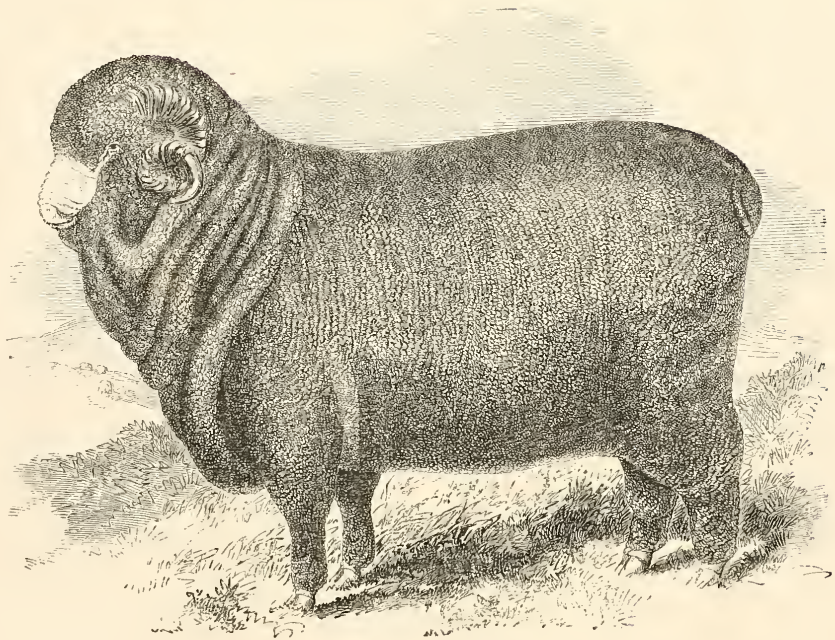
COLL



GOLD DROP.

Infantado Ram, bred and owned by Edwin Hammond, of Middlebury, Vt. Three years old.

REPORT

OF THE

COMMISSIONER OF AGRICULTURE

FOR

THE YEAR 1863.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1863.

REPORT

OF

THE COMMISSIONER OF AGRICULTURE.

DEPARTMENT OF AGRICULTURE,
Washington, D. C., January 1, 1864.

SIR: I have the honor to submit my second Annual Report. Although the year just closed has been a year of war on the part of the republic over a wider field and on a grander scale than any recorded in history, yet, strange as it may appear, the great interests of agriculture have not materially suffered in the loyal States. With the exception of some fruitless incursions along the border, and the invasion of Pennsylvania and defeat of the insurgents on the now historic field of Gettysburg, the loyal people have everywhere enjoyed a "broad and quiet land," with abundant health and prosperity, while a wider territory has been cultivated and a larger yield realized, except where drought and frost interfered, than during any previous year. Notwithstanding there have been over one million men employed in the army and navy, withdrawn chiefly from the producing classes, and liberally fed, clothed, and paid by the government, yet the yield of the great staples of agriculture for 1863, as compared with the previous year, has been as follows, viz:

	1862.	1863.
Wheat, in bushels	169, 993, 500	191, 068, 239
Oats....do	172, 520, 997	174, 858, 167
Corn....do	586, 704, 474	449, 163, 894
Hay, in tons	20, 000, 000	18, 500, 000
Tobacco, in pounds	208, 807, 078	258, 462, 413
Wool.....do	63, 524, 172	79, 405, 215

The comparison, with the exception of corn and hay injured by drought and frost, is even more favorable for 1863, if instituted in regard to the general products of the farm. This wonderful fact of history—a young republic, carrying on a gigantic war on its own territory and coasts, and at the same time not only feeding itself and foreign nations, but furnishing vast quantities of raw materials for commerce and manufactures—proves that we are essentially an agricultural people—that three years of war have not, as yet, seriously disturbed, but rather increased industrial pursuits, and that the withdrawal of agricultural labor and the loss of life by disease and battle have been more than compensated by machinery and maturing youth at home, and by the increased influx of immigration from abroad. In spite of the vast influence of the enemies of free institutions in Europe, brought to bear on the masses of her people against our republic, notwithstanding the flame of civil war still rages within our borders, yet the tide of immigration was never stronger, healthier, or more promising. While some as adventurers seek this western world for military fame, stimulated by our large bounties and the chances of promotion, or to fight, sincerely, the battles of freedom and equality, the greater part come to labor, to enjoy independence and quiet, and to make happy though humble homes for themselves and their children.

According to the report of the New York Commissioners of Immigration, the number of immigrants arriving at that port during the eleven months ending November 30, of the year 1863, was 146,519, against 76,306 during 1862. This proportional increase holds good in respect to the other great ports of our country, independent of the large number of persons from Canada and other portions of America. To an intelligent mind, and especially to every American, the causes of this increasing influx of foreign population, even during a period of war, are very evident and gratifying. I shall simply indicate some of these causes, without discussing them at length.

In the first place the present rebellion is being understood abroad in its true light—as a revolt against democratic institutions, the rights of labor and human nature, and that the triumph of the government guarantees to immigration its great rewards of peace, prosperity, and freedom.

In the second place none but actual citizens, or those who have legally declared their intention of becoming such, are liable to military service; while at the same time such aliens enjoy nearly all the advantages of citizenship. However manifestly unjust this immunity is to those who defend and support the state, yet it stands forth as a noble proof of the generosity of the republic towards all who, in foreign lands, oppressed and poor, desire to better their condition.

Again, the political, religious, and social institutions of the United States, such as the elective franchise; freedom of speech, of the press, and of worship; the separation of church and state; the tenure of the soil and of other property; the honorable condition and remuneration of labor; the cheapness of education, of food, and raiment; the equality of all citizens in the courts, and the open and fair field in the race of public and private life; all these, and more, are justly attractive to the masses in Europe when properly explained and understood. And no better service could be rendered the government and the great cause of agriculture than the preparation and dissemination of correct knowledge throughout Europe respecting the United States as the country of immigration.

A fourth cause, attracting at this present time so many honest sons of toil from the farms and workshops of Europe to America, is the demand for general labor, especially agricultural, owing to the vast number of our citizens now in the army and navy, or who have perished in the defence of their country.

And lastly, as the more general and positive cause of all, may be stated the cheapness and fertility of some lands, and the cheapness and capability of other lands, in connexion with the provisions of the homestead act, by which the government offers, gratis, to each actual settler one hundred and sixty acres of the best unappropriated land. Besides this free grant, the government offers vast tracts of land at $1 25 per acre, while improved or exhausted farms, in all parts of our country, may be purchased on the most favorable terms. In this connexion there are several topics worthy of most serious consideration, and to which I desire briefly to call attention.

Whatever, owing to the war and the march of events, may be the future condition of land and labor in the rebellious States, or the legal decisions of the courts, arising out of confiscation, litigation, or the demands of the military service, yet a great change must gradually take place, not only in the tenure of the soil and its modes of culture, but in the people themselves and their institutions. Much of the land will gradually pass out of the hands of its present proprietors, either by purchase, the decision of the courts, or by the force of circumstances. Many estates will be divided into smaller farms and occupied by the humbler classes in the south, whites and freedmen, and by industrious and enterprising settlers from the other States and from Europe. The old fallacy, so long inculcated by politicians and accepted by the people like many other fallacies respecting the south, that none but negroes can toil there, will be thoroughly exploded during the present generation. Once divide there the vast estates and elevate labor to its true dignity, by hiring instead of owning it, and I venture the prediction that in less than ten years after the close of the war, over a million of the industrial classes, native and foreign, will have settled in the sunny south, making it teem with new beauty, progress, and wealth. The tides of immigration which now flow across the sea, and sweep west and northwestward with such irresistible power, bearing and leaving in their course the rich deposits of industry and art, of prosperity and life, will then divide at the Alleghanies and equally enrich the hills, the valleys, and savannas of the south.

The great laws governing the flow of population are as palpable as those governing the physical world; and these laws should be studied and heeded by our legislators if they desire to populate and develop equally every part of our country. Men who have been oppressed in the Old World, and have yet manhood enough left to seek a free life in the New, will not settle in the mild latitudes of the south, where labor is legally degraded, but go, though it be to the forests and winter snows of the northwest, where labor is honorable in all

Now, in respect to the south, with its magnificent zones of climate and naturally fertile soil, there is no question but that her agricultural products and general prosperity will be vastly increased by the new condition of things imposed upon her by the rebellion. Terrible as is the ordeal, time, moderation, freedom, and industry will be the great healers and rectifiers; so that it shall be seen that even war offers its compensations as well as peace. Plantations that now contain from three to five thousand acres of land will be divided into farms of from three to five hundred acres, which can be more easily and better tilled, and made far more productive. While the south will continue to grow the great staples, such as cotton, sugar, and rice, many other semi-tropical productions may be introduced, of equal value and more easily cultivated, together with all the cereals, grasses, fruits, and vegetables of the temperate zone.

