON, *for the Committee.*

STATE OF MAINE.

BOARD OF AGRICULTURE, Jan. 22, 1864.

WHEREAS, the prosperity of agriculture depends greatly upon the extent of the home demand for farm products; and because such demand is smaller here than it is in other States, where the number of consumers is proportionately greater than it is in Maine; and because the value of land in Maine is consequently less than the same quality commands where manufactures prevail to a greater extent; therefore,

Resolved, That we recommend to the Legislature the adoption of such measures as in their judgment may most effectually encour-

age the prosecution of all branches of industry, and especially the establishment of manufactures of every sort for which we have sufficient water power and other natural advantages.

This report was discussed not only in formal session, but at one or two informal meetings, at which the joint Legislative Committees on Manufactures and on Agriculture, together with other gentlemen, were present and participated.

Hon. Mr. Cram of the Senate presided, and remarked that the committee of which he was chairman had now under consideration a bill to permit towns to exempt manufacturing corporations from taxation for a limited term of years—and would like an expression of opinion from those present in regard to the expediency of such an enactment. He was himself in favor of a liberal policy—one which would invite the investment of foreign capital. He believed that all interests were linked together, and that what aided one would benefit all, either directly or indirectly.

Hon. Charles Holden of the Council, in response to an invitation from the Chair, spoke as follows :

I came in, Mr. Chairman, to listen to the essay of my friend, Dr. Weston, and I am happy to say, what I have no doubt all of this audience feel, each for himself, that I have been highly interested and instructed. Though I was detained in another part of the capitol, for some time after the exercise commenced, I have heard sufficient of it to assure me that it contained valuable matter, which the people of Maine ought to well understand, and that it is full of that practical wisdom, which is of immense interest to everybody. I have not the conceit to presume, that on this topic, so well illustrated as it has been, I can add much, if anything. It is essential that some one should begin the discussion, and I am very happy, if it be necessary, to break the ground, with a few words of commendation, if thereby our interchange of opinions may be facilitated. It is good to talk these matters over here, not only for ourselves, but for the State at large. Thanks to the facilities of the printing press, what may be said here by this little band, will find its way into the hands of thousands of the people of the State, to be by them conned over and made available. Hence, I hope, that the men of well-trained minds and practical information, whom I see all about me, will make this a free and general discussion, that what they are so well posted on, may, by means of the

faithful reporters present, find its way to every nook and corner of the State, and thus do a most blessed work.

Let every one present, so far as the time will permit, give his assent or dissent to the doctrines of the able Essay just read, and his reasons therefor, and thus these points laid down, apparently so essential to our material growth as a people, will be sustained by the testimony of many witnesses, or shown to be fallacious, and of consequence not proper to be relied on.

One or two subjects commended themselves to me particularly as the reading of the Essay progressed. It was a great thought, that you may graduate the use of all things employed in the arts by the use of *Iron*. There have been the dark ages,—the golden age,—the age of literature and science,—and there has been the iron age. As an element of force and service, iron has no superior. Other things being equal, the iron age may be accounted a grand and noble one. The speculative and trading minds of many of our people are watching, from day to day, with feverish anxiety, the fluctuations in the price of gold, and its concomitants—but a far more important observation is that, which watches what progress is making in the various new modes of use, and new inventions, into which the imperial metal, *Iron*, is being transformed. The operations in the former are ephemeral, and the stock market, and its wonderful capriciousness, will cease to hold in wonder its worshippers, when the present emergency ceases. But the march onward to perfection, of the latter glorious metal, will denote the progress of that nation, which turns and moulds it to greatest amount and variety of utility. Let the lovers of iron not lose their devotion by the brilliancy of the gold question—but in the truest sense make this to be celebrated in history as the "Iron age."

Another suggession in the Essay won my attention more particularly. Dr. W. spoke of the Osier willow, and of the propriety of its cultivation in this State. I was not aware till now, that it was grown in Vermont. I have no doubt it was carried thither from Hartford, (Conn.) On two visits to that city, in my public capacity, within the last two years, among the many exhibitions of industry and art in that lovely place, I was highly interested in examining the Osier plantation there, which was introduced from Germany by the late Col. J. C. Colt. Among the many enterprising and far-reaching plans put in operation by this wonderful man, for the enriching and enlarging the city of Hartford,—and which

has done so much for that beautiful spot,—he conceived that the growth of this twig would be easily effected in that soil,—that it would be a new facility for employment and trade, and would help to enrich himself. To conceive of an enterprising measure and to do it, with him, were coincident, and the Osier was brought along, set out, and the workman from the fatherland came with it, to transform the delicate shoots into a thousand shapes of beauty and utility. Should you visit Hartford, Mr. Chairman or gentleman, it is quite unnecessary, I have no doubt, for me to say, do not fail to visit the beautiful workshops where this material is twisted into so many elegant and substantial forms; and also observe the modest and unique residences of these people—for they brought their customs and home habits with them, and have not yet shaken them off for those of America. They live in a quarter of the city by themselves, and their peculiar structures, and that part of the place, is by no means the least attractive to the stranger. I would that the State of Maine were favored with many such indefatigable and keen-sighted men as the late John C. Colt.

Seizing upon two or three points like these, which particularly won my attention, I leave others for the elaboration of those who may follow me. All through this Essay are valuable suggestions and facts affording ample food for thought. They have interested me very much. I was glad to hear the point made so resolutely against the doctrine—now, I am thankful, very much weakened from that of old times—that inducements should not be offered by our State, to bring in capital from other States, to help improve and make profitable our great natural wealth, now lying rough and unwrought.

The old democratic party, whose prestige is fast fading away, suffered itself, when it controlled the public interests of this State, to embrace this fallacy. A close, narrow policy, which so embargoed our splendid privileges of field, forest and flood, that the capital which would gladly have made them sing with the resounding echoes of cheerful thousands bringing them into life, beauty and use, found other avenues for their wealth, enriched other lands, and made *them* sing, while ours lingered for years in pristine solitude. This policy was one of the avenues through which this grand old party—to which I was in former days proud of my allegiance—lost it arterial blood. Tax foreign capital heavily, was the urgent doctrine of that dominant party—and it was done; but

as the fiat fell upon the capitalist who was knocking at the door of the State for admission—it fell with more ominous echo upon the party that enforced it. That fiat has been lifted. The capitalist has entered and been gladly received—but the party which laid the ban, in its power and exclusiveness, has become feeble and harmless.

The time will come, when, from this enlarged policy towards strangers who would enrich our land while aiding themselves, the State of Maine shall indeed blossom in its yet untrodden fields, with a perpetual splendor. And it shall be through the doings of this Board, if its members be true to their duties, that many of these advantages, growing out of this more enlarged and healthy state of things, shall be effected.

Mr. Holden continued his remarks still further, and spoke of the unwise policy also heretofore taken by the State in excluding manufactures by imposing heavy taxation; and notwithstanding the fact that the people of the State will be heavily taxed hereafter on account of the sore trial that had been for wise purposes put upon them, yet the subject of the proposed bill commended itself so thoroughly, that he thought the State owed it to herself to do something to encourage the starting of manufactures, partly for the benefit that would result therefrom to the people of the State, and partly to make amends for its unjust policy heretofore.

He closed with an elegant description of the future of Maine, when, through the liberality of the State, there should be opened new avenues for the strength, sinew, and power of our people, many of whom, young and vigorous, will be returning, ere long, from a necessary but bloody war, successfully, gloriously closed for the whole world of humanity; and who will then turn with new vigor and zest to the arts of peace—building up and extending all over Maine, pursuits that will add untold wealth and strength and grandeur to our beloved State.

Mr. Goodale said he could not expect to add anything to the force of the views presented in the report, but would make a few remarks. The prosperity of agriculture depended in a great measure upon the number of *consumers*. Many have supposed that it is simply the commerce and manufactures of England that have made her so powerful a nation, and that in these centered her greatest interests, but it is not so. Her agriculture is greater than either, or both together. McQueen states the extraordinary fact

that the *animal manure* (throwing out of account the immense amount of artificial fertilizers used) annually applied to the crops in England, *surpasses in value the whole amount of its foreign commerce;* and Daniel Webster tells us there is no doubt that it greatly exceeds it.* But all this does not suffice to meet her wants. She has to go to the ends of the earth for supplies of food, that cannot be grown at home, for her immense population. Why is this? Because manufactures are fostered, and because, being fostered, agriculture and manufactures go on hand in hand. Her food is all consumed at home. No large portion of its value is absorbed and lost to the producer by transportation.

We may have it so here, if we will. Our water power, navigable streams, raw material and other natural facilities exceed those of any other New England State; but they are not improved as they should be, nor as they might have been. There was formerly —and it was very disastrous in its effects—a strong prejudice against the employment of foreign capital. It was thought that if rich men came among us to get richer by establishing manufactures, that, somehow, it must be at our expense. We are just beginning to learn that every dollar so invested is a help to every one in the community. The money so invested creates a demand for labor, and it pays for that labor. It creates a demand for all the products of the farmer, and pays better prices for them than the farmer can realize from their sale in a distant market. It enhances the value of real estate all about it. It helps to pay our taxes, and bears its share of all public burdens; and while we have these advantages in prospect, may it not be well to exempt capital so engaged from taxation for a brief term of years, in order to secure them all before long? He thought so, and thought it wholly safe and democratic in the true sense of the term to let the people of each town decide for themselves. He well recollected, as a boy, the current gossip in the town where he resides, regarding the proposed establishment of cotton manufactures, thirty-five years ago or more. The Boston capitalists who bought Factory island and its water power were stigmatized as "aristocrats," "cotton lords," &c., their advent was not welcomed, little aid or sympathy did they get from the town's people. But now, we understand the working of it better, for the price of land and its products has advanced pretty steadily ever since; while an occasional check to

* Works of Daniel Webster, Vol. 1, page 448.

manufacture has repeatedly shown the difference between activity and stagnation. Nobody now wishes them away, and he ventured to say the same is true about Lewiston. The matter is now better understood throughout the State.

Again, we have abundance of raw material of numerous kinds. Take iron for one example. We have its ore in abundance and of a quality not surpassed if it is equalled in the world. Plates from the iron made at Woodstock, N. B., were proved at the trials at Shoeburyness, Eng., to be impenetrable to the heaviest shot, which shattered all other sorts tested. The pirate Alabama is plated with that iron, made within ten miles of our line. We have inexhaustible quantities of the same ore within our lines, but not a ton of it has ever been smelted.

Then for water power, we have hundreds of places in Maine where it can be bought for a quarter the cost of a steam engine of the same capactity; and while the former will run forever at no charge, the latter must be fed continually. This improvement of our natural facilities and resources is the surest and readiest way to enable us to bear prospective burdens and put us on the high road to prosperity.

William D. Dana of Perry spoke of the influence upon agriculture caused by the manufacture of iron in Washington County, and said that land which before was worth but $4 per acre is now worth $40. Wood in the Pembroke market has risen from $2.00 to $3.50 per cord, and other farm products in proportion. By the encouragement of manufactures a market was made at home for all farm products, which obviated the necessity of paying transportation to a remote market. He spoke of the fact that young men and women had been obliged, heretofore, to leave our State to obtain employment in factories and shops of Massachusetts, and hoped the remark that "Maine was a good State to emigrate from" would never be said of us in the future.

Mr. Waterman of Robbinston said the farmers in his section found it difficult to raise enough now to supply the demand. Potatoes in the spring were usually worth $1.00 per bushel, and butter 30 cents per pound. The price of land and the price of house-rent had also advanced in a tenfold proportion in as many years.

Mr. Anderson, President of the Board, spoke of the intimacy of the relation between agriculture and manufactures, and expressed his opinion in favor of such a law as had been proposed.

Mr. Dingley of Auburn referred to the growth of Lewiston within the past fifteen years, all of which was caused by the manufactories in the place, and of the advantage it gave the farmers; yet strange to say, the farmers at first thought the building of mills would be of no benefit to them. What was the result? The town is now four times as large as it was then, and farmers, instead of going to Bath and Portland, a distance of twenty-five or thirty miles, now have a ready market and high prices at their own doors. He believed the former policy of the State in excluding manufactures to be a bad one.

Mr. Woodman of Portland made some remarks in which he contrasted the trade of that city now with what it was twenty-seven years ago, and the influence of manufactures in building it up, increasing its business, and adding to the value of real estate. It now has its manufactures of glass, iron, sugar, and numberless other branches of productive industry. The farmer, trader and manufacturer have an interest in common. One business firm in Portland now performs annually as large an amount of business as was transacted by all who were engaged in the same branch of business in 1827.

Mr. Kelley of Newburg said he had formerly been a resident of Massachusetts, and had noticed the change that had been wrought upon the Merrimac river by the establishment of manufactures, and the wealth that had accumulated there by their agency. He spoke of the advantages of Maine for the purpose of manufacturing, and regarded them as superior to most of the New England States. We have a healthful climate, and we produce the men capable of making the best use of the capital employed in manufacturing operations. Capital is useless without the hand of man to develope and give life to the work which it constructs. Capitalists, twenty years ago, had been discouraged from coming into Maine on account of the wrong policy of a political party then in power, and had it not been for that, he believed Maine would at this day have stood ahead of her sister States in all the industrial pursuits of life. But those days are past, and now is the time for us to employ our long neglected resources and capabilities, and the State should extend the utmost liberality and encouragement to every branch of manufactures.

Several other gentlemen spoke on the subject, all agreeing substantially with the views above given.

The report and resolution were subsequently adopted.

Mr. Goodale, Chairman of the Committee on the proposed Agricultural College, submitted the following Report:

The Committee to whom was given the question "What action will the Board recommend in respect to the proposed Agricultural College?" report: That the more thought has been given to the subject, the more hesitation is felt in expressing a decided opinion regarding the action which would, at the present time, best subserve the interests of the people of the State. The magnitude of the interests involved, reaching as they do into all the future, affecting the development of our untold natural resources and defying computation; the novelty of the subject, the limited experience of similar institutions in this country, together with our comparative ignorance of their working and results; the probable inapplicability to the wants and genius of our people of the methods of other countries; the doubt which exists in the minds of some regarding the extent to which its want is actually felt at the present time among the industrial classes, for whose benefit it is intended, and consequently regarding the probable number of pupils who would, at an early day, avail themselves of its advantages; the uncertainty which attaches to the money value of the grant made by Congress for its endowment, its probable insufficiency *suitably to endow* such an institution as is felt to be needed and to be required by the act; the objections to having it incorporated with any of the existing literary colleges; the necessity, arising from the burdens of the war, of incurring no expenses beyond those palpably needed to meet the wants of the State—all these, and other considerations which might be named, contribute to the hesitation above alluded to.

With only such dubious data with which to arrive at conclusions, your Committee suggest whether it would not be wise to endeavor to obtain an extension of the time during which the College may be provided and set in operation. By the terms of the act five years are allowed for this purpose—dating probably from its approval by the President, (July, 1862.) In all probability such an extension might be obtained, and especially if several of the States should unite in the request, as it is believed they would gladly do.

In view of the disturbed condition of the country, so different from that which prevailed when the bill was under consideration in Congress, the request seems a very reasonable one. The obtain-

ing of it would in nowise hinder the establishment of the College at the earliest practicable period after satisfactory conclusions were reached; while it might lessen any liability to the adoption of ill-judged or unfortunate measures.

Your Committee also suggest the propriety of recommending to the Legislature the appointment of a commission whose duty it should be to investigate the subject in all its bearings as thoroughly as possible, to inquire into the methods, condition and prospects of similar institutions elsewhere, and to report thereon to a subsequent Legislature.

With a view to placing these suggestions in a form for action, the following resolutions are submitted:

Resolved, That the Board of Agriculture recommend to the Legislature that it request of Congress an extension of the term during which the Agricultural and Industrial College may be "provided" by the State.

Resolved, That we recommend also the appointment of a commission whose duty it shall be to investigate all points connected with the establishment of such a College, and to report thereon to a subsequent Legislature.

The report gave rise to some discussion the main point in which was, whether the expression in favor of an independent institution was as strong and decided as it should be.

Mr. Anderson said if the Board is of opinion that it is better to have the institution established upon its own basis, let that opinion be expressed; if it has a contrary opinion, let that be as expressly stated—but let there be no obscurity in the language.

If this institution is established upon its own basis, it may not go along so smoothly for the first few years as if it were connected with some already established literary institution. The governing principle of our action should be, what will be best for a series of years—and we all know that it will commend itself better to the farmers and mechanics of Maine to have its establishment an independent thing. The professors, tutors, pupils and all, had better live for a few years in a log house, if it can have a good farm, good farm buildings, and have the branches well taught. This is the best way to begin. If the State can give $20,000 to such an institution of learning as we already have several of, he believed it could give $100,000 to an institution that would be of such vital moment to the inhabitants of this State from one end to the other,

as this will be. He alluded to the difficulties arising from connecting the proposed Agricultural College with some literary institution, among which were the social caste it would create among the students, difference in the objects of the course of study, &c.

Mr. Goodale said the object of the Committee in making the report was not to go over ground already fully covered before. The Board was already fully committed in favor of having it upon an independent basis, by its action last year. The present report threw out the idea that *probably* the fund was insufficient to endow such an institution as we should want at the recent price of the public lands. But if we should wait a few years they will undoubtedly increase in value with the increasing influx of foreign emigrants to our country.

It also enumerates the causes of the embarrassment of the Committee in coming to a decisive opinion upon many points. These are expressly stated in the first half of the report. What is the reason why we do not set down and carve out a detailed plan at once? Simply because there are so many objections to encounter, and these objections are expressly stated. If the phraseology of the report was not distinct enough, it could easily be amended.

The report was then amended by adding the following resolutions:

Resolved, That the Board fully assents to and endorses the sentiments expressed in the resolves upon this subject which were adopted at their session of last year.

Resolved, That in the opinion of this Board it is desirable that the Agricultural and Industrial College should be put in operation at the earliest period practicable.

And thus amended the report was adopted.

Report on Third Topic—to wit: "By what methods may the usefulness of Agricultural Societies be increased?"

The condition of our Agricultural Societies, and the general policy manifest in their operations, were examined at some length during the last session, and the limited powers attaching to the Board were exercised in moderation, to lead the several societies to that course of practice deemed consistent with the design of the act conferring State aid on them.

To what extent the recommendations then made by the Board, may ultimately affect them towards the realization of greatest

good, we can hardly estimate from the returns of one year's operations.

The records of the Board show that we have been constantly mindful of the fact, lamentable as it is, of the exceedingly moderate accumulation of practical data that is annually expected from experimental operations in agriculture and kindred pursuits,—data on which all progress essentially depends. That something more is wanted in that direction to give vitality, is self-evident.

The efficiency and success of Agricultural Societies are based on the public spirit of the men who compose them. Their present system of operations is the outgrowth of their experience,—in some cases now extending through an existence of many years.

The policy of the Board, limiting its interference to simple suggestions, we trust will not be reversed without due reflection, and for the most palpable and cogent reasons. Too much stress cannot be laid on the importance of a compliance with existing regulations, where written statements are made the condition on which premiums are to be awarded.

Your committee submit for consideration, a plan that if adopted by the societies in their regulations, may go very far in removing present remissness,—if regulations may ever be expected to control or affect human actions or propensities in matters of this sort.

STATE OF MAINE,
Board of Agriculture, Feb. 1, 1864.

Resolved, That this Board recommend to the several Agricultural Societies, receiving the bounty of the State, that they so amend their regulations as to require all competitors for premiums on crops, dairy products, or other objects for which existing laws require a written statement, including such cases as involve an account current for the season *as a necessity* to the completeness and reliability of such statement when made, to enter their intentions to so compete, in the months of April or May; and that the Secretaries of the Societies be requested to return a list of such entries to the Secretary of the Board, at the close of the month of May in each year.

And to the end, that the habit of awarding premiums on accidental crops, products and results, should at once be superceded by a better and more honorable practice, we recommend that the premiums be so reduced in number that the means at command

will allow them to be of such magnitude as will secure an adequate compensation for the time and labor consumed in the experiment.

C. CHAMBERLAIN, *for the Committee.*

Mr. Rogers did not regard the plan proposed in the report, of increasing the usefulness of societies, as one that could be carried out so as to add materially to the present operations of the societies. He regarded the statements made by exhibitors of articles at our shows as of little account, and questioned the expediency of requiring them.

Mr. Jaquith said that crops were frequently entered for premiums when the statements in regard to their expense was not inserted; if it was, the statements were often incorrect. The amounts of crops harvested were often over-estimated.

Mr. Lee did not wish to oppose the plan suggested, but only to question the practical results of the thing. The statements of premium crops, as published in the Secretary's reports, were of but little account, or real use. Was willing to favor any plan that would bring a different result.

Mr. Goodale. The statements of premium crops for the last two years, have not been published, not because they were not good and useful, but because they would occupy too much space, and swell the annual volumes beyond usual size.

Mr. Chamberlain regarded it to be competent for the Board to instruct societies, through its Secretary, how and for what articles or crops premiums shall be awarded. If it had stepped out of its sphere, it was in recommending the entries of premiums to be made in the spring.

Mr. Rogers thought agricultural societies knew better what was the best way to conduct their affairs, and that the Board should not instruct them in so doing. What was the best course of procedure in one section, would not do for another.

The report was accepted, and left to the disposal of the Secretary.

Mr. Rogers, for Committee on Fourth Topic, submitted the following report:

The Committee to whom was referred the question, "What have been the most profitable branches of husbandry the past year?" have had the subject under consideration, and report, that among the numerous branches of husbandry that have been prosecuted, and the diversified circumstances under which they are prosecuted,

that it is difficult, if not utterly impossible, to determine precisely which are the most profitable. That branch of husbandry, or that crop, that would prove remunerative in one locality, might prove very unprofitable to another differently located.

We have, however, no hesitation in saying, that the hay crop of our State is by far the most valuable and important crop that we produce, and generally all our farm operations, particularly in the older parts of the State, should be conducted with a view to increase the fertility of our grass lands, and augment the hay crop. We believe that the thrift of those who attend to farming exclusively, and who pursue a mixed husbandry, as do most of the farmers of this State, may be very correctly estimated by the amount of hay they cut.

From the meagre statistics returned the past year, embracing less than half the towns, we learn that there was harvested in those towns in 1862, 370,238 tons of upland hay, which, at $10 per ton, a low estimate of the average price of hay at the barns that year, would amount to $3,702,380. The amount of interval and other low land hay, was 80,484 tons, which, at $5 per ton, amounts to $402,420, making the aggregate amount of $4,104,800 worth of hay returned. Now multiply this amount by two, for you will bear in mind that returns have been received from less than half the towns, and we have $8,209,600, as the value of the hay crop of that season. Admitting that there was the same amount of hay cut the past year, and fixing the average price of upland hay at $15, and interval and other low land hay at $7½, which we think is below the average market value, and we have $12,215,790, as the value of the hay crop of this State the past season, an amount three times the value of all the corn, wheat, rye, barley and oats, that are produced in the State. It will be seen that the raising of grass is not only among the most profitable, but is the most important branch of husbandry in which our farmers engage, and should receive their first attention.

In order to secure the highest prosperity of the farmer, it is not only necessary that he should secure an abundant crop of hay, (in so doing he has made a beginning in the right direction,) but he should also dispose of it to the best possible advantage. In treating upon the topic under consideration, it is proper that we endeavor to ascertain what method of disposing of this crop has yielded the best return the past year.

When hay brings, as it now does upon our seaboard and along the line of our railroads, from eighteen to twenty-two dollars per ton, the inducement to sell is great. We believe that ordinarily, aside from the value of excrement, hay does not yield a return of eight dollars per ton in rearing stock for the market. Of course there should be kept sufficient stock suitably to conduct the operations of the farm, and to supply the wants of the family. Beyond the keeping of the necessary stock, which may usually be done to a great extent with the poorer qualities of hay and other forage not suitable for market, with the addition of roots or other provender, we are forced to the conclusion, that more profit has been derived by farmers in many parts of the State, by selling their hay than by feeding—but these hay-selling farmers should make use of every available means to sustain the fertility of their fields or they will find not only their farms but their purses progressing in the wrong direction, for mother earth, bounteous though she is, ought not to be expected to discount liberally, long after she ceases to receive deposits.

Sheep husbandry, to those favorably located for prosecuting it the past year, has been one of the leading, and perhaps we may venture to say, the most profitable branch of husbandry in which any considerable portion of our farming community have been engaged. By referring to the report of the Commissioner of Agriculture, it will be seen that in 1860, woolen fabrics were imported to the amount of $37,763,745, an excess of twenty-one per cent. above the amount of imports for 1850. Besides this, large quantities of foreign wool are imported and manufactured in this country, to supply our wants.

It is estimated that the people of the United States use annually about four and a half pounds of wool to each individual inhabitant, and this amount is still increasing, while cotton remains at any thing like its present prices. The increase of the wool crop has not kept pace with the increase of our population, while woolen fabrics are being used to a much greater extent than at any previous time in the history of our country. In consequence of the immense national debt with which our Government will be burdened by reason of the war, it is reasonable to expect that the duties on foreign importations will be high for many years.

In view of these and many other reasons that might be named, your Committee are led to believe that sheep husbandry must con-

tinue to be a profitable branch of business for some years, at least. Yet we would be far from recommending that all should bend their energies in that direction.

Orcharding, in those localities where the soil and convenience for marketing are favorable, has yielded a rich return for the care and expense bestowed upon it, and under other circumstances it would not be advisable to attempt to raise more than enough for home consumption—this all farmers should endeavor to do.

We might allude to many other branches of husbandry that have been prosecuted successfully under certain circumstances, but will forbear.

In closing we would exhort our brother farmers to study well their calling, so as to turn to the best possible account the limited amount of manual labor left them with which to prosecute their farm operations, relying upon a bountiful Providence to bless their endeavors.

Mr. Dill and some others dissented from the opinion that it was more profitable to sell hay than to feed it to farm stock. After considerable discussion regarding the views presented in the report, it was accepted and left to the disposal of the Secretary.

Mr. Anderson stated that the only member of the Committee on the Fifth Topic who was practically familiar with the subject, had been obliged to leave on account of sickness, and as the others of the Committee had no experience in the matter, and but few facts or data had been obtained—which were that most meadow hay was about two-thirds the value of English hay for neat stock, and that in cold weather it did not furnish a sufficient amount of heat for the animal system—he asked that the Committee be excused from farther service at this time ; which request was granted.

Mr. Anderson then submitted the following report on the Sixth Topic:

The Committee to which was referred the subject of the Geological Survey, having duly considered the matter referred to, beg leave to report in favor of renewing and continuing the survey.

Your Committee—(taking the words of a report to the Legislature made in February last)—believe that "the objects of the survey are to ascertain and bring to light, and thus to put in the way of development, *all the natural resources of the State.*" And this,

again quoting from the same report, is in fact "taking an inventory of the goods and chattels which we possess, or rather like taking an account of stock of the raw material with which Nature has endowed our domain, and stating the place of its deposit and the probable amount which can be relied on for future use. That such knowledge is not only useful, but necessary to the proper conception of what our domain is, and what can be done in and of ourselves, and, consequently, what our prospective wealth and power may become, is self-evident. Every prudent man deems it necessary to do this in regard to his own private property. The Executive and the Legislature stand in the same capacity to the public domain as an individual proprietor does to his own possessions; and, by parity of reasoning, should take the same pains to ascertain what our resources are. That community is the wealthiest and the strongest which possesses the most of the natural resources of industrial material; *provided,* that while possessing them, they know of their existence, their nature, location and the facilities for bringing them into use, and thus for converting the raw material into actual wealth and power."

Although there may have been sufficient reasons for discontinuing the survey, and although those same reasons may still continue in full force, yet your Committee conceive it to be their duty to consider only what the advantages to the State might and probably would be from a more intimate knowledge of its own resources, which must be obtained from the complete examination which has already been so thoroughly and fairly commenced.

By the fifth section of the act creating this Board, it is our *duty* to "investigate all such subjects relating to agriculture, horticulture and the arts connected therewith," in this State, as we may think proper.

Your Committee believe that the Board has not the right to and ought not to shirk any duty from mere politic motives, while it should carefully avoid infringing upon the province of legislators. Your Committee therefore submit the following resolution:

Resolved, That the Board of Agriculture recommends the resumption and continuance of the geological survey of the State.

JOHN F. ANDERSON, *for the Committee.*

The report was accepted, and the resolve adopted.

Mr. Goodale presented the following resolve relative to immigration, which was unanimously adopted:

WHEREAS, The great want of the State at the present time is labor, and because agriculture being the largest interest in the State suffers more than any other from the lack thereof, therefore

Resolved, That the Board of Agriculture recommend to the Legislature the adoption of such measures for the encouragement of immigration from Europe, and especially from its northern portions, as in their wisdom may be deemed best adapted to accomplish the desired end.

This resolve formed the subject of discussion both at the regular sessions of the Board and at several conferences with the Legislative Committee on Agriculture.

It was remarked that every farmer knows and sensibly feels the difficulty of obtaining help to perform the necessary labor on their farms. This is occasioned by the call of government to fill up our immense armies which are doing battle for the preservation of our government, our institutions, and all that we hold dear.

Taking away from home between thirty and forty thousand of our young and enterprising men into the army, ten thousand or more into the navy, eight to ten thousand more into other duties connected with the service, necessarily reduces our productive and laboring classes to a pretty low figure, and it is no wonder that the farmers who have always had either boys of their own or hired men to assist them in their farm work, should feel the loss of them, and find themselves puzzled to know how they shall carry on their usual business without them.

There is only one way to overcome this evil, and that is to invite into our community the surplus population from those countries or sections of country from whence they can be spared.

It appears by the reports in the papers of the day that there is already a greatly increased emigration from Europe to the United States. Our State, however, is remote from the usual channel or route of such immigrants. They mostly land in New York, or ports south of us, and find their way into the Western States. Of course they afford relief to that section of the Union, but not to us. It would be wise to adopt some legislative action by which a portion of this tide of population which is now setting so strongly into the country may be turned into our own borders, and for our own benefit. Other people do this to the manifest advant-

age of their industrial interests. The Canadian Government have long since adopted this course, and have or had a commissioner and other government officials to invite immigrants into the Province, and to attend to their wants when they arrive, and find for them good locations and situations. Such a course has worked well there,—it will work well here.

What we want is an honest and industrious class of immigrants from a country whose climate and topography resembles our own. We want farm laborers, farmers, and working men from the countries of Northern Europe, as the Swedes, the Norwegians and the Danes, who are well known as among the steadiest, most reliable, and most industrious and honest of the European races from which the vast tide of emigration to this country is made up. They are a very desirable people for us to settle upon our public lands, or to receive as farm laborers in our State to supply the wants caused by the recent drains upon our laboring population, to occupy our as yet unsettled domains, and to aid in developi ng our rich agricultural and mineral resources, and placing our State in the front rank of wealth and political strength.

We can, if we please, send commissioners or agents to the northern sections of Europe, and invite enterprising and thrifty emigrants to turn their course to Maine, and settle on our wild lands. This would insure not only an influx of a hardy and industrious population, which would so far relieve the want of laborers to that amount, but be the means of improving the public domain.

Why not form an Immigrant Aid Society? It is believed that such an association, formed of able and earnest men, using every available means, can make arrangements by which a large immigration may be induced, particularly from Sweden, to settle upon our State lands, and supply our farmers with help, at rates not exceeding the average cost of labor. Other States have associations of this kind, which use their endeavors to divert a portion of the tide of immigration to their respective States, and they have been successful.

It appears by the following extract from the Waterville Mail that a move has been already made to introduce mechanics into this very county of Kennebec:

"A band of English operatives from Lancashire—about forty adults, male and female, with a fair proportion of little folk—came over the Maine Central Railroad, on Thursday, from the west.