The half has not been told or tested in regard to the capabilities of the southern States. In times past, all their available capital, skill, and labor having been devoted to the cultivation of the great staples, no special attention was given to other crops of equal value, more developing to the country and more conducive to the comfort of the people. With smaller farms and intelligent and interested labor, the following, among other articles, might be introduced and successfully cultivated in the south: the tea and coffee plants; the opium poppy, the vanilla, ginger, castor bean, assafœtida, wax and quassia plants, silk cocoons, gum arabic, mastic and camphor trees, the Chinese yam, the sweet chestnuts, the earth and other almonds of southern Europe, the Persian walnut, the cork and gall-nut oak, the arrow, licorice, and orris roots, various valuable hemps and grasses, the prune, fig, date, pomegranate, olive, tamarind, guava, nectarine, shaddock, pineapple, and pistache, Iceland moss, the cochineal, indigo, dyer's madder, frankincense, balsam, Egyptian senna, and various other productions which we now purchase abroad at an annual expense of many millions of dollars.

The articles above enumerated form but a small portion of the possible productions of the south; while she is known to be capable of yielding not only the great staples of commerce and manufactures, but an abundance of almost every kind of food if sufficient attention was paid to its cultivation. It is a notorious fact that in the palmiest days of the south, except on the tables of the wealthier classes, the diet of the great body of the people, in variety of meats, vegetables, and fruits, was generally poor and often produced elsewhere, simply because tillage was otherwise directed or totally neglected.

Although discussion on the subject of the exhausted and abandoned lands of the south and the best modes of reclaiming them would be, just now, a most valuable contribution to the agricultural needs and changing condition of the country, yet I have not, at present, the data necessary for such an undertaking. Let me call attention, therefore, more especially to Virginia, one of the greatest but most neglected agricultural States of the Union.

Virginia contains 39,265,280 acres of territory, only 11,435,954 of which are under cultivation of one sort or another, the remainder being wild, worthless, or abandoned land. In 1860 the total population of the State was 1,596,318, 490,865 being slaves, who were owned by some 55,000 masters. At that time the actual number of whites over fifteen years of age engaged in agriculture was only 108,304. The rebellion has materially altered these figures, and completely ruined whatever of prosperity slavery had not yet destroyed. Nature, however, has done everything for the "Old Dominion," and time and free institutions will yet vindicate her ancient generosity, abused and tempted though she has been to the very verge of exhaustion by a false and shiftless husbandry.

Among the productions of Virginia, as enumerated in the last census, were wheat, corn, rye, oats, tobacco, cotton, rice, wool, pulse, sweet and other potatoes, barley, hops, flax, hemp, silk cocoons, maple, cane and sorghum molasses, honey, buckwheat, hay, butter, cheese, clover and grass seeds; the various fruits and vegetables of the temperate zone; superior cattle, sheep, horses, and mules, besides a wealth of game and shell-fish on all the tide-waters of the State. Besides these, Virginia is capable, according to the laws of the isothermal zones of climate, of producing a much wider range of products. She is extremely well watered, affording an abundance of moisture to the soil, while her water-power is not surpassed by any State. Her sea-coasts, bays, and navigable streams afford easy access to the best markets, while her great estuary offers sites for cities, whose commerce, fed by free institutions, might rival the chief marts of the country.

The mineral wealth of Virginia is equal to that of almost any other State, but it has not been greatly developed. Besides gold, there are numerous and vast beds of iron, copper, and lead ore; the hematite iron ore of the valley of Virginia especially yielding a very superior metal. Other portions of the State possess vast deposits of gypsum, marl, salt, and coal, with oil wells and mineral springs.

The valley of Virginia, elevated in position and watered by the Shenandoah and the affluents of the James, is exceedingly fertile, and, owing to its extensive limestone formations, must ever continue a great wheat-growing region. On the other hand Eastern Virginia is composed wholly of tertiary sands, clay, and marls, the latter deposits being found, of course, along the borders of the Chesapeake and Atlantic. Some of the strata of Eastern Virginia abound in fossil shells, and little altered in appearance from those of living beds along the coast, and furnish most valuable material for fertilizing the worn-out lands.

The soil of the tide-water region is a light sandy loam, capable, with proper culture, of yielding well; but at present it is about exhausted under the vicious system of tillage practiced there for several generations. All the worn-out lands of Virginia can be easily brought up to their former fertility by ploughing a little deeper and by the application of lime to correct the acidity of the soil. Lime decomposes the organic matter in the soil and frees the carbonic acid. It acts, also, upon the silicates and earthy salts, decomposing them and allowing such combinations as the plants require. The free use of gypsum and marl, also abundant in various parts of the State, would soon redeem the exhausted land.

Without dwelling upon the general agricultural advantages of Virginia, I desire to call attention to one or two special points. The soil and climate of the State are finely adapted to the cultivation of grasses and the raising of stock, especially sheep. It was stated by the late Peter A. Brown, who had in his cabinet specimens of wool from all parts of the world, that the wool from Virginia had more life and better working qualities than any other that had ever come under his microscopic examination. Owing to climate, diversity of surface, and the abundance of iron in the soil, Virginia is well adapted to all kinds of fruit, especially grapes, which are rapidly becoming one of the great crops of the country.

At the close of the present unnatural and causeless war, Virginia, whose soil has been so often pressed by hostile armies and moistened by the best blood of the republic, will begin a new and better life. Centrally situated, with water-sheds looking eastward and westward over a vast empire of free and hopeful men, blessed with a salubrious climate and so many and such vast natural advantages, she will be settled, at an early day, by a vigorous and progressive people. These general observations will equally apply to several of the other southern States.

Without dwelling further on general topics, I desire to call attention to the *labors* and expenditures of the Department of Agriculture during the past year; to what it proposes to accomplish during the coming year, and to the increased appropriation necessary to enable it thoroughly to fulfil its mission.

A belief in the importance of agricultural statistics had been gaining strength in the minds of our thinking men for a long time. But the events of the last two years, and the present condition of the United States, in themselves, and relatively to other nations, has wrought a thorough conviction that an absolute necessity existed in our country, so essentially agricultural, upon which other nations are so largely dependent for food supplies, and with which the interests of trade and commerce are so closely interwoven, that more reliable information must be obtained as to the supply, present and prospective, of the various crops which would be required to meet the demands of home consumption and for foreign export. To get the facts from which reliable estimates might be made, required my first attention after the organization of the department, and gave me no little anxiety.

The joint resolution of Congress, passed March 3, 1863, that "the heads of the several departments of government be required to furnish the Superintendent of Public Printing with copies of the documents usually accompanying the annual reports, on or before the first day of November of each year," could not have been intended to apply to this department, whose duties, under the organic act, in "the collection of statistics," could not possibly be concluded by that time.

To accomplish this great and very important object has required a large amount of time and labor, and, notwithstanding many difficulties, the work thus far has been accomplished to the satisfaction of the farmers of the country. Although very much indebted to the full and complete returns of the Census bureau, yet such were the extraordinary changes which had occurred in this country since those were taken, in the diversion of laborers from the farm to the defence of their country; in the change of so many from producers to mere consumers; in immigration; in the unusual increase and consumption of some productions and diminution of others, that I found other and additional sources of information necessary.

A system of correspondence was attempted with reasonable success. The secretaries of the various agricultural societies and farmers' clubs are the proper persons to furnish, themselves or by others, the desired facts. In many cases they have done this faithfully and earnestly; others having neglected it, intelligent and active farmers and business men of all professions were prompted to supply the deficiencies.

Societies and clubs should be formed in every part of the country, with competent and efficient officers, and all such organizations which now exist should be officered by such men. The societies and the farmers composing them would then be brought in direct connexion with the department, with results beneficial both to themselves and the government.

About two thousand circulars, with questions plainly put, and requiring but simple answers, have been sent monthly to correspondents in every State and almost every settled county, the replies to which, requiring much labor in their compilation and arrangement, have been, with reports on the weather from observers of the Smithsonian Institution, and with other timely suggestions from the department, published monthly, ten to fifteen thousand in number, and spread over every portion of the country.

The success attending the first attempt of our government to collect the agricultural statistics of the country is attested by the newspaper press all over the land, commercial and political, as well as agricultural, and is an indication of what might be done in a well-arranged plan, provided for by Congress and carried out by governmental aid. There have been issued, in all, about twenty thousand circulars of inquiry, and sent out about seventy thousand monthly reports.

It may be proper to remark here that my first annual report, embracing a vast amount of valuable and timely agricultural information and statistics, furnished by able contributors, has been published and distributed during the year for the benefit of farmers generally.

The meteorological reports published by the department have been furnished through the kindness of Professor Henry, of the Smithsonian Institution, taken from the registers of more than a hundred observers, at various points in almost every loyal State, and have been read with deep interest by the people.

It is believed that immense benefits would accrue to the country, if, from various stations, the condition of the weather could, under the direction of the government, be daily reported by telegraph to this department.

In this connexion I beg to allude to one of the difficulties in the way against the successful working of the department. Under the postal law of March, 1863, this department is debarred from receiving any article, or communication even, except the postage be prepaid. The 42d section provides that "all correspondence addressed to any executive department, or any officer in it, must now be prepaid, except official communications written by some officer of the department, or an officer under its control or responsible to it." As there is not, and cannot be, any such officer "responsible" to this department, I have been obliged, at a considerable expense, to forward to all the "correspondents," and to Smithsonian observers, prepaid envelopes, and stamps for their returns.

This, however, I do not regard as the most objectionable feature; but every inquiry or item of information concerning any tree, plant, fruit, or seed, any noxious or beneficial insect, any disease attacking plants or animals communicated to this department, although inuring to the benefit of the whole country, must be taxed upon the individual who makes the inquiry, sends the information, or forwards the specimens of seeds, plants, or insects, sometimes quite heavily—in some cases so heavily that communication is entirely barred. As all information received by this department is the gratuitous, unpaid gift of the people, I venture to express the hope that Congress will early so amend the law that the farmers of the country may be put in free communication with a department created for their benefit.

The great, imperative, and increasing calls upon the department for seeds of all kinds, from all sections of the country, especially from the west and from the border States, where the desolations of war with the rebels and the Indians had destroyed the crops of the preceding year, gave me an early and loud warning that it would be no light labor to comply with that part of the act requiring me "to procure and distribute new and valuable seeds."

Pursuing what I regarded as the most judicious and satisfactory course, I imported from England, France, Belgium, Russia, Sweden, and other foreign countries, several hundred bushels of choice wheat and other cereal grains, and several thousand dollars' worth of the most valuable seeds for field and garden culture, including a large collection of such flower seeds as were deemed suitable for our country. These, with an assortment of the choicest varieties of the most desirable grains and vegetables grown in our own country, were spread over the country with a lavish hand.

In addition to these, about fifteen hundred bushels of cotton seed were procured, packed, and distributed mainly among the farmers of the west. There was, too, a very great demand made upon the department for tobacco seed, which was not readily found in many parts of the country, but which, fortunately, I was prepared to supply, and by which the wealth of our country was increased millions of dollars.

Of the quality of these seeds and their products it is sufficient to say that, in reply to a question proposed to all the correspondents of the department as to the seeds, the response was universal that the seeds were good and had produced most satisfactory results. The whole number of packages of seeds, cereals, &c., distributed is about 1,200,000. Of these over half a million were sent or given directly to those applying for them. About 300,000 were distributed to members of Congress, and over 300,000 to agricultural societies. About 40,000 were quart packages of wheat and other cereal grains; about

950,000 garden and flower seeds; about 120,000 tobacco seed, and the remainder cotton, flax, &c.

The anxiety of the people of the country to obtain the seeds, and the satisfaction manifested at their reception and the resulting productions, are a sufficient attestation that the distribution of valuable seeds by the department is a recognized custom and duty which may not be abandoned, the complaints of captious or interested parties to the contrary notwithstanding; and I hazard nothing in saying that in no department of this government does the expenditure of a like sum confer upon so large a proportion of the people anything like the same amount of pleasure and substantial enjoyment.

The propagating and experimental garden, a most important branch of this department, in former years suffered much through incompetency and neglect. In order to remedy these evils, and in so far as it may be possible to make up for lost time, I have taken great pains to secure the services of a gentleman eminently well known in that department of science needed to carry on successfully the experiments to be made.

During the year there have been distributed from the garden of the department about 25,750 articles, comprising vines, bulbs, cuttings, and plants. About one-half of these were distributed through members of Congress; the remainder has been sent for dissemination by agricultural and other rural associations.

While the introduction and propagation of new and valuable plants will always command a large share of attention as one of the principal objects of the garden, still it is believed that investigations having in view a more thorough knowledge of the diseases of plants, especially with reference to those of our more valuable and generally cultivated fruits, should receive more attention than formerly. Acting upon this belief, and being convinced of the immense importance of the grape crop as a fruit for general consumption, and more particularly in view of the extraordinary increasing interest now developing in regard to the production of native wines, an extensive correspondence has been opened with vineyardists in all parts of the country, for the purpose of comparing the results of experience and observation in regard to the influences of soil and climate, as also the effects of varied treatment and the estimation of varieties. Much valuable information has thus been contributed, embracing a collection of facts without which it would be impossible to reach intelligent conclusions.

It has been considered advisable, as one of the best modes of extending interest in pomological and horticultural pursuits, to establish examples in order to exhibit practically the results of varied modes of treatment and applications of systems. This feature is being extended, and is found to be of peculiar and special interest to visitors, and its results have already been repeatedly acknowledged by those most capable of appreciating such efforts.

The limited facilities of the present garden greatly retard the full development of this object. It is highly necessary to establish specimen orchards of the best fruits, in order to illustrate the best modes of culture, and arrive at a correct knowledge of the nomenclature of varieties of fruits. This want is now severely felt, and its fulfilment would be hailed with genuine delight by all who are fully alive to the growing importance of fruit culture.

The purposes of the garden, as a proper auxiliary to the department, will not be fully answered until a botanical collection and museum is established. It is a source of well-founded surprise by visitors to the capital of the nation that no systematic attempt has been advanced having in view the foundation of a museum of native vegetable products, or a general botanical garden of plants.

It is daily becoming more and more apparent that, in order to fully carry out the objects of this department, increased facilities must be secured for the extended cultivation of agriculture for the purposes of comparative experiment. In no other way can we arrive at the intrinsic value of new introductions, except by comparing them with those whose merits are already well established. Again, with reference to the varied operations and practical details of farming, the various implements employed in the cultivation and amelioration of the soil, the advantages or disadvantages of thick or thin seeding, under what condition and with what crops they may be followed, the effects of draining, and the best and most economical modes of providing it, are only a few of the more immediately obvious subjects affording matter for study and investigation. To accomplish more fully what I deem to be necessary for the full development of this branch of the department, it will be necessary to increase the glass conservatories and propagating houses, for which I have asked an additional appropriation.

I long ago perceived that the few acres of the propagating garden were quite too limited for the need of this department in its present organization, and that much more land would be required to carry out my ideas of what experimental ground should show. To do this effectually, and essentially for the benefit of the farmers of the country, there should be placed at the control of the department land enough to test the various grains, grasses, and seeds of every kind that may be offered, to try their genuineness, their soundness, their value, and the adaptability of any foreign ones to our own use.

I have especially felt the want of this the past year, when suggestions have been made as to the practicability of growing various trees, shrubs, medicinal, and especially textile plants, either from foreign parts or spontaneous productions of our own forests or swamps, and it has seemed quite impossible to fulfil that paramount duty, so emphatically set forth in the establishing act, "to test, by cultivation, the value of such seeds and plants as may require such tests, to propagate such as may be worthy of propagation, and to distribute them among agriculturists."

The Commissioner of Public Buildings, appreciating the difficulties under which I labored, very kindly gave me authority to use that portion of "reservation No. 2, between Twelfth and Fourteenth streets west," of government grounds, and I at once made preparations to bring it into suitable cultivation, when I was notified that the use of it was essentially necessary to the War Department as a cattle yard.

In the belief, however, that this want will be but temporary, it is hoped that Congress will make a permanent appropriation of it for the use of this department, with sufficient means for its improvement.

Entomology being one of the subjects mentioned in the act establishing this department, and the destruction of fruit and other crops by insects having now become so serious, I determined to make it an important branch of the department, and have employed a gentleman well known throughout the country as a skilful, practical entomologist, who has been paying special attention to the best modes of extirpating insects injurious to vegetation. Through him I have made arrangements to place on exhibition, in the department, his large collection of insects, accompanied with drawings and descriptions; also his valuable collection of *fac similes* of all the fruits of the country, together with his complete herbarium.

But the space assigned to the Department of Agriculture, of a half dozen rooms in the basement under the Patent Office, is too limited and inconvenient for any department of this government, and it is not only insufficient for our present accommodations, but is a positive bar to any increased operations which I propose, and I call your excellency's attention to the matter.

Congress having, at its last session, appropriated "$20,000 for investigations to test the practicability of cultivating and preparing flax and hemp as a substitute for cotton," I proceeded to carry its intentions into effect as soon as the appropriation became available.