They go into the employ of the North Vassalboro' Manufacturing Company, having crossed the Atlantic in the Hibernia for that purpose. Shorter by a head than the average Maine Yankee, they are a hardy, intelligent looking people, and being familiar with the work, will make valuable laborers in the new mills."

At one of the informal meetings of the Board, Rev. Dr. Tefft, late U. S. Consul at Stockholm, being present, remarked that—

"During the last year he had been in a foreign country, and had stood where the sun does not rise for forty-eight hours in midwinter, and does not set in summer for a like period. Sweden and Norway are fifteen degrees farther north than Maine, and yet those countries had proved to him that our Dirigo State, with its snow and ice, can become one of the most fertile places in the world. He spoke of the similarity of the soil and the productions of Sweden and Norway with those of Maine.

We have a large sea coast, the best of harbors, streams in abundance, making the finest mill sites in New England. After traveling throughout the States he was satisfied that Maine possessed the best facilities for manufacturing of any. Sweden was under as high a state of cultivation as any other country in Europe except the British Isles. Though far in the north, the farms look better and the gardens look more productive than any between here and South Carolina. He was thus made to believe that the State of Maine is capable of becoming as productive as Sweden. Why not? We have a milder climate, a little longer season, and a very similar soil. Though we import a great portion of our breadstuffs, Sweden exports annually about 4,000,000 bushels of grain, with a population of only 3,000,000.

We need people only to make us what we ought to be. The State of Maine would to-day have a population of a million if it had retained its young men and women. The current of emigration is now setting westward and southward more than ever; and you cannot make a tide of emigration set east any more than you can make water run up hill. Under these circumstances we must look to Europe for a population. We have depended too long upon the West. There never was so much excitement and desire among people abroad to emigrate as there is to-day. The war has been a great advertisement for us in Europe. They understand that we are a great nation able to protect ourselves against foes external and internal to the end of time. From his experience in Sweden he knew that the Swedes were very desirous of coming over here.

He had had over two hundred applications from smart active young men in a single day in that country to come here at some public expense to be returned by them hereafter.

There are four classes in Sweden—first noblemen, next clergymen, then burghers or citizens, then a wide step to the peasants, who are subdivided into several classes. The servants could all read and write, from the highest to the lowest, yet they are not highly educated. Their education, in whatever occupation they are employed, is of a very finished character, which is the style of all Europe. A man who is educated as a miner knows but very little else; if a farmer, very little besides; but he is thoroughly conversant with his particular occupation.

We cannot depend in this State upon anything which the General Government will do for us in regard to immigration. The United States own vast lands in the West, and none in this State, so they will direct all who come to the West. The Board of Trade in Boston is hard at work to induce immigrants to go to Massachusetts. If we want men to settle the State of Maine, if we want to make labor cheap, we have got to simply help ourselves. The Swedes and Norwegians are accustomed to work very cheap. A man's average wages per day are about 13¼ cents, and they feed themselves out of that. If we would promise them a thousand Rix, or about $250 for the year, and board, he believed that at least half a million would leap at the chance.

He proposed that an agent should be appointed to scatter information among the people, and show them our inducements. This only the United States was about to do, as the bill before Congress did not propose to pay the passage of immigrants. He believed that if a few Swedes could be settled in our State, they would soon draw a great community here.

He thought that we should form an Immigrant Aid Society by which both our State and those poor laboring people can be greatly benefited. We should go to work at once, as we should not for a great while, perhaps never, have so favorable an opportunity as now. The tide of immigration will pass by entirely unless we take measures to turn the stream this way.

The following order was introduced by Mr. Anderson: *Ordered*, That the Secretary be instructed to urge upon the proper legislative committee the importance of encouraging the propagation of fish in our ponds and streams.

Accompanying this order Mr. Anderson submitted some remarks on the importance of employing our waters as well as our lands for the production of food. He had been led to introduce the subject in consequence of a communication received from an old friend, who, although somewhat eccentric, was a man of deep reflection and of original views, and who attached great importance to fishways in all rivers which were interrupted by dams erected for mills. He quoted instances where great benefit had accrued by their use.

Mr. Rogers objected to the order as one irrelevant to the duties of the Board of Agriculture.

Mr. Goodale was glad the subject had been introduced. Some attention had been given to it in this country, but very little compared with France and other parts of Europe. It was there contended by those familiar with results, that an acre of water could be made to yield as much food for man as an acre of land, and with much less trouble and expense. If this be true it is worth knowing and practising here. We have facilities in Maine for Aquæculture in our streams and inland lakes unsurpassed by any other section. The main object of Agriculture is the production of food and it matters not whether it comes from an overflowed rice swamp or from dry upland, from field, garden or lake. We desire to cultivate that part of our possessions which will yield the most profit, and there can be no more valid objection to stocking a pond with fish than a pasture with cattle or sheep.

After some further discussion, in which a general desire was manifested for more light upon the subject, the matter was referred to the Secretary.

The usual complimentary votes having been passed and responded to, the Board adjourned without day.

BONES AND SUPERPHOSPHATE OF LIME.

The subject of Manures is ever one of the greatest importance to the Agriculturist; and now that so large a proportion of the labor of the country is diverted from the channels of productive industry to the preservation of the nation's life and integrity, it assumes a magnitude proportioned to the necessity of growing an adequate supply of food for man and beast, both for home consumption and for the support of great armies in the field, and for doing this with a greatly diminished amount of labor. There is consequently an imperative necessity upon us both to economize labor so far as practicable and to employ all the means which Providence has placed within our reach to increase the fertility of our farms.

The economical management and judicious application of ordinary farm-yard manure, and the utilization of resources less commonly drawn upon, particularly by the more extensive employment of marine manures, have received considerable attention in former reports. I feel, however, that upon one division of this subject, namely, the value and use of bones, something more may be demanded at the present time.

It is said to be less than a hundred years since bones were considered to be of value enough for manure to be used at all. They are occasionally mentioned in books on agriculture as far back as 1770, prior to which I find no allusion to them. About 1812 they began to be saved and used somewhat generally in England. It is said their fertilizing properties when crushed, were first discovered by accident, as follows: The cutlers of Sheffield who used bones largely in the manufacture of handles for knives and forks, threw the refuse of their turnings, scrapings and planings into large heaps, and there remained undisturbed for a long time. At length one of these heaps required to be removed to make way for some new buildings to be erected, and the bone refuse was carted away as rubbish. By mere accident it was spread on grass land, when its fertilizing effect "astonished the natives;" but even then they little thought it was owing to the bone which had been applied, and not a few attributed it to some grand manurial agent *below the surface* before unknown—accordingly they began to dig

for more of it, but the results at length led them to the conclusion that the extraordinary crops produced were due to the heap of rubbish which had been spread about. Of course the experiment was repeated, and thenceforward the value of bone dust as an efficient fertilizer became an established fact. The demand increased, old heaps assumed new value, and old pits and holes, into which they had been thrown to fill up, were excavated and every particle saved.

About 1814 machinery was first used for crushing in Yorkshire, and the success attending the operation led to improvements and extension, and soon bone crushing became an established trade.

Bone manure, including superphosphate of lime, has been used to some extent in Maine, and its use is steadily increasing, but by the mass of farmers its value is by no means properly appreciated, nor are suitable measures employed to save and to employ the supplies of this invaluable fertilizer which are within our reach. It is true that in the larger towns agencies are used to collect waste bones, but when gathered, they are nearly all shipped to other States, and only a very small fraction ever finds its way back, in any form, to fertilize our own fields.

The amount of bones annually wasted in the State is considerable. To get some idea of what it is, let us assume that the consumption of meat is half a pound daily for each individual, or less than one-half the army ration, (which was twenty ounces or a pound and a quarter,) and that of this one-sixth part is bone. This would give fifty thousand pounds of bone daily, or twenty-five tons, say nine thousand tons per annum. In a crude state bones have brought, at crushing mills in years past, from ten to fifteen dollars per ton; they now readily command at least twenty dollars, at which price the above named quantity would amount to $180,000. In the same time the price of crushed bones has advanced in an equal or greater ratio, with a constantly increasing demand.

I suppose only a very small proportion of the bones produced here are turned to any better account than the manure which is dropped on the highways. In fact, it is nearly all wasted. This ought not so to be. It is true that in their crude state they are of little use; their fertilizing properties are firmly locked up and unavailable for plants until finely crushed or submitted to chemical processes which may liberate the phosphates contained in

them and bring them into a condition in which they may be taken up as food by the roots of plants. We have power enough, labor enough, and skill enough to do this were attention called to its importance, and in no other direction would enterprise tell more effectually upon the production of the State.

The solidity and toughness of bones in their natural state are such as to require powerful machinery to reduce them to fineness, nor do they decay readily, but unlike most other animal substances they dry and harden upon exposure. In this state they are for agricultural uses almost worthless, one bushel of fine bone dust producing more effect than a hundred bushels of whole bones. The question therefore arises whether there be any practicable method by which those who have no access either to a bone mill or a bone market may realize something near their intrinsic value; and in reply I would say there are two methods open to them. First, the bones may be burnt and the ashes applied to the soil. This is a wasteful method because it involves the loss of all the organic matter in the bones, but inasmuch as the bone earth or phosphate of lime is saved and reduced to a condition comparatively available to plants, it is decidedly more economical than losing the whole. Another and greatly preferable way, although requiring more time and labor, is by fermentation. First let them be broken as small as may be with a sledge hammer. Next put down a layer of muck or earth a foot thick, and on this pile the bones in a heap, mixing in horse dung, muck, spent tan, sawdust, either or all, or of some other substance which will retain moisture and gradually decay, enough to fill all the cavities among the bones, and wet the whole thoroughly with stale urine or the drainings of a dung heap, and finally cover the heap with a thick layer of muck or earth. In warm weather decomposition will commence quickly and will progress more or less rapidly as the pile is large and heat and moisture kept up. The larger the heap, the finer the bones, the more stale urine they absorb and the warmer the weather, the more rapid and complete will be the decomposition. Should fermentation cease without sufficient reduction of the bones, the heap may be overhauled and made up again, moistening and covering as before. Should it heat through to the surface and ammonia escape, it should be covered more thickly with muck or earth.

Bone compost successfully prepared by this method contains the phosphate in a finely divided state ready to be taken up by plants,

and also all the ammonia furnished by the decomposition of the organic matter. It is an exceedingly valuable manure and the best substitute for a good superphosphate which can be furnished from home resources.

As the use of superphosphate will undoubtedly become more general and extensive among Maine farmers, it will be well to add some farther remarks concerning it.

Phosphoric acid is a never-failing constituent of all plants cultivated for food whether for man or beast, as well as the characteristic ingredient in the bony skeleton of all animals. It enters into the composition of all soils capable of cultivation, and according to the investigations of eminent chemists it is widely distributed throughout inorganic nature, being found not only in the stratified rocks but also in those of igneous origin, as granitic and basaltic rocks, trap and others.* As usually found it exists in combination with lime, and also, but to a much more limited extent, with magnesia and other bases. Prof. S. W. Johnson in a report to the State Agricultural Society of Connecticut, gives so concise and clear an account of the chemistry of the phosphate of lime that I quote here his statement:

"The reader will please bear in mind, that phosphate of lime is in chemical language a *salt*, which means—in a chemical sense be it remembered—a compound of two classes of bodies, the one called *acids*, the other *bases*. These bodies follow the universal natural laws of *combination in definite proportions*, and the numbers expressing their proportions are termed *equivalents*. We can best illustrate this with a body like sulphate of lime, (plaster of Paris or gypsum)

* "Large amounts of phosphorus are in the course of geological revolutions extending over vast periods of time, restored from the organic realms of nature to the mineral kingdom by the slow process of fossilization; whereby vegetable tissues are gradually transformed into peat, lignite and coal; and animal tissues are petrified into coprolites, which, in course of time, yield crystalline apatite. After lying locked up and motionless in these forms for indefinite periods, phosphorus, by further geological movements, becomes again exposed to the action of its natural solvents, water and carbonic acid, and is thus restored to active service in the organisms of plants and lower animals, through which it passes, to complete the mighty cycle of its movements into the blood and tissues of the human frame. While circulating thus, age after age, through the three kingdoms of nature, phosphorus is never for a moment free. It is throughout retained in combination with oxygen (forming phosphoric acid), and with the earthy or alkaline bases, for which its attraction is intense."—Dr. Hoffman.

which is a salt, consisting of but one acid, and one base, and but one equivalent of each.

The acid is *sulphuric acid*, its equivalent is	40
The base is *lime*, its equivalent is	28
The salt is *sulphate of lime*, its equivalent is	68

The above becomes intelligible when it is considered that in every specimen of pure gypsum that has ever been examined, the lime and sulphuric acid are present in exactly the proportions indicated by the numbers forty and twenty-eight, and it has been proved a hundred times, that when lime and sulphuric acid are brought together in such circumstances that they can unite, they always do unite in the above proportions. The word equivalent simply means that twenty-eight parts by weight, grains, pounds, &c., of lime, are equal to, or go as far, in making a salt, as forty grains, pounds, &c., of sulphuric acid.

Unlike sulphuric acid, (one equivalent of which usually combines with but one equivalent of a base,) one equivalent of phosphoric acid usually unites with *three* equivalents of base; and these three equivalents may be all of one base, or two of one base and one of another, or, finally, may be all of different bases. What is most remarkable is, that *water* may act as a base; but it is not customary to allow the water to figure in the name of the compound; and in this way, the three phosphates that contain lime and water as the basic ingredients, are all called phosphates of lime. They are distinguished from each other by a variety of prefixes, unfortunately numerous, and none of which are strictly in accordance with the general principles that regulate chemical name-making. The constitution of these three phosphates of lime may be represented as follows:

The first is phosphoric acid (72), lime (28), lime (28), lime (28).
The second is phosphoric acid (72), lime (28), lime (28), water (9).
The third is phosphoric acid (72), lime (28), water (9), water (9).

The equivalents are given with each ingredient, and by adding them together, we find the equivalent of each phosphate.

The first, 72 of acid, and 84 of base, is	156
The second, 72 of acid, and 65 of base, is	137
The third, 72 of acid, and 46 of base, is	118

What is the use of these equivalents? may be asked. In 156 parts (ozs. or lbs.) of the first are 75 parts (ozs. or lbs.) of phosphoric acid: in 137 parts of the second, and in 118 parts of the

third, is the same quantity. A simple operation of "rule of three," will reduce these quantities to *per cents.*, and thus we may more readily compare their composition.

Per cent. composition of the Phosphates of Lime.

	1.	2.	3.
Phosphoric acid, - -	46.15	52.55	61.02
Lime, - - - -	53.85	40.88	23.73
Water, - - - -		6.57	15.25
	100.00	100.00	100.00

With regard to the names of these phosphates much confusion exists.

To No. 1 have been applied the names neutral, ordinary, tri-phosphate and bone phosphate. To No 2, bi-phosphate and neutral phosphate. To No. 3, bi-phosphate, acid-phosphate and super-phosphate. No. 1, we may designate as *bone phosphate of lime,* because it is the chief earthy ingredient of bones, or at any rate it remains when bones are burned, and constitutes the larger share of bone ashes. It is almost absolutely insoluble in pure water; but dissolves perceptibly in water containing in solution salts of ammonia, or common salt, or carbonic acid. It is also the principal ingredient of the so-called mineral phosphates;—of *Apatite* that occurs in the iron mines of northern New York, of the *Eupyrchroite* of Crown Point, and the *Phosphorite* of Estramadura in Spain, and of Hurdstown, New Jersey. In the fossil bones, the so-called *Coprolites* of certain districts in England, and in the phosphatic nodules of the silurian rocks of Canada, a variable quantity of bone-phosphate of lime is contained. The phosphoric acid of all the genuine guanos exists mostly in combination with lime as bone-phosphate.

No. 2, most commonly called the *neutral phosphate of lime,* deserves notice as occurring mixed with bone phosphate in the Columbian guano and in other similar phosphatic guanos recently imported.

The agricultural value of phosphoric acid and of the phosphates of lime is well understood. To them bones mainly owe their efficacy as a fertilizer. It is well known that although bones are highly useful when applied to the soil in a coarsely broken state, they are far more valuable if reduced to small fragments, or better still if ground to dust. This is because nothing can enter the plant in a solid form. All that a crop absorbs through its roots must be dissolved in the water of the soil. The bone phosphate of

lime is only slightly soluble in water, and is of course very slowly presented to the plant. The more finely it is divided or pulverized, the more surface it exposes to the action of water, and the more rapidly it dissolves. By grinding it is only possible to reduce bones to a gritty dust, fine perhaps to the unaided eye, but still coarse when seen under the microscope. Chemistry furnishes a cheap means of extending the division to an astonishing degree, and enables us to make bone manure perfect both in its mechanical and chemical qualities.

This brings us to No. 3, or *superphospate of lime*, which is the characteristic ingredient of the genuine commercial article known by that name, in which, however, it is largely mixed with other substances. Its peculiarity is ready solubility in water. It may be prepared from either No. 1 or No. 2 by adding to these phosphoric acid, or by removing lime in presence of water. In practice lime is removed.

If to 156 parts (one equivalent) of bone phosphate of lime we add 80 parts (two equivalents) of sulphuric acid,* with sufficient water to admit of an intimate and perfect mixture, then the 80 parts of sulphuric acid take 56 parts (two equivalents) of lime and form sulphate of lime, while the phosphoric acid retains 28 parts (one equivalent) of lime, and 18 parts (two equivalents) of water replace the lime removed by the sulphuric acid, so that there results 136 parts of sulphate of lime, and 118 parts of superphosphate.

The manufacture of good superphosphate of lime, consists essentially in subjecting some form of bone phosphate of lime—it may be fresh or burned bones, mineral phosphates or phosphatic guanos—to the action of sulphuric acid. The product of such treatment contains sulphate of lime, superphosphate of lime, and still a greater or less share of undecomposed bone phosphate, together with some free sulphuric acid, because the materials cannot be brought into such thorough contact as to insure complete action.

The reader can easily perform a simple experiment that illustrates the change which superphosphate of lime, or any soluble phosphate, always undergoes when brought into the soil. Stir a spoonful of superphosphate in a tumbler of water; let it settle and then pour off the clear liquid into another tumbler, (if no superphosphate is at hand, use instead of the liquid just mentioned,

* *Oil of vitriol* consists of about 75 per cent. of pure sulphuric acid, with 25 per cent. of water.

strong vinegar in which some bits of bones have stood for a few days.) Now stir a few lumps of salæratus or soda, in water, and pour it gradually into the first liquid. Immediately a white cloud, or *precipitate*, as the chemist calls it, is formed; at the same time the liquid will foam like soda water, from the escape of carbonic acid gas.

This white cloud is *precipitated bone phosphate of lime*, and does not essentially differ from the original bone phosphate, except that it is inconceivably finer than can be obtained by any mechanical means. The particles of fine bone dust will not average smaller than one hundredth of an inch, while those of this precipitated phosphate are not much more than one twenty-thousandth of an inch in diameter as shown by examination with the microscope.

Since the particles of the precipitated phosphate are so very much smaller than those of the finest bone dust, we can understand that their action as manure would be correspondingly more rapid.

In fact, the application of superphosphate to the soil is always speedily followed by the formation of this precipitated phosphate: the iron, lime, potash, &c., of the soil having the same effect as that produced by the salæratus or soda in the above experiments. The advantage of dissolving, or rather acting upon bones with sulphuric acid, is then not to furnish the plant with a new food, but to present an old dish in a new shape more readily accessible to the plant. In addition to the advantage of *subdivision* thus presented, another not less important is secured, viz., *distribution*. This may be illustrated as follows: If one part of a quantity of superphosphate be mixed with chalk, lime, or ashes before use, while another portion is directly applied, in both cases precipitated phosphate will be furnished to the soil. The *subdivision* will be equal, but the *distribution* will be unlike. In the first case, the ready-formed phosphate is very imperfectly mixed with the soil by the mechanical operations of tillage. In the latter instance, if the superphospate be scattered on the surface, it is unaffected until a rain falls upon it. Then the superphosphate dissolves, and trickles or soaks down into the soil, meeting here with a particle of lime or potash, and depositing a particle of bone phosphate, travelling on a little way and depositing another, and so filling the whole soil to a certain depth with the precious fertilizer.

It seems then that it is important not only that the superphosphate be *made*, but that it *remain* such until strewn on the soil. I

would suggest that the simplest, and for agricultural purposes the most accurate way of designating the phosphates of lime, and all other phosphates, is to divide them into two classes, *soluble* and *insoluble*, and always to base calculations on the *phosphoric acid* they contain, because it, and not lime or water, is the valuable ingredient of them all."

It should be clearly understood that the commercial article sold as superphosphate of lime is not the pure chemical substance which properly bears this name, for, as remarked by Prof. Johnson in the above quotation, it contains sulphate of lime and other substances. It is more properly a compost which contains a considerable and distinguishing proportion of superphosphate, and which has been prepared in such a manner as to afford the soluble phosphate in the cheapest form in which it can be procured for agricultural purposes. To buy the chemically pure article to apply to the land would be like purchasing pure caustic potash when this alkali was required for manurial purposes, instead of using unleached ashes, which would supply it at a greatly cheaper rate. Sulphate of lime or gypsum is necessarily present in considerable quantity, because this substance is formed in the very process by which insoluble phosphate is converted into soluble phosphate. It is well if no extraneous substances are added purposely to adulterate it and cheapen its cost. Partly owing to the fact that the superphosphates of commerce are a sort of compost, there is no other fertilizer which so easily admits of adulteration and fraud, and there are no other means of assurance of genuineness than a careful and thorough analysis. Actual trial will prove its success or failure in any given instance, but this result may depend not a little upon the soil, or season, or crop, or manner of application. Simple inspection, however critical, without chemical testing, will give no clue whatever to its quality; and yet of all the artificial manures which have been prepared and used, this is the only one the use of which has steadily increased from the time when it was first announced by Liebig in 1839, now twenty-five years ago. From being sparingly made and cautiously employed, its consumption is now to be reckoned by hundreds of thousands of tons. The best article is made from raw or unburned bones, but the supply of these is altogether inadequate to the demand, and the price they bring when merely crushed to coarse powder is such that little inducement exists to convert them into superphosphate. Proba-

bly more than nineteen-twentieths of all which is sold is made from phosphatic guanos, sugar refiners' spent bone black, bone ashes from South America, and from mineral and fossil phosphates.

To give some idea of the extent of the manufacture, it is stated on good authority, that not less than one-half of all the oil of vitriol made in Germany is used to make superphosphate, and in this state is applied to the land! As might be supposed under such circumstances, there have been extensive frauds in its manufacture and sale, large quantities of worthless trash having been sold in its name. Many men, both ignorant and unscrupulous, have embarked in its preparation, and as a very inferior article may look as well as the best, very serious impositions have been endured by the buyers.

Of late years the practice has prevailed in England of selling by analysis with a guaranty that the bulk equals the sample; and there as well as elsewhere, in the long run, honesty vindicates its claim to be deemed good policy. Those who cheat lose their customers after a while, and the business gradually and naturally centres in the hands of a comparatively small number, who by honest dealing, connected with sufficient skill, energy and capital, are able to do a remunerative business, make a uniformly good article and sell at fair prices.

During the present year the commercial value of superphosphate has been so considerably enhanced by the advance in sulphuric acid, (necessarily used largely in its manufacture,) that many farmers will deem its present price a prohibitory one. This being the case, I would call special attention to the fact, that within a very recent period, by means of new and improved machinery, bones have been reduced to a state of greater division than heretofore, and that an article is now to be found in our markets called "Flour of Bone," so very fine as to be much more readily soluble than ordinary crushed bone, and so, of course, more readily available by the roots of plants.

It would seem probable that this article may, to a considerable extent, supersede the superphosphate, and from a limited experience of its use during two years past, in comparative experiments with other forms of phosphatic manures, I have been led to the opinion that it is worthy of extensive use, as furnishing phosphate of lime in a form more economical than any other as readily available to the uses of vegetation.

AQUÆCULTURE.

This is rather a new subject to the farmers of Maine. It is comparatively new to proprietors elsewhere. The prime object of Aquæculture being identical with that of Agriculture, to wit: *the production of food,* it has, as is very natural and proper, attracted, from agriculturists abroad, a degree of attention in some measure commensurate with its importance.

Not many years ago, Lavergne, in his excellent work on the Rural Economy of Great Britain, wrote as follows: "The object of all cultivation is the production of the greatest possible quantity of human food upon a given surface of land; to attain which object widely different means may be adopted." Had he written now, he might probably have omitted the words "of land," or have added "and water." The principle here asserted is a very just one, and a wise policy will ever seek for the method best adapted to the end in view, whatever may be the field of operations, whether dry land, wet land, running stream, lake or ocean.

Where the surrounding conditions are more favorable to the production of herbage than of cereals, cattle and sheep will be preferred to grain crops, and vice versa. There are, as we all know, many cases where a mixed husbandry is preferable to either grain alone, or stock alone; and if it be true, as alleged by those who are entitled to credence and profess to know whereof they affirm, that under favorable circumstances an acre of water is capable of producing annually as much value of food as an acre of the best land, with less labor and less risk of exhaustion, and as Maine has apparently great advantages for its prosecution, it seems advisable for us, at least, to investigate the claims of aquæculture, and to learn something regarding its methods.

At the last session of the Board, the subject was introduced, and a general desire manifested to have more light thrown upon it. I had proposed to myself to furnish a paper on the subject and had collected some materials for the purpose, but being prevented from doing so, I am happy to more than supply its lack by one from the pen of our veteran agricultural friend, Dr. E. Holmes of Winthrop, who undertook the task *con amore,* and to whom the subject in

some of its aspects has long been familiar, inasmuch as he has bestowed study and observation upon it for years past.

The paper is presented with the hope and expectation that it may accomplish something among us toward the hastening of the time when the dominion decreed to man, at the creation, over the fish of the sea, shall be more successfully asserted than it has ever yet been; when the command "Let the waters bring forth abundantly" may *by the coöperation of man*, be more fully responded to. Its facts and suggestions, and especially with regard to the feasibility and pecuniary profit of an increase of the *Salmon crop*, are commended to thoughtful consideration:

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AQUÆCULTURE.

"Practical Physiology will exercise its empire over organic matter by an applica- of the laws of life."—COSTE.

Aquæculture bears the same relation to the water, that Agriculture does to the land, and like Agriculture, involves the knowledge and practice of obtaining from it in the most efficient and economical manner, its products both vegetable and animal.

There is this difference, however, water, being an element in which man cannot live, he can have direct supervision only on the surface, or in comparatively shoal parts of it. There is also another difference depending principally on the character of the products, and that is, but very few of the vegetable products which grow wholly submerged in the water are used directly by man for food. Hence the attention of man has been almost exclusively given to the animal products which exist in the waters, not only of the ocean, but of the interior streams and lakes. Although mankind have obtained large amounts of sustenance from this range of animal life ever since God gave them "dominion over the fish of the sea," it is but a few years since attention has been directed to any methods of guiding and aiding the propagation of fishes by artificial means, or in artificial reservoirs, in accordance with the natural laws of fish breeding as developed by observation and close study of their natural history. It is true that the Romans, according to the accounts of Columella and others, did something in this line, but their labors were principally confined to the construction of artificial fish ponds, in which certain species

were enclosed and fed daily to increase their size and fatness, and in which they bred in the natural way, without any special interference from their keepers.

The Chinese claim to have practised the art of artificial fish-breeding a long time before the Romans did. Indeed, they declare in regard to this business, that, like all other branches of industry among them, it has been practised there "from time immemorial." I have no authentic documents which establish their claims to such ancient priority, and their history is made up of such a mixture of fact, fable and romance, that we hardly know what reliance to place upon their claims to so much knowledge and practical skill so long ago in what are now considered modern arts.

Jacobi, a German naturalist, and a very close observer of the instincts and natural habits of animals, about a century ago (1763) promulgated the doctrine that the propagation of fishes could be carried on by artificial means; that the eggs of fishes were impregnated and fertilized by the absorption of the male sperm through their outer coatings, and that, by pressing the female when her ova were at a mature stage, they could be received into vessels of water, and by mingling with this water the "milt" of the male, obtained in the same manner, the eggs became impregnated, and if then placed in situations similar to what the parent fish would place them, they would hatch, and thus by following out the requirements of the species when in a state of freedom, could be reared with ease in any numbers.

This was a very interesting and important discovery. A few establishments for fish-breeding in this manner were at that time made, but it would seem more for the demonstration of the fact that such a thing could be done, or for the gratification of curiosity, than for any practical use or benefit, as the system did not come into very extended use, and was, for many years, discontinued—the facts only remaining on record as among the known laws of this branch of natural history.

It thus remained dormant until about the years 1835 to '40, when it may be said to have been rediscovered and put into successful practice by two fishermen of Bresse, in the department of the Vosges, in France—Messrs. Gehin and Remy. These men were in all probability ignorant of the discoveries of Jacobi. They followed fishing for a living, and by long observation of the different species of fish, especially of trout, they obtained a knowl-

edge of the same facts and laws that he had discovered, and they forthwith put them in practice for the purpose of making them profitable in their business. They succeeded so well that the art began to attract the attention of others who had more leisure and capital to carry out subsequent discoveries, and fish-breeding has now become a regular and systematic business in many sections of Europe, and as firmly established on a regular basis of philosophical facts and pecuniary capital as any other.

To this latter condition of the art the world is much indebted to Prof. Coste, who, learning what the Messrs. Gehin and Remy had done and were doing, visited them and for a time became their pupil in the art. M. Coste was Professor of Embryogenie in the College of France, and having become satisfied with the practicability of the business as fully demonstrated by the operation of Gehin and Remy, by his influence with the Emperor obtained from the French government a grant of 30,000 francs ($6,000 nearly) for the purpose of establishing the business at Huningue, with a view of instituting experiments and making such further observations as would tend to develope all the laws by which nature governs the propagation and rearing of such species of fish as could be obtained.

Many valuable facts have thus been brought to light. Other institutions of the kind have sprung up and multiplied in other parts of the world. Eggs of fishes are now obtained, impregnated and carried to any distance to places where needed, as easily and safely as the eggs of hens or ducks.

A knowledge of these facts very naturally prompts the question, why not introduce such fish-breeding establishments in Maine? Our territory furnishes every facility for such enterprise. Our seaboard is known as furnishing one of the best marine fisheries in the world, and our many inland lakes, with their rivers and minor streams, were once the haunts of innumerable fresh water species, and of the migratory kinds of fishes also, that at different times and seasons changed their location from lake to ocean and from ocean to lake, according to the promptings of their habits and instincts.

No part of the Union afforded the aborigines a greater and more abundant source for game of this sort, than did Maine, and for years the products of the lakes and streams afforded to the early settlers a large and unfailing supply of subsistence, and in many

instances prevented the effects of famine, from the lack of provisions occasioned by the failure of harvests or the ravages of the Indians. It is not so now. The improvements of civilization by the clearing up of the forest and the construction of dams and mills, have very materially interfered with the natural habits of this latter class, and diminished their numbers, in some places completely destroying them and thereby a great supply of this variety of food.

These obstructions have, undoubtedly, indirectly an influence on the productiveness of many marine species. As the great diminution of the supplies of this species of fish has been caused by artificially interfering with their natural course of life, it certainly becomes a legitimate object both of science and art to restore the supply, by studying into their habits, ascertaining what they require, and restoring to them such means for breeding and feeding as their natures crave.

For this reason I have thought it not only expedient, but that it would be highly useful as well as profitable to call your attention to the business, and give a few details of the best modes of conducting it, and have divided my remarks into two departments, viz., Marine Aquæculture and Interior Aquæculture.

Part I.—Marine Aquæculture.

Under this head would naturally be embraced an almost boundless variety of subjects, including as it does the production of all the marine plants, as well as the immense number of species and varieties of animals with which the ocean is filled.

In the report of 1861, the consideration of such marine plants as were found most abundantly on our shores, and their uses as material for manures, and their preparation as fertilizers, were presented. Your attention is now called to only one topic out of the many, which presents itself under the range of oceanic animals, and that is, the production of the oyster.

The coast of Maine, or rather some parts of the coast, was once a rich and prolific oyster bed. This is proved by the presence of oyster shells still found in the mud in many places, but more decidedly by the great accumulation of shells in some places on the main land, especially in Damariscotta and Newcastle.

Prof. Hitchcock says that the remains of two species of oysters are found on the coast of Maine, viz., the *Ostrea borealis* and

*Ostrea Virginiana.** It is a fact that however productive these beds were formerly, but few oysters are found on the coast now. What has occasioned this change is not certainly known. Many philosophical conjectures have been brought forward to account for it. One theory, and perhaps as plausible as any, is that there has been a change in the flow of the Gulf Stream, it formerly having been nearer the shore than now, and thereby causing a warmer temperature of the water on the coast than there is at present. How near the truth this conjecture is, cannot now be definitely settled for the want of data to determine several points of inquiry connected with it. We have no record of the average temperature of the water at different locations on our coast, either at the present or any former time. Observations are being continually made on the land in regard to the average temperature of different locations, and these observations have been the data for establishing a range of isothermal lines. That similar lines, or rather that the theory of isothermal lines, pertain also to the ocean as well as to the land, cannot be doubted, but years of careful observation are required to trace them out. Again, it is not yet well settled what is the average temperature of water, all other things being equal, to ensure the greatest product of an oyster bed. That the different species of animals in the ocean require different temperatures to enable them to flourish and come to the greatest perfection, is as true in regard to them as it is in regard to land animals. Every one knows that many birds migrate from our climate to the South, on the approach of winter, and return in the spring for the purposes of breeding during the warm seasons of our summers. Many fishes also do the same.

"The whale is only to be found within a certain space of the Gulf Stream, which it avoids as if it were a fire stream, and a little pamphlet on the herring fishery, translated from the Dutch by order of the Board of Trade, shows that herrings seek such parts of the North Sea as are not colder than 54 degrees nor warmer than 58 degrees, thus teaching fishermen within what limits they may profitably ply their calling."†

Different species of shell fish undoubtedly require peculiar degrees of temperature as a condition of healthy production, and to

* See Report of Scientific Survey of Maine for 1861, p. 292.

† Highland Journal of Agriculture, 1861 to 1863, p. 274. What is called the "English herring" is here referred to.

this rule the oyster cannot be an exception. Two things are true in regard to it, viz., it was once very abundant on our coast; it is not now. What average temperature it requires has not been settled by any experiments to my knowledge. Francis, in his work on fish culture, casually remarks that "one of the worst foes that oyster bed proprietors have to dread is frost, which destroys vast numbers in the shallow waters." This is on the coast of England. Still, he says "the profits are very large, and the subject is well worth the attention of proprietors by estuaries, sea-lochs and such localities as are favorable for oyster beds."

I take the liberty to say the same to the shoresmen of Maine. Whatever may have been the real cause of the decrease of oysters in our own waters, there are undoubtedly many locations where, with care and attention, they may be now successfully propagated. This is evident from the fact that they do still exist here. That they would be a profitable production is abundantly evident, although I have no statistics in regard to the amounts brought from abroad and sold among us.

How Oysters Produce their Young.

Before going into details respecting the best mode of breeding oysters, it will be well to consider the natural laws of their reproduction. It is a common remark among fishermen that oysters and clams are unwholesome during any month that has not an R in the name of it. Now the innocent letter R can have no influence, but it so happens that the months of May, June, July and August are destitute of this letter, and they are the very months in which oysters breed. In May, they begin to grow milky. The season of spawning is from June to September, sometimes to the end of September. But in spawning they do not leave their eggs like many other animals. A very accurate writer thus briefly but clearly describes the process:

"They incubate them in the folds of their coverlet within (or mantle) and among the layers or laminæ of their lungs (branchiæ, as anatomists call them.) There they remain surrounded by mucous matter necessary to their being developed, and within which they pass to the embryo state. The mass of eggs (*ova*) in consistence and color resemble thick cream, and breeding oysters are therefore called "*milky.*" The pale tint which characterizes them, gradually in the process of development changes to bright yellow,

then to a darker yellow, and ends in a greyish brown or very marked greyish violet. The whole mass, which meanwhile is losing its fluidity, probably by absorption of the mucous matter enveloping the ova, is then like a piece of compact mud. This indicates the near termination of the development and expulsion of the embryos and their independent existence; for by this time they can live well enough without the protection of the maternal organs. On leaving the mother they are furnished with swimming apparatus, (its singular nature has been described by Dr. Davaine,) enabling them to move to a distance in search of solid bodies to which they may attach themselves.

The oyster produces not less than from one to two millions of young, so that the animated matter from all the adults of a breeding bank, or oyster bed, is like a thick mist dispersing from the central spot from which it emanates, and so scattered by the waves that only an imperceptible portion remains near the parent stock. All is dissipated, and if these myriads of wandering animalcules, borne about by the waves, do not meet with solid bodies to which they may attach themselves, their destruction is certain; for those that do not become a prey to the lower creatures that live on the *infusoriæ*, fall at last into some place unsuitable to their future development, and are frequently smothered in the mud."*

Apparatus and Fixtures Convenient or Necessary to Preserve and Protect the Young Oyster.

We have seen by the above description of the breeding process of the oyster, that the incubation is carried on within the shell of the parent, and you can do nothing until the young are hatched and sent forth in a living state, but so small in size that they appear like a mist in the waters. Then is your time to interfere and use your skill in catching and holding these *misty* particles in some safe place. Remember what has just been said—"*if these myriads of wandering animalcules, borne about by the waves, do not meet with solid bodies to which they may attach themselves, their destruction is certain.*" The duty of the oyster breeder is therefore obvious. He must place solid bodies, that these animalculæ, these almost invisible oysters, shall meet and *stick to*.

The requirements, in short, are these. Select some suitable location where there shall not be any very swift currents—no vio-

* Highland Journal of Agriculture, 1859, p. 96.

lent waves--water of suitable depth to insure neither the extremes of the cold of winter nor the heats of summer, and where there shall be no shifting about of the soft ooze at the bottom, nor contamination of the water by accumulations from mines or manufactories. Procure oysters on or before the month of May, and deposit them. Then place framework of wood, or hurdles like fish wiers, around or among them, which the young floating oysters shall meet and adhere to. Yankee ingenuity will not be slow to contrive fixtures for this purpose, and applicable to the location where they are wanted. I will however copy from different sources the description of apparatus successfully used for this purpose.

In Italy, there is a salt lake called Fusaro,* which has been for many years used for the artificial breeding of oysters with great success and profit. We have none like it in Maine, but the system adopted there may in part be adopted in many places on our coast. Francis says it is about a league in circumference and from three to six feet deep in the middle. The bottom is muddy and is dotted over with large stones or fragments of rocks to which the oysters attach themselves. Round about these stones, large stakes, which project above the water, are stuck into the soil, not so tightly, however, but that they can be withdrawn. From these stakes to others extend cords or lines, and from these cords, at intervals, are suspended faggots, to and among which the spawn of the oyster, when first hatched, can attach and ensconce itself until safe from any outward danger. The use of these faggots and stakes is important, as when the young of the oyster is first hatched, it scatters in all directions, until it finds something to which it can safely attach itself. * * When about three years old the oyster becomes edible, and is ready for the harvest. When they wish to gather them they break off by means of hooks those which are attached to the rocks, or, by pulling up the stakes and faggots, pick off those by hand which are large enough, replacing the others again in the water to grow for future gathering.

Under the patronage of the French government M. Coste has been engaged in replenishing the almost exhausted oyster beds on the coast of France, and establishing others in places where none grew before, and so successful has he become, that millions are now annually gathered where none were found before. In all

* This lake is of volcanic origin, and was the famous Acheron of Virgil.

these operations he has adopted the use of frames of timber and plates of hurdles and faggots sunk to the bottom of the water or suspended by lines and ballast a few feet above, for the purpose of intercepting and catching the spawn—"spat" as it is sometimes called—and retaining it in a place of safety until matured and ready for market.

In the island of Re, on the French coast, Dr. Kemmerer has adopted the following plan to intercept and save the oyster spawn. He covers a number of tiles with a coating of mastic, brittle enough to peel off with the young oysters on it. When this coating is well covered with spawn, he gets it off in one piece, and deposits it in the place where he wishes the oysters to grow, and uses the tiles again in the same way as long as the seeding season continues. Thus you see that almost any arrangement which will intercept the floating spawn or "*spat*" of the oyster, if placed in a convenient and proper position to favor their future development, answers all the requirements of successful oyster culture.

Are there not thousands of such places on the coast of Maine, now comparatively unproductive, that, with very little capital and labor, might be converted into rich and productive oyster banks, affording innocent and nutritive luxury to the community and remunerating profit to the proprietors?

Muscle Culture.

Muscles are abundant on our coast, and as little or no use is made of them, it may provoke a smile, perhaps, if we devote a few remarks upon the mode of cultivating them. I wish merely to observe that the same fixtures and operations required in oyster culture will insure success in rearing the muscle. Although they are considered of no value with us, in other parts of the world they are prized as an article of food,* and are also gathered by cargoes to supply bait for fishermen when in pursuit of cod and other sea fish. In many places on the coasts of Scotland and France the gathering them by dredging and preparing them for bait makes a large business. But dredging is a laborious and unpleasant work, and it may not be amiss for any one to know, that if it should ever

* To some stomachs and constitutions the muscle is injurious, but the French, who are fond of them, say this is owing to their being bred in foul docks among poisonous solutions of copper-bottomed ships, which impregnates them with deleterious properties, but those reared on hurdles are very different both in flavor and nutritive properties.

be an object among us to obtain them in quantities, they may be raised, as has been said, in the same manner as has been described above in remarks on oyster culture. They can thus be made to propagate where they can be gathered by hand with comparative ease and dispatch.

A writer over the signature of D. E., in the Highland Journal of Agriculture, (1859 to '61,) quoting in part from M. Coste, gives the following sketch of the process of muscle breeding on hurdles at Commachio, in the bay of Aiguillon, in France. It seems that they become milky there two or three months earlier than the oyster. The seed, as he calls the young muscle, is fixed in February. Towards the month of April, he says the *seed* fixed in February and March to the single stake is scarcely the size of a lint (flax) seed. In May it reaches the size of a lentil; in July that of a French bean, and in this stage they transplant them. At this season the muscle gatherers detach the young from the stakes by means of a rake with a handle, and proceed to fasten them, one bunch after another, (each wrapped in a piece of old net,) among the branches of the hurdles, care being taken, however, that each separate bunch shall be at such a distance from the next one, that when grown they shall not mutually incommode each other. The net soon rots and thus presents no obstacle to their expansion. In the end they have grown so much as to touch each other. Arrived at this stage, they can be weeded in order to afford room for younger generations, and may be picked out, wrapping each bunch as before in a piece of net before consigning them to their new *habitat*. At the end of twelve months they are marketable. They then undergo their last transportation to the in-shore hurdles, where they are at hand any time, and do not suffer, though the sea leaves them dry twice every day. It is a singular fact, he remarks, that muscles growing together on the same hurdles do not all possess the same qualities. Those on the highest rows are better flavored than those on the middle rows, and the latter are deemed inferior to those lower down, which are covered with mud whenever the waves agitate the bottom. But M. Coste affirms that even the least esteemed of these are preferable to the finest gathered in the sea.

Before closing this part of our remarks on marine aquæculture, it may be well to call attention to two other species of bivalves found and in much esteem on our coast. These are the common

clam (*Mya arenaria*) and the quahog (*Venus mercenaria*). The former is abundant, the latter rather scarce. They are both self-generative, but I know of no experiments instituted for the purpose of multiplying them by a course of culture. As they live imbedded in the sand, each in its own domicil, the process of culture must of course be different from that of the oyster or muscle. And here let me observe is a new field of research and discovery for some of our young and enterprising shoresmen. Will some of them enter and let the world be benefitted by the new facts which their labor and ingenuity may develope?

Part II.—Inland Aquæculture.

Having spoken of one branch of Marine, or rather Maritime Aquæculture, I will now call your attention to a branch of Inland Aquæculture.

Everybody in Maine has heard how productive of various kinds of fish our numerous rivers, lakes and streams used to be in olden times. Many of you can still remember how plenty and cheap salmon, shad, alewives and other fish used to be, and with what facility they were taken, and how much they added to the subsistence of the people.

An aged woman, who formerly lived on the banks of the Kennebec in Vassalboro, and who, at that time, had a large family of children to support, once told me that, in spring and early summer, the fish from the river were a very essential aid to them—that many times she has sent one of her boys down to the river early in the morning to catch a salmon for breakfast, with as much certainty that he would bring one home in season, as if she had sent him with the money to a city fish market, where she knew they were kept for sale.

Every one now knows that salmon, shad and alewives, and indeed all the other kinds of migratory fishes—those that spend their winters in the salt water, and come up out of the sea at certain periods, as if sent by a kind Providence, to spend the spring and summer in fresh water—are now very scarce indeed, and in some streams totally extinct. Every one knows, too, that many of the species of fishes which remain permanently in our fresh waters, have very much decreased in numbers, as well as in size and fatness. People say that this is a necessary consequence of the building of dams and mills, and filling the streams with obstruc-

tions of various kinds required for the industrial pursuits of a civilized community. No doubt it is a consequence of these obstructions, but it need not be a *necessary* consequence. I hold that dams and mills might be constructed, and continued, and yet by a little concession on the part of dam and mill proprietors, and a more general diffusion of the knowledge of the natural history of fishes, more intimate acquaintance with their peculiar habits, instincts, and wants of life, the mills might remain and the fish continue to perform their annual pilgrimage to and from their breeding haunts, if not in so great numbers as in former times, yet in such numbers as to afford a vast amount of provisions and even luxury to the communities which are now wholly deprived of them.

I am aware that this subject has been discussed over and over again—that for years and years past, every session of our Legislature was thronged, and committees were worried and teased by mill owners on the one hand and fishermen on the other—one demanding the privilege of building dams and mills without let or hindrance as to the fish, and the other pleading for some reserve, some fish-way, or some accommodation to the annual flow of fish, which had been of such signal service to the support of the people on the banks and vicinity of the waters in question. I am also aware that our Legislators, actuated by a sincere desire to do justice to all parties, and to give equal rights to all, have, in most instances, made provisions in the several charters and private acts pertaining to mill owners, for the passage of fish at certain times and seasons, with a hope that, while it encouraged the establishment of mills and machinery, there would also be at the required times a safe and successful transit for the various species of fishes that required such passes as one of the indispensable requirements for the continuation of their existence. And we are all aware also that, either from ignorance of what the habits of the fish demand, these ways have not always been properly constructed,* or from

* The charter granted to the Augusta Dam Company required that suitable provisions should be made for the passage of fish. When the dam was built, it was thought by the engineer and others, that a long inclined plane extending from the pitch or brow of the dam to the bottom of the river below, over which the water could flow with a steady, uniform current, would not only allow fish to ascend, but also render a better passage of logs, and make the dam more firm and secure. The results did not meet these expectations. The fish could not go up so long an uninterrupted sheet of water. The logs often in low stages of water grounded and stopped by the way, and the water at the foot of the dam, by its revulsion or sud-

selfishness in mill owners in not keeping them open at suitable times, these provisions have in most cases failed, and the destruction of the fish is the inevitable result.

Notwithstanding this discouraging state of things, it does seem to me that, by proper attention to this business, and by a more general spread of the knowledge of the system of artificial breeding of fish, and careful provision being made to enable them to carry out the dictates of their natural instincts, these kinds of fish might again be introduced into the waters which formerly swarmed with them, and a supply of them afford, as of old, an annual and rich return for the care and labor they would require. This has been successfully done in other countries, why cannot it be equally as well done with us?

I am the more sanguine that this can be done in all our rivers and streams which they naturally inhabited formerly, because of the partial success that has attended the keeping open perfectly constructed fish-ways in a few parts of the State.

Experiments have been successful in some other States, by which some streams and lakes have been stocked with fish of kinds never known there before, and others again filled from which the fish had been driven by the obstructions thrown in their old pathways, with no means given by which they could surmount them.

It will be well, however, before going into detail in regard to the artificial propagation of fish, or of the replenishing exhausted lakes and streams, to examine some points of the natural history of the species proposed to recommend for propagation, and thereby

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denly checked momentum, dug under and began to undermine, and the apron had to be removed and the water allowed to pitch over perpendicularly. This saved the dam, but no fish-way was provided, and the fish for years kept back, until a new "*fight*" was made in the Legislature, and a fish-way opened near the bottom of the dam.

The fact is, that fish cannot ascend a long continuous pitch or cascade of water. We formerly have frequently watched the movements of salmon when ascending the Ticonic Falls on the Kennebec at Waterville in the spring of the year. They invariably selected those portions of the falls that were most interrupted by breaks or steps of the ledge forming little basins at different stages in the fall. They would fetch a spring and go up a pitch of water almost perpendicular for four or five feet, and then rest themselves some time in the basins preparatory for another spring, and so continued their operations until the last pitch was scaled and they reached the smooth water above the falls. This fact indicates that if a direct passage could not be made in a dam, a series of short falls or steps would meet the requirements of the migratory fishes.

become better prepared to conduct the business more understandingly, and more in accordance with their natural requirements.

Salmon (Salmo salar.)

The largest and most valuable of the migratory tribe of our fishes, and the loss or scarcity of which is most severely felt, is the salmon.

The study of the habits and instincts of the salmon has been more carefully and thoroughly pursued in England and Scotland than in this country. From facts developed thereby, it appears that there are some peculiarities in regard to their natural habits in the English waters, and probably everywhere, which render them very different, as far as is known, from the characteristics of other fish.

According to the observations of Mr. Brown of Scotland, who has made the natural history of the salmon a special study, and who has published a very pleasant and interesting book upon the subject,* the young fry, in the first stages of its growth, cannot live in the salt water. The fishermen in that section of Great Britain enumerate several stages or periods of growth in the salmon, for each of which they have a distinctive name. In its first stage, they call it "parr." In this stage its scales have not grown, and it is so different in appearance from what it is at the next older period, that it was long considered by fishermen as a distinct species of fish, having no connection with salmon. This stage, or period, continues generally about one year, but it is a little remarkable that all of these "parr," even of those hatched at the same time, do not all change at the same time. Some of them continue in the "parr" state a year longer. In the next stage, or period, they are called "smolts." The scales and many of the specific forms and colors of the salmon now show themselves, and all acknowledge them to be the veritable young salmon. During this stage, there seems to be some interior physiological as well as external change. Instead of its being unable to live in the salt water, it now seeks for it, going down the rivers to the ocean, and remaining there during the winter. After remaining absent a few

* Natural History of the Salmon, as ascertained by the recent experiments on the artificial spawning and hatching of the ova and rearing the fry at Stormontford, on the Tay. By William Brown. Perth-Glasgow: 1862.

months, a portion of them return, much enlarged in size, though not of full growth. They are then called "grilse." In this grilse stage they have become sufficiently matured to breed, and they seek the cool head waters of clear and gravelly streams for the purpose of depositing their spawn in those places. But, as in the case of unequal change of the "parr" to "smolts," there is a similar inequality in the change from "smolts" to "grilse," some of them remaining until the next year before they appear, when they come as full-grown salmon, instead of coming in the "grilse" stage. There is another peculiarity observable in them. Besides being unable to live in the salt water while in the "parr" stage, it is remarkable that, young as it is, the male parr is capable of impregnating the ova of the "grilse" or more matured salmon. We quote from Mr. Brown's work a few of his remarks in corroboration of the above statements. The fact that the fry of the salmon, in its "parr" state, cannot live in salt water, was tested by him by putting some "parr" into the salt water. "Immediately on being immersed in it, the fish appeared distressed, the fins standing out stiffly, the parr markings becoming of a brilliant ultra marine color, and the belly and sides of a bright orange. The water was often renewed, but they all died, the last living nearly five hours. After being an hour in the water, they appeared to be weak and unable to rise from the bottom of the vessel which contained them, the body of the fish swelling to a considerable extent." He then took eggs which had been previously manipulated upon, and dropped them into sea water, which destroyed them almost instantaneously. He then put "smolts," which had had on their scales for some time, into the salt water, directly from the fresh water, and they seemed to enjoy it as if they were in their true element. These facts, he observes, "prove that until the parr is covered with the new scales, it is unable to live in salt water, and also that salmon cannot hatch or breed in the sea."

In regard to the precocity of the male "parr" as to its power of impregnating the ova of the "grilse," and older salmon, while the female "parr" has to undergo the changes before mentioned, Mr. Brown observes that, "why those parr that remain behind in fresh water for another year do so, we cannot tell, but such is the fact, and the best reason we can give is, that by this means the river has always fish in it that will migrate at least a month sooner in the spring than the fry of the first year, and also that males will

be always at hand in the river, during the spawning months, in a fit condition to supply the want of male salmon, when that occurs. This is a wise provision of Nature, as many females, in small and distant tributaries, might be left without a male if there were no parrs, male parrs having been proved to be in a breeding state at that time." This fact has been often demonstrated by trial of them in the artificial impregnation of the eggs of the matured salmon.

Process of Spawning.—I have never had an opportunity of witnessing the spawning operation of the salmon, although I have made several excursions to the head waters of the western rivers of Maine at various seasons partly for that purpose. The obstructions now in these rivers, and the eagerness with which the salmon are hunted and caught, as soon as they appear in the spring, prevent the most of them from getting up to the ancient spawning waters. They probably do it early in the fall or late in the summer. I have seen them caught in the upper Penobscot late in August, but those I examined had no spawn in them, although they were plump and vigorous.

All the salmon tribe, which includes the several species of trout, white fish, &c., seek gravelly and sandy shallows for the place of depositing their spawn.

Salmon, in the English waters, where they are more strictly protected by game laws, have been subject to more critical examination, and a few quotations from some of the close observers in that country will illustrate the general habits of this fish, though the time or season of their spawning may vary from those that inhabit our waters.

A writer in "Bell's Life in London," under the sporting head, says "as soon as they (the salmon) have paired—the females seeking the males, as it is said maids do of leap years—they choose a fit spawning locality, from which, if they can, they chase away all other fish. For some days they are engaged in this operation. This being done and the female ready to lay her mature ova, or eggs, they commence constructing what I call their nests."

Mr. Young, in his book of the salmon, and who has often watched them, gives the following account of the situation and construction of their nests and subsequent operations:

"The spawning bed," he says, "which may be called a continuation of nests, is never fashioned transversely or across the water

current, but straight against it. The way the bed is formed has never heretofore been accurately described. Some have affirmed that the male fish is the sole architect; others that the female does all the work; others, again, that the tail is the only delving implement used, &c., &c. A salmon spawning bed is constructed thus: The fish having paired, chosen their spot for bed-making, they drop down stream a little, and then rushing back with velocity towards the spot selected, they dart their heads into the ground, burrowing their snouts into it. This burrowing action, assisted by the powers of the fins, is performed with great force, and the water's current aiding, the upper part or roof of the excavation is removed. The burrowing process is continued until a first nest is dug sufficiently capacious for a first deposition of the eggs. That done, she retires down stream, and the male instantly takes her place, and, pouring by emission a certain quantity of milt over the deposited ova, impregnates them. After this, the fish commence a second excavation, immediately above the first, and in a straight line with it. In making these excavations they relieve each other. When one fish grows tired, it drops down stream until it is refreshed, and then, with renovated powers, resumes its labors, relieving at the same time its partner. The partner acts in the same spirit, and so their labor progresses by alternate exertion. The second nest completed, the female enters it as she did the first, again depositing a portion of her eggs, and drops a little down stream. The male forthwith enters the excavation and impregnates the ova in it. The different nests are not all made on the same day, but on different days progressively.

The ova in the first nest are covered with gravel and sand dug from the second, being carried into it chiefly by the action of the current. The excavating process thus described is day by day continued, until the female has no more ova to deposit. The last deposition of them is covered in by the action of the fish and water, breaking down some of the gravel crust above and over the nest. Thus is formed a complete spawning bed—not at once, not by a single effort, but piecemeal, and at several intervals of greater or less duration, according to the age and size of the fish and quantity of ova to be deposited. The time occupied in deposition chiefly depends upon the size and fecundity of the female fish. The average time is from five to ten days."

Mr. Young adds that as soon as salmon have spawned they are

called *"kelts"* or *"foul fish,"* and are totally out of condition and unfit for human food. They drop down into the pools below their spawning beds, and there remain until somewhat recovered from the exhausting process of procreation, and then proceed slowly seaward, recovering and increasing their strength as they go along, and eagerly taking the fly and other baits thrown to them.

It is also stated by different observers, that the salmon eggs hatch in the gravel in from 60 to 120 days, according to the greater or less temperature of the water. They have been hatched artificially in much less time by being kept in warmer water.

Well, say you, all this is very interesting and very well, but how am I to avail myself of the knowledge in the artificial or any other mode of propagating salmon? In answer, permit me to say that these facts tell you what the salmon requires for successful propagation. The nearer you can come to nature's requirements in the propagation of anything, the more successful you will be.

More details in regard to salmon and trout breeding will be given by and by. The salmon is the head and type of this family (Salmonidæ) of fishes. The same requirements, with few exceptions, are necessary for the various species of trouts, whether brook trout or lake trout, and also for the white fish, (Coregonus,) which inhabit some of the northern lakes of Maine, only their operations are on a smaller scale, and they do not leave fresh water at any time for a sea life as do the salmon. They all, however, leave the deep lakes and their summer haunts, and come up in autumn to the shallow pebbly and sandy head waters of the streams to deposit their spawn, and then retire into winter quarters.

Shad and Alewives.

Although there are several other migratory fishes besides the salmon which spend the winters in the sea and come up to fresh water in the spring or autumn to spawn, such as the smelt, the frost fish or "tomcod," eels, &c., the two above named, next to the salmon, are most valued and most sought and cured for economical purposes. They too, in early times, used to fill the rivers and smaller streams of Maine in countless numbers, affording almost inexhaustible stores of subsistence to the people and a large surplus for exportation to less favored countries. They too, like the salmon, have had to give way to the inexorable improvements of civilized life, and have been annihilated by dam and mill

and the many obstructions which the white man has thrown in their pathway. They are more simple in their wants and modes of life than the salmon. Their visit to fresh waters seems to be for the mere purposes of selecting a safe place for their spawn, secluded from the many sea enemies that are constantly following and preying upon them. They used to come up in myriads in the spring months, filling the rivers and dividing off into the tributaries, and following up until they came into the lakes. In the shoal and warm waters of these near the shores, where they could find sandy bottoms, they would excavate shallow basins, deposit their eggs, and soon return again to the ocean. The young descend late in the summer or early autumn. On their way up they were plump and fat, full of life and vigor. On their way down they were lean and lank and not worth catching—a *"shotten herring"* being considered the poorest of all fish and a proverbial type of the meanest of all animal life.

The loss of these fish from the waters where they were once abundant, is a serious one to the community. I do not recommend the artificial propagation of the shad and alewife, but it may be safely urged, that by a little modification of the laws necessary for their preservation at certain seasons of the year, and proper provision and attention to fishways to enable them to find the proper summer haunts, they could be again turned up our rivers and streams, and made to fill our numerous lakes with their young, which would thus ensure an annual return of them, sufficient to keep up the supply for propagation, and afford at the same time a vast addition to the subsistence of the community by their surplus. They are not all gone. Every spring, shoals of them, though not in such vast multitudes as of old, range along our coast, and are led by their instincts to seek the fresh waters for the purposes of continuing their species.

Three years ago, in the month of May, in company with a friend, while passing by the lower lock of the Cumberland and Oxford Canal, in the city of Portland, our attention was drawn to a crowd of men standing by the side of the lock, several of whom had long-handled nets, with which they were fishing, or rather dipping out fish from the water. On coming up, we saw that they were catching alewives in great numbers. It appeared that these fish, in their peregrinations along the coast, had been attracted by the fresh water of the canal, and instinctively entered it in order, as

they supposed, to follow up to its source, (Sebago Lake,) but were brought to a stand-still by the upper gate of the lock. The men engaged there then shut the lower gate, and commenced catching them. As soon as those of them that were confined in the lock were all caught, the men opened the lower gate again, and admitted a lot more of them, and thus a wholesale destruction of them went on. I supposed that some of them might possibly work their way up, when the several locks should be opened for the passage of boats, and thus Sebago made a breeding place for them, but on inquiry, am told that there are few or none seen there. Now it would be a very easy matter to stock that lake with young herrings (alewives) by proprietors of the canal forbidding any of them to be caught on certain days, and placing men along the route to let them through the gates into the lake. Indeed, it seems that by renting the privilege of fishing for them on certain days, some considerable revenue might accrue to the company, while the production of the fish would become again a benefit to the section of country through which the canal passes. The same system might be adopted on many streams by having fish-ways or fish-locks, to aid their ascent, with much benefit to the country and no detriment to the mill interests.

Artificial Propagation.

A few rules and details for the artificial propagation of fish will now be given. It has been stated in the commencement of these remarks when and by whom the process by which fish propagate naturally was discovered, and the practical use which had been made of this knowledge. The eggs of fishes are, as has been stated, impregnated, *after they are laid by the female, simply by the immediate diffusion of milt from the male among and throughout the water in which they are deposited.* A knowledge of this single fact has led to great results, by making it as easy a matter to raise or breed fish, having all the fixtures ready at hand, as it is to raise chickens. All you have to do, after having your ponds or reservoirs ready, is to obtain a male and female fish—trout for instance —at the proper season, when the eggs of the female and the milt of the male are mature, and then, first gently press the eggs from the female into a vessel of water, and immediately follow it by pressing the milt from the male into the same vessel. Dr. Garlic of Cincinnati, Ohio, who has published a very interesting little

book on this subject, thus describes his first attempt at artificially spawning and impregnating the eggs of trout:

"On the 21st of November I captured a pair by means of a landing net, and placed them in a bucket of water, and being provided with an earthen vessel, I made my first attempt. I partially filled the earthen vessel with water, and taking the female in my left hand, and making gentle pressure on her abdomen with my right, the eggs were forced into the earthen vessel containing the water; the male was treated in precisely the same manner, forcing the spermatic fluid into the same vessel; the appearance of the eggs was almost instantly changed from their bright golden orange color to a pale transparent yellow; they were then placed in running water with the vessel containing them."

Here you have the whole "craft and mystery" of artificial impregnation and propagation of fishes—the corner stone of Aquæculture. Two things must be observed and followed. 1. Press gently, for if the eggs and milt are not mature, they will not pass out by gentle pressure, and severe pressure would be injurious. 2. Follow up the diffusion of milt with the eggs, for it has been proved that they soon spoil if this is delayed.

Francis, in his work before mentioned, gives a more detailed account of his mode of operating. He considers a flat shallow tin dish, such as is used for baking pies in, to be the best receptacle to catch spawn in. It should be about half filled with pure water. If the spawn renders the water turbid and thick, something is wrong, and possibly the fish is not mature. He recommends that, before operating, you should collect in tubs of water about you, the fish you intend to operate upon, and it should be your first care to see that you have a plentiful supply of male fish, as it is better to have more males than females, for, although a small portion of milt will fecundate the ova, yet it is desirable that *enough* should be discharged to permeate the water in the dish thoroughly. Indeed, when the water is stirred to mix the milt and ova properly, it should be of a cloudy milky whiteness.