I found, by communications from every part of the country, that much interest was felt in the matter, and that the people of the middle and western States, especially, did not confine the meaning of the appropriating clause merely to the preparation of flax for cotton machinery, but took the broader view concerning the cultivation and preparation of flax generally, and with reason, growing, as they do, nearly all the flax in the country. With the view of placing this investigation beyond all reasonable complaint or suspicion of partiality, I determined to intrust it in the hands of a commission, and accordingly, on the 1st of July, appointed Hon. J. K. Morehead, of Pittsburg, Pennsylvania; W. M. Bailey, of Providence, Rhode Island; and Dr. J. A. Warder, of Cincinnati, Ohio, as commissioners, whose names are a sufficient guarantee of industry, ability, and integrity.

The commission met at the department, and, having organized, passed the following vote, which was duly published in the papers, and, by circulars, widely spread throughout the country:

"*Resolved*, That the Commissioner of Agriculture be requested to issue an advertisement, by circular or otherwise, calling upon manufacturers and experimenters to send to this department, on or before the 20th day of November, samples of the fibres and fabrics prepared by them, to be accompanied, in all cases, by precise statements as to the various processes, and with estimates as to the probable expense per pound of the preparation of the material, and of the proportion of fibre that may be produced from a given quantity of the stalks or straw of flax and hemp."

The commission then adjourned to meet here early in December, when, after due action on its part, a report will be rendered to Congress.

In the hope of having, at some future day, the means and conveniences of introducing and testing foreign trees, plants, and vegetables, I have taken great pains to establish communications with our consuls residing in foreign ports, and with great success. Many of them replied promptly, and forwarded desirable specimens of seeds and plants, and much valuable information.

I desire especially to express the obligations I am under to the State Department for furnishing every facility for these communications, and for its attention and promptness in forwarding to this department everything of interest to the agriculturists of this country.

The balance of the appropriation for the fiscal year ending June 30, 1863, remaining unexpended on the 31st of December, 1862, was $25,675 98; deficiency appropriation, (March 3, 1863, chapter 79,) $20,000. The amount appropriated for the fiscal year ending June 30, 1864, is $95,000, (February 25, 1863, chapter 59.) The expenditures from the 31st of December, 1862, to the 30th of November, 1863, for all purposes, amount to $87,792 96, leaving an unexpended balance of the appropriation for the fiscal year ending June 30, 1864, of $52,883 02.

In reference to the special appropriation of $20,000 "for investigations to test the practicability of cultivating and preparing flax and hemp as substitutes for cotton," I have the honor to report that, up to this time, no portion of it has been expended.

In asking of Congress an increased appropriation for the next fiscal year, I desire to notice, very briefly, a statement frequently made by some of our public men, that agriculture does not need or desire legislative aid in any respect; in other words, that farmers only wish to be let alone. No doubt agriculturists object to injurious legislation as much as any other class of our citizens; but when the government aims directly to benefit the farmer, leaving him, however, free to accept or reject its aid, by the introduction of foreign stock, grains, grasses, roots, fruits, and other products, by imparting valuable information as the result of chemical analysis, of experiments in culture and machinery, by gathering and diffusing throughout the country valuable statistics relating to home and foreign crops, showing the excess or diminution of the same, in order to guide the farmer in the planting and disposal of his grain, there is no question as to their approval.

One of our ablest public men, in speaking of agriculture as it exists in portions of our country to-day, makes the following remark, over which every farmer and legislator should ponder: "If St. Paul worthily had his spirit stirred within him by the senseless idolatry of polished, intellectual Athens, I feel that an honest man, who knows what agriculture might and *should be* in the United States, can hardly restrain his indignation in view of what it quite commonly is. To look over an average farm on this Atlantic seaboard, and see its owner gravely ploughing around and over the same stones that his great grandfather ploughed over a century ago, when they should long since have been removed, or the fields containing them given up to the growth of timber—growing two hundred bushels of corn per annum on ten acres, when he might grow that quantity so much cheaper on four, I feel that patience with such infatuation is scarcely less than a crime."

No reflecting mind can but admit that there is too much cause for manly indignation at the condition of agriculture in portions of our country. Still, I believe the time is past when even a respectable minority of our farmers *wish to be let alone,* or are indifferent to the progress made, and to be made, in their vocation. The only class of farmers who wish to be let alone—and this wish is the child of ignorance—but who ought, of all others, not to be let alone, for the sake of their country, their calling, and themselves, are those described above. There was a period, it is true, prior to the opening up of our country to a home and foreign market by railroads and canals, when even a better class of farmers were willing to follow the old systems of tillage, chiefly because there were few opportunities for improvement, but little intercommunication, and no markets. But the great and increasing demand for all the products of the farm at the present day, as well as the wider range of domestic wants and comforts, together with the intellectual and material resources of the farmer, have developed a general desire for agricultural knowledge and aids, in order that the farm may be made more attractive and productive.

Now, the individual farmer, however desirous he may be to avail himself of every agricultural help, cannot always do so unless he is aided by some associated effort like the Department of Agriculture, where legislative aid, extensive correspondence, time, and ability are combined for purposes of experiment, for the collecting and distribution of seeds, plants, roots, grasses, information, &c., &c., for the following reasons:

In the first place our country is so vast that many farmers, if left to their own resources, far distant from the great centres of the republic, are deprived of association at fairs and elsewhere, with intelligent agriculturists, or of pro curing the best stock, seeds, implements, and information.

Again, the majority of our farmers, though thrifty and ambitious to excel, are unable of themselves, for want of time, means, or ability, to make those thorough experiments and investigations which have done so much to develop the resources of the soil, and thus the wealth and prosperity of the nation.

Thirdly, it is impossible for isolated individuals to collect and arrange for practical use the vast stores of agricultural information and statistics which are being gathered by associated effort, and which are to stimulate and direct agricultural pursuits, as well as guide legislation.

Too much cannot be said in favor of agricultural statistics. They form the key which is to unlock the hidden treasures of maturing nature, or the chart which is to reveal to the husbandman and merchant the great laws of demand and supply—of tillage and barter—thus enabling both to work out a safe and healthy prosperity. Indeed there is no logic so irresistible as the logic of statistics, and, in this country, those relating to agriculture are of the highest importance; and I am convinced when the agricultural statistics of the United States are properly collected and arranged, and thoroughly studied by our people, no other argument will be necessary to stimulate our farmers to higher excellence, or to induce our statesmen to give to agriculture all possible legislative aid.

Sir John Sinclair, the friend and correspondent of Washington, in urging upon legislators the importance of agriculture, advocated the widest possible diffusion of knowledge on the subject. To preserve the fertility of the soil; to free it from the superfluous moisture; to cultivate it to the greatest advantage; to raise its products at the least expense; to gather and apply the best manures; to procure the best instruments of husbandry; to select the best stock; to feed them in the most judicious manner; to secure the harvests, even in the most unpropitious seasons; to separate the grain from the straw with economy and success; in short, to perform all the operations of agriculture in the most judicious manner—these are the points, with those before mentioned, to which the Department of Agriculture devotes its attention, and for the accomplishment of which it asks legislative aid. Everything which has a tendency to benefit the tillers of the soil is an advantage to the whole community, for their interests are reciprocal and inseparable; and as the general good is unquestionably promoted by the fostering of the agricultural interest, it becomes the duty of those who are intrusted with the management and direction of public affairs to give special attention to this great interest which lies at the foundation of our national greatness.

If we examine the history of those foreign countries, ancient and modern, which have attained the highest agricultural prosperity, it will be found that every one of them was generously aided by the government; and, on the contrary, where legislators have neglected the interests of agriculture, their countries are backward in wealth, intelligence, and prosperity. Indeed, the above observation is true in regard to the various States of our republic, where legislative aid has been extended or refused.

But agriculture should be fostered by our government just now on other and higher grounds. Agriculture feeds not only our own and other nations, but the subsistence of our immense army and navy; and the revenues on which the government relies for the payment of its immense current expenses, are derived, directly or indirectly, from the productions of our soil. And the more and the earlier we can increase these productions by the appliances of science and art, and by introducing improved seeds and valuable articles of produce, the easier and the sooner will the public debt of our country be extinguished. By such agricultural progress, not only will the yield and value of the soil per acre be increased, but also the value of the products themselves will be enhanced, and we shall be better enabled, year after year, to compete with other nations in supplying food to the millions of Europe, thus gathering wealth in return, and making our country, more than ever, the granary of the world, and our farmers the stay and staff of our government in all the vicissitudes of peace or war. Besides, agriculture is the great conservative element or interest of the republic. It is the parent of the physical and moral health of the state

Its patronage by the government *will certainly* increase its products. And, finally, since agriculture is by far the most extensive and important interest of the country, and represented by much the largest body of citizens, it is manifestly unjust to neglect this and foster inferior interests.

In concluding my report, and in calling attention to the excellent agricultural contributions of my countrymen accompanying it, my thoughts turn naturally to the future of our beloved country. That future, to my mind, is full of promise to the next if not this generation. Nations, like men, are made strong and self-reliant through trial, and unless our conscious and growing strength tempts us to military excesses abroad, our greatness is secured beyond all peradventure. A mighty giant, resting firmly on the soil and acquiring development and strength by toil, by thought, and by equity, our republic will dominate the western continent and adjacent seas, and command the fear and the respect of all nations.

ISAAC NEWTON,
Commissioner of Agriculture.

To His Excellency ABRAHAM LINCOLN, *President.*

THE AGRICULTURAL EXHIBITION AT HAMBURG.

BY DANIEL NEEDHAM, OF VERMONT.

THE international exhibition at Hamburg marks an epoch in the history of civilization. Although an experiment, it was successful in every particular. Other international exhibitions had been holden at London, at New York, at Paris, but Hamburg was the first to inaugurate such an exhibition of a purely agricultural character. It was a noble compliment to the art of arts which underlies all individual and national success, and forms the support and strength of all national greatness. Many there were among the most hopeful advocates of the exhibition who questioned its merits, but the merchants of Hamburg, who never hesitated after the first proposition was made, applied themselves with indefatigable energy to secure for their beautiful city the honor of having achieved a signal success in the holding of the first international exhibition, based solely upon the results of agriculture. The chief among them, who for many months had infused life and vigor into the busy acts of preparation; who had been the great centre around which the merchant princes of Hamburg had gladly revolved; who had been the light under the influence of which each step had been taken, but a few brief days before the complete fulfilment of all his hopes and labors in this behalf, was followed to the silent tomb by a concourse of mourners whose heartfelt sorrow was written in no doubtful characters upon their countenances. Baron Merck had been the first to propose, and the chief to execute the great plan; and when weeks had lessened to days before the grand opening of the exhibition, and hope was fast ripening to fruition, and the gathering people at Hamburg had already swollen to multitudes from Great Britain and all continental Europe to witness the success of the plan made and brought almost to a full maturity by this master mind, those who would have cheered his passage through the streets of the great city, and showered boquets upon him as he passed beneath the windows of its palatial dwellings, followed as silent mourners to his quiet grave.

The sudden demise of Baron Merck made many sad days for Hamburg and its multitude of strangers. Pity it was that one who had done so much, who had planned so skilfully, who had labored so indefatigably and disinterestedly in behalf of the great exhibition, should not have lived to see how perfectly every conception was developed.

No expense was spared to notify the civilized world of the contemplated fair. Circulars and posters, printed in every spoken language of Europe, were sent broadcast, by mail and express, wherever facilities permitted. Thousands of circulars were printed in English, and distributed from New York to the farmers, breeders, and mechanics of the United States. Nor were the inducements held forth of an ordinary character. Large premiums were offered, as well as the rare opportunity of exhibiting, at one of the grandest entrepots of Christendom, specimens of valuable breeds and the results of mechanical skill and industry.

To America particularly was the invitation of no every-day character. To mechanical America, with her thousands of inventions for lessening agricultural labor, with her cheap agricultural implements designed for the people and sold at a price bringing them within their reach, with the untrammelled genius which ever in her infancy had made her a beacon-light to the Old World, the opportunity was one which we should not have failed to improve to our utmost extent. But with a cruel rebellion taxing our resources, with a million of intelligent artisans, mechanics, and farmers on the field of battle, with the pressure of foreign interference which at times darkened our horizon and threatened to protract the great struggle of liberty with slavery, it was not strange that Congress should neglect to make an appropriation for an international exhibition, or that our manufacturers, whose workshops were already crowded with unfilled orders, should have failed to send large numbers of specimens of their handiwork and skill. Could Congress have realized the inexhaustible resources of the nation, could it have appreciated the readiness with which a free people have sprung to the support of a free government and free institutions, no doubt an ample appropriation would have been made, and a government ship despatched from the great metropolis of America, freighted with the fruits of our agricultural and mechanical industry. Such a demonstration at such a time would have aroused the people of the Old World to something of our appreciation of the vastness of the resources of our great and prosperous country. Well, indeed, would it have been could some fine American frigate have been achored in the Elbe, with the stars and stripes floating from the mainmast during the period of this great festival, that the gathered thousands from all Europe might have seen that in the midst of this terrible rebellion, and whilst we were enforcing a blockade on a coast of three thousand miles, our government had ships and money to devote to the great arts of peace.

The President, however, was not unmindful of the great opportunity offered, and without any appropriation to cover the expenses of a commissioner, appointed the Hon. Joseph A. Wright, of Indiana, to discharge that responsible labor. The letter of the Secretary of State covering this appointment of Mr. Wright cannot be out of place in this connexion.

DEPARTMENT OF STATE,
Washington, March 28, 1863.

SIR: You are aware that the President communicated to Congress, at its late session, an invitation from the government at Hamburg to the government and citizens of the United States to participate in an exhibition of agricultural products, machinery, and the like, which is to be held in or near that city in the course of next summer.

No appropriation, however, was made to defray the expenses of any such participation on our part, nor was any authority granted on the subject. The reasons for this need not be adverted to. They will easily occur to a gentleman of your experience in public life. The apparent indifference of Congress, however, in regard to the matter, cannot reasonably be imputed to any insensibility in regard to whatever may tend to the advantage of the agricultural interests of the country, or to any coldness towards Hamburg itself, with which we are closely connected by commercial and other ties, and which we acknowledge to be a community with every title to respect.

Notwithstanding, however, this apparent neglect of Congress, the President is unwilling that the United States should be without any representative on the occasion referred to. Moved, therefore, by a regard for your standing and character at home, and particularly by the practical interest which it is understood you take in agricultural affairs, the President desires you to repair to the exhibition at Hamburg, and there take charge of the interests of such citizens of the United States as may become exhibitors on the occasion. It is to be distinctly understood, however, that no expense to the United States is to be occasioned by them, and that your own services will be gratuitous.

I have the honor to be, sir, your obedient servant,

WILLIAM H. SEWARD.

Hon. JOSEPH A. WRIGHT.

Although government furnished no direct aid, and there was no concert of action among the people, the circulars distributed throughout the loyal States kindled an interest which increased with every passing day, until the last ship laden with America's handiwork had sailed for Hamburg.

New York, Connecticut, New Jersey, Rhode Island, Illinois, and Vermont, sent representatives to show their great good will, and note the progress of agricultural development. One of our distinguished sheep-breeders sent specimens of his flock, and a few of our inventors and manufacturers samples of American agricultural machines and implements. While the effort was being made to gather these evidences of American skill, merchants of New York and Philadelphia, in consonance with their well known liberality, contributed about five thousand dollars to defray the expenses of transportation of all articles which might be forwarded. Independently of this, the German merchants, bankers, and citizens of New York made a liberal donation, including a complete assortment of agricultural implements. Thus, without direct aid from the government, and principally through the influence of the tireless labors of Austin Baldwin, of New York city, a very general interest was awakened, and a creditable exhibition secured from the United States.

No more accessible point could have been selected for an international exhibition than the city of Hamburg. Hamburg is an independent republic, and a member of the German Confederacy, with an area of one hundred and fifty square miles, and a population of more than a quarter of a million. The city of Hamburg is the capital of the republic. It is the principal city of Germany, ranking third in trade and commerce of the cities of Europe. It is one of the four Hanse Towns, and contains a population of nearly two hundred thousand. It is beautifully located on the north bank of the Elbe, at the mouth of the Alster, and seventy-three miles from the German ocean. The Alster forms two beautiful basins—one on the north of the city, and designated the Ouster Alster; the other within the fortifications of the city, and known as the Inner Alster. These beautiful lakes add greatly to the beauty of the city, while they contribute, by furnishing a ready means of transit to the suburbs, to the comfort and luxury of the people. The city was formerly surrounded by fortifications, and is still entered by gates, which are closed at night, and at all hours of both day and night guarded by a military police. The most beautiful part of the city is that which surrounds the Inner Alster.

Hamburg has railway communication with all parts of the continent, and, by steam and sailing vessels, keeps up commercial relations with all the leading ports of the world. During the year 1859 there arrived at this port four thousand five hundred and fifty-four (4,554) sea-going vessels, representing the colors of twenty-five nations, and in 1860 no less than five thousand and twenty-nine (5,029) sea-going vessels, representing twenty-six nationalities, arrived at the port of this flourishing European city. During the years of 1859–'60, including all the arrivals from the rivers and seas, fifty-eight thousand eight hundred and nineteen (58,819) vessels arrived in the former, and fifty-nine thousand nine hundred and sixty-two (59,962) in the latter, year.

The commerce of the city is rapidly increasing. In 1852 the imports were $125,449,222, whilst in 1857 the imports had increased to more than $224,000,000. The exports, during the same period, correspondingly increased. A commercial treaty was established with Lubec as early as the year 1214, and this treaty laid the foundation of the Hanseatic league. It was made a free city of the Germanic empire in the year 1770, and united itself to the Germanic confederation, as a free Hanse Town, on the 8th of June, 1815.