Having then discharged the ova into the tin dish, and turned the female back into the water, you should take a male fish and press forth the milt on the water, moving the fish round about, as he does, so that the milt may cover as large a portion as possible. It will flow into the water in a thin milky stream. If one fish does not furnish enough, take another and add a portion of his milt, and

when you have enough, lay the fish aside and gently stir the water and ova with the hand, until the whole be thoroughly mixed, and every egg may have received its due proportion.

The tray should be allowed to stand a few moments, that the charm may have time to work, and then pour off a portion of the discolored water and pour in, gently, a fresh supply of new water from the stream. Then pour off a portion of this water and add more fresh water, causing as little disturbance of the ova while doing so as possible. This process should be repeated two or three times, until the water in the tin dish is perfectly clear. When the water is quite clear, the whole may be poured into a small tin pail holding from half a gallon to a gallon of water, the pail being about one-third full of water. The lid of this can should be perforated to admit air. Place it where it will not be disturbed, and continue your operations with another pair of fishes, and when sufficient spawn has been collected for your purposes, pour all into the can, which should not be more than half or two-thirds full of water. You can then carry this spawn where you please, *provided no rude shaking of it takes place.* Such are Mr. F.'s directions.

You will see that in the directions given above the fish is held up above the water, but Mr. Glover, an experienced and skilful manipulator in this business, objects to this, and holds the fish differently. He directs you to operate in this way: Place the tin dish before you, take hold of the fish by the head *with the left hand,* as described above, hold it up tail downwards so as to allow the spawn to drop down towards the vent, then take hold of the fish with the right hand, just below the vent, so that the back shall be compressed by the fingers and palm of the hand, leaving the thumb free to manipulate the belly of the fish ; slightly bend or crook the fish, in order that the spawn, which has dropped down towards the vent, may be kept back and not be allowed to fall away from it when placed in a horizontal position. Press the belly of the fish into the water to the bottom of the tin dish ; the dish, by this means, greatly assists the grasp in holding the fish. Now rub the side of the thumb (the inside, not the ball,) against the belly of the fish, just above the vent, pressing out the ova gently. The ova in the neighborhood of the vent will flow out freely, and when it ceases, hold up the fish again, tail downward, to allow the rest of the ova to fall down to the neighborhood of the vent, and so continue the operation until all be pressed out. Sometimes, if the

fish be large, it may be necessary for a second person to hold the tail to prevent the splashing about of water and ova.

How should the Eggs be used after Impregnation?

You have seen that it is no very difficult thing to procure eggs and impregnate them; the next question is, how to manage them successfully afterwards. It is one thing to lay eggs and quite another thing to hatch them, and still another thing to rear the young to maturity. The mere hatching is very simple. Francis says he would "undertake to hatch a hundred young salmon with the aid of a cheese plate and a tumbler of water." But as hatching involves the subsequent treatment of rearing, and as all animals, in the state of nature, always forelay for the support of their young before producing them, it is necessary, in order to succeed as well as they do, to follow their guide. Let nature guide, is a good rule in nearly all the departments of life. Follow out, therefore, as near as you can, the natural laws and requirements which the fish themselves practise in their native undisturbed condition. This tells you that the eggs of trout, and salmon, &c., should be exposed to running water, and not to stagnant or turbid and foul water. As has been previously urged upon you, study the natural laws of the fish you wish to propagate, and you have the key to the whole system, and all that remains for you to do is to apply the laws so discovered as well as you can in an artificial way.

In hatching the eggs that you have procured and impregnated as above directed, it is not necessary that you should place them in natural streams, though that would be better. You may hatch them in your own room, or shop, in earthen and wooden reservoirs, and feed and care for the young until large enough to transfer to your fish pond, provided you have running water or any other pure water in agreement with the natural requirements with the species you are breeding.

Your ingenuity will prompt you to get up such constructions as will meet your wants. Some use simple willow, or wicker baskets, in which the eggs are deposited with clean sand and gravel, over which a little stream of water, from an acqueduct, or some reservoir, flows steadily and gently. Some use wooden troughs, placed side by side, but one elevated a little higher than the one next to it, like stairs, and let the water run into the top one, from thence into the one next below, and so on through them all and

out from the lowest one. Where you have a spring, or a stream suitable, you can make larger and more permanent fixtures, and on a larger scale. Dr. Garlic gives the following description of the plan that he and his partner, Dr. Ashley, adopted: "At the head of a spring we built, says he, a house eight feet in width by twelve in length. We placed a tank, made of two-inch plank, four feet wide by eight feet in length, and two feet deep, in the end of the building nearest the bank. The water from the spring enters the tank through a hole near the top, and escapes through a similar hole at the other end, from which it is received into a *series of ten boxes*. These last boxes are eighteen inches long, eight inches wide, and six inches deep, and are so arranged that the first is much higher in the series than the last one. They must be filled with clean sand and gravel to the depth of two inches, the sand being placed at the bottom. The impregnated eggs are to be scattered over and among the gravel, care being taken not to have them in piles or masses." It is well to have the lower end of the boxes grated with wire cloth to prevent the young fish, when they are hatched, from "*skedadling*" and leaving you.

So much for the apparatus, or fixtures, or in other words the *nests* in which to hatch your finny chickens. If those described don't suit you, or meet the peculiarities of your location, as was before observed, your wits will soon suggest such variations as will answer your purposes.

Having your nests all made, and the eggs all suitably deposited, the incubation process has begun. Your next care is to keep them clean and allow no sediment or mud to accumulate over them. Examine them frequently and see that all goes on right, and if any of the eggs turn white, they are addled ones, and will never hatch, and should be picked out with a wire forceps, a spoon, skimmer, or some other suitable instrument, and thrown away. It is said there is a species of moss, called "*byssus*" by botanists, that sometimes grows upon the eggs and destroys them. This must be owing to their being in impure water or sand. When this takes place, you should remove all the eggs, throwing away the mossy ones, and clean out the nests, and supply clean new sand and gravel and better water.

It takes trout's eggs about 60 days to hatch in water kept at about 42 degrees. In colder water it will take longer; in our natural streams in Maine it takes twice that length of time, say 120 days or four months and perhaps longer.

How to Treat the Young Fish.

Your fishes being now hatched, how shall you manage them? You will find when the young fish is hatched that he has a comparatively large sac or bladder-like bag attached beneath his body, which he carries about with him for some time, it growing gradually smaller and smaller until it disappears. This bag is a part and parcel of the egg, and contains a source of nourishment for the young fry until it becomes absorbed and assimilated to its body. During this period, which lasts nearly or quite a month, they will need no feeding, but they will require care and protection. Boxes or tanks, or any kind of reservoir holding a barrel or two of water, which should run gently through it, will hold a thousand of them. The orifice where the water passes out should be covered with wire cloth to prevent their escaping. When the bag has nearly disappeared from beneath their bodies, you may begin to feed them. Lean beef, or mutton, or other animal flesh, may be boiled and crumbled or hashed up very fine and given them. Worms and maggots may be given them, but not too profusely at first. Fresh fish may also be cooked and fed out to them in the same way. When about two months old, shift them into larger quarters, or, if you have a pool, or small pond of water, they may be placed in it, provided there are no larger fish there to gobble them up. Some recommend to keep them in tanks until they are a year old, before placing them into ponds, but this is too much trouble, if you have suitable ponds for them. In aquæculture of this kind, you will need separate ponds for the young and old, as much as you do in agriculture for your calves and older cattle. This is conformable to nature, for if you observe carefully, you will always find the young fry in the shallow pools and margins of lakes and streams, where the larger fish cannot very readily get at them.

After they are about a year old, fish get to be pretty voracious, and will eat a great variety of food, and should be fed accordingly, if you want they should grow fast and be fat and sweet. Trouts, in a state of nature, will eat water insects and small shell fish which they find attached to aquatic plants, and will catch flies and other insects on the surface. They will also eat dead animal offal, worms, maggots, bread, and almost every thing you may give them. You can thus "stall feed" them as well as you can an ox or a sheep, and the profit will be comparatively greater, because they will eat food of but little worth fed out in any other way.

Application of these Principles to Salmon Raising.

It has been stated in the course of these remarks, that salmon are a migratory fish, changing, like the wild geese, their climate and their feeding ground twice in a year; that in spring and summer they seek the fresh waters, and that in winter they live in salt water; that they breed in the "shallows" of rivers, in nests that they form in the ground; that the female deposits her ova in them, and that immediately afterwards the male impregnates the ova by shedding his milt upon them; that the ova are hatched on an average in 120 days; that the young so produced do not assume the fish form until a month old; that it is then a salmon fry, sometimes called in England a *"parr;"* that it continues in fresh water in this state one year, and them becomes covered with scales, and is called a *"smolt,"* is about five or six inches long, "with a silvery coat of two or three ounces in weight; that it then migrates to salt water, feeds there three or four months, grows rapidly, and comes back a *'grilse'* or young salmon, sometimes weighing eight pounds;" that it then spawns as did its parents in the shallows, and then again seeks the salt water; that in three or four months it returns, still more increased in size, becoming "a mature salmon of seventeen or more pounds." And this is the routine of salmon life, migrating and immigrating from lake to ocean and from ocean to lake every year, if not taken or molested any way. But it has been seriously molested in our rivers, shut out from its natural haunts and breeding grounds, and continually pursued and destroyed whenever it shows itself in fresh water, caught by spears and hooks and nets and wiers and in every conceivable way that ingenuity could devise to destroy it utterly from our waters. There are but two ways to restore them, viz.: first, by having suitable fish ways and the command of the waters for the time being, to ensure their safe transit and safe existence during the spawning; and second, by preparation of artificial ponds for them to hatch in and grow for one year, preparatory to their migration to the sea. And how is the best way to do this? It has been done successfully in other countries, and perhaps the account that Mr. Young gives of his experiments by the side of the river Shin, in Great Britain, which he had conducted for three years at the time he made them public, will be as good a guide for you as can at present be given. It supposes that you are so situated as to have the control of a little land by the side of a river that salmon would

have access to from the sea, if they had a chance; and there are many such rivers in Maine. "To give the seed (salmon eggs) the same advantages as those would have which naturally spawned in rivers, the artificial breeding ponds should be constructed in the immediate vicinity of, or in *the* river, and the pond should be fed by a small stream, or 'lead,' taken from the river, so that the *temperature* and all the conditions of the one may in every respect agree with those of the other. At the spot where you propose to take the 'lead' from the river, you commence the erection of a wall to shut out the main current. The wall may be built in the river by the side of its banks, and its height there is to be greater than the highest flood marks of the river. In the bottom of the wall, where it takes the 'lead' from the river, an opening or *drain mouth* is to be constructed of the width of the current you wish to flow your ponds inside the defending wall. This opening at the upper end of the wall is to be so framed that, whether the state of the river is low or high, the supply of water to the pond will be neither injuriously diminished nor increased.

The *drain mouth*, or opening in the wall, is to be secured by a strong iron grating, the bars of which are to be half an inch apart. This grating will prevent the accumulation in the pond of any thing hurtful to them. The bed of the pond must be dug to the depth of five feet, and they must be nine or ten feet in width, or about eighteen or twenty in length. Their bottoms must be lower by five feet than that of their feeder. The bottom must not be quite flat, but graduated, rising from the end furthest from the head of the current, toward the opening of the *drain mouth*.

The necessary inclination can be given to the bottom of the pond by beginning with a layer of gravel one foot thick at the farthest end, and finishing off toward the mouth with a layer of gravel eighteen inches thick. The bottom of the pond will thus become an inclined plane.

The ova are to be deposited at the top of the gradient where you have finished off with a layer of eighteen inches of gravel, in order that they may have the benefit of sharply running water.

The lower part of the inclined plane, or the deepest part of the pond, suits best the fry after incubation. The walls that are to secure the pond may be stongly built of rough stone, but no lime must be used in the walls or any thing connected with the pond. To secure the pond from the entrance of the smallest fish, besides

the iron grating already mentioned, there must be another of copper wire cloth, so fine as to prevent the possibility of the smallest trout passing through the interstices.

If a diminutive trout should enter, it would devour the fry as soon as they are hatched. Each end of the pond should be secured in the same way. At the end where the water runs out there should be, if possible, a fall in the river which would effectually prevent the ascension of any predatory fish. Some persons have tried artificial breeding (of salmon) in ponds supplied with water from springs and hill-burns, but in such trials no sensible person ought to expect satisfactory results, or, at any rate, results similar to those that would be derived from the use of ponds constructed in salmon rivers, or fed by water emanating directly from them.

Both the development of the fish *in the egg* and *from the egg* depends upon the temperature of the water, and we know that a single frosty night will reduce, by many degrees, the temperature of rills and rivulets. Fry, therefore, hatched in ponds fed by these hill streams must be stinted in growth—kept at a *stand still* during many weeks—and they can never arrive at the *smolt* state in the same period of time as fry bred in the waters of rivers. These latter fry are in their natural element—natural as to temperature, and in the food, insects, &c., it produces.

On the contrary, fry bred in ponds fed by springs are, as it were, subjected to a different climate, strange and unnatural to them, barren or nearly so, of insects, and foreign to their innate tastes. Their progress in growth, therefore, cannot equal that of the fry bred in favorable localities.

When the ponds are perfectly formed and constructed, they should be filled with water, and it should be allowed to run freely into and out of them for a few days previously to depositing the spawn in them. This is necessary in order that the newly laid gravel may be washed well, the beds properly seasoned, and all mud or alluvial matter got rid of. The artificial spawning beds must be reduced as nearly as can be to the condition of the naturally formed ones of rivers.

The next step to be taken is toward procuring proper spawn for depositing in the ponds. To do so we must watch carefully some natural spawning grounds of the river,—or some river at the time when operations of spawning are going on,—and we must capture a pair of salmon that have actually commenced the spawning

process. If we do not, we cannot be sure of procuring spawn in the ripe state. We must avoid capturing, at random, any pair of fish we may see on the spawning bed, because many consorted males and females are seen hovering about the spawning bed several days before they begin depositing their spawn. If from such fish ova are expressed by manipulation, they will be found in an immature state, their pores not yet open for the reception or absorption of the milt, and expressing it over them will not produce impregnation. On the contrary, when a pair that have commenced spawning are captured, their ova and milt will be found in the matured state required, or at least a portion of them. The spawn may be then pressed out into vessels and impregnated by the processes already given.

And Mr. Young says, I would solicit the attention of the owners of rivers to the following great fact:—Salmon spawn, artificially expressed from parent fish, and treated in the manner directed, may be conveyed without injury very long distances—from rivers in one country to rivers in another.

The pond being ready for the reception of the spawn may now receive it. It must be imbedded at the head of the pond—at the commencement of the inclination of its bottom, in a small trench about five inches in depth, formed longitudinally with the current, and not across it. The spawn must not be laid all of a heap in the trench, but carefully mixed with gravel all over its bottom, and then covered in with the gravel that has been excavated in forming the breeding furrow. The trench and its covering must lie on the slightly inclined plane principle. The gravel with which the trench is covered in must not be pressed down, except very slightly, in order to prevent the free percolation of the water, which must have full ingress and egress to and from the spot where the seed lies deposited. The action and constant moving of water are essentially necessary to perfect this strange incubating process. Without them ova will be non-productive, for placed in gravel at the bottom of still, or slugglishly running water, they will putrify, or, to use a generally known expression, they will be "*addled.*"

Thus you have the benefits of Mr. Young's experience. You perceive that his method requires no complicated machinery—no spawning dishes or utensils or breeding boxes He made his beds in the soil of an old mill-race in the river Shin, and took his spawn from that river. The temperature of his spawning beds and of

the river was the same, and his artificially bred salmon assumed the silvery migratory smolt coat at the end of twelve months." What man has done, man can do again, and the experiments so successfully accomplished by Mr. Young in the river Shin can be made in most of the rivers of Maine."

Perhaps the inevitable question of Yankee foresight and prudence will arise here and ask—"Will it pay?" A few facts may be useful by way of answer.

A few years ago, experiments were instituted on a large scale at Stormontfield, near Perth, in Scotland, upon the propagation of salmon. Three hundred thousand (300,000) eggs were placed in the hatching boxes in the months of November and December. They hatched out in April and May following, and in June they were placed in a pond prepared for them, where they were fed and protected for a year. They had then become "*smolts*," and were large enough to be let out into the river and go down, according to their natural instincts, to the salt water. A large number of them were marked, previously to being let out, by cutting off the fleshy (adipose) fin that grows between the dorsal fin and the tail. The largest of them weighed at that time but about two ounces, and measured from five to seven inches in length. They were gone to the sea about two months, and in August many of them returned, and such of the marked ones as could be were caught, weighed and measured. The increase in size was prodigious. The smallest one weighed $3\frac{1}{2}$ pounds and the largest one $9\frac{1}{2}$ pounds, and the others were of different weights intermediate between these figures. The nine-pounders measured $2\frac{1}{2}$ feet in length. It was estimated that about 200,000 of those hatched were turned out to sea.

Now let us make a little calculation on the returns and see if it will pay. As salmon, from the egg state to maturity, are the prey of almost everything, we will suppose that only half of the 200,000 returned the past year, and that these weighed on an average six pounds. This would make an increase of veritable, substantial salmon in two years and a half from the egg, say 600,000 pounds of salmon, and this we will say is worth only 10 cents per pound. This would figure up to sixty thousand dollars worth, ($60,000). Is not this a pretty fair per centage of profit on the investment? If this should be thought to be too large, take the

data and make such deductions and allowances you please, and satisfy yourself whether it would pay.*

Perhaps you will object because I have given you experiments of foreigners altogether. I would gladly have given those of home origin if I could have found them, but, with one exception, I know of none. This exception is the experiment of the Messrs. Treat of Eastport, who commenced, a few years ago, the work of assisting the salmon to breed in certain waters they had the control of (for a certain time) in their own natural way. We are informed that the experiment went on well and encouragingly until stopped by a proprietor of the water above them, who made a demonstration of his "vested rights" by putting a dam across the river, thus shutting them out, and *damm*-ing the experiment as well as the water.

Propagation of Trout.

The trout is a favorite fish the world over. Every body loves the trout, both for the keen sport it gives to the angler, and for the rich, delicate and nutritious treat it affords for the table. Handsome in form, beautiful in spot and color, wary but bold and active in his movements, he has always been the choice spirit that challenges the admiration as well as skill of all lovers of good old Izaak's "gentle art," whether he be schoolboy or man.

The trout is found too in a greater variety of locations than any other fish. Wherever he is, however, you find pure and living water—none of your stagnant pools or dead seas hold him. In the clear and silvery lakes of our forests and woodlands, in meadow brook and mountain tarn, in our broad rivers in the very spot so accurately and poetically described by Thompson—

> "Just in the dubious point, where with the pool
> Is mixed the trembling stream, or where it boils
> Around the stone, or from the hollow'd bank
> Reverted, plays in undulating flow,"

you will find him in the warm season of the year. In late autumn, you will find him with his chary spouse crowding up to the sources

* In 1846 there were taken by the net alone, on the Tay and Earn, below the mouth of the Islay, upwards of 34,000 salmon and 30,000 "grilse" (yearling salmon.) Allowing the average weight to be 10 pounds, you have 640,000 pounds, which at only 10 cents per pound would amount to sixty-four thousand dollars, ($64,000.)

of our streams to deposit their spawn in the sandy and gravelly beds, to be hatched in the coming spring. In midwinter, you will find him in a "state of retiracy," down in the deep waters of the lakes, far out of the way of frost and snows, ready to take any bait you please to send down to lure him to his destruction. "Take him all in all," he is a "smart enterprising" fish, and, like the "universal Yankee nation," is found wherever he can get a living, and a living he is bound to have, even if, like this same prototype, he gobbles up a weaker neighbor or two for his own special benefit. I once caught *three* trouts at one pull on a single small hook. One was large, and inside of him was a medium sized one, and inside of that a small one. They afforded a practical illustration of the proverb sometimes *whispered,* no doubt *unjustly,* in commercial circles, that "the great fish eat up the little ones."

With all the other good qualities of the trout, they are the easiest and most satisfactory fish for artificial domestic propagation. Though naturally shy and wild, they are very easily tamed and rendered so docile, that they will come fearlessly at call, and take food from your hands. They will remain healthy and contented in artificial ponds, provided you furnish them with pure water and suitable food.

Trouts, with mature spawn, can be easily taken with nets in October and November, at the head waters and shallows of our spring brooks. The process of extruding and hatching the eggs, has already been given. Nothing further need be said, therefore, except a few hints on the construction of ponds for their accommodation. Whether your pond be a division of a natural stream, or made by leading spring waters into an excavation dug for the purpose, it will be most convenient to have at least three of them connected together. The upper one may be the smallest and shoalest, to receive the young fry as soon as the umbilical vesicle has been absorbed, and they will do to put in. The second may be larger and deeper, into which they should be introduced when a year old, to make room for another brood of young fry ; and the third should be largest and deepest of all, to receive those that are two years old and in which to be fed and fattened, and from which they can be taken, whenever you feel disposed to treat your aquæcultural skill and labors by luxuriating upon the fat of the fish pond. Between this lower one, and the next above, should be a race way, or space with gravelly bottom, into which they may

pass up in the fall, to indulge their natural instincts in the spawning season. It will be a good plan to introduce into some part of it such aquatic plants as pond lillies, pickerel weed, &c., as these afford a harbor for many aquatic insects which trouts love. Frogs, in the spring of the year, should be introduced where they can spawn, as trouts are very fond of their eggs and the young tadpoles.

Transferring fish to different waters.

The transferring of fish from their native waters to those not inhabited by them, is a branch of Aquæculture that has sometimes been practised with good results.

I was, many years ago, told by some of the old settlers on the Kennebec, that there were no pickerel ever seen in the tributaries on the west side of that river, in the vicinity of Augusta, until they were transferred there from Togus lake, which is on the east side, by the late Robert H. Gardiner. They were put into the Cobbossecontee stream above the mills in Gardiner. The few put in at that time have multiplied and spread into all the connecting waters, and are now, with the exception of the perch, the most abundant of any species of fish found there.

There are several modes of transferring fish for the purpose of supplying waters deficient of them. One very good method is by the means of the impregnated ova of the kinds you wish to obtain. These may be safely and successfully carried almost any distance of a few weeks travel, by being properly packed in moistened sand, or in wet cloths or sponges, &c., &c., and then hatched, and placed in the water where it is desired the fish should be.

It is said by some, though I have never seen it done, that fish, caught in the winter, and immediately covered in snow, become torpid, and may be kept so a long time, and when placed in water, recover from their suspended animation, and suffer no ill consequences by the operation.

A very excellent mode of transferring fish, was adopted by Drs. Garlic and Ashley, by keeping them during the passage in ice water. This kept them in a partially torpid state and they remained very quiet while on the way. "The transportation of live fish," he remarks, "has always been a laborious business to me, and hazardous to the fish, until I hit upon the plan of conveying them in water made very cold by the addition of ice. I carried four

hundred and twenty trouts a distance of twenty-eight miles, without changing the water once, in a barrel only three-fourths full of water. The water was kept as cold as it possibly could be by the frequent additions of ice. I lost only four or five of the fish, and these were killed by being jammed between the pieces of ice. They were in the barrel fully eighteen hours without the water having been once changed. I feel very confident they would not have lived a single hour in the water, had it not been for the extreme cold caused by the frequent additions of ice. The fish, however, were all small,—one-third of them, perhaps, were two years old; the remainder were yearlings and young fry of six months."

There are several species of fish found in other sections of the United States, but not now found in our waters, that would be quite an acquisition if transported hither. I will name but one, however, now, and that is the Black Bass, (*Centrarchus Fasciatus* of DeKay, *Grystes nigricans* of Agassiz.) This fish is found in the rivers and small lakes in the western part of New York, and has been introduced from them into some of the ponds (lakes) in or near Plymouth, Mass. It might be obtained from them without much trouble and introduced into some of our own waters. It grows to good size, say from twelve to eighteen inches in length; takes the bait or fly readily, and affords exciting sport to the fisherman and richly rewards his skill with an excellent repast for his table. It breeds in April and May, and is recommended as being a superior fish for artificial ponds.

There is also a capital fish found in the Fish river lakes in the north part of Aroostook county, and some other lakes in the northern parts of Maine, but not known in those of the interior, or seaboard. It is the White Fish, (*Coregonus albus.*) It belongs to the salmon or trout family, (*Salmonidae,*) lives in the deep waters during summer but comes up with the trout in autumn to the head waters and shallows to spawn. There is no doubt that it will live where the trout will, especially the lake trout, or "togue," and it would be a valuable acquisition to fishing grounds in any part of the State where they are not now found. Would it not be well also to try a transfer of the delicate "Blue black trout," (*Salmo Argwas-suc* of Girard,) found now only in the Rangely lakes, to some of the lakes near the seaboard?

There is one precaution to be observed in this transferring fish from one locality to another. You should be sure that their new home is well furnished with food natural for them.

Hybridizing or Cross-breeding of Fishes.

There can be no doubt that fishes may be hybridized, and new breeds made by crossing different species with each other. This would be, if not profitable, at any rate a curious and interesting operation, and afford opportunity to the naturalist to observe some of the laws of the physiology of this class of animals in respect to the laws of their propagation.

That different species of the same genus have, in some instances, "crossed the breed," as it is called, is proved by several authentic cases. The following is one of them. It was related to me by my friend J. F. Anderson, Esq., of South Windham, in this State. It refers to some crosses between the gold fish and different species of the *Cyprinidæ* family. "Regarding the cross between the gold fish and the chub, there can," he says, "be no doubt, for I repeatedly observed such results in the little pond at the foot of my garden, in which a lot of gold fish were introduced to a lot of chubs which had been its previous occupants. They bred there for several years, but one spring the bank (or wier, for, as you remember, it was an artificial pond,) gave way, and they all went into the Presumpscot river. During that, or the next season, Daniel Dole, Esq., an observing man, living near Cobbywright brook, one of the tributaries of the Presumpscot river, brought for me to examine, 'a very queer fish found in Cobbywright.' I at once recognized one of the speckled and splashed, red and white fish bred in my pond."

The ease with which the ova of fishes can be impregnated by artificial means, as has been before described, makes it also a very convenient, and probably a very efficient method of getting up cross breeds. It will also be the true method of ascertaining how far the eggs of one species can be impregnated by the milt of another species, and vice versa. It may be doubtful how far you would succeed in crossing the species of different genera, such as the pickerel and trout for instance. If there is nothing incompatible between them, and the milt of one will fecundate the ova of the other, there would be trouble in obtaining individuals of both species in full maturity at the same time of the year. The pickerel spawns in the spring, and its eggs hatch in about three weeks, while the trout spawns late in autumn, and its eggs are much longer in hatching. If by any means the pickerel could be delayed in the maturing of its eggs, and the trout matured earlier, the experiment might be fairly tried. This idea is thrown out

merely to illustrate some of the difficulties in the way of such experiments, and not with any expectations that any particular benefit would arise from such a cross. A trial, however, might easily be made between species of different genera that mature at the same season of the year, as the pickerel and the white perch, or the yellow perch and white perch, or any others that are in season together.

Again, the salmon and the trout might be tried together, and if the hybridizing would produce a cross that, while it partook in its characteristics as to size and good qualities of the salmon, without its propensity to migrate to the sea, but remain in fresh water all the time, it might prove quite an acquisition.

Some have thought that the salmon trout, which is caught in some of the Maine lakes, (*Salmo Sebago*, Girard,) is or was originally a cross of the salmon and common trout. Whatever may be the facts in this case, one thing is certain—a very good and excellent fish, whether for sportsman or epicure, is that same salmon trout, and is deserving more attention, protection and culture than has hitherto been bestowed upon it.

Conclusion.

My sole object in preparing this compilation of observations, experiments and facts upon Aquæculture, and recommending special attention to it Maine, is to invite an investigation of this great subject by the people—a subject so full of hopeful results and promise of producing, if successfully carried out, an almost unlimited supply of healthy subsistence to our population, and that too from sources now lying neglected and dormant.

You will admit that it would be a crying evil, and a crime, if the now fertile acres that yield so freely to the hand of agriculture, the rewards to its industry, should be allowed to become neglected and thereby fail to give their yearly supply of food and comfort to man. Is it less so in our having suffered our lakes and rivers and smaller streams, that once teemed with an annual overflow of animal life, full of grateful and generous sustenance to the community, to become almost fishless and barren?

The plea of ignorance of the science and practice required for restoring them to usefulness again, may be urged with much truth and reason by way of excuse for not doing it; but, hereafter, it may be hoped that the diffusion of knowledge in regard to the

experiments and researches made and making in this department of industry will soon dispel this ignorance, and that the true principles of Aquæculture, in all its bearings, both maritime and inland, will take their stand in rank and importance with those of Agriculture, and both be considered as equally of vital necessity to the strength and prosperity of the State. That, guided by these principles, the productive powers of our whole domain, of ocean and lake and land, will soon receive the attention and culture they deserve, and our people be able to gather full harvests of rich subsistence from our waters and "suck an abundance from the sands of the sea."

FRUIT CULTURE.

My report last year contained a paper relative to the culture of the Apple and the Pear—the most valuable fruits of temperate climes. It is proposed to continue the same general subject by submitting some remarks relative to other fruits, several of which, although demanding less extensive cultivation, are yet equally worthy of a place in every well appointed fruit garden.

The Plum.

The plum is a valuable fruit both for the dessert and for domestic cookery, especially for preserves. In most of the desirable varieties it is hardy enough for our climate, and in some locations it succeeds well, but oftener its culture is very precarious and uncertain, and chiefly from two causes: first, the liability of the fruit to be stung by the curculio, and next, the liability of the tree to the disease called Black Knot. These are so serious obstacles that by many its culture has been abandoned. Where it has succeeded, the fruit produced in Maine has fully equalled if not surpassed the productions of any other State in the Union.

The plum thrives best in a rather moist, rich place, where there is a sufficient depth of soil, and of a clayey or loamy character, rather than sandy or gravelly. It is somewhat of a domestic tree, that is, it usually thrives best about buildings, and especially if planted near accumulations of chip-dirt, soap suds and the like. If such situations are well sheltered, all the better. In propagation, budding is preferable to grafting, although the latter will succeed if performed quite early in spring, say in March or April. The common Canada plum, often erroneously called pomegranate, makes a good stock to work the plum on if budded when not more than two or three years from the seed and very near the ground. The common horse plum makes a good stock also, but damsons and suckers of all kinds are to be avoided.

The only remedy for the ravages of the curculio which has been found to be of much avail is by shaking the trees and killing the beetles. As soon as it commences to puncture the fruit place

some sheets under the tree and jar it smartly several times. This is best done by sawing off a lower limb leaving two or three inches next the trunk. Strike this with a wooden mallet, when the insects will be dislodged and fall upon the sheets, when they should be killed at once. If this practice be followed up fairly for a week or two the crop may usually be saved.

With regard to the cause or remedy of the disease known as the Black Knot but little is certainly known. Many suppose it to be caused by the puncture of an insect, and grubs of the curculio and sometimes of other insects are found in the knots upon their being cut open, but these are more probably a sequence of the disease than the cause of it. There is a strong probability that the disease is a constitutional one, and that it affects the whole circulation, for we find when the attack is malignant that if the knots be wholly removed manifestations of the disease presently appear in other places. In cases of mild attack the complete removal of all the diseased portions—amputating limbs when necessary—proves a successful and sufficient remedy; and this should be practised in all cases until found ineffectual, in which event the tree should be cut down and burnt. Washes of various kinds have been used to apply to the surfaces from which the knots have been removed. Solution of common salt, of chloride of lime, of copperas, and of other salts, also spirits of turpentine and the like, but I have found no advantage from their use beyond what has followed *clean* cutting. The entire and complete removal of the affected part is of most importance. Often for a term of years the disease does not appear at all, and anon it breaks out with much virulence. Such attacks usually follow a winter of unusual severity, or a season of excessive produtiveness, producing debility.