Hamburg is not only the chief port of Germany, but to all northern Europe. More than one hundred millions of the people of northern Europe can be supplied with necessaries and luxuries through this port, more readily than by any other channel of communication. Less than four hundred miles of water separate it from the coast of England, and five hundred from the great metropolis of the world, with which it has daily steamship communication. Thus situated, it was a fit place for an international agricultural exhibition. The exhibition grounds were on the outside of the city limits, and covered more than eighty acres. Laid out with marked taste and skill, they not only delighted the eye with the exquisite beauty and symmetry of their design, but met the entire wants of the exhibition.

Eighty buildings, some of them three hundred feet in length, were arranged in groups, and otherwise, for the accommodation of stock, farming implements, machinery, seeds, and the products of the earth. At the entrance, a colossal arch symbolized the triumphs of agriculture in blessing, civilizing, and enriching mankind.

Among the four banners at the royal entrance, we saw with pleasure and pride the stars and stripes of our native land. Immediately inside of the grand entrance was an artificial fountain, sending its jets of cool water fifty feet into the clear air, and falling in pearls of feathered spray, which gave a refreshing coolness to a July temperature. On either side of the fountain were arranged with artistic elegance tens of thousands of flowers and roses—roses of white, and red, and yellow, growing from bushes whose high tree-shaped tops gave a most delightful shade in the day's decline; dialytras, fuschias, and broad-leafed panzies, with countless other flowers, loading the air with rich and delicious odors, were so placed as to delight every eye, and secure from every lip words of admiration and delight. A little beyond, and in a line with the fountain, stood a high circular edifice, richly ornamented and painted, with a lofty gallery, from which floated more than a hundred flags and streamers. This was the orchestra; and from early morning until late in the afternoon a band of fifty musicians poured their sweetest strains upon the perfumed air, while thousands of listeners seemed chained to this spot as though the combination of roses and musicians, odors and music, had produced enchantment. In the back ground stood the banquet hall, a building of fine proportions, substantially built, and extensive enough to seat at table more than one thousand guests. In this hall the first meeting of the judges took place; here the first speech of welcome was made by one of the executive officers, and a free entertainment provided from day to day for all the members of the various committees. The headquarters of the delegates and commissioners occupied three buildings immediately in the rear of the banquet hall, the name of each being painted in large letters over the door of every room. These rooms were nicely furnished, and arranged in a very convenient manner. In the room set apart for the "Deligirte aus den Vereinigten Staaten von Nord Amerika," which, being interpreted, signifies the "Delegates from the United States of North America," not only did the delegates meet, but it was the grand gathering room of all American exhibitors and visitors. Here was many an anxious wish expressed to hear from our dear native land, four thousand miles away; and here it was that we first received with enthusiastic welcome the telegraphic despatch announcing the surrender of Vicksburg.

On the ground, at the right hand from the main entrance, stood a shed of enormous length, devoted exclusively to poultry. The coops were all well filled, and the variety of fowls extensive. Dorkings, Malays, Cantons, Chittagongs, Cochin Chinas, and game; domestic and wild turkeys; Egyptian, Bremen, and wild geese; and ducks of high-sounding names, aided in making up the great collection.

The contributions to this department numbered three hundred and forty, and were furnished by eight distinct nations. In front of the poultry shed was a group of three long buildings, filled with every variety of products: Wheat from England, France, the Baltic, the Mediterranean, and all the countries of Germany; corn from the south of Germany, from France, and the United States; seeds in almost endless variety, neatly packed and labelled, in glass jars; wool from all parts of central and northern Europe, from South America, and the United States; cotton from the East Indies; flax from Denmark, the United States, Belgium, and England; and the products of the earth in form and variety sufficient to represent the soils and climates of thirty different nations. This, the most difficult part of the exhibition to arrange, was methodized in the most careful and perfect order, every article being labelled and numbered.

A little further on were the sheep pens, a group of long, wide sheds, partitioned in the centre, lengthwise, giving ample accommodations to more than two thousand sheep. All the best breeds of Europe were represented. Here were Merinos from Prussia, Saxony, France, Silesia, and the United States; Merinos with broad backs, full bosoms and buttocks; with round bodies and short, thick heads and necks; with short legs, wide apart, straight and strong; Merinos with heavy folds and wrinkles, with wide dew-laps, plaited or smooth; Merinos with heavy folds on the neck, and thick, even wool; Merinos with short staple and uneven, with a combination of thickness and length, with wool low down on the knees and hocks; Merinos of all sizes and weights, from pens of little Mechlenbergs to pens of tall, heavy French, weighing more than two hundred pounds. Every variety of Merino was there, and as we laid open the fleeces of sheep after sheep in this class, and noticed the difference in size, in weight, and in form, and in length, thickness, and quality of staple, we wondered if it was possible that this great variety had sprung from the same origin. Beyond were pens of South Downs, and Leicesters, and Cotswolds, from Great Britain and many continental countries, with longer and coarser wool; some of them of enormous size, too heavy to stand, and too indolent to indicate, either by the motion of head or tail, their dislike of the uninterrupted personal examinations of visitors. The small quantity of hay and grain fed out to these fat sheep was quite surprising. The shepherds from England were very intelligent in matters appertaining to the breeding and blood of sheep, but, beyond their occupation, had little knowledge of the world.

To the rear of the sheep pens, and at the left of the banquet hall, were the cattle pens. They were ample in space and number. Here were pens of noble short-horns, a breed which has commanded universal admiration for half a century, and whose origin can be traced a hundred years. They were principally from England, Scotland, Prussia, and Sweden. The fine heads, full, prominent nostrils, bright, mild eyes, long, broad, muscular necks, deep, projecting chests, short fore legs, wide, even hips, mark the breed with great distinctness, and the crowd constantly surrounding these pens indicated the short-horns as the favorite cattle. A bull from Suffolk, England, which took the first prize of two hundred thalers, was an object of universal admiration. With his mild, pleasant eyes he looked upon the crowd who were pressing his soft, velvety skin with their fingers, and almost impressed them with the belief that he was intellectually conscious of his superiority.

A beautiful cow from Suffolk, and another from Yorkshire, England, had the same points in the main, but with more tapering, thinner, and lighter necks. The Suffolk cow took the first premium of one hundred thalers, and the Yorkshire cow the second premium of fifty. So nearly equal were the merits of these two animals, that the judges were nearly divided in their opinions, and reached their final conclusion only after a long and careful examination and discussion.

In this department the animals were all meritorious, and it was only after the most patient examination that the judges made their decisions. The Ayrshires were not as numerous, but the pens exhibited a goodly number, and the best specimens of their class. Some were red and white, giving a bright contrast of colors. One was nearly all red; another was a brilliant strawberry. Their heads were small and clean, with long faces, narrow at the muzzle, and a lively, kind expression. They had small eyes and short, slightly curved horns, straight backs, broad across the loins, and fine, long tails, bushy at the end. Scotland took all the prizes for Great Britain and Ireland, and Mecklenburg and Hanover monopolized the premiums awarded to the cattle in this class exhibited from the continent.

Several other distinct breeds were on exhibition, some of them much more largely represented than either short-horns or Ayrshires, but none of them commanding such universal praise. Hollands and Oldenburgs made a fine show, and justly took all the premiums in their respective classes. No American could examine these fine breeds of cattle without feeling that at home we needed more careful breeding in our cattle, and that, at the best, it would require many years before America would be able to compare her bulls, cows, and oxen with those of the Old World.

The stalls for the horses were in the most remote part of the ground. Every variety of European horses was on exhibition. The heavy, stout-limbed dray-horse, with enormous feet and head; the nimble, tall, long-necked English race-horse; the long-limbed, arch-necked, smooth-haired carriage horse, were here in large numbers. These horses were all heavy, varying from eleven hundred to fifteen hundred pounds. In the department of horses, in which ponies were included, some fifteen nations were represented. England took her full share of premiums here as elsewhere. Many times we wished that two or three of our best Morgans could have been there to exhibit points of value in roadsters which were entirely wanting in every carriage horse on exhibition. There can be no doubt but that the Morgan horse would readily make himself a favorite in the countries of Europe. The whole labor in breeding for roadsters appeared to be to secure a high horse, and we were assured over and over again, by horse-breeders, that no other style of horse would command the markets, although it seemed well understood that these long-legged animals had less endurance than horses of a less weight.

There were many horses from Hanover, representing the European cavalry horse, but they were not very unlike the English carriage horses. They were bred to a short gait, and had a steady and graceful motion. There was no trotting course connected with the exhibition grounds, and the horses were shown without carriage or harness, led by a halter in a circular enclosure of one hundred and fifty feet in diameter. This manner of exhibiting failed to produce much enthusiasm or general interest. The judges, with a small company of spectators, not often numbering five hundred, had plenty of room for observation.