Varieties.

The GREEN GAGE is universally considered to be the standard of excellence, having never been surpassed in quality. It is of medium size, rather flattened, and the tree is less vigorous and productive than some others.

IMPERIAL GAGE. This is quite large, oblong, greenish yellow, with faint stripes under the skin, of fine quality. The tree is of vigorous upright growth and productive. One of the best for general culture. It often passes under the name of Green Gage.

WASHINGTON. Of the largest size, yellow, very handsome and of

fine quality. The tree is very thrifty and in most situations, sufficiently productive. A general favorite.

JEFFERSON. This is a fruit of the first quality. Large, oval, yellow with a purplish red cheek, very rich, juicy and luscious.

MCLAUGHLIN. A native of Bangor, in this State, and originated by James McLaughlin. Probably a seedling of Green Gage, which it equals in quality and somewhat resembles in form, although much larger and deeper colored. Exceedingly rich, juicy and sweet, rather early and good bearer.

COE'S GOLDEN DROP. Very large, oval, beautiful and excellent. Valuable for coming after other fine plums are gone. Requires a warm situation to enable it to ripen fully—October.

Other plums which in many gardens have given a high degree of satisfaction are the *Drap d'Or*, (very early,) *Smith's Orleans, Lombard, Purple Favorite, Columbia, Yellow Gage, Bleeker's Gage, Lawrence.*

I examined the fruit of a seedling originated by Col. Henry Little of Bangor, well known for his zeal and success in the advancement of horticulture in Maine, which bore the past season for the first time, and which gave promise of fully equalling any plum yet known to cultivators. As the first fruit of seedlings is rarely equal to what they bear in subsequent years it will be watched with much interest.

THE CHERRY.

The Kentish cherry, common throughout New England and generally called *tame*, to distinguish it from the sorts which grow wild among our forest trees, was formerly very plenty through the State. It proved hardy and bore abundantly. But of late years the stock has become diseased, from some cause, and having been usually propagated by suckers which carried the tendency to disease with them, it is now grown with less success than formerly, and in some sections has become extinct. They were acid and of only tolerable quality. The Duke and Morello cherries are next in hardiness to the Kentish and are hardy enough to succeed in all situations where the conditions are not very unfavorable. Of these the *May Duke* is perhaps the best—and most of them are greatly preferable to the Kentish. What are known as the Heart and Bigarreau cherries furnish the finest fruit of all, but the success attending their culture will warrant the expectation of satisfactory

results only in warm dry soils, underlaid by a dry subsoil and in favorable situations as regards aspect and shelter. Under such conditions the Heart cherries form vigorous, rapid growing, luxuriant, branching trees, desirable for shade and ornament as well as for their excellent fruit. For standard trees they should be budded upon seedlings of the Mazzard cherry and the season for budding is rather earlier than for apples or pears. For dwarf trees the Mahaleb or Perfumed cherry is used. Upon this stock they grow for a few years with nearly as much vigor as upon the Mazzard, but this vigor is checked after a while and the trees then devote their strength to the formation of blossom buds and fruit, more than to the production of wood. The common small red wild cherry sometimes called pidgeon cherry, which produces its fruit in umbel-like clusters similar to those of the cultivated cherry I have found to succeed as a stock to bud the better sorts upon. The seedlings should be worked at one or two years of age, from the seed, and near the ground; if grafted into limbs the scion greatly overgrows the stock, and the trees are short lived. The wild black cherry, choke cherry, or any sorts which produce their flowers and fruit upon *racemes*, like strings of currants are wholly unfit to use for stocks. I have never known buds or scions to succeed upon these, even temporarily.

Varieties. Among the best of the Duke cherries are the May Duke, Reine Hortense, Belle Magnifique and Belle de Choisy. Of the Heart and Bigarreau varieties the Black Eagle, Coe's Transparent, Elton, Napoleon and White Bigarreau or Yellow Spanish have given the best satisfaction.

GRAPES.

Maine is no exception to the remark that the grape vine is indigenous to all parts of New England, although more plentiful in some parts of the State than in others. When Wood Island, near the mouth of the Saco River, was discovered, it was so abundantly stocked with vines as to receive the name of Isle of Bacchus. Wild vines, in various sections, are found growing freely in valleys or on hill sides, climbing high trees or rambling over rocks and bushes, some of them ripening their fruit (such as it is) in any season, some of too late maturity to be of any value even were were the fruit of such quality as to render them desirable, which is rarely if ever the case. It is true that the State lies north of what is usually considered the grape-growing section of the Union, and only the earlier ripening varieties will arrive at full maturity.

For many years the culture of the grape has received some attention, but the earlier attempts were invariably made either with varieties of the foreign vine, like the Sweetwater or Black Cluster, &c., or with native sorts better suited to a more southern latitude, like the Isabella and Catawba. The shortness of our seasons, the severity of the winters and the vicissitudes of cold and heat, moisture and drought, prevent much success with such kinds. The Isabella has been more grown than any other, but it is too late in ripening to succeed except in rare cases and in exceptional seasons. It not unfrequently colors tolerably well and is often supposed to be ripe, but I have never seen it attain the quality which it does five degrees or more farther south.

Within a few years quite a number of kinds have been introduced of earlier maturity by several weeks, and some of these have been successfully grown and ripened, as we have reason to believe, in nearly all parts of the State. We have seen them as far north as twenty miles north of Farmington, thirty miles north of Bangor, and as far east as Calais. It is believed that with these, and still more so with others yet to be brought to notice, for every year scores or hundreds of new seedlings are being introduced to cultivation, some of which will undoubtedly excel any yet produced

both in quality of fruit and earliness of ripening, every farmer and every citizen with only a few rods of land may have an abundance of this most estimable fruit for his table, or for the manufacture of a domestic wine which shall displace the adulterated wines of foreign production, and the miserable, drugged imitations made here, now sold under the name of wines among us.

To attain this desirable result it is absolutely necessary to confine our efforts to varieties of native origin and of the earliest maturity, and to bestow suitable culture. Such a result is worthy of strenuous and continued exertions.

In all ages the grape has been used as the emblem of plenty and felicity. As such it is frequently mentioned in the Bible. To sit under one's own vine and pluck its luscious fruit in security has been deemed the height of outward human felicity.

The grape is an eminently healthful fruit, and its curative properties in disease are so well understood in some countries that the "grape cure" is more familiarly known and resorted to than was ever the "water cure" among us.

The *Vitis Vinefera*, the species indigenous to the eastern continent, and imported hither from thence, as before remarked was early introduced, but except under glass, where the vicissitudes of climate and the liability to mildew are greatly under control, little success has attended the culture of any of its varities. In the vicinity of Augusta, and in a few other places, it seems to be comparatively free from liability to mildew, and the Sweet Water and Black Cluster sometimes ripen fair crops, but they cannot be recommended for general culture.

In the *Vitis Labrusca*, one of the species indigenous to the western continent, we have a very different plant and one perfectly adapted to our climate. Its foliage is thicker, more downy, especially upon its under surface, and so less liable to scorch beneath the rays of a hot sun. Its growth is far more robust and vigorous, its wood longer jointed, its habit greatly hardier. The fruit varies very much in size, color, flavor and time of ripening. As found growing wild it is rarely fit to eat, the skin being thick in most wild varieties, the pulp tough, and of foxy, disagreeable flavor. But there is abundant proof that it is capable of great amelioration, not by mere cultivation of the wild vines, which does no good, *but by the variation induced in successive generations of seedlings*, through cultivation. In this way it will undoubtedly become the parent of

varieties as much better than the wild fruit as the Baldwin, or Greening, or the melting Beurres and Doyennes are better than the wild crab apple and pear from which they sprang.

The obtaining of grapes combining in a sufficient degree all desirable characteristics, both of vine and fruit, is a work already well begun, but by no means completed. Contributions to it should be made by every cultivator as opportunity may serve. Mr. Bull, whose success in raising the Concord is so well known, has related his experience in this matter, which is so instructive that we copy it for the benefit of any who may desire to grow seedlings :

"The raising of new varieties of grapes from the seeds of the best natives, is probably the most direct way to obtain such kinds as will be best adapted to our climate, good enough to satisfy our taste, prolific and profitable for the market. This will be a work of time, but it is fairly begun and must succeed.

Perhaps I cannot do a better service in this connection than to state my own experience in this branch of horticulture. Having pursued it for nearly twenty years, and finding my first opinions greatly modified in the course of that time, I may perhaps, save the beginner some time in his practice which he might otherwise lose for want of reliable data to commence upon.

I was led to commence the raising of grapes from seed, from the impossibility of ripening any of the grapes then in the lists of the nurserymen. Living in the valley of the Concord, with a season shortened at each end by the early and late frosts incident to such localities, loving grapes more than all other fruits, but not able to ripen them, I turned to our native stock and procured from all quarters native vines which had a local reputation for excellence, but found myself disappointed in all of them.

Believing that a good grape could be obtained out of this stock, and that if I attained success it would lead others to follow the same course, so that in time Massachusetts could have her own grapes, as she already had her Baldwins, her Porters, her Hubbardston, and other excellent seedling apples, I set about the matter; I wanted a grape to begin with, which should be a vigorous grower, prolific, early, hardy, and with these preliminaries, of as good quality as possible. I found a grape having these qualities—a pretty good eating grape for a native—and with this I began. In five or six years the seedling bore fruit; these seeds were planted again, and in the third generation I found the habit

so broken up that I got grapes of great variety in color, shape and quality, some of them excellent, if I may trust my own judgment. From the original stock, black as night, I have obtained grapes white as the Chasselas, delicate of texture, and of a most agreeable flavor. I had planted these seeds promiscuously in beds of rich soil, and when these seedlings bore fruit, their seeds were planted in the same manner. This was not the best way. I raised many hundred more seedlings than I had need to, and should have succeeded more rapidly if I had planted only the seeds from the grapes showing the most marked change from the original type. I thought I multiplied my chances of success by putting all the seeds into the ground; I had not yet learned that nature makes constant efforts to return to her normal condition, and resents the interference of man. Her purpose is merely the continuation of the species, and she gives vigor and adaptation to that end. The horticulturist desires the fruit and not the seed. His efforts are directed to ameliorating the harshness of flavor, to softening the pulp, to making, in short, the fruit more edible. He accomplishes this by putting the seeds into a soil rich with stimulating composts, abounding with the particular food which is best adapted to his purpose.

The new conditions change the character of the plant. Instead of meadow or pasture where the parent vine grew with vigor, indeed, but with the coarse habit incident to wild nature, the newborn seedling revels in the abundant and congenial food prepared for it, and grows apace with cells and tissues enlarged, and stimulated by the nature of its feeding, and shows a change of habit more or less marked. In a bed of a thousand seedlings there will be vines showing a decided difference from the rest in shape and texture of leaf, length of joint, and shape and prominence of buds. These are the signs of improvement, of the *departure* from the native type, and the tokens of success to the cultivator. These vines deserve his special care; from them he will obtain vines with still more marked change of habit, and the greater the divergence from the original type, the more certain will be his success. In the third and fourth generations great differences of shape and size will be observable, and it is probable that size, color, or any particular quality could be established as a characteristic in the progeny of such grapes, by continued breeding from them. I do not advance this idea as a fact established, but a probability worthy the attention of the breeder.

Full details of all the facts and circumstances relating to grape breeding cannot be given in a brief essay like this, but it may be necessary to state that most of the seedlings, if you begin with the wild grape, will prove to be barren or worthless in the first generation. The barren grapes may be distinguished, for the most part, by their great luxuriance of growth, and, in *the first year*, the seed bed will be filled with those rampant, and, to the novice, promising vines. My experience leads me to reject these strong growers of the first year, or to plant them by themselves, as possibly I might get a good grape out of them, and if so, the strong habit of growth is desirable.

I have spoken of these seedlings of the first year, because the seeds continue to come up for two, three, and even four years, and my best grapes come from these later crops.

I think there is much probability in the theory propounded long ago, that one or more seeds of every fruit is strongly impressed with the peculiar type of the species to which it belongs, and will bring its like with precision, as happens with long established breeds of cattle. How far seeds of grapes are impressed with incipient change by stimulant composts, or modes of culture applied to the parent vine, is an interesting inquiry for the horticulturist. I may be able, when farther experiment has furnished me with more numerous and reliable data, to furnish to the public some facts in elucidation of this obscure subject.

I would strongly advise those who purpose to raise seedling grapes, not to go back to the wild vine, but to take seeds of new varieties, having the characteristics of vigor, &c., which they desire in the offspring. Plant the grapes whole, in rows to facilitate weeding. The placenta-like substance about the seed in the whole grape, nourishes the seed, and promotes its vegetative power. When the seedlings have grown one year, lift them out of the bed without disturbing the level of the ground. This can be easily done if the bed is thoroughly saturated with water, and with the aid of a fork to loosen the ground, while you draw the plant out carefully without breaking a single root. The second year another crop will come up; these will give a greater proportion of bearing vines. These are lifted in the same way as at first, to make room for the third crop which will succeed them. These last I save with the utmost care, as they will show the greatest improvement. When these seedlings are planted out they should be put into good

soil enriched with bone-dust, ashes, and sulphur or plaster. These fertilizers I consider indispensable to the grape. Stable manures induce luxuriant growth of wood, but if applied to vines not carrying crop, give a lax tissue to the vine; if it is in crop you may safely apply them as top-dressing, to increase the size of the fruit, but many good cultivators believe it impairs the flavor of the fruit."

Soil. The best soil for grapes in this northern latitude is a warm, light, rich and friable loam, with a dry subsoil. If not naturally dry, thorough underdraining is indispensable, for with a wet subsoil the vines cannot long remain healthy, and with one sufficiently dry almost any soil easily permeable to the roots can be made to give good results. As a general rule good corn land is suitable for the grape, for like Indian corn it delights in warmth and requires it to bring the fruit to maturity. It need not and ought not to be so deep as most writers recommend. Ten or twelve inches is as great depth as gets sufficiently warmed in this latitude. It is usually recommended to have the soil very deep and very rich—to trench to the depth of several feet and to manure very heavily.* In warmer sections, with a longer season, this practice succeeds better than here, but is unsuitable to our needs. In order to get good fruit it is indispensible that we secure well ripened wood and as short jointed as possible, and deep soils heavily manured produce a late rank growth of shoots which cannot properly ripen in our short seasons.

Aspect. A gentle slope or side hill facing to the south is to be preferred. If varying from south it is better to southeast than southwest. The vine will, however, usually succeed in any aspect from southeast to southwest, but the warmer the better. Special attention should be given to *shelter* from the prevailing and most destructive winds. Tight board fences six or eight feet in height, at suitable distances, answer a good purpose in garden culture, but for extensive vineyards screens of evergreens are to be preferred.

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* As a specimen I quote from Phin on Grape Culture: "Twenty inches is the least depth to be relied upon, and if very favorable results are desired it should be made three feet. The subsoil to this depth should be thoroughly loosened * * * adding at the same time a good supply of manure or compost. * * * For table grapes we doubt whether the soil can be too deep or rich," &c. Others go the length of recommending loading the soil with carrion by burying all the dead carcasses of animals and the like; which would be bad practice anywhere.

Manure. As a general rule, mineral manures, such as bone dust, superphosphate of lime, ashes and gypsum, are preferable to animal manures. Well decomposed composts containing stable manure are used to advantage at the time of planting, and should be well incorporated with the soil, which should be made rich enough to yield fifty or sixty bushels of corn per acre. Composts may also be used subsequently as a top dressing, as needful. Vines in full bearing are less liable to injury by animal manure than those carrying little or no fruit. Table grapes will also bear more to advantage than those intended for wine, as the flavor of the latter is affected injuriously by an application the effect of which may be wholly imperceptible in the former.

An excellent compost may be prepared as follows: To five or ten loads of meadow muck which has been exposed to a winter's frost, add twenty bushels of unleached wood ashes, ten bushels of fine bone dust, five bushels of gypsum, and seventy-five pounds of superphosphate of lime; the whole to be well incorporated and subsequently turned and mixed again. This quantity is sufficient for one acre, and the application need not be repeated sooner than three years.

Some grapes require a richer soil than others, as the Delaware, which rarely makes satisfactory growth unless the soil be richer than is needed for many others. The greater the natural vigor and the more luxuriant the natural habit of a vine, the less the amount of manure which is required.

Planting. A very common error with beginners in grape culture is to desire vines of large size, in order, as they think, to obtain fruit sooner than from small ones. It is true they may get a little fruit sooner in this way, but it will be at the cost of permanent weakness and lack of thrift. Whatever the age or size of a vine, it should be cut back close at planting, and the best vines are those of not more than two years' growth. A well grown thrifty vine of one year, with good roots, is greatly preferable for transplanting to one just as good in all other respects except that it is three, four or more years old. In case of the latter, it is impossible to save a fair proportion of the fibrous roots, the true feeders of the plant. It matters little whether they be grown from cuttings or layers, so they be well grown and well rooted. As a general rule the roots of vines should be planted about six inches in depth. Let the roots be evenly spread out in every direction, none crossing

each other, and covered with fine earth. It is well, and especially if they be layers of one year, to cut off the ends of the roots a little with a sharp knife, as they are thus induced to send out more fibres. Autumn is the better season if the soil be dry and suitable for the grape, as they make better growth the following season. But if the soil be wet or heavy or liable to heave by frosts, planting is better deferred until spring.

The distance apart at which vines should be planted varies somewhat with the design of the planter. For vineyard culture eight feet apart is a good distance and from eight to twelve feet upon trellisses and against walls generally.

Pruning and Training. Volumes might be written merely to describe briefly the countless plans and modes of training and pruning the grape which have been devised and practised in different times. Were this paper intended for an elaborate treatise on grape culture it would be highly proper to describe those most in vogue, but as it is written for the use of farmers, who prefer to know one good way over reading about different methods, we will endeavor to point out plainly and briefly what we believe to be the best mode in a northern region like ours, and which is like the method commonly called spur pruning, and this in connection with training on a trellis, or on a continuous row of upright stakes (which serves very well as a substitute for a trellis), or against a tight fence or building. Arbors may do very well for a shade, but are quite too shady to ripen fruit well so far north as this.

When the vines are obtained from the nursery they are usually furnished with several shoots of the previous years growth. Some prefer to plant the vines as they are, and to let them make all the growth they will the first year, with a view to getting as much growth of root as possible. Most good cultivators prefer to cut back closely at the time of planting, and to let only three buds shoot from it, two of which are stopped when a foot long and the other trained carefully to make all the growth it may until August, when that one is stopped to ripen its wood properly. Adopting either method, the vine is to be cut back at the end of the season, and the next year two shoots only are allowed to grow, and all the others are to be pinched in. These are to be encouraged to make as much growth as possible. If trained to a trellis let them be laid in diagonally, with a view to training them horizontally the succeeding year for the permanent arms of the vine. Let them be

stopped in August, as the wood should be as thoroughly ripened as possible. At the end of the season cut out all the laterals and shorten back the arms to a strong bud. The third year you will lay in these arms horizontally right and left, tying them to the lower wire of the trellis. If well grown, and the wood well ripened the previous year, these side shoots or arms will probably push every eye but you will allow only a part to grow. Select the most promising ones at about three feet apart and train them uprightly, rubbing out all the intermediate ones; pinch in all the laterals on the new shoots at the second leaf and pinch the upright shoots when they reach the top of the trellis. If a strong healthy growth has been attained these upright shoots may be left at the fall pruning nearly their whole length, for bearing the year after—but if the growth is weak let them be shortened accordingly. The following year these upright shoots may be allowed to bear; probably every eye will push and show fruit, but *only every other one* should be allowed to bear and this one to carry *only one bunch*—all the rest must be taken off if permanent health and vigor be desired in the vine. It requires some nerve in the beginner to destroy three-fourths or more of the promise of fruit, and if not fully convinced of its necessity he will leave too much on, and find out too late how serious is his error. This thinning out of the fruit is best done when the berries are of the size of peas; the best and best placed bunches only should be reserved. No single item in grape culture is of so much importance as the reduction of the amount of fruit which the vine shows, to such an amount as it can carry *and ripen well and early*, without injury in subsequent years. From what I have seen, the opinion is firmly held that if two-thirds of the fruit which is left on the vines in this State was removed at the proper time, the value of the remainder would be double what it is, to say nothing of earlier ripening and permanent vigor and productiveness, which are two very important considerations.

The side shoots from these upright canes may be allowed to grow as far as they will without much over-lapping of each other, and then stopped. The laterals also should be kept pinched in. Your vine is now established in permanent form, and all the future pruning necessary is to cut back these bearing shoots at the fall pruning, leaving spurs of one or two eyes to bear the year after. This mode of pruning is called spur pruning and is deemed the best for out door grapes in this latitude. When these spurs push their

eyes in the following spring rub out all but *the best one* and treat this as last year. If this be not done you have a thicket of weak wood and foliage, of no value, in place of a suitable number of strong productive shoots. The vine should be allowed as much foliage as can be fully exposed to the sun and air, and no more. It needs so much to elaborate the juices taken up into nourishment for the fruit, and too many leaves are as hurtful as too few. Leaves should never be removed to let the sun shine directly on the fruit, for the ripening process is effected entirely by and through the action of the sun and air on the leaves. Where space is abundant vines may be trained horizontally near the ground in a fan shape or circular form, four or more branches being allowed to start from the stem and diverge in different directions, being supported by a suitable number of stakes at a foot and a half or two feet from the ground. I have seen this plan attended with remarkable success in several cases, especially in light sandy soil; the maturity of the fruit being apparently much hastened by reflected heat from the ground, and showing as favorable results as when grown against a wall.

Time for Pruning. The general pruning should be performed soon after the leaves fall in autumn, as this practice, it is believed, tends to hasten the maturity of the fruit, as well as obviates all liability to the bleeding which occurs if pruning be deferred until spring. Thinning out a vine by removing all needless shoots, is an important part of pruning and training, and is best done by rubbing off with the finger, in June, as soon as the buds have attained two or three inches growth. In this way all the strength of a vine can be directed to the fruit bearing shoots, instead of being wasted by the growth of useless or injurious wood which must be afterwards cut away.

Ringing or Girdling. The practice of ringing or girdling portions of the vine is sometimes resorted to for the purpose of hastening maturity and also of increasing the size of the fruit. It is done by taking off a portion of bark below the fruit about half an inch in length by cutting clean to the wood, and then removing the ring of bark between. This should be done, if at all, as soon as the fruit is set or before it is larger than peas, and should be practised only on branches which may be wholly removed in the fall, such ones being wholly useless for future bearing. It may be done on the shoots of the present year or on older canes bearing many bunches. Occasionally it may be done to advantage, but it is not advisable to practice it extensively. A suitable *thinning*

out of the bunches of fruit when quite small, is the true method of hastening maturity and is always safe and expedient.

Grafting. Grafting the grape vine in order to change the fruit of inferior sorts or of barren or worthless seedlings to a better variety is sometimes desirable, but the process is more difficult and uncertain than in the case of fruit trees. It is usually practised by cutting off the stock at or below the surface of the vine and inserting scions by the usual mode of cleft-grafting. I have been oftener successful by inserting scions into each of the main roots at a little distance from the stem thus multiplying the number of scions and the chances of success. There is a difference of opinion as to the preferable time for the operation. Some graft very early in spring, and others wait until the leaves appear and the rush of sap has diminished in force. Mr. Fuller, in the "Grape Culturist," advocates grafting in autumn and protecting the parts from frost by an inverted box or flower pot covered with straw and earth, and asserts that by this mode almost as much growth is attained as the original vine would have made. Grafting upon pieces of root, I have found a successful method of propagating sorts which strike root from cuttings with difficulty,—like the Delaware and some others. After a year's growth or when finally planted out, vines grown by this method should be set deep enough to throw out roots from the scion and thus become permanently established upon their own roots—as with vines grown from eyes, cuttings, layers, &c.

Old vines may be successfully grafted by the mode known as "grafting by approach" or "inarching," a young vine of the sort desired being first planted as near as possible to one to be operated on, and when established, the two are *inarched*, and when fairly united the old vine is cut away and its whole strength thrown into the new one. This method requires more skill than ordinary grafting, but properly done is very satisfactory.

Winter Protection of Vines. Grapes are sometimes spoken of as hardy, very hardy, half hardy and tender. As there is no standard of hardiness, these terms are to be understood comparatively. The Isabella is considered a hardy sort in New York, and it is usually left there without protection, yet it sometimes suffers badly, and in some parts of the State is occasionally killed to the ground. The Delaware, Concord, Muscadine and many others do the same here; mature vines will often grow pretty well after a winter's

exposure. Yet I have never seen any which were not benefited by being laid down and slightly covered, enough to pay abundantly for the trouble it costs. In our short seasons we need all available helps to early ripening of fruit, and vines which are protected start with much greater vigor and make more rapid progress to maturity of fruit than those left exposed. I would recommend therefore that in all cases the vines be laid down. As the winter snows are usually quite sufficient to cover them, there is little need of much else. Boughs of evergreens serve the best purpose, and as they are in most cases easily obtained, are usually employed. Along the sea coast, or in other places where snows are less abundant, the covering may be used more plentifully. As it is not simply cold but rather alternate freezing and thawing which injures them, protection is to be given with this fact in view.

Enemies. Few cultivated fruits are less subject to the attacks of insects or diseases than the grape. In some sections of the country several sorts of beetles are troublesome, and occasionally the rosebug has committed severe depredations, but in this State I have never seen them numerous enough to cause trouble.

Of diseases, there are two which are sometimes serious, viz., the rot, which affects the fruit, and the mildew, which chiefly attacks the foliage. The rot is a disease which first shows itself by discoloration just beneath the skin, and arrests ripening. When severe it causes the berries, sometimes only a few and sometimes the whole bunch, to shrivel and perhaps drop off. The Catawba and its seedlings, such as Anna, Diana, &c., seem more subject to it than other varieties; in fact, I have noticed it here only with these, if we except the Concord, which during the past season for the first time has showed occasional berries affected in a somewhat similar way; some of them showing a deep red blotch as they begin to color, the ripening process being at once arrested. The most probable cause of this disease is a wet subsoil. At any rate we know that stagnant water is baneful in its effects upon the roots of the grape, as well as upon other fruits, and should always be avoided, and I have never seen the disease in this section of the country except upon lands underlaid by a wet subsoil.

What we call mildew is either identical with or closely analogous to the vine disease of Europe which has of late years proved so destructive. It is, more properly, a sequence, or accompaniment of disease, than a disease of itself. Mildew is a minute fungus or

parasitic plant which attaches itself for the most part to the leaf, and draws its nourishment from it, soon destroying vitality if not arrested. It rarely or never attacks perfectly healthy vines, but only after they have become weakened by unfavorable atmospheric or other influences. It usually appears late in summer, after a spell of wet, foggy, muggy or changeable weather, and at such times the vines should be closely watched so that it may be taken in hand at once, as its progress is sometimes very rapid. Some localities are much more liable to it than others, and some are almost free from it. Some varieties are also more liable than others to its attacks. Generally, the thinner and more delicate the foliage the greater the liability. Mildew first appears as a white speck and usually on the under side of the leaf; this speck is soon surrounded by others, and sometimes it extends quite rapidly, in which case the leaves ere long change color and lose their vitality. When this occurs, the ripening of both wood and fruit is arrested. Much can be done in the way of prevention by securing healthy conditions for the vine, as a dry soil, sheltered situation, proper food, &c. When it appears, it should be attacked at once with sulphur. This is so effectual a remedy that Sicily, we are told, has been more than compensated for the injury to her grapes from the vine disease, by her increased exports of sulphur used for counteracting its effects in other countries. Waltershausen estimates that the consumption of sulphur in the vine growing countries of Europe, for this purpose alone, amounts to 850,000 *centner*, or more than forty thousand tons. It is said also that this demand has largely increased its price.

This antidote is applied in various ways; sometimes in powder by dusting it upon the leaves; but the best method, decidedly, which I have found, is by using a solution made with lime, in water, applying it with a garden syringe, showering especially the under side of the leaves. It may be prepared as follows: Take two or three pounds of flowers of sulphur (which having been sublimed is in a very fine state of division; roll brimstone or or crude sulphur being unsuitable), put it in a barrel together with two or three times as much of the best quick-lime, and gradually add hot water, stirring constantly; as the lime slakes the liquid boils and more water is added until the vessel is conveniently full; when the liquid settles clear it is ready for use. If deeper than a pale straw color it may be diluted before use, although I have

found no injury from applying it in the strength above indicated. The vessel should be kept very closely covered, as, if the air be admitted, the solution decomposes, precipitates the sulphur and loses its efficacy. Hot water may be subsequently added to the sediment, as long as the liquid shows by its color that it takes up a portion of sulphur. Its application to the vines should be kept up until the disease is manifestly subdued. Sometimes one application is sufficient and sometimes several are required.

Perhaps it may be well in conclusion to recapitulate some of the more common errors in grape culture, which are :

1st. Neglect of pruning and training during the earlier years of its growth. Where so neglected it is impossible to get the vine in good form subsequently without cutting down and beginning anew from the bottom.

2d. Allowing too many upright canes, the consequence of which is a crowding of the bearing shoots proceeding from them, weak wood, small bunches, imperfect ripening, &c.

3d. Neglect of thinning out the weaker shoots from the spurs early in the season, which also results in a profusion of weak wood, crowding of shoots and of foliage, small and poor fruit, &c.

4th. Neglect of properly thinning out the fruit. No vine, *whatever its age when planted, ought to be allowed to bear before the third year*, and then not more than a third of what it shows ; after that, from one-half to two-thirds should be removed as soon as the bunches are well formed.

Varieties. The number of varieties which have been proved in this State is very large. The number which have given ample satisfaction is very small. Of these the Delaware and Hartford Prolific take the lead. Others, however, possess qualities which entitle them to a place in every good collection.

Among the newer sorts of which we have too little experience to enable us to speak with confidence, there are several regarding which the testimony of cultivators and good judges elsewhere, is such that they may be planted in strong hope that they will prove very valuable acquisitions to our limited list of really good sorts. It should be borne in mind that the fact of any given grape proving good in one locality is not conclusive evidence that it will succeed equally well in another, and this aside from difference in its time of ripening ; and no grape can be deemed to be fairly tested until it has borne fruit for at least five years, and ten or fifteen would be much more satisfactory.

DELAWARE. This is unquestionably the finest flavored and richest grape which has been found to succeed in open culture in Maine. When the wood is properly ripened it is one of the hardiest, and it is plentifully productive. Its period of ripening is with the Hartford Prolific and other very early sorts, or commonly from 10th to 20th September. It requires a rich soil and good treatment if we would develop all its excellencies. Being more reluctant to strike root from cuttings than almost any other grape, it is somewhat difficult of propagation, and vines from the nursery are necessarily smaller and more delicate than many other sorts, but when once established, the vine makes a good growth, although its habit always less luxuriant and more delicate than such coarse growing sorts as Isabella, Concord, Diana and the like. It is believed to have originated in New Jersey and to have been carried thence into Delaware county, Ohio, where its excellence was first made known to the public through Mr. Thompson, who also disseminated young vines. Our first vines were obtained from him in 1855, and our estimation of its value has steadily increased ever since.

Bunch medium to small, compact, usually shouldered. Berries small, skin thin, beautiful bright red passing into wine color. Flesh free from pulp or acidity, exceedingly juicy, sweet, vinous, rich and aromatic.

Those who prefer quantity to quality, profit to real excellence, and to have their vines bear abundantly with the least possible amount of care or attention, will not plant the Delaware so largely as the next in our list.

HARTFORD PROLIFIC. In the present state of grape culture this is believed to be on the whole the best adapted for extensive and general cultivation in Maine, inasmuch as it will grow and bear and ripen its fruit in almost any soil or situation and with almost any treatment or lack of it; though of course, greatly better where properly cared for. It was introduced by Mr. Paphro Steele of Hartford, Conn., about 1851 or 1852. Being in Hartford early in September, about that time, we visited the original vine which we found to be a chance seedling which had sprung up in his pasture and was rambling over some bushes, giving little evidence of pruning or care of any kind, but evidence enough of productiveness and early maturity. The quality too was better than we had ever seen connected with its other excellencies. The opinion was formed

that it promised well for cultivation in Maine. A dozen vines were engaged and the twelve years experience with it since then has resulted in the opinion above given. Some have complained of it for not being wholly free from the native aroma, some because it does not always hold its berries so well as might be desired. It must be acknowledged to be open to criticism in both these respects, but with fair treatment neither of them are very serious objections; while for combined health, vigor and freedom from mildew or other disease, for hardiness, productiveness and certainty of ripening a crop of fruit of good quality we have found no other equal to it. Old Colony is considerably earlier; Union Village a good deal larger, Delaware decidedly better, and others may surpass it in some other respects, but taking it altogether we consider it the best for extensive cultivation which has been fairly proved *thus far*. It is coming to be more highly appreciated where the season admits the culture of later ripening varieties and perhaps no other sort is now more extensively planted *for profit* in the middle States than this.

Such is its productiveness that it requires to have a *large proportion* of the fruit thinned out if we would not have the vines weakened and would have the fruit in perfection and early. I have not found two-thirds or three-quarters too much to remove. What is left is so much larger, better and earlier as to be worth much more than the whole would be if left on, besides which the vine is left in vigorous health and strength.

Bunches large, shouldered; berries large, round; skin black, with a little bloom, flesh rather pulpy, juicy, mingling sweet with acid and some native perfume. Ripens about the middle of September.

Northern Muscadine. This grape was introduced by the Shakers of New Lebanon. By them and by some others it is extolled as being the best of all grapes. By some others it is decried as utterly unworthy of cultivation. The facts are, that it is very hardy, very early, sufficiently productive and strongly charged with the muskiness or foxiness peculiar to our wild species. With those who like this, and they are many, it is a great favorite. There are those who cannot endure the odor. Aside from this foxiness, which being a matter of taste, is not a point to dispute about, it combines many good qualities, being sweet and rich as well as hardy, and so early as to be almost sure to ripen a crop in any season. It has the fault, very serious for a market grape, of shed-

ding its berries from the bunch as they ripen. On the whole it is a grape which will give good satisfaction to a great many.

Bunches medium size—berries medium, brownish amber colored, flesh pulpy and sweet, foxy. Ripe about middle of September.

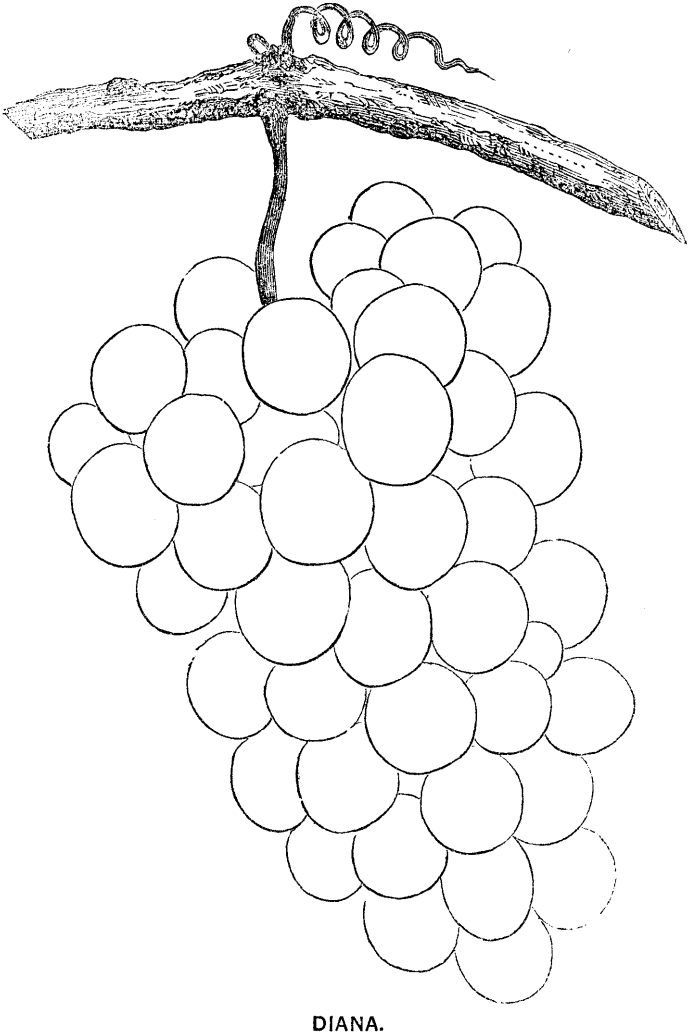
CONCORD. This was originated by Mr. Bull of Concord, Mass. When well grown it is one of the largest and finest grapes we have; very handsome in both bunch and berry. Although usually ten days or more earlier than the Isabella, it is a week or more later than the Hartford Prolific, and should have a favorable situation in order to ripen its fruit fully. It needs less pruning than some other sorts, and, like many others, the fruit is earlier and greatly better on old vines than on such as have just come into bearing. The earliest and best fruit I have grown was from a vine trained horizontally near the ground, (as mentioned at page 149,) and pruned very little. At the South and West this variety is becoming more and more highly esteemed every year. To develope its capabilities fully, a longer and warmer season than ours is required.

DIANA. A seedling of the Catawba, originating in Massachusetts, which has with many obtained a high reputation, and which in perfection is second to very few others in quality. It is liable to considerable variation in quality even in places not remote from each other. Its time of ripening, being rather later than the Concord, demands that it should be planted only in very favorable locations. In my grounds it has proved more liable to the disease called "rot" than any other, but I have heard of no complaint of this from other cultivators in the State. It begins to ripen scattering berries toward the end of September, which are sweet as soon as well colored, but the bunches are not fully ripe until some weeks later. It may be kept during winter with more ease than any other I have known.

REBECCA. A fruit of the highest excellence, being, when fully ripe, unsurpassed by any other in delicacy and richness of flavor, but the vine is rather tender and of delicate growth, and its maturity rather late for this latitude. Were it sufficiently early, hardy and vigorous, it would leave little to be desired. As it is, it should be planted only in the most favorable situations.

EARLY HUDSON. A very good grape and one of the earliest, but we have discontinued its cultivation from its failure to set its fruit well, leaving only a few scattering berries of full size in each

bunch, besides which it forms a larger number of small ones which are destitute of seeds.

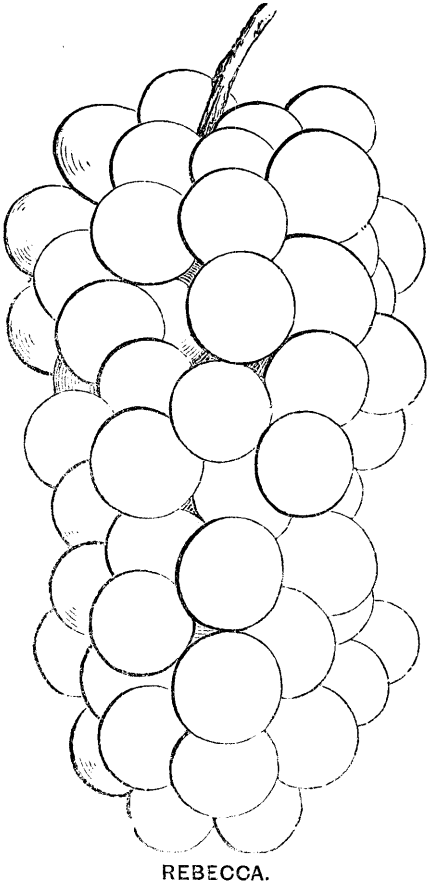


DIANA.

UNION VILLAGE. The largest and handsomest native grape we have ever seen. The vine is a prodigious grower, and rarely if ever ripens its wood sufficiently to withstand the winter, and in consequence it often suffers severely. It is also rather too late for this latitude, being hardly more than a week earlier than the Isabella.

CLINTON. A rather small, black grape, with a compact bunch,

which colors early, but is unfit to pluck until its harshness of flavor has been meliorated by the early frosts. Scarcely worthy of being planted now that we have better ones, although on its introduction fifteen or twenty years ago its vigorous growth, productiveness and extreme hardiness rendered it a desirable acquisition when we had none earlier or hardier than the Isabella.



REBECCA.

Old Colony. This is the earliest grape, without exception, which has fruited here. Bunch and berry of good size and the berries adhere well until they shrivel almost to raisins. It is one of the best common native grapes, and for its early maturity desirable to plant in the northern part of the State. It ripens a week or more before the August Pioneer, Jennings and some others which have been recommended as being the earliest sorts known.

BLOOD'S SEEDLINGS. Of these there are two. The black colors very early and ripens rather late; when fully matured it is as pleasant as any of its class. The white resembles the Northern Muscadine, except that the berry is larger and the bunch rather smaller. Both have the thick skin, firm pulp and other characteristics of the common natives, and with those whose tastes have been formed on these as a standard of excellence they are esteemed as valuable.

Among the sorts which have been tried in this State and found wanting in some indispensable characteristics, either of vine or fruit, or are of too late maturity to render them desirable compared with some above described, may be named the To Kalon, Anna, Charlestown, St. Catherine, Franklin, Taylor's Bullitt, Garrigues, Arkansas, Eliza, Emily, Baxter, Marion, Oporto, American Hamburg, Massachusetts White, King, Cowan, Warren, Logan, North America, Dracut Amber, Canby's August, York Madeira, Comstock, Columbia, Ruband, Cutter, Miner, Graham, Catawba and Isabella.

NEWER SORTS. So great has been the enthusiasm in regard to grape culture in the Northern States, and so plentiful the production of new seedlings, which, viewed with the eye of parental fondness and partiality, have been thought by their originators to be worthy of general cultivation, that it would be impossible to give even the names of all which have been brought forward with high encomiums within a few years past. Some of these will undoubtedly prove as good, and very likely even better than any we have proved thus far, and probably the great majority of them will drop out of notice as fast as they are proved.

Many of our readers are probably desirous to know what evidence appears regarding the quality, earliness, or probable value for culture in a location so far north as ours, of some, at least, of those which have been most persistently pushed into notice and of which small vines are now for sale at high prices. Having endeavored to obtain reliable information, the attempt will be made to respond according to our best knowledge and belief.

Among the more prominent and promising of these new sorts are the ADIRONDAC, IONA and ISRAELLA. The first originated with Mr. Witherbee, at Port Henry, in the northern part of New York, and has been disseminated by J. W. Bailey of Plattsburg. I saw the fruit at the meeting of the American Pomological Society, at Boston, Sept. 17th to 19th, 1862. The Committee on New Fruits

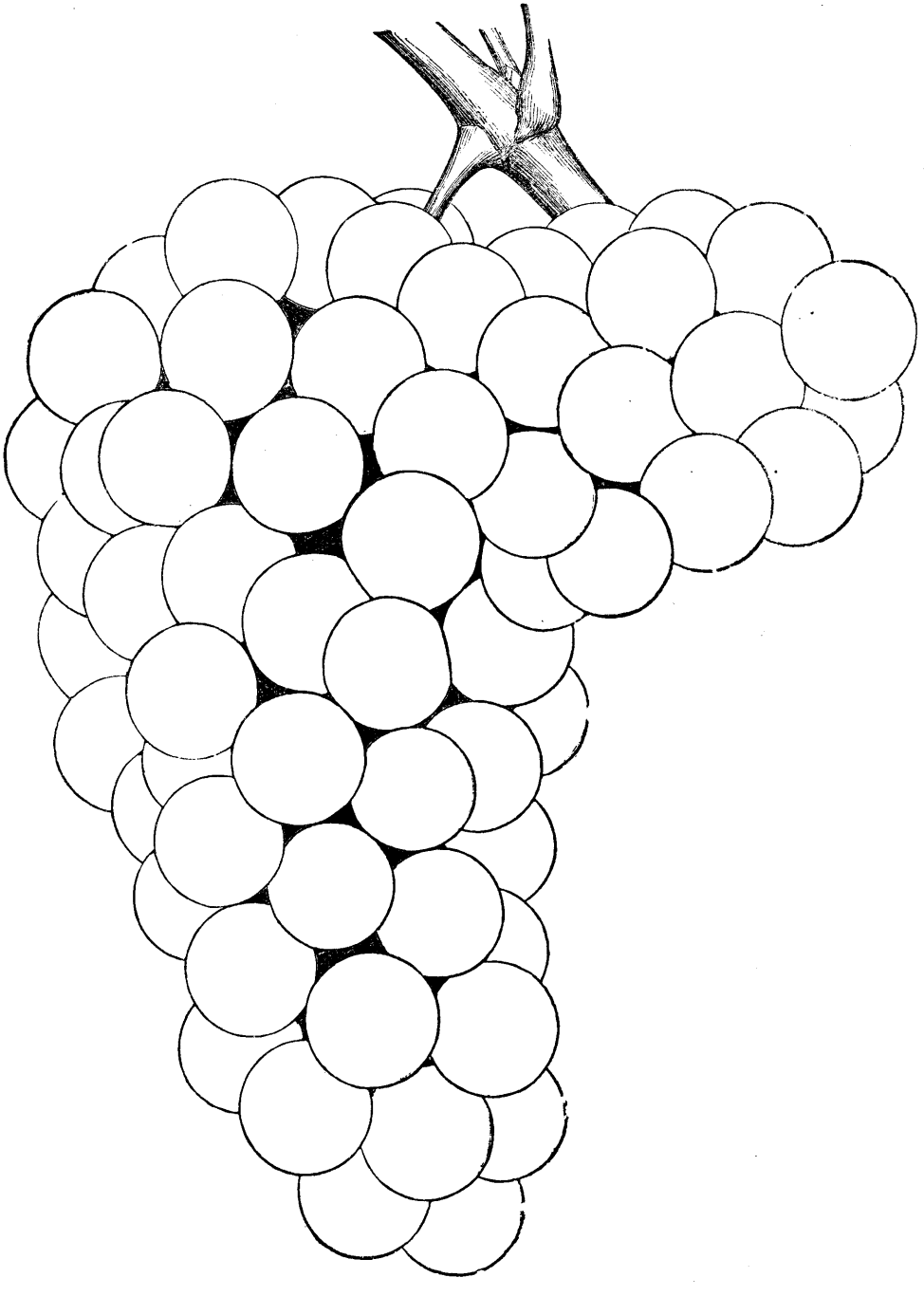
reported of it as follows: "Bunch large, compact; berries large, round; color dark purplish red, with a blue bloom; seeds large; flesh greenish white, soft, not perfectly ripe, but promises excellently well." Mr. Hovey visited Mr. Bailey at Plattsburg (September 3d,) and in a late number of his magazine says: "It is only three or four years since it was planted in his grounds, but the oldest vines had begun to bear, and to our surprise we found the grapes quite well colored, and would soon be ripe. As regards vigor, we could see little difference between it and the Isabella or Hartford Prolific on the same trellis. Its comparative period of ripening was our next object; this was obtained by tasting the Hartford Prolific and Delaware, which were not so much advanced as the Adirondac."

The two others above named are seedlings grown by Dr. Grant at Iona, an island in the Hudson near Peekskill. The Doctor is well known as an enthusiastic cultivator and has done much to disseminate the Delaware. The one he calls IONA is undoubtedly a grape of high excellence, larger than the Delaware, and like it of a deep wine color when ripe. It will also probably be found to vary but little from the Delaware in its period of maturity, and the prospect is that it will soon be ranked among those most worthy of extensive cultivation.

The ISRAELLA is a dark colored grape of good quality, said to to ripen a week or more earlier than the Hartford Prolific. If such proves to be the case here it will be of very great value.

The CREVELING is not particularly new, having been cultivated to some extent for nearly ten years, but of late it has gained favor with many, and the demand for it has become so great that its price, instead of receding as usual after being largely propagated, has enhanced, and the call for it continues to be large. It has not yet fruited here long enough to speak of its merits from personal knowledge, but elsewhere it has exhibited the quality, earliness and other good properties of the Hartford Prolific, without any liability to drop from the bunch. The only objection made is that the bunches are not sufficiently compact.

ALLEN'S HYBRID has been before the public for some years. It partakes of foreign origin and has much of the character and appearance of the Chasselas. When fully ripe it is of honied sweetness, as desirable in its way as the peculiarly rich flavor of the Rebecca, but like the last named it cannot be depended upon



ISRAELLA.

to ripen fully in the open air in Maine except under very favorable circumstances.

E. S. Rogers of Salem, Mass., some years ago attempted the hybridization of the native with the pollen of the foreign species, and has sent out forty or more of his seedlings, under numbers. Some of them are very large and beautiful and have attracted much attention. Nos. 3 and 9 are said to be among the earliest, and Nos. 4, 15 and 19 to be the best in quality. It seems probable that some of them may attain an established reputation where the season is long enough to admit of their ripening fully, but evidence of sufficiently early maturity in any of them for this latitude is, as yet, wanting.

Regarding some newer sorts which have been introduced to notice with high recommendations, such as the Winchester, Cuyahoga, Framingham, Maxatawny, Miles, Lydia and several others, we are not prepared to express any opinion.

The Currant.

The currant is one of the most valuable of the smaller garden fruits, being exceedingly wholesome as a dessert fruit in its season, and is used in various ways in domestic cookery, as for pies, tarts, jam, jelly, shrub, and in fact in almost every way in which fruit may be applied. A jelly from the Black currant is one of the most successful remedies known in bronchitis and other forms of sore throat where an astringent is needed. Were its virtues better known, it would greatly displace nitrate of silver and other powerful agents now used.

The flavor of the black currant is at first disagreeable to many, but generally they soon become fond of it. I have never known children to be averse to it, nor for them to be affected with summer complaints while having free access to the fruit. The white currant, being less acid than the red, is generally preferred for the dessert. From red currants, with the addition of refined sugar, a wine may be made which, properly made and with suitable age, is not only wholesome and palatable, but closely resembles a pure grape wine, and may be used in its place.

The currant is perfectly hardy, thrives in various soils, and comes to as great perfection in Maine as in any part of the world. Its propagation and culture are of the easiest possible, and it deserves a place in every garden, and to be more extensively culti-

vated than it is. Being so easily grown, it is too often utterly neglected, and in many cases where it is grown it receives no culture at all. Under such circumstances the fruit is very inferior to what may be produced with a little care.

In the neighborhood of large towns, where the fruit is put up in cans for shipping, and where large quantities of jelly are made, it may be a very profitable crop, often yielding several hundred dollars per acre.

Currants are propagated by cuttings, and the culture required is simply to prepare the ground properly by digging, manuring and planting out the young plants in rows four feet apart and three feet asunder in the rows, and subsequently keeping the ground clean and free from weeds, manuring as often as necessary to keep up the size and productiveness of the plants. If they grow vigorously, it is well to shorten in the strong young shoots annually, and remove wholly the weak ones. By this pruning the bush is kept in better form and larger fruit is obtained.

Varieties. In some sections of the State the common old fashioned red and white varieties are still cultivated. In others the red and white Dutch have been introduced, which are larger and better, and for some years were considered the best to be had. Still more recently, however, we have introduced newer sorts from English and French cultivators, which greatly eclipse them, and these are just beginning to be disseminated.

Red Currants.

Red Dutch. Of good size, productive and of good quality; excellent for cooking, jams, jellies and wine. There are several subvarieties of this, bearing longer or shorter bunches, but the difference is slight.

Victoria, or Raby Castle. Originated by an English cultivator, Mr. May. It has longer bunches than the preceding, and ripens late, thus forming a succession, and often hangs on in favorable seasons until late in September.

Cherry. A comparatively new sort of exceedingly vigorous growth and with fruit of very large size. Until the plants have attained full growth, it has proved but a shy bearer, and the fruit is more acid than some others; bunches short. Within a few years a sort has been imported under the name of Long-bunched Cherry, which bore much longer bunches during the past season, with berries equally large.

La Versaillaise. A new variety of French origin, of the largest size, exceedingly productive, of better quality than the Cherry, and the plant a vigorous grower. Its size, beauty and productiveness render it a great favorite. The drawing we give of this sort we take from fruit grown under high cultivation, in good soil, with

LA VERSAILLAISE.

the plants well pruned and cared for. We have grown the fruit frequently to measure five eighths of an inch in diameter or nearly two inches in circumference. To secure growth of this size, the ground must be well trenched and deeply manured, and the plants well grown and closely pruned. The variety imported under the name of *La Caucasse* seems to be identical with the above.

La Hative. From its name we would expect this to ripen earlier than the others, but have not been able to distinguish a very marked difference in this respect. It is as large as the Versaillaise, very productive, handsome and good; very desirable.

WHITE GRAPE.

La Fertile. This and the two preceding were raised by M. Bertin of Versailles. It is suitably named, being a prodigious bearer, fruit of very large size and similar in quality to its congeners. Will be a general favorite.

Red Imperial. Another new French sort of the largest size and very productive. Has so far proved a less rapid grower than the above named sorts.

Knight's Sweet Red. Of English origin and less acid than any other currant we have grown. In other respects it is not much unlike the Red Dutch, though hardly so free a grower.

Some of the newer currants have not fulfilled the expectations entertained of them, as *Fertile de Pallua*, which, although very productive and rather early, has no special excellence. The last remark also applies to *Fertile de Angers* and several others.

Macrocarpa is of largest size, but hitherto has proved but little more productive than the Cherry currant.

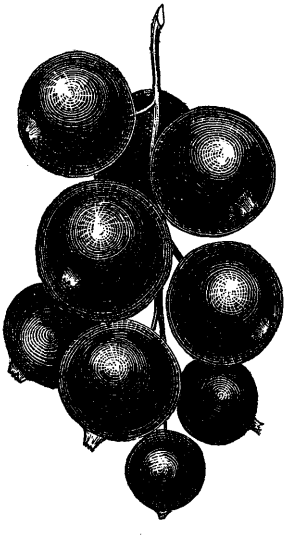
Gloire des Sablons, imported at high cost, proves to be similar to an older striped variety, and desirable chiefly as a curiosity.

White Currants.

Of these we find no marked difference between the large White Dutch and White Grape, in their fruit. There is some difference in the habit of the plants. Both are large and fine and very desirable. White Gondoin has a longer bunch and the plant longer shoots than most others. White Imperial has, during the past year, proved rather larger than any other. It is of very late introduction, and comes highly commended. White Transparent is a new French sort resembling White Dutch. Under high culture it gives berries and bunches of very large size.

Black Currants.

Of these the Black Naples and Ogden's Black have proved the best, and deserve more attention than they have received. In



OGDEN'S BLACK.

many gardens the only black currant grown is one much later in ripening, very insipid in character, and quite worthless compared with the above.

The Gooseberry.

The gooseberry is a useful fruit for the dessert, and also for tarts, jams and other culinary purposes. The varieties of the foreign gooseberry are far more numerous and varied in size, color and flavor than the currant; in fact they are almost numberless, and embrace white, red, yellow and green—small and large, up to an ounce or more in weight. But unfortunately in our climate they are all so liable to be ruined by mildew, that their culture has almost been abandoned.

In our indigenous species, however, we have a plant perfectly fitted to our climate, and although little has yet been done to improve it by rearing new varieties from seed, that little has accomplished so much that we may hope, now that its wildness has been fairly broken, for numerous varieties giving a larger range of color, size and flavor. The first success in this line was the production some twenty-five years ago of Houghton's Seedling by a person of that name, at Lynn, Mass. It is of pale red color and of moderate size, but possesses a thin skin and a fine flavor, equal in quality to the English gooseberry, is extraordinarily productive and always free from mildew.

A sort called the Mountain Seedling has been disseminated by the Shakers of Lebanon, somewhat similar to the above.

The finest seedling we have seen, of our native species, was grown by Charles Downing, Esq., of Newburgh, from seed of the Houghton. It is considerably larger than its parent, color a light green, flavor rich and good. The plant is productive and its habit more erect than Houghton's. It is very scarce and but little known as yet, but deserves to be extensively disseminated.

The gooseberry succeeds with very simple cultivation. A rich soil free from weeds, and pruning enough to remove the weak and ill-placed shoots, are the chief requisites. It is easily propagated both by cuttings and layers.

The Blackberry.

During ten years past or more the blackberry has attracted considerable attention in various parts of the country, and several improved varieties have been introduced to cultivation. Among these, the most prominent are the New Rochelle and the Dorchester. The first named, sometimes also called the Lawton, is quite large and handsome, and when *fully ripened,* which is not until some time after it is fully colored, is sweet, rich and very good. As I have seen it in the Middle and Western States, it is a very desirable fruit and worthy of extensive cultivation. The Dorchester is about the same size, but of more elongated form and in quality equal to the New Rochelle. It is also rather the hardier of the two, but neither of them will pass through average Maine winters, unless covered with snow, without having their canes either winter-killed or so much weakened as to produce only a scanty crop of small, poor berries. The canes are too stiff, and with the New Rochelle too branching also, to be laid down and protected to advantage. It is with the cultivated as with the sorts found growing wild in our woods and pastures. After an unusually mild winter, like the last, or after one during which the canes have been well protected during the severe weather by a covering of snow, we have fruit, more or less, and from fair to good; in other winters we get none or little and poor.

I have known many attempts to cultivate various sorts of the blackberry in Maine, have myself grown a dozen or more of those most highly recommended, but I have never learned of success at all commensurate with the cost and trouble. Several new sorts have been introduced too recently to speak of them with confidence, some of which *may* prove hardy enough to warrant cultivation. So far as my own observation extends, some of those bearing white, or more properly, pale colored fruit are hardier than the black fruited sorts.

ON THE BEET ROOT AS A SOURCE OF SUGAR.

Among the incidental benefits which will accrue from the great struggle in which we, as a nation, are engaged, not the least may probably be an emancipation, more or less complete, from dependance upon other countries for articles of daily use. This will come to pass through the creation of new branches of industry and by the development of existing resources and facilities for some production hitherto unimproved. The new burdens and duties laid upon us call loudly for exertion to meet them; and no people under heaven are better able to respond to the call. We were never so wedded to slothful habits or traditional methods and customs that a new enterprise promising sufficient pecuniary reward would not be readily undertaken; and now, whatever of routine we formerly had has been thoroughly broken in upon, all are minute men ready for any call. If the war has taxed our means it has aroused our energies. If it has disturbed peaceful pursuits, it has developed unsuspected strength and has shown that we have unequalled elements of greatness. Something has already been accomplished towards achieving this independence of foreign countries, and much more may be done. I desire now to call attention briefly to one or two articles. The consumption of sugar in the United States is about 660,000,000 pounds, of which about one-third only, (including the product of Louisiana and Texas,) is produced within its borders. For the balance an annual expenditure of some thirty to forty millions of dollars in specie is required.

The production of maple sugar at the north has largely increased for a few years past, and were this tree as easily brought to maturity as an annual or biennial plant, doubtless the production would be more rapid still. In the *beet root* is a resource which has been successfully drawn upon in other countries, and no reason is known why it may not equally prove available here.

Some facts regarding the history of beet sugar industry may therefore be interesting at this time. When France was involved in her great first revolution which drew the other nations of Europe upon her, and afterwards through the Directory, the Consulate and the Empire, every resource was strained to its utmost capacity.

During twenty-five years of exhausting war, shut out from the seas and thrown back upon herself, new and mighty energies were born of her extremity; agriculture and manufactures were extending, new branches of industry were erected, unthought of resources developed, until at length the nation emerged from her struggles more self-sustaining and stronger than ever before. Among her first needs forced upon her by this war, was a substitute for cane sugar. As early as 1747 a Prussian chemist discovered sugar in the beet, but his process would not make it at moderate cost, and the discovery was, at the time, unfruitful. Nearly fifty years later, another chemist, Achard, discovered a practicable method and published the details of the process. In 1810 Napoleon offered one million of francs for the first successful beet sugar factory which might be established. In 1812 he ordered the formation of five public schools in which nothing but the manufacture of sugar was to be taught. Each pupil was to receive one thousand francs after three months faithful attendance, and every one who would engage in raising beets or making sugar was to be relieved from taxation during five years. In 1813 Napoleon ordered that four imperial castles should be converted into sugar factories, and their parks be planted with beets. His orders were in process of execution when France was invaded by the coalition of other European nations and he fell from his throne. Meanwhile cane sugar had so accumulated in the colonies and warehouses of England that prices were greatly reduced, and English farmers used it to feed to cattle and swine. With the fall of Napoleon the beet sugar manufacture lost its support; all the establishments for making it were ruined, and the very idea was ridiculed. By degrees ridicule gave place to more correct views, and in about ten years, in 1825, not far from thirty establishments were again under way. Beet sugar was then free of impost, while colonial sugars were charged 53 francs per 100 kilogrammes, or about 4½ cents per pound. The manufacture soon became so successful as in large measure to supplant the foreign article, and the revenues began to suffer. The nobility then ruled France, and being deeply interested in the colonies, a heavy tax was soon imposed on home-made sugar, but in spite of this the manufacture was continued, and many improvements being introduced, it has gone on with varying success. In 1848, the duty on beet sugar was 50 francs, and on West Indian 44. It is now the same on all.

Official reports state that in 1857 there were 283 factories in operation, making 83,126,618 kilogrammes of sugar. In 1858, there were 341 factories making 151,514,435 kilogrammes of sugar. The kilogramme being two and one fifth pounds, the product in 1858 was 333,331,757 pounds, and the duties paid amounted to 63,861,200 francs, or upwards of twelve millions of dollars.

In Austria, the number of beet sugar factories in 1858 was 109, of which 52 were in Bohemia, 34 in Silesia and Morovia, 15 in Hungary, and 8 in other portions. They consumed 10,551,000 cwt., and reported a product of 7½ per cent. of sugar, or upwards of 36,000 tons.

In the Zollverein, in 1858, there were 251 factories, consuming 28,409,674 cwt. of beet roots, and the average product quite as large as in Austria.

Thus it appears that a branch of industry now highly successful, began only under the protection of government, and with the aid of its fostering bounties struggled against difficulties with no very flattering success for many years. Others may commence with the benefit of the skill and experience so costly to them in its acquisition.

That the beet is destined to produce a large proportion of the sugar used in the United States, I entertain no doubt. Whether New England will be able to compete successfully with the prairie States in its production, is more doubtful; and yet the beet grows well here; probably quite as well as in Russia, where it is extensively grown for sugar.

Not much success can be expected from making sugar from beets in small quantities. Experience abroad has shown that nearly every factory which used less than two thousand tons of roots, has, one after another, given up the business.

While, therefore, we may not urge the trial of experiments in the manufacture of beet sugar in a small way, we can and do recommend a larger culture of the beet as a root crop for feeding to stock. This can be done with no danger of loss from the failure of doubtful projects, but with positive benefit to our herds from a more plentiful supply of succulent food. At the same time we may incidentally learn more than is now known among us regarding the necessary amount of labor or manure required, the average yield, and the cost of production per acre and per bushel. With these data in hand, in connection with the accumulated results of

experience of other parties in the manufacture of sugar from the root, it will be comparatively easy to arrive at satisfactory and reliable conclusions regarding probable profit from the manufacture of beet sugar in New England.