The swine were exhibited in pens, constructed in the same manner as were the pens for the sheep, and near the sheds occupied by the cattle. The Berkshires attracted general attention. Their finely-shaped heads, small bones, and capacity for taking on great thickness of fat, has given them a good reputation on the continent, and among breeders and farmers generally they are favorites. Two hundred and twenty-five Berkshires were entered, and a good share of premiums were taken by England.

A few pens of little white and black Chinese excited considerable curiosity. These were very small-limbed, round in the carcass, thin-skinned, and finely bristled. Their heads were so deeply imbedded in the neck that in some instances their appearance was almost ridiculous, nothing but the snout being perceptible at a side view. But it was said they were tender and difficult to raise, the sows being very poor nurses. Their hind quarters were very small in proportion to their bodies, and their weight, when fatted, seldom exceeds two hundred pounds.

Some pens of pigs from Hanover and Mechlenburg, resembling Cheshires, but not entered in that name, were very creditable specimens of the race. They were of various colors—blue, black, and white, with great heads and long, pendant ears. They were very long, flat-sided, and narrow; large-boned, long-legged, and, on the whole, ill-shaped. But they were in fine condition, and could easily be made to dress six or seven hundred pounds. It was claimed that they fatted easily and were a profitable breed.

The principal breeds of the continent have been bred from Great Britain and Ireland. The premiums ranged from twenty to fifty thalers, and out of thirty-five premiums awarded, strange as it may seem, twenty-eight were taken by Great Britain.

At the right hand of the banquet hall, extending from the enclosure on the front almost to the rear of the ground, were twenty-four long, double-roofed sheds, appropriated to the exhibition of agricultural implements and light machinery. Over each shed hung a sign, upon which could be read the name of the nation whose products of skill were therein exhibited. Midway of the first row was the American shed, in which most of the American contributions were arranged: corn brooms, dusters, and brushes; pots and cans of preserved American fruits; McCormick's reaper, the same which took the gold medal at the World's Fair in London; harrows, seed sowers, root cutters; hay and manure forks; hoes, ploughs, cultivators, horse hoes, horse rakes, and other implements of agriculture, were hung up and set about in such a manner as to well fill the entire shed. New York contributed a large proportion of this collection, but Pennsylvania, Illinois, Rhode Island, Indiana, Massachusetts, Michigan, Ohio, and Vermont, were all represented. Great Britain filled three long buildings with her light machinery and implements of husbandry, cutlery, ploughs, harrows, horse hoes, and potato diggers in great quantities; many curious and elegantly made implements for amateur farmers—costly and of little practical value.

Sweden, Denmark, Prussia, Austria, Hanover, Hamburg, Canada, Belgium, Holland, Uruguay, and Venezuela, were all here, occupying space in the great rooms, and they looked larger and more important than they ever looked before. A little German State impressed us with a new and enlarged idea of its importance as we looked upon a great building filled with the works of the mechanical skill and industry of its people; and having passed around and examined carefully the specimens of its handiwork, we felt increased respect for the little realm, the name of which we learned at school in our boyhood, but with which we had seldom met since.

As we noticed from day to day the great crowd gathered around the American shed, and observed with pride that the contents attracted more general interest than those of any other building on the ground, we could not but feel a regret that America was not there in her full strength to impress, as she should and could have done, all Europe, with the magnitude of her genius. America may well learn a lesson of Great Britain in this particular. She comprehends the value of such opportunities, and is not backward in improving them. Twelve vessels loaded with live stock and machinery ploughed the German ocean and the waters of the Elbe that England might be properly represented at the international exhibition. England covered a fourth of the space on the exhibition grounds. Was it machinery, lifting great volumes of water; massive engines, moving about the ground like huge elephants, or stationary engines driving the wheels to threshing and winnowing mills or moving ploughs through the dry, hard, clay soil—they were from England and of English manufacture to a very large extent. Twelve or fourteen acres were covered by heavy machinery, and a large proportion of it English. That a nation making such a demonstration should wield an influence of fearful magnitude over the governments of the world is a matter of little surprise. That America could have made a demonstration of equal magnitude and merit, no person conversant with its resources and the skill and energy of its people can entertain a doubt.

On the 12th day of July, 1863, a magnificent breakfast was given to the prize judges who had been appointed by the executive committee. It was served at twelve o'clock noon, in the banquet hall on the ground. The judges were welcomed by one of the vice presidents of the executive committee, and at the conclusion of the address of welcome he alluded most happily to the delicate and responsible duties the judges were appointed to discharge. "Be careful," said he, "to do justice without partiality, without prejudice. The world has been invited to this exhibition, and all men who are here as exhibitors of live stock, of machinery, or of farming implements, are entitled to equal consideration. As I know no fear can intimidate you, so I am confident no prejudice, either individual or national, will warp your judgment. The world demands of you deliberate, honest decisions, and I feel assured that in the results of your deliberations those demands will be fully met."

The address, occupying about thirty minutes, was delivered with much earnestness and received with marked satisfaction. At the conclusion of the breakfast the several committees met and organized by the election of a chairman and secretary. The United States were represented by two committeemen, one on manufactures and one on sheep. The committee on manufactures consisted of eleven gentlemen, representing seven nationalities; the committee on sheep, of eighteen gentlemen, representing eleven nationalities. The two gentlemen representing the United States were Austin Baldwin, of New York, and Daniel Needham, of Vermont.

At the conclusion of the organization of the committee on which it was my privilege to serve, I must confess to a strange surprise at the announcement of the chairman: "The judges will meet at this place to-morrow morning at six o'clock to commence their labors." At first I was quite disposed to regard the matter as a joke, but finding no joke had been perpetrated, judging by the looks of my associates, I concluded that I had misunderstood the announcement, and, at my request, the hour of meeting was again proclaimed "at six o'clock to-morrow morning." Determined that America should be prompt at the committee meeting, I left my lodgings at five o'clock a. m. on the 13th, with but four miles between myself and the fair ground. But my driver was stupid and his horses dull, and, greatly to my discomfort, the time occupied in reaching the entrance gate was precisely an hour. Alighting at the main entrance, I hurried to the committee-room, which I reached five minutes after the hour appointed. Every member of the committee, myself excepted, had arrived in time, and five minutes before my arrival they had gone to their labors.

On the evening of the 13th the executive committee gave a banquet at Street's hotel to the commissioners, delegates, and invited guests. At this meeting speeches of welcome and congratulation were interchanged until a late hour. It was an occasion long to be remembered. The banquet, in elegance and luxuriance, was all that art and culinary skill could make it. It was a banquet—a German banquet. Whoever has had the good fortune to attend one will appreciate the character and interest of this occasion; whoever has not, could get but a feeble idea of its magnificence from any words of mine.

On Tuesday, July 14, at precisely ten o'clock in the forenoon, amid the sound of bugles and the beating of drums, a thousand flags, representing all the civilized nations of the earth, were unfurled to the breeze from flag-staffs occupying every conceivable position on the buildings within the exhibition grounds. From the banquet hall, from every bureau, committee-room, and office, from every shed and stand, from the arch and gate posts of the outer and inner entrances, were these splendid emblems of nationality raised to the bright sunlight, whilst from the gathered thousands there broke upon the air shout upon shout and cheer upon cheer, until, by their own hurrahs, the multitude had made themselves wild with joy; and this was the opening of the great international agricultural exhibition. The committee commenced their labors on the day previous to the grand opening, but it was intended that their work should have been commenced at a much earlier day, so that at the time of opening, the decisions could be announced. But on account of the death of Baron Merck, the original arrangement was necessarily changed.

The ploughing match was one of the most important features of the fair. It was witnessed by a large number of spectators, and took place on a field quite a distance from the grounds on which the great exhibition was held. The power was horse and steam. We watched with great anxiety the results of ploughing with the horses, as several American ploughs were tried side by side with the English ones. As furrow after furrow was turned, we were constrained to admit that in this department the English had the advantage. The ground upon which the trial was made was a low meadow, mostly clay, very hard and dry. The soil was in bad condition to show the best work from any plough. There was no room for debating the result, however, for the American ploughs on trial did their best under the circumstances, guided as they were by practical American farmers. The steam ploughing was good. There were five entries made, all with stationary engines, and all from England. The ploughs were arranged to cut from three to five furrows at a passage, there being two sets of shares to avoid the necessity of turning the plough. The engine, having two upright drums or capstans, is set at a point in the field which may be called the apex of the triangular space occupied by the apparatus. At each of the other angles is set a guide pulley, through which a strong wire rope was passed from one of the drums to the other, and to this rope between the pulleys the ploughs were attached. By the movement of the engine the rope was first wound around one of the drums and unwound from the other, and the furrow being run through, the motion was reversed and the ploughs were run back in the opposite direction. They were attached to a frame which was balanced upon the axle of a carriage, the guide pulleys being moved as required to reach the unploughed portions of the field. This ploughing was all admirably done, considering the condition of the ground.