It may be well to state that the "*White Silesian*" is the variety almost universally used for the production of sugar, as it yields a larger percentage than any other.

The beet succeeds best in a mellow loam, which should be deeply worked in order to enable the root to draw heavily upon the subsoil for nutriment and also to insure moisture in dry seasons. It is an ameliorating rather than an exhausting crop, as it receives most of its support from the air, and returns largely to the soil in manure, for even when used in the production of sugar, the pulp remaining is consumed by cattle.

In view of the fact that the Mangold is becoming a favorite root with many farmers, producing largely, it might be well to sow a portion of the plot prepared with this, as well as with the White Silesian, thus enabling the cultivator to form an accurate judgment regarding the comparative cost of production and the feeding value of each.

ON CHICORY AS A SUBSTITUTE FOR COFFEE.

Another article of daily consumption for which a considerable sum in gold is annually sent out of the country is coffee. Our climate forbids the growth of this plant, and unless we do without it the gold will continue to go. At present, numerous substitutes are extensively used in its stead. Undoubtedly a very large proportion of what is vended by grocers as roasted and ground coffee contains hardly a homœopathic sprinkling of the genuine article. These compounds consist, for the most part, of peas and beans,* rye and barley, in varying proportions, and are often mixed with other ingredients. A chief object of the manufacturers seem to be so to blend the flavor of the ingredients that no one shall present a recognizable and particularly disagreeable predominance over the others.

These mixtures are sold under various fancy names, more attractive than descriptive, and rarely so suggestive of the actual composition as one noticed in a western city labelled "Ry! O Coffee."

If substitutes are to be used, it is preferable to use the best, and especially since it can be grown by every farmer, or by any one who has a garden, as easily as any other vegetable.

Many years ago Von Thaer wrote as follows:—"Of all the plants which have been proposed as substitutes for coffee, and which when roasted and steeped in boiling water yield an infusion resembling coffee, chicory is the only one which has maintained its ground. It has been used (in Germany) in this manner for thirty years, even when the price of coffee has been low, and has always yielded considerable profit both to manufacturers who prepare it in large quantities, and to those who cultivate it." Since this was written by that eminent agriculturist, the consumption of chicory has increased in Europe many hundred fold, and it is now extensively grown for export to this and to other countries. Regarding its healthfulness as a beverage we express no opinion, and only remark that widely differing views have been held on this point,

* The plant grown in some sections under the name of coffe is merely a variety of the English bean, and differs from the Hone beans, Windsor beans, &c., so extensively grown in England for the use of stock, mainly in the size and form of the seed.

as is well known to be the case with regard to both tea and coffee also. The verdict of the masses is also equally well known. It may be stated that at one time it was believed abroad that the use of chicory diminished the revenue from duties on imported coffee, but it afterwards appeared that the prohibition of chicory lessened instead of increased the import of colonial coffee; and that the latter, and especially the green coffees, were generally believed to be materially improved in flavor by an addition of a third or a half of chicory.

Chicory is a perennial plant found wild in various parts of Europe, and is sometimes seen among us as a weed bearing a star shaped blue flower, doubtless introduced from abroad, like numerous other weeds. It has a root like a carrot, and is of the easiest culture in almost any soils of moderate fertility, succeeding best in those of a loamy character and a little inclining to clay, dry, deep and rich. The mode of culture may be the same as for the carrot. A fair crop in Europe is considered to be from one and a quarter to one and a half tons of (dried) roots to the acre.

We gather some facts from the *Annales de Chimie,* as follows: The manufacture of a factitious coffee from the roasted root of the chicory appears to have originated in Holland, where it has been practised for more than a century. It remained secret until 1801, when it was introduced into France by M. Orban of Liege and M. Giraud of Korning, a short distance from Valenciennes. The manufacture of chicory-coffee, however, remained stationary for a long time and of no great importance, but for the last thirty years it has extended considerably, and has become an object of commerce of great importance. Manufactories have sprung up in several localities, especially at Arras, Cambray, Lille, Pais, Seulis in Normandy, Brittany on the continent, and also in England. Although grown to a great extent in England, large quantities of dry chicory have been imported from France into England, and its cultivation has become a source of great prosperity.

The plant requires a deep soil, of good quality and well prepared; the seed is sown in May and the harvest takes place in October. Some time before digging the roots, the leaves are mowed and fed to cows.*

* Chicory was formerly used in England extensively as a forage plant. Its leaves given alone communicate a disagreeable flavor to the milk, but in connection with other plants it forms an excellent fodder.

The roots are cut at first longitudinally and then transversely, in pieces from two to three inches in size—they are then carried into the drying chambers or kilns, and placed in layers of about a foot deep and frequently stirred to facilitate drying and prevent burning. Three or four such operations are performed every twenty-four hours. The roots thus dried are called cossétes. They may be kept in granaries; but are usually sold at once to the manufacturers, who roast them according to the demand.

When the roasting is nearly complete, two per cent. of butter is added and a couple of turns given to the roasting machine. This addition is made in order to impart lustre to the chicory and to give it the appearance of roasted coffee. It is then empted into iron vessels, and after cooling is crushed in vertical stone mills or between iron cylinders; it is then sifted, and during this operation a small quantity of reddish coloring substance (*rouge brun de Prusse*) is added to give it the color of coffee. The product is then weighed off, and sold in packets under a variety of names, but very rarely under its own; for instance, among others, Mocha Powder, Ladies' Coffee, Cream of Mocha, Pectoral Coffee, Chinese Coffee, Polka Coffee, &c., &c.

We have above stated that it forms an important article of commerce, above 12,000,000 pounds being consumed in France and a large quantity is exported. It appears from the tables of commerce in France that from 1827 to 1838 there were exported 458,791 kilogrammes of chicory-coffee of the value of 321,282 francs, and since that period the amount has vastly increased.

The seed can be obtained at any of the regular seed stores in our cities or principal towns, and any one who desires to buy it, can readily procure an ounce or more—enough for one family—at very small cost.

ON REGULATING THE SEX OF THE OFFSPRING OF ANIMALS.

[From the Journal of the Royal Agricultural Society of England, 1864.]

If there be any device for regulating the sex of the offspring of our flocks and herds, every breeder is interested in knowing it; even if a hint can be given which only improves his chance, without costing much trouble, it is still a boon.

It would seem from the following testimonial that Professor Thury of Geneva had got some insight into one of the factors which enter into this complicated and mysterious problem.

"I, G. Cornaz, manager of the property of my deceased father, M. A. Cornaz, late President of the Agricultural Society of Roman Switzerland at Montet, Canton de Vaud, hereby certify that I received from M. Trury, Feb. 18, 1861, a paper containing confidential instructions for the purpose of making a practical experiment to ascertain the law which regulates the sex of the offspring of animals.

I have applied these directions to my herd of cows, and obtained at once, without any tentative trial, the desired results.

In the first instance, in twenty-two successive cases, I endeavored to obtain heifer calves. My cows were Swiss, and my bull a pure Durham. Heifer calves were, therefore, in request—bull calves being only fit for the butcher; *in every instance I obtained the desired result.* Later, when I had bought a pure-bred Durham cow, I was anxious to breed a bull to take the place of the one which I had bought at so large a price. Again I acted according to Professor Thury's directions, which are ready of application, and again I was successful. Besides my Durham bull, I designedly bred six half-bred oxen for the plough from cows selected for their color and size. My herd comprised forty cows of all ages.

On the whole I have tried the new directions twenty-nine times, and in each case obtained the desired result, male or female; I have had no instance of failure. I personally watched each trial. I can consequently declare that I consider Professor Thury's system to be real and certain, and I hope that all breeders will specially profit by it.

Drawn up at Montet, Feb. 10, 1863.

(Signed) G. CORNAZ."

We may learn from a pamphlet of Professor Thury, "On the Law which Regulates the Sex of Plants and Animals," what is his scientific theory, and what are the practical directions which he deduces from it.

The following statement is a brief summary of his views. Starting with the vegetable kingdom, Professor Thury adopts the theory of Knight, who, in concert with Wolff, De Candolle and Robert Brown, considered stamens and pistils to be fundamentally identical (both being modifications of the leaf), and further regarded the production of the male organ in plants as due to greater maturity or more perfect development.

Considering how general the laws of Nature are, the Professor infers that the propagation of animals follows an analogous course. He states that it has already been admitted that for certain oviparous animals the last hatchings produce males; that Huber recognized as fact that early fecundation produces female bees, and *vice versa;* and so from one step to another he arrives at the conclusion that an egg yet unimpregnated is female during the first part of its passage down to the matrix, and male in the last part. The sex, then, of the creature will depend on the degree to which the egg is matured at the moment of fecundation. He therefore considers it to be a general law that fecundation which follows shortly after "heat" or menstruation breeds female offspring, and *vice versa*.

The following are his directions and cautions:

1. The peculiarities of different cows should be observed and taken into account. The number of hours during which they take the bull varies from 24 to 48. To obtain a heifer, the first part of this period is to be selected; for a bull calf, the latter part.

2. Exceptional animals, such as are fat or tied up, afford no fair criterion; but healthy, well conditioned specimens, living in the open air should be selected for experiment.

These views should be taken for what they are worth. So far as the result depends on the mother; and she is a fair representative of her sex, the hint may, very probably, be serviceable; but that the sex of offspring is quite independent of the sire, as is here assumed, is a doctrine which, with some, will not pass unchallenged.

It is very desirable that the principles enunciated above be properly tested on a sufficiently large scale, and by reliable persons, who would themselves take care that the advice given should be correctly followed. The results of a few years experience would then enable us to determine whether Mr. Thury's deductions are valid as a law.

To the Legislature of Maine:

The undersigned, Commissioners appointed under the "Resolve relating to the establishment of a college for the benefit of agriculture and the mechanic arts," approved March 25, 1864, submit the following

REPORT:

The act of Congress, approved July 2, 1862, a copy of which is appended to this Report, donated to this State, conditionally, two hundred and ten thousand acres of land. One of the conditions annexed to the donation is that "no State shall be entitled to the benefits of this act unless it shall express its acceptance thereof by its Legislature within two years from the date of its approval by the President." This condition was complied with by this State by resolve of the Legislature, approved March 25, 1863; information of the fact was communicated to the Department at Washington, and thereupon the scrip for the number of acres before named was issued and forwarded to the Executive of the State, in whose possession it still remains.

In 1863, March 25, the Legislature provided by resolve for the election of thirteen persons, to be chosen by the Legislature then in session, in joint convention, who were to constitute a Board of Regents of such college or institution as should thereafter be established under the provisions of the act of Congress before referred to. The Legislature adjourned without holding the election provided for by the resolve, and, therefore, it has now no force.

In 1864, March 24, the Governor was empowered by resolve to make sale of the land scrip before referred to, but in making such sale he was required to "act in concert with the Governors of the other States." The authority to sell conferred by this resolve has never been exercised, the concert of action contemplated having become, from various causes, impracticable. The scrip cannot be sold, therefore, under any existing legislation, nor until the Legislature confers on some one authority to make the sale.

On the day following, March 25, the resolve providing for this

Commission was passed, and the undersigned were subsequently appointed the Commissioners.

Such is a brief history of the legislation in this State in relation to the donation of lands by Congress for the purpose specified in the act of July 2, 1862.

MEMORIAL TO CONGRESS. The act of Congress provides that any State which may claim and take the benefit of its provisions, shall provide, *within five years*, at least not less than one college, as described in the fourth section of the act, or the grant to such State shall cease. Whether that term commenced at the date of the act, July 2, 1862, or at the date of the resolve accepting the donation, March 25, 1863, may be questionable. The resolve under which we act authorized us to "memorialize Congress for an extension of the term during which the college for the benefit of agriculture and the mechanic acts may be provided." We have not so done, because the last session of Congress was so near its close when we entered on the performance of our duties that we could not hope for any action on our memorial before its adjournment, and we have not presented any such memorial to Congress now in session because we believe your action will render it unnecessary. If our anticipations in this particular are not realized, ample time yet remains for the performance of this duty by us or by some other duly constituted authority.

ACTION OF OTHER STATES. It is made a part of our duty to confer with the authorities of other States engaged in the same enterprise; the object being, probably, to ascertain what they had done, were doing, and were proposing to do. This duty we have performed, so far as lay in our power, by correspondence, and by personal interview with gentlemen in Massachusetts who have the subject matter in charge; and have to report, that in most of the States where the donation has been accepted no further action has been had than in our own; they seem to have been, like ourselves, awaiting the further action of States in which the initiatory movement towards the establishment of the contemplated institution has been made.

In MASSACHUSETTS, the Legislature has appropriated nearly one third of the interest on the fund derivable from the sale of the land scrip to the "Institute of Technology," practically to the promo-

tion of the mechanic arts; the balance to the "Massachusetts Agricultural College:" an institution established more especially for instruction in branches related to agriculture, and located in the vicinity of Amherst College.

The amount of the land scrip held by that State is for 824,000 acres; of that, 100,000 acres were put in the market in June last, and one third of that amount sold for eighty-five cents per acre; of the amount sold recently we are not informed.

In NEW YORK, the income derivable from the fund has been appropriated by act of Legislature for the endowment of the "Peoples' College," an institution chartered several years ago for the avowed purpose of affording instruction in agriculture and the mechanic arts.

The price of the scrip in that State has been fixed at eighty-five cents per acre, and has never varied from that rate. Up to October last sales had been made to the amount of over sixty thousand dollars.

In NEW JERSEY, the income of the fund has been appropriated, by act of Legislature, to the endowment of a department, in which the instruction shall be in conformity to the requirements of the act of Congress, in "Rutger's College."

The sale of the scrip is confided to a Board of Managers, who have not yet, unless very recently, determined the price at which to sell.

In CONNECTICUT, the income of the fund has been appropriated, by act of Legislature, to the maintenance and support of "such courses of instruction as shall carry out the intent of the act of Congress," in that department of Yale College known as the "Sheffield Scientific School." The act of Legislature referred to provides the number and the mode in which the pupils to be admitted and instructed, gratuitously, shall be selected.

The land scrip of this State was for 180,000 acres, and has been sold for $135,000. The whole amount has been invested in bonds of the United States.

In VERMONT, the attempt has been made by legislative action to incorporate the three existing colleges with a new corporation, under the name of the "Vermont State University and Associate Colleges," the income arising from interest upon the fund derived from the sale of the land scrip to be appropriated to the support of the new organization; conditioned that such new organization shall

at all times maintain a regular course of instruction which shall conform to the requirements of the act of Congress.

Whether the attempt has been successful, we are not informed; in our opinion, it is not material that we or you should be. We all know that in our State any such combination, involving the extinction of the individuality of our numerous literary institutions, would be impracticable.

We learn that more than one-half of the land scrip of this State was sold some time ago; a portion at eighty cents per acre, and the remainder at eighty-two. The proceeds were invested in bonds of the State.

In NEW HAMPSHIRE, under a resolve similar in purpose to the one under which we are acting, a Committee has been appointed, with authority to "prepare a scheme for the establishment of a college for education in Agriculture and the Mechanic Arts." We hope to procure a copy of the report of that Committee in season to present it to you or your Committee who may have the matter in charge, before your final action in the premises.

No sale of the scrip belonging to this State had been effected, nor, as we are informed, had any effort been made to effect a sale up to October 17th, ult.

In MICHIGAN, The State which has heretofore done more to promote agricultural education than any other State in the Union, the income arising from the fund has been appropriated, by act of Legislature, to the support of the "State Agricultural College," an institution which has existed since February 14, 1855, and was originally established in compliance with the requirements of the Constitution of the State, that "the Legislature shall encourage the promotion of intellectual, scientific and agricultural improvement; and shall, as soon as practicable, provide for the establishment of an agricultural school." In making the appropriation, however, the Legislature required that military tactics and engineering should be added to the course of instruction already provided by law.

A portion of the lands subject to location under the Act of Congress are within the limits of this State. The necessary measures have been taken by the duly constituted authorities to select such lands. Whether sales have been effected to any great extent, or at what price, we cannot report; but the *minimum* price fixed by the Legislature is two dollars and fifty cents per acre.

This is the extent to which we can go in communicating information as to the action of other States, excepting in those which have evinced no more energetic enterprize than we have in our own; their action has been the counterpart of ours.

You will perceive that no one of the States enumerated, with the exception of Massachusetts, has thus far provided, on an independent basis, an institution or college, such as is contemplated by the act of Congress, Sec. 4. That in all the cases where an appropriation of the income to be derived from the donation has been made, it has been to sustain some existing institution which was able and willing to assume the obligation to maintain such course of instruction as is required by the act making the donation. The obvious reason for adopting this course will be made apparent in another part of this report.

PROPOSED LOCATIONS, THEIR ADVANTAGES, &C. It is made a part of our duty to "invite and receive donations and benefactions in aid of said college, and also proposals for the location thereof; to visit and examine all such proposed locations, when so directed by the Governor and Council, to consider the respective advantages of such locations, and to entertain all propositions which may be made for that purpose."

This part of our duty we have discharged by advertisements in the public press, calling the attention of the public to the subject, inviting donations and benefactions, and by visiting and thoroughly examining the locations proposed, three in number, all tendered to the State for the benefit of the proposed college.

In the month of September last, by invitation of Benjamin F. Nourse, Esq., a native of this State, but now residing in the city of Boston, we visited and examined a farm belonging to him at Goodale's Corner, in Orrington, the fact that he was willing to offer it as a gift to the State for the benefit of the proposed College, if the Commissioners should encourage it by their favorable opinion, having been previously communicated to one of our Commission. The examination of the premises impressed us so favorably, taking into consideration their pecuniary value and peculiar adaptation to meet the requirements of a model or experimental farm, that we invited Mr. Nourse to submit his proposition in writing, which he accordingly did, and which we embody in our Report, premising that the description of the premises contained in it is in every particular correct.

BOSTON, September 5, 1864.

To Messrs. W. G. Crosby, Samuel F. Perley and Joseph Eaton, *Commissioners:*

GENTLEMEN:—I now formally tender to the State of Maine, through you, the free and unconditional gift of my farm at Goodale's Corner, Orrington, as a site for the proposed State Agricultural College—the offer of which was implied by my invitation to you for your recent visit and inspection of the property.

The area of the farm is about 425 acres. Its westerly line bounding on the highway known as the "the back road" from Bangor to Bucksport; its easterly line runs on the margin of Brewer's Pond for about three-quarters of a mile; its northerly and southerly lines bounded by lands of other proprietors. Its distance from Bangor is between seven and eight miles.

It consists of two principal portions—the home farm of about 200 acres, and of wood lots and burnt lots about 225 acres; or as specifically divided of

72 acres plowed land and mowing fields,
78 do of pasture,
1½ do in apple orchard,
1½ do in new pear and apple orchard,
10 do in muck and peat bed,
137 do in wood land, mostly young growth, and
125 do of rocky land, of little value, much of it recently burnt over.

Of buildings there are:

A new and commodious house of 11 rooms, with wood-house and wagon-house attached;

A new barn, 42 by 60 feet, having an eight-feet basement story fitted throughout with cattle stalls, which leaves the whole capacity of the barn above for storage of hay, grain, &c.;

An old barn, in good condition, 36 by 44 feet, beneath which is a deep manure cellar;

A small building for storage of tools, &c., having projecting sheds for wagons and carts on one side, on the other for cattle shelter;

A piggery (new) about 18 by 30 feet; and

A sheep shed (old) of good capacity.

Among the improvements of a more permanent character are, 2916 rods, or 9 miles and 36 rods, of covered drains, 3, 3½ and 4 feet deep, of which about three-fourths were laid with tile and one-fourth with stone—all believed to be in good order.

400 rods, or $1\frac{1}{4}$ miles, of substantial stone wall.

800 rods, or $2\frac{1}{2}$ miles, of rail fence, of which one-half is new, or nearly new; (only half the outside or boundary fences included,)

270 rods of good, smooth farm roads.

4 wells of good water.

An apple orchard of 100 trees, the greater part mature, bearing trees, many of which are feeble and decaying.

A new pear and apple orchard, in healthy, thrifty condition, of

84 apple trees,

202 pear trees, set in orchard rows, and

68 do do reserved in nursery row.

354 trees in this orchard, of which about 70 are bearing this season.

In other places on the farm are about 100 good pear and apple trees—a total of 550 fruit trees.

A grape trellis of 18 rods, has 24 vines of such sorts as Hartford Prolific, Concord, Delaware, Isabella, Rebecca, &c., of which half have borne and ripened well good crops.

There is a fair supply of farm implements—plows in variety, harrows, cultivators, seed-sowers, roller, mowing-machine, horse-rake, hay-cutters, carts, wagons, and the many other tools required for ordinary farm work.

You, gentlemen of the Commission, have seen the premises, and know the character of soil, the merits and defects of the whole estate.

Such as it is, with its buildings and other improvements, and its farm implements, I freely offer to my native State, if it shall be found acceptable for the purposes of the proposed College.

It is to be supposed that many other farms will be offered for this purpose, and among them some more favorably situated, if not more valuable or better adapted than mine. Should it be so, let me ask of your courtesy to let me know that mine will not be accepted as soon as it shall be apparent, that arrangements for the ensuing season may not be too long suspended. While, if my farm shall be acceptable, it will give me great pleasure to execute the deeds for its tranfer.

I remain, gentlemen, with great respect,

Your obedient servant,

B. F. NOURSE.

We have remarked that an examination of the premises produced

and left on our minds a favorable impression. If the perusal of the foregoing truthful description of them does not produce the same effect on the *legislative mind*, we shall distrust our own judgment, or accept the doctrine that a Legislature is something less than *human*.

The advantages of this location, we think, are obvious; perhaps [illegible]sadvantages are equally so.

It is desirable that the location of an institution designed more especially for the benefit of the industrial classes—the people—should be at a point which all can reach, in the ordinary modes of travelling, at comparatively small cost; in other words, at some central point, some point to which the great thoroughfares of travel converge. The farm at Goodale's Corner fails to meet this requirement.

There is one other disadvantage attending this location, as well as the one we shall next consider: the want of buildings necessary for the operations of the institution; rooms for recitations and lectures; for a chemical laboratory, a geological and mineralogical cabinet, a library, and various other purposes. The population in the vicinity is sparse, and adequate provision for the board and lodging of pupils could be made only by the erection and furnishing of buildings for that specific purpose. The dwelling-house on the premises, beautiful as it is in its architecture, and as nearly perfect as it well can be in its construction, can be of service only as the residence of the President or Professor; the associate teachers and the pupils remain to be provided for.

This provision must come from one of two sources—the State or individuals; for the act of Congress provides expressly that "no portion of said fund, nor the interest thereon, shall be applied, directly or indirectly, under any pretence whatever, to the purchase, erection, preservation or repair of any building or buildings."

No individual has offered to donate the money required for the erection and furnishing of necessary buildings; we cannot recommend that, in the present pecuniary crisis, the State should do so; funds for this purpose from both sources failing, it becomes most manifest that the location for the institution must be where the buildings required for its operations can be furnished gratuitously, at least until the means for defraying the expense of their construction can be derived from some source other than the donation from the General Government.

We next visited the premises in Gorham tendered to the State by Hon. F. O. J. Smith. The character of the premises and the advantages of the location are accurately set forth in his communication to the Governor, a copy of which we subjoin.

NEW YORK CITY, Feb. 8, 1864.

To His Excellency Samuel Cony, Governor of Maine:

SIR:—I am owner in fee of a well known farm in Gorham, county of Cumberland, nine miles from the city of Portland, accessible by railroad several times daily, and the same now occupied by Col. J. J. Speed.

It consists of a fraction rising ninety acres, of which about one fifth is in woodland and pasture, and four fifths of tillage, without a rod of waste land in the four fifths, under proper cultivation.

It has upon it a small farm house and barn of inconsiderable value. But it has a mansion house and stable, the former of commodious size, built of the best material and in the most workmanlike manner, and of great architectural beauty. It is in good condition of repair, and upon a site of unsurpassed natural as well as artificial beauty. It is within three fourths of a mile of the State Female Seminary in Gorham village, and a like distance of the York and Cumberland Railroad depot. It cost a former owner, as I am well informed, upwards of thirty thousand dollars.

I propose to donate this entire property to the State with a perfect title, on the single condition that the State will locate and sustain upon it permanently the Primary Agricultural College which it has undertaken to establish under the munificent grant of lands by the government of the United States.

I speak of a primary college, as I believe it will be found wise and advantageous to the State, in the future, and more satisfactory to the people, to distribute portions of the funds that will be derivable from the federal grant, if judiciously handled, to different localities and branch schools of instruction in the State, in order better to secure the diversity and extent of territory and soil requisite to develope and reduce to practical illustration and popular instruction the varied departments of agricultural science and its adjunctive arts. The scattered population of the State will also be doubtless better accommodated by this distributive system. Cattle and sheep husbandry and horse breeding, for instance, require a far greater extent of territory, and a very different soil,

from that best suited to the cereal products, and grasses and root culture.

So, theoretical instruction—lecturing tutors and consulting managers—of a State system for diffusing agricultural knowledge for subsequent or cotemporaneous reduction to practice, as well as an accumulating State library, and perhaps, in time, a zoölogical garden and a museum of natural history, may each well have a location different and even distant from the auxiliary branches of a State system, where practical agencies will be the peculiar characteristic of their selection and uses.

However, be this as it may, and I defer all to the ultimate decision of those to whom is properly entrusted the responsibility of the subject, I tender to the State the above donation of a property I believe to be preeminently suited in beauty and salubrity of location, in proximity to the commercial capital of the State, in accessibility by railroads and county roads, and in ready adaptability to the ends in view, coupled only with the one condition above expressed.

I will venture to add, that if accepted, it will afford the State an immediate nucleus for starting the great beneficent scheme of the Federal Government for popular instruction in the noblest of human employments, without affiliation with any existing creations of a sectarian character, and with a fair prospect therein of maintaining it in like exemption forever—a result which cannot be too cautiously fostered to insure permanent and undisturbed success, and the enduring good will of all truly catholic minds.

Your Excellency is at liberty to make such use of this communication as may in your judgment be most judicious for definite action at an early day.

With sentiments of great respect,

Your obedient servant,

FRANCIS O. J. SMITH.

This location labors under the same disadvantage as that at Goodale's corner, namely, the lack of necessary buildings, although not to so great extent. It is but a short distance, about three fourths of a mile, from the village in Gorham, where pupils could readily be provided with board and lodging; but the buildings necessary for conducting the operations of the institution, such as have been before enumerated, would still be wanting.

These two locations are all that have been offered to the State gratuitously and unconditionally. Whether accepted or not, the thanks of the people of the State are due to the gentlemen making the several offers for their noble and disinterested generosity.

The only other proposed location visited is in Brunswick, and is tendered to the State conditionally; on what condition fully appears in the following communication from President Woods of Bowdoin College:

WHEREAS, the President and Trustees of Bowdoin College have received, from bequests made by the late Josiah Little, Esq., (in 1860), a fund of the estimated value of twelve thousand dollars, and hold the same in trust for the purpose of "aiding in the establishment and support of an institution to teach the principles of science appertaining to agriculture and the mechanic arts," and have already made some provision for such instruction to be given to such students as might offer, by the appointment of a professor, to be supported in part by the income of this fund.

And whereas, the State of Maine has received, by Act of Congress, July 2, 1862, certain land scrip of the estimated value of two hundred thousand dollars for the endowment, under certain conditions, of an institution "to teach such branches of learning as are related to agriculture and the mechanic arts."

And whereas, it is believed that the common object had in view in these separate benefactions may be best promoted by an united agency.

Now, therefore, it is proposed that the said land scrip shall be transferred and assigned by said State to said Corporation in trust for the objects and on the conditions prescribed.

And, on said transfer and assignment being made, said Corporation hereby engages to establish an institution, separate and distinct from any and all others, for the sole object specified in the fund and the grant above mentioned, to enact laws and statutes for its government, and to make all the appointments and arrangements necessary to put this institution in operation within the time limited by said Act of Congress, and in general to perform, without involving any expense to the State, all the obligations assumed by it in accepting said grant, and all those imposed on any institution which may be established under its provisions.

More particularly said Corporation engages on the condition aforesaid:

I. To keep all monies derived from the sale of said land scrip separate from any and all other monies of which it may be possessed; to invest them in suitable stocks yielding not less than five per cent. upon their par value; to take care that the capital fund shall remain forever undiminished, (unless it should be thought best to expend ten per cent. of it in the purchase of sites or experimental farms;) to give satisfactory guarantees to indemnify the State against any unauthorized diminution or culpable loss of said capital fund, and to employ the whole income, adding thereto the income of the fund above mentioned, for the object above specified, and for no other object whatever.

II. To appoint a Faculty, which shall constitute the Executive Government of the Institution, and have intrusted to it the general management of its affairs, which shall have authority to enact such rules and regulations, in addition to the statutes and laws enacted by the Corporation, as they may judge necessary to secure the best order and strictest discipline, and which shall also have authority to elect a Dean or Secretary, whose duty it shall be to keep a careful record of their proceedings, and to act as their agent; said Faculty to be distinct from and independent of any and all other faculties, and shall consist of the President of the Corporation, the Professors (and Lecturers) of the Institution, one member from the Trustees and two from the Overseers of the College; the Secretary of the Board of Agriculture, the Superintendent of Common Schools, and the Adjutant-General of the State, *ex officio*, or of any three to be nominated annually by the Governor and Council.

III. To appoint and support by adequate salaries not less than Professors or Lecturers, including among these the Josiah Little Professor of Natural Science, to be selected impartially with sole reference to their qualifications for their office, whose duty it shall be, at such times and in such order as may be determined by the Faculty, to give courses of instruction, which, until otherwise ordered, shall be completed within one year, in the following branches of study, viz.: 1. Vegetable Physiology and Botany; 2. Comparative Anatomy, Physiology and Zoology; 3. Stock-breeding, Veterinary Surgery and Pharmacy; 4. General, Practical and Technical Chemistry; 5. Mineralogy, Geology, Mining, &c.; 6. Physics, (Acoustics, Optics, Heat, Electricity, &c.); 7. Practical Mechanics, (Constructions, Machines, Architecture); 8.

Entomology; 9. Military Tactics, (Infantry and Artillery Tactics, Use of Small Arms, Theory of Ordnance and Gunnery, Science of War); 10. Mathematics and Engineering; 11. "Other Scientific and Classical Studies," (History, Philosophy, Political Economy, Constitution of the United States and of State of Maine, English Literature and Modern Languages,) such as it may be expedient from time to time to add to the more strictly practical studies before mentioned, to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life.

IV. To admit to this Institution, and to any or all of these courses of instruction, such students as may be nominated from the several representative districts in the ratio of the representation, and such others as may apply, the whole number not to exceed. until otherwise ordered; such students, unless they come from another State, to be subject to no charge for tuition, and to no fees whatever, except five dollars on matriculation and three dollars on graduation, for the incidental expenses; to be not under eighteen years of age; to pass examination, in order to admission, in the common branches of English education, and such other studies as may be prescribed from time to time, and may be found necessary to qualify them to pursue with advantage the courses to which they propose to give their attention; to be subject to all the laws and regulations which may be enacted by the Corporation or the Faculty, and to be entitled, after attending on the instructions of the Institution for one year, and having passed a satisfactory public examination in one or more of the departments, to receive the degree of Bachelor of Science, and a diploma bearing the signatures of the President and the Faculty, and specifying the department in which they had been examined, and their grade of merit; or in case they have not attended through a whole year, to receive a certificate, stating the time they have been present, the studies pursued, and the progress made.

V. To provide the necessary philosophical and chemical apparatus, cabinets of specimens in geology, botany, mineralogy and comparative anatomy, and a museum of natural objects, appropriating for this purpose the sum of one thousand dollars a year for years, and afterwards the sum of annually, and at the same time to allow the apparatus and collections already belonging to the College to be used in the instruction of the students of the Scientific Institution.

VI. To provide for the Institution a library, to consist of books and periodicals relating to agriculture and the mechanic arts, appropriating for this object one thousand dollars a year for
years, and afterwards the sum of
annually, and at the same time to give to the students of the Scientific Institution the use, under certain conditions, of the public libraries of the College, it being understood that this library shall also be open to the use, under certain conditions, of citizens of the State at large engaged in agricultural and mechanical pursuits.

VII. To provide a building, to be erected by the College within such time as may be agreed upon, and without drawing in any manner, or under any pretext, upon either the capital or the income of the original fund; to be equal in style and similar in plan to the Maine Medical College; to be appropriated to the objects and uses of the Scientific Institution, and known by such name as may be given to this Institution; to contain lecture-rooms for all the courses of study not otherwise provided for, and also rooms for the library, cabinets and museum; and until such building can be erected, to set apart, for the uses of the Institution, such College buildings, or portions of them, as shall furnish it with ample accommodations.

VIII. To provide land for an experimental farm, and for a botanical garden, to be under the direction of a Superintendent, in which students may employ themselves, at their option, in manual labor, and may see the results of different methods of culture, provided, however, that they shall be encouraged to make such experiments on their own farms at home, and shall be expected to report the results to the Superintendent.

IX. To provide a gymnasium and a Campus for military drill.

X. To make an annual report to the Governor and Council, and to other schools established by the national grant, representing the condition of the Institution, the investment, income and expenditure of the funds, the Professors employed, the salaries paid and instructions given, the number of students admitted and graduated, and to hold themselves subject, in their administration of the affairs of the Institution, to such visitation, stated or occasional, as may be directed by the Legislature; provided, that should the fund fall short of the estimated value, the Corporation shall be proportionately relieved from the obligations here assumed.

LEONARD WOODS,

in behalf of the Committee.

This location is nearer the centre of population than either of the other two, and is accessible by railroad daily from the east and west. The tract of land referred to as the site for an experimental farm embraces about three hundred acres; the soil is well adapted to the cereal products and root culture; presents the ordinary diversity to be found in a territory of the same extent in our State, and combines all the elements desirable in a farm for experimental culture, but is not suitable for a stock farm.

That you may have full knowledge and the benefit of all the methods suggested to us for the appropriation of the income of the fund derivable from the sale of the land scrip, we present to you, in this connection, a plan proposed by President Champlin of Waterville College. The plan in all its details appears in the following draft of a bill prepared by him:

AN ACT establishing an Industrial College under the act of Congress donating public lands to the several states and territories for the benefit of agriculture and the mechanic arts.

SECTION 1. *Be it enacted, &c.,* That the Governor, the Attorney General, the Secretary and the Treasurer of the State, together with the Superintendent of Common Schools and the Secretary of the Board of Agriculture (or should any of these offices be abolished, then the vacancies to be filled by the Legislature), be, and hereby are, constituted a body corporate and politic, under the name and style of the "Board of Trustees of the Maine Industrial College;" of which body the Governor shall be the President, and the Secretary of the Board of Agriculture and the Treasurer of the State, the Secretary and Treasurer, and that meetings of this board—at which a majority shall always be necessary to constitute a quorum—may at any time be called by the Governor, by mailing to each of the other members, at his usual place of residence, a written or printed notice, stating the place, time and object of the meeting, at least ten days before the same is to take place.

SECT. 2. *And be it further enacted, &c.,* That the above-named board be, and hereby are, authorized and directed to sell, as soon as may be after the passage of this act, through suitable agencies in the cities of Boston and New York, the land scrip issued to this State by the United States for the benefit of agriculture and the mechanic arts, and invest the proceeds of the same in stocks—which the State hereby guarantees shall produce an interest of not

less than five per cent.—and deposit these stocks for safe keeping with the Treasurer of the State. And of these sales and transactions they shall make a report to the next Legislature of this State and also to Congress.

SECT. 3. *And be it further enacted, &c.,* That the said board be authorized and required to establish in Bowdoin College a professorship of chemistry applied to agriculture and the arts, in Waterville College a professorship of civil and rural engineering, or of mathematics applied to the mechanic and other practical arts, and in Bates College a professorship of agricultural zoölogy and veterinary science, including the anatomy, physiology and pathology of animals; these professorships to be established in the above-named institutions on the following conditions, to wit:

1. That the particular branches to be taught in these special departments shall be agreed upon between the boards of the Industrial College and of these institutions respectively, and be so arranged as to come as near as may be within the compass of a single year, and together with certain additional studies selected from the general studies of the college by the same parties, sufficient to occupy the time of a student for two years, shall be called the "Scientific Course" of the college; and those completing this course satisfactorily, or the studies of the above-named special departments in two of the colleges, shall be entitled to the degree of Bachelor of Science, while those completing the studies of but a single one of these departments, shall receive a degree suited to the nature of the case—for which degrees they shall pay the same fees as other students.

2. That it shall be the duty of the professors thus provided for to give instruction in the studies belonging to these special departments, and such other kindred studies in the Scientific Course as may be assigned them by the two boards above referred to; also to make to the Secretary of the Industrial College an annual report of the attendance on their instruction and of the general conduct of their departments, and to lecture in concert, during their winter vacations, and in conjunction with other lecturers, in a course of public lectures on agriculture and the mechanic arts. The pay for which services, as well as their appointments to their offices, shall be agreed upon between the boards of the Industrial College and of the institution where each is to serve.

3. That the said colleges shall make no charge for the instruc-

tion given these special students by the professors thus appointed, and allow them to pursue other studies belonging to their course and enjoy the general privileges of the institution, on the same terms as other students; and after paying the salaries of said professors from the annuities allowed them by the State, shall expend annually all that remains in materials, books, apparatus and other provisions for these special departments—which books, apparatus, &c., they shall hold in trust for the Trustees of the Industrial College, and deliver over to them, in case this arrangement should ever be brought to a close, as hereinafter provided for; that they shall teach gratuitously, to such of these special students as desire it, military tactics, and afford all the accommodation and facilities at their command to the course of lectures provided for in the last section of this act.

4. That the students in these several departments shall be subject to the same rules and regulations as to attendance on college exercises and general conduct and deportment as the other students in the institution.

SECT. 4. *And be it further enacted, &c.,* That, on receiving from the Trustees of each of the above-named institutions their assent to the foregoing conditions, the professors provided for above shall be appointed, and the said board shall authorize and direct the Treasurer of the State to pay over annually to the Treasurer of each of these institutions twenty-five per cent. of the income of the said stock deposited with him for safe keeping, *provided* such annual payments to each of these institutions shall in no case exceed the sum of two thousand dollars. And these annual payments to the aforesaid institutions shall be continued forever, unless the Supreme Court of the State, on complaint being made to them, shall decide that the foregoing conditions have been violated by either of the said colleges, in which case payment shall be withheld from that institution till it conforms to the conditions as interpreted by said court; *provided,* however, that at any time within three years after the first day of January, eighteen hundred and seventy-four, the Legislature may make a new disposition of the whole matter by repealing this act, or the colleges, or either of them, may withdraw their assent to the conditions.

SECT. 5. *And be it further enacted, &c.,* That the remainder of said income shall be expended under the direction of the board of the Industrial College, partly in paying expense of conducting experiments calculated to throw light upon doubtful problems in

American agriculture, and partly in employing additional lecturers for a course of public lectures on agriculture and the mechanic arts, to be delivered in rotation, sometime during the winter months, in Brunswick, in Waterville and in Lewiston—these lectures to embrace, besides the subjects included under the special departments provided for above, the applications of botany, meteorology, physical geography, entomology, geology, mineralogy, political and rural economy, &c., to agriculture, together with instruction on mining, theoretical and practical agriculture and horticulture, and other subjects interesting to farmers farmers and mechanics.

We are not inclined to recommend the adoption of the plan proposed in the foregoing bill for various reasons. We will state but two:

First. It makes no provision for the "*practical* education of the industrial classes in the several pursuits and professions in life," as the act requires. We believe that any system for the education of pupils in agriculture and the mechanic arts is imperfect which does not unite practice with theory; that pupils should be taught not only *what* to do theoretically, but *how* to do it practically. The student in surgery may become very learned in theory by attending courses of lectures, but it is the actual dissection of the *subject* which qualifies him for the practical discharge of the duties of his profession.

Second. As we construe the law, such an appropriation of the income derived from the sales of the scrip, as is proposed by the bill, would not be in accordance with the spirit of the act or the intention of its framers. It would not be the *endowment of a College where the leading object* would be such as is contemplated by the act. We do not see how under such an appropriation of the fund that provision of the act could be complied with, which requires that "an annual report shall be made regarding the progress of the College, *recording only improvements and experiments made, with their cost and results.*"

Recommendation of Commissioners. Having thus briefly presented to you the advantages and disadvantages of the several proposed locations, it may be expected, although it is not made part of our duty, that we should express our own opinion as to which one is the most eligible; which one it will be for the interest of the State to accept.

Assuming the market value of the lands donated to this State to be eighty-five cents per acre—the price established in New York—the highest price at which they have been sold in Massachusetts—we have as proceeds of sale of the 210,000 acres the sum of $178,500. That sum invested in stocks bearing five per cent. interest would yield an annual income of $8,925. We take five per cent. because that is the minimum rate fixed by the act of Congress, and because it is as large a rate of interest as can be anticipated in the *long run*, although for some ten or twenty years to come six per cent. might be realized. But adopting six per cent. as the rate of interest, the annual income from the fund would be only $10,710. That amount would be totally inadequate to support, on an independent basis, such an institution as is contemplated by the act of Congress. That act requires the maintenance of an institution of a higher grade than our academies and high schools; "a college where the *leading* object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, . . . in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." Such an institution would require a corps of professors equal in number and acquirements to those employed in other New England colleges. To make it thoroughly efficient, it should be furnished with a chemical laboratory, an anatomical, mineralogical, and geological cabinet, and territory for an experimental farm, beside workshops, and the pecuniary means to keep the whole machinery in active motion. To do this the income from the fund as before estimated we believe to be utterly inadequate.

The land for an experimental farm has been generously tendered to the State; but from what source is the money to come to pay the expense of erecting the buildings necessary? It must come, as we have before said, from the State or from individual charity: the former we cannot advise; we have no reason to hope for the latter. But even were this want supplied, the want of teachers, lecturers, material for demonstration in the various branches to be taught, and for operating the farm, still remains unsupplied. Every practical man, without resort to arithmetical calculations, will at once perceive that a larger income than our fund will yield will be required to meet that want.

It may be said that if the income from the fund is not sufficient

to support a *college*, let it be appropriated to the support of an *academy* or a *high school*. Our reply is that such an institution would not come up to the expectations of the donating power, nor answer the requirements of the act; that its insignificance would deter those from attending for whose especial benefit it was the intention of government to provide; that but a few years would elapse before it would be calling on the State for aid; that its feebleness would constitute its strongest argument; that without that aid it would dwindle and finally perish.

We believe that the proposed institution should be sustained by the donation from government, and we are unwilling, as individuals, to become party to or indorse by our recommendation any arrangement which, by any possibility, can subject the State to loss, or impose on it any burthen or responsibility beyond that which it has voluntarily assumed in accepting the donation.

The question presents itself, Shall we reject the donation because instead of yielding an annual income of twenty-five or fifty thousand dollars it will yield ten thousand only for the education of our industrial classes? This question we answer in the negative, because the expenditure of even that sum only for the proposed object cannot fail to be productive of good results; not to so great extent as the expenditure of a larger sum, but yet to *some* extent. We should answer the question in the affirmative, if by the acceptance of the donation the State was to be committed, directly or indirectly, to the expenditure of its own moneys in furtherance of the object. Not because that object is not a laudable one, and one well worthy the fostering care of the State, but because the pecuniary burthens resting on the people in the present crisis are as heavy as they can well bear.

Assuming, then, that it is for the interest of the State to accept and retain the donation—that the probable income to be derived from it will be insufficient to sustain, on an independent basis, such an institution as the act of Congress contemplates in its broadest sense, and that it is impolitic to impose on the State the burthen of supplying the deficiency, we do not hesitate to recommend the acceptance, with certain modifications, of the proposition embraced in the foregoing communication from President Woods. In so doing we shall comply with the requirements of the act of Congress; we shall preserve the fund intact, as no portion of it will be required for the purchase of lands; we shall be spared the necessity of appealing to the State or to individuals for the funds

required to erect buildings and purchase the apparatus necessary to make the institution practically useful to the people. Every necessity of that character will be at once promptly supplied under the proposition, and on the sale of our scrip and the investment of its proceeds, our Industrial College, or College of Agriculture and the Mechanic Arts, will be at once ready to enter on its career of usefulness.

It may be said that in adopting the proposed plan, we are simply establishing a department of agriculture and the mechanic arts in an existing institution. Admitting such to be the fact, we shall be doing what other States have done, and what they and we shall be justified in doing. We shall be doing *something*, and, under the circumstances, the most we can do with the fund for the benefit of the industrial classes.

But, in accepting the proposition, we do more than establish a department in Bowdoin College. We establish an institution on a basis of its own; we avail ourselves of the Josiah Little Fund, which that College holds in trust for the benefit of agriculture and the mechanic arts: we receive from the College the aid which can only be derived otherwise from the State or individuals.

It is true that the College may derive corresponding benefits from the accession of students, and the additional importance it may acquire from its local connection with the Industrial College; but the objection that a bounty bestowed blesses him who gives as well as him who receives, comes with an ill grace from the recipient of the bounty.

It may be objected that in adopting the plan proposed, the interests of the State are made subservient to those of the College; or, in other words, that the State will be thereby relinquishing to the College the entire management and control of the fund which Congress has intrusted to the State for the benefit of the people. This objection we would obviate by providing that the control and appropriation of that fund shall be confided to a Board of Trustees or Overseers, composed of the Governor of the State, the Adjutant General, the Attorney General, the State Treasurer, *ex officio*, and three others, to be selected from one or more of the industrial classes by the Governor and Council—seven in all, to represent the interests of the people, and of the President of Bowdoin College, three of its Professors, those whose departments of instruction are most intimately connected with the branches taught in the Industrial College, one of its Trustees and one of its Overseers—

six in all, to represent the interests of the College; thus providing, that in the event of any conflict of interest, real or imaginary, between the parties, the people, through their representatives, shall have the controlling vote.

The plan submitted by President Woods proposes that the scrip shall be assigned to the College. This, we think, cannot legally be done. The act of Congress contemplates that the scrip shall be converted into money, that money invested in stocks, and those stocks held by the State inviolate forever; a perpetual fund, "the capital of which shall remain forever undiminished," &c. The income derived from that investment, however, may be appropriated in such way and manner as the Legislature may direct, subject to the provisions contained in the act.

As the whole movement in the premises is experimental, it may be well to provide, in the event that such an arrangement is made with Bowdoin College as is recommended, that the arrangement may be terminated by either party at the expiration of a given term, say ten years; but the expediency of such a provision is submitted to the wisdom of the Legislature.

In arriving at this conclusion, we are gratified in finding that it is fully indorsed by the recommendation of the two last Executives of the State in their annual communications to the Legislature.

Governor Coburn, in his message to the Legislature in 1863, treating of the subject under consideration, says:

"There can be no doubt, I think, that vast benefits will flow from this act (act of Congress), and I have no hesitation in urging upon you the prompt acceptance of its terms and conditions. As none of the proceeds arising from a sale of lands can be devoted to the erection of buildings, it may be *expedient*, and, indeed, *absolutely necessary*, to allow some of our *existing institutions* to avail themselves of the benefit of the grant, provided satisfactory guaranties can be given that its design will be faithfully carried out."

Governor Cony, in his address to the last Legislature, says:

"While among the sciences to be taught, it is declared that the leading object is to teach those relating to agriculture and the mechanic arts, the language of the act making the grant declaring specifically that it is not its purpose to exclude other sciences, is pregnant with the conclusion that the *design was to establish institutions of learning of the highest order*, for its scope is as comprehensive as its whole spirit is liberal."

"If Maine is to have the institution which this grant designs,

the Legislature will find it necessary either to endow a *new one*, with a very *liberal amount* of funds to *start it*, to be *followed by annual appropriations to the end of time, or avail itself of some one of those already existing*, which has heretofore been the recipient of the bounty of the State, *securing thereby edifices, library and laboratory*—the gathered results of large expenditure and patient effort, *indispensable to the proposed institution, demanded by the purposes of the grant*, and the *first* and *most expensive* to be provided by the *State*. Without the slightest preference as to what institution shall be selected with which to connect the Agricultural College, my convictions are very decided that it is expedient to adopt some one of them."

We abstain from presenting in detail our views of the way and manner in which the affairs of the proposed Institution should be conducted, of the branches to be taught, and the methods of instruction, because the consideration of that subject is not committed to us; but we would respectfully commend to the careful consideration of the Committee, to whom that duty may be intrusted, the report of the Committee on Agricultural Schools to the Legislature of Massachusetts, made at its January Session, 1851, House Doc. No. 13, and especially to the communication of Professor Hitchcock, which makes part of that report.

We cannot refrain, however, from expressing the opinion that among the branches most important to be taught are practical agriculture and horticulture, chemistry elementary and applied, natural history, especially zoology and botany, elementary and applied mineralogy and geology, anatomy and physiology, human and comparative, veterinary medicine and surgery, mathematics as applied to civil engineering, surveying, irrigation, draining, construction of roads and bridges, &c., &c., book-keeping and military tactics.

Agricultural law, or rural legislation, comprising the rights and duties of owners and occupiers of lands as to fences, ways, watercourses, upon streams, rivers, ponds and tide-waters; titles to real estate under deeds, leases, grants, &c., and the duties of persons acting in a representative capacity would also be a very desirable and useful branch of instruction, not comprehended in the course of instruction in any literary institution now existing in the country. Instruction in this department might be given by a lecturer, or by the Professor in some other department.

We are also of opinion that a farm and workshop, collections of

dried seeds and grasses, of minerals, rocks, soils, marls, clays, &c;. of insects injurious to vegetation, a chemical and philosophical apparatus, and a scientific and agricultural library are equally desirable, and, indeed, necessary appendages to such an institution.

To carry out this idea thoroughly, and make the institution as efficient as we all desire it should be, the following Board of Instruction would be required:

1. A Professor of Mathematics.
2. A Professor of Elementary and Agricultural Chemistry.
3. A Professor of Agriculture, theoretical and practical.
4. A Professor of Natnral History and Geology.
5. A Professor of Anatomy, Physiology, and Veterinary Medicine and Surgery.
6. A Professor of Civil and Rural Engineering.
7. An Instructor in Military Tactics.
8. A Superintendent of the farm and gardens.
9. A Superintendent of the work-shop.

To this list may be added a Professor of Horticulture and Agricultural law. It is not improbable that the duties of two or more of the Professorships above enumerated may be discharged by one and the same person possessing the requisite qualifications.

History, &c., of Similar Institutions. The Resolve under which we act makes it the duty of the Commissioners "to learn what they can of the history, present working and prospect of usefulness of similar institutions."

Institutions for instruction in agriculture and the mechanic arts are of so recent origin in this country that they can hardly be said to have a history. Not so on the other side of the Atlantic. Mr. Colman, in his able Report on European Agriculture, completed in 1844, describes nine agricultural schools only, although others then existed, probably, but of too insignificant character to attract his notice. Professor Hitchcock, in his Report made in January, 1851, enumerates three hundred and fifty-two. This rapid increase in number is an argument in favor of the recognized beneficial influence of such institutions. The mode of operation of those schools, the branches of instruction, the objects sought, and the best method of attaining those objects, are fully set forth in that Report; we would gladly embody it in this, were it not too voluminous, and were it not within your reach. We refer to it for all the informa-

tion of value we are able to communicate in relation to the practical working of institutions of this character.

Argument is not required to prove, what with us has become a truism, that the diffusion of education among the people is productive of incalculable benefit; but education implies something more than instruction in reading, writing and arithmetic, the Latin, Greek and French languages; it embraces every acquirement necessary to enable a man to discharge every duty devolving on him as a member of the great human family, every duty incident to his profession or calling in life.

We cannot all be members of the *learned* professions, as they are styled, or merchants, farmers or mechanics; but we all have a common interest that each and every one should be thoroughly educated in his calling, be it what it may; for the extent of his education in such calling is, in a great degree, the measure of his usefulness in society.

The best interests of the community require that the lawyer should be something more than a pettifogger, the physician than a quack, the merchant than a huckster, the farmer than a mere clodhopper, the mechanic than a botcher. The means and appliances for the education of the lawyer, the physician, the merchant, have already been brought to bear on their several departments in business life; not so with the farmer and the mechanic. An opportunity is now presented of supplying that well recognized deficiency; the opportunity should not be neglected.

We should not dispose of this topic with these brief remarks, had it not been most thoroughly discussed by the very able Secretary of the Board of Agriculture, in his Report for 1862, pp. 146–153, to which we beg leave to call your attention; as, also, to his Report for 1863, pp. 268–271, under the title, "Proposed Agricultural College," and his Report for 1859, pp. 249–264.

W. G. CROSBY,
JOS. EATON,
SAM'L F. PERLEY,
Commissioners.

December 19, 1864.

APPENDIX TO FOREGOING REPORT.

An act donating lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there be granted to the several States, for the purposes hereinafter mentioned, an amount of public land, to be apportioned to each State a quantity equal to thirty thousand acres for each senator and representative in Congress to which the States are respectively entitled by the apportionment under the census of eighteen hundred and sixty. *Provided,* That no mineral lands shall be selected or purchased under the provisions of this act.

SECT. 2. *And be it further enacted,* That the land aforesaid, after being surveyed, shall be apportioned to the several states in sections or sub-divisions of sections, not less than one quarter of a section; and whenever there are public lands in a state subject to sale at private entry at one dollar and twenty-five cents per acre, the quantity to which said state shall be entitled shall be selected from such lands within the limits of such state, and the Secretary of the Interior is hereby directed to issue to each of the states in which there is not the quantity of public lands subject to sale at private entry at one dollar and twenty-five cents per acre, to which said state may be entitled under the provisions of this act, land scrip to the amount in acres for the deficiency of its distributive share; said scrip to be sold by said states and the proceeds thereof applied to the uses and purposes prescribed in this act, and for no other use or purpose whatever: *Provided,* That in no case shall any state to which land scrip may thus be issued be allowed to locate the same within the limits of any other state, or of any territory in the United States, but their assignees may thus locate said land scrip upon any of the unappropriated lands of the United States subject to sale at private entry at one dollar and twenty-five cents per acre: *And provided further,* That not more than one million acres shall be located by such assignees in any one of the states: *And provided further,* That no such location shall be made before one year from the passage of this act.

SECT. 3. *And be it further enacted,* That all the expenses of management, superintendence, and taxes from date of selection of said lands, previous to their sales, and all expenses incurred in the

management and disbursement of the moneys which may be received therefrom, shall be paid by the states to which they may belong out of the treasury of said states, so that the entire proceeds of the sale of said lands shall be applied without any diminution whatever to the purposes hereinafter mentioned.

SECT. 4. *And be it further enacted*, That all moneys derived from the sale of the lands aforesaid by the state to which the lands are apportioned, and from the sales of land scrip hereinbefore provided for, shall be invested in stocks of the United States, or of the states, or some other safe stocks, yielding not less than five per centum upon the par value of said stocks; and that the moneys so invested shall constitute a perpetual fund, the capital of which shall remain forever undiminished, (except so far as may be provided in section fifth of this act,) and the interest of which shall be inviolably appropriated, by each state which may claim the benefit of this act, to the endowment, support, and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.

SECT. 5. *And be it further enacted*, That the grant of land and land scrip hereby authorized shall be made on the following conditions, to which, as well as to the provisions hereinbefore contained, the previous assent of the several states shall be signified by Legislative acts:

First. If any portion of the fund invested, as provided by the foregoing section, or any portion of the interest thereon, shall, by any action or contingency, be diminished or lost, it shall be replaced by the state to which it belongs, so that the capital of the fund shall remain forever undiminished; and the annual interest shall be regularly applied without diminution to the purposes mentioned in the fourth section of this act, except that a sum not exceeding ten per centum upon the amount received by any state under the provisions of this act, may be expended for the purchase of lands for sites or experimental farms, whenever authorized by the respective legislatures of said states.

Second. No portion of said fund, nor the interest thereon, shall be applied, directly or indirectly, under any pretence whatever, to the purchase, erection, preservation, or repair of any building or buildings.

Third. Any state which may take and claim the benefit of the provisions of this act shall provide, within five years, at least not less than one college, as described in the fourth section of this act, or the grant to such state shall cease; and said state shall be bound to pay the United States the amount received of any lands previously sold, and that the title to purchasers under the state shall be valid.

Fourth. An annual report shall be made regarding the progress of each college, recording any improvements and experiments made, with their cost and results, and such other matters, including state industrial and economical statistics, as may be supposed useful; one copy of which shall be transmitted by mail, free, by each, to all the other colleges which may be endowed under the provisions of this act, and also one copy to the Secretary of the Interior.

Fifth. When lands shall be selected from those which have been raised to double the minimum price, in consequence of railroad grants, they shall be computed to the states at the maximum price, and the number of acres proportionally diminished.

Sixth. No state, while in a condition of rebellion or insurrection against the government of the United States, shall be entitled to the benefit of this act.

Seventh. No state shall be entitled to the benefits of this act, unless it shall express its acceptance thereof by its legislature within two years from the date of its approval by the President.

SECT. 6. *And be it further enacted*, That land scrip issued under the provisions of this act shall not be subject to location until after the first day of January, one thousand eight hundred and sixty-three.

SECT. 7. *And be it further enacted*, That the land officers shall receive the same fees for locating land scrip issued under the provisions of this act, as are now allowed for the location of military bounty land warrants under existing laws: *Provided*, Their maximum compensation shall not be thereby increased.

SECT. 8. *And be it further enacted*, That the governors of the several states to which scrip shall be issued under this act, shall be required to report annually to congress all sales made of such scrip, until the whole shall be disposed of, the amount received for the same, and what appropriation has been made of the proceeds.

Approved July 2, 1862.

I am deeply gratified in being able, through the courtesy of the Commissioners, to present to the farmers and mechanics of the State, as well as to the Legislature, their very able report, in the foregoing pages.

My own views have been so often and so fully expressed in previous reports, that it seems needless to do more at the present time than to submit a few brief remarks and suggestions.

1st. Although the public burdens are very heavy and are likely to continue so, the State is not yet reduced to pauperism, nor are its inhabitants unable or unwilling to support and maintain such institutions as are needful to secure a fitting and useful education to their children.

2d. By the Constitution it is made the duty of the Legislature, (this body has several powers conferred upon it, but almost the only *duty* distinctly defined by the Constitution is,) "to encourage and suitably endow, from time to time, as the circumstances of the people may authorize, all academies, colleges and seminaries of learning within the State."

3d. Few towns would hesitate to accept a very liberal grant offered to them for the support and maintenance of a useful and necessary school, conditioned upon their raising a smaller sum in aid of the same.

4th. The classes for whose benefit the proposed college is especially designed are very numerous; they bear a very large proportion of the public burdens. Equally with the so called learned professions they have ever valued and cherished institutions of learning, and have cheerfully contributed of their substance for their support.

5th. So far as I am acquainted with the views of the industrial classes in Maine, their preference is strongly in favor of a separate and independent institution. They have, as yet, expressed no unwillingness to aid, if necessary, in establishing the proposed college upon an independent basis.

6th. The literary colleges have received bounty from the State with a liberal hand. What valid reason exists why this alone should receive no aid whatever from the same source?

7th. The proposition of Bowdoin College, although doubtless submitted with a willingness to admit of some modifications, indicates an appreciation of the importance of practical instruction

considerably at variance with that held by many who are deeply interested in the successful working of the Industrial College. It proposes no workshop, and that labor on the farm be optional with the student. Another view is, that the workshop with its fixtures and tools, and the farm with its stock, its implements and its crops, are necessary and indispensable portions of its apparatus for instruction, *and should be in daily use as such;* that a student in chemistry might as well confine himself to the reading of text books, listening to lectures and attending to recitations, without practice in the laboratory, as a student in agriculture might, at his option, keep aloof from the farm.

8th. Then, too, with regard to the proposed course of study; it is certainly a very comprehensive one to be mastered in the term mentioned—one year—a length of time insufficient, in the opinion of some, to enable any ordinary student to acquire even a meagre and rudimentary acquaintance with the branches of study which are named, and in which courses of instruction "shall be completed within one year."

9th. It seems very desirable, at least, that, together with a diffusion of knowledge in connexion with the training of youth, the proposed institution might contribute somewhat towards an actual increase of knowledge. This can only be done by laborious investigations, conducted by such persons as have attained what is known in their several specialties, and are possessed of skill, ability, means, patience and an earnest desire to push forward for more. Agriculture, *as an art*, has been pursued for six thousand years or more. Diverse opinions have been held on many points of practical importance. Experiments without number have been tried by thousands in all ages to ascertain the truth concerning these same points, and the diversity of opinion is scarcely less to-day than it was in the times of Cato, Virgil or Columella. Why is this? Just because the problems involve so many intricacies and complications, always with subtle forces and laws of matter, not fully understood, and very often with the laws of organic life and being, of which still less is known, that a successful solution would require a degree of knowledge and skill and care and precision in the operator to conduct the needful experiments in the best manner and with all the appliances of science to enable him to eliminate errors, and having done this, to repeat the experiments again and again under all the varying conditions of soils, seasons, &c., &c., &c., that not one person in a thousand, and probably not one in a million, possesses the skill, the means and the patience to conduct them to a demonstration. Something is now being done abroad to

good purpose. Probably more has been accomplished towards solving the problems of European agriculture within the past twenty years, than in the twenty centuries previously. Something ought to be done here; and where and how can it be better done than by the corps of such an institution?

10th. While the training, development and instruction of the youth who attend the college course must necessarily occupy to a large degree the efforts of professors and teachers, it seems highly desirable, if practicable, that their direct influence and teachings might reach larger numbers than can possibly be gathered within the college walls. Might not this be effected by having a considerable interval between the regular terms of study, and a part of this interval devoted to the delivery of courses of public lectures, say during the winter months, at various central points in the State at a distance from the college proper; which courses of lectures should be free to all, or with a fee barely sufficient to defray incidental expenses? Several advantages might be expected to accrue from the adoption of such a plan. It would serve to bring the institution to the knowledge of, and into intimate relations with great numbers of the industrial classes who would otherwise remain in ignorance of, or comparatively uninterested in its existence or operations. The people would sooner feel that this was their own institution; they would feel a deeper interest in it, a sense of property in it, would more freely extend to it their sympathy, coöperation and support. The number of regular students would more rapidly increase, and the reflex influence of such a direct mingling with sturdy practical farmers and mechanics would be highly beneficial upon the corps of teachers, and enable them to do more effective service.

I crave your indulgence for the crudeness of these remarks and suggestions, which are necessarily penned in haste and with little time for elaboration or revision. They are offered with extreme diffidence and only because of an earnest desire to assist, in however feeble a measure, towards the adoption of a wise plan in a matter of vast prospective importance.

S. L. GOODALE,
Secretary of the Board of Agriculture.

JANUARY, 1865.

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ERRATA. Page 3, stating expiration of term of members, for 1867 read 1865, for 1865 read 1867.