The expense of the engine and machinery connected with the steam plough was from three to four thousand dollars. The movement of the ploughs could not have been less than three miles an hour. The first prize was awarded to John Fowler, of Leeds, England. Governor Wright, the commissioner appointed by President Lincoln, in alluding to this matter, uses the following language:

"Several unsuccessful attempts having been made in our own country to plough by steam, these trials received the especial attention of Americans present. Five ploughs were entered, cutting from three to four furrows at each course, in a highly satisfactory manner. I was convinced that if some modification was made by which the expense attending the machinery for this operation could be materially diminished, the introduction of ploughing by steam could be easily effected so as to be highly advantageous to the agricultural interests in many portions of the country.

"It is most manifest that steam is designed to play an important part in many of the branches of agriculture. In the opinion of your commissioner we have not been sufficiently mindful of the progress made in Great Britain and other portions of Europe in the improvement in agricultural implements, brought about by the sharp competition of the English manufacturer for the European market. We are content with our unparalleled success, and we may well say we are ahead of the nations of the Old World in machinery in its adaptation to the wants of the people, in cheapness and utility, in the great labor-saving machines of the day, threshers, mowers, reapers, grain cleaners, &c. Yet a few days' witnessing the steam ploughs and steam machines in operation upon the national fair grounds at Hamburg would induce you to say we are behind many of them in the application of steam to agricultural work. Whatever the wants of the present day may be, the time is not far distant when many portions of our country will require this wonderful element, if we shall fully develop the hidden resources of our rich but diversified country. So important did the steam plough appear, that a partial promise was procured from an eminent English firm to attend the first national agricultural exhibition held in the United States with their steam ploughing apparatus, if an invitation should be extended to competitors in this mode of ploughing."

There can be no doubt that either of the steam ploughs would work with great satisfaction upon the prairie lands of the western States, but whether the system of ploughing can be made economical may be considered very questionable.

Of the superiority of steam for the purpose of threshing, grinding, cutting roots and fodder, there can be little doubt. But it is a power, the use of which must always remain beyond the reach of the ordinary farmer. Not only the expenditure connected with the purchase of an engine, but the expense and difficulty of repairs, and, with ordinary care, the rapid depreciation in value, are obstacles of no small magnitude in the way of general introduction of steam apparatus.

RECAPITULATION.

In the department for horses some eight premiums were divided among five hundred and thirteen horses entered for exhibition, the premiums ranging from fifty to four hundred thalers. The entries in every class in this department were highly meritorious animals. Although the horse is a leading feature of an American agricultural show, at this exhibition it failed to excite more interest than the animals of other departments. The grooming of the horses was constant. In no instances did a groom have in charge more than one horse; and it was no unusual thing to see two servants, hours at a time, at work upon the same animal.

There were nine hundred and four entries of cattle. Independent of these were two or three herds not entered for premiums. One hundred and fifty-six prizes were awarded, ranging from twenty to one hundred thalers.

The number of sheep entered for premiums was seventeen hundred and seventy-one. Some three hundred more were on exhibition, but not entered for premiums. Nine hundred and thirteen were of the class of Merinos, two hundred and twenty-four South Downs, three hundred and sixty-nine Leicesters, and two hundred and seventy-six Cotswolds. The prizes awarded to the sheep varied from twenty-five to fifty thalers. Eighty-six prizes were taken, large numbers of which, in the classes of South Downs, Leicesters, and Cotswolds, were taken by England.

The class in which the American sheep contested was the Merino, and contained three hundred and fifty entries. The American prize sheep called Vermont Merinos took three premiums—two first and one second. One first premium was taken for length of staple; the other for weight of fleece. These sheep were bred by George Campbell, of West Westminster, Vermont, and were accompanied by him to Europe. No other sheep or animals were on exhibition from the United States. Mr. Campbell was the only American who dared to take live stock across the Atlantic and the German oceans, that the results of skilful American breeding might be compared with those of European breeding. The effort of Mr. Campbell was attended with great expense and risk, but he was well rewarded in the satisfaction which he experienced in gaining for America that which no other nation had given her credit for possessing, and which few of her own citizens appreciated was her due, the honor of breeding the heaviest fleeced Merinos, and Merinos having the longest staples, of any in the world.

No greater surprise could have been created on the continent of Europe than was awakened by the announcement that the American sheep had taken two first premiums in the class of Merinos. At first it was not credited by the breeders and exhibitors gathered at the fair.

Not only had it been supposed that America would not take a premium in this department, but there was a general conviction, sympathized in by the German press, that we could have nothing in the class of Merino sheep which could at all compare with the celebrated flocks of Prussia, Saxony, and Silesia, all of which were fully represented. After it was rumored and generally credited that the twelve American sheep on exhibition had taken two first prizes, the surprise was so great that a feeling of doubt and incredulity respecting the wisdom and impartiality of the decision was quite apparent. Deter-

Plate I.

MERINO EWES.

Owned by George Campbell, of Westminster, Vt.

mined that this doubt should be removed, I proposed a sweepstakes premium of one hundred thalers, to be given to the exhibitor who could show the heaviest fleece in the class of Merinos, the sheep to be sheared on the ground, in the presence of a new committee to be appointed, and the fleeces to be weighed in the presence of the judges and spectators. As none of the exhibition sheep had been sheared, this was a feasible and conclusive manner to determine the correctness of the decision of the judges. The proposition made was this: that every party entering for the sweepstakes should pay ten dollars; if two entered, I would make up the balance of eighty dollars; if three, the balance of seventy; and if ten, the whole sum of the sweepstakes would be raised by entries. Three days were given for entries, and they were to be made at the American bureau, on the exhibition ground. After the lapse of the three days, no one had entered but George Campbell, the American exhibitor. This fact being publicly announced, there remained no doubt about the merits of the Vermont Merinos. It was subsequently stated by some of the exhibitors that the best breeds of Europe were not at the fair.

The twelve American sheep were afterwards sold by Mr. Campbell to Count Shen Thors, of Silesia, for five thousand dollars. Thus was the public opinion confirmed, that America not only had the most valuable Merinos on the exhibition grounds, but the most valuable in Europe.

The moral influence of this triumph was very great. The thousands who had gathered around the pens of sheep on exhibition from the flocks of Louis Napoleon, deserted the pens of the Emperor, and gathered in equal, if not larger, numbers around the Vermont Merinos. That the result of the exhibition in this particular will be to give America a great trade in Vermont Merinos, and make her one of the leading sources of the world for fine woolled sheep, there can be no doubt.

In the month of February, 1864, I received a letter from a leading house in New York city, informing me that they had received letters from German agricultural societies, making inquiries relative to the cost of American Merinos. "I have no doubt," says the writer, "but that, owing to the impulse given by the Hamburg fair to various industrial pursuits in our country, the United States will be benefited, in less than five years, to the extent of millions." Mr. Campbell informs me that the prize sheep were all descendants from the importations of Jarvis and Humphrey, but mainly from the latter. In a letter bearing date February 18, 1864, Mr. Campbell writes to me: "In 1839 I bought twenty full-blood Spanish Merino ewes, which were direct descendants from Mr. Humphrey's importation. The same year I also purchased an equal number of full-blood ewes, a cross of Jarvis's and Humphrey's stock. More recently I have received very choice sheep from the celebrated flocks of Messrs. Hammond, Sanford, Cushing, and other Vermont breeders."

More than three thousand farm implements and machines were on exhibition. Seventy-five steam engines were used in operating the machinery. One engine of eight horse-power, designed for drawing ploughs, attracted great attention. Its weight was ten tons, and was moved on a portable track, which revolved with the wheels, the track being in pieces or sections, and attached to an endless chain. The pieces of track looked like huge feet, as in their revolution they laid themselves down for the ponderous wheels to pass over. The machine was easily guided by two small wheels in front. It moved itself with the speed of four miles an hour around the fair grounds, and in the open street outside. It was designed to draw six ploughs at the rate of three miles an hour. This machine was from England, as was a large part of all the heavy machinery on the ground. It was very noticeable that, while all the machinery and farm implements from England were heavy and expensive, those from America were light and cheap. Thirty-four nationalities were represented at the exhibition in their contributions, including, among other things, four thousand one hundred of the finest horses, cattle, sheep, and swine; several of the reigning sovereigns of Europe being numbered among the contributors. More than one thousand persons were contributors and competitors. After a most thorough examination, and the most carefully applied tests, before a very able committee, the United States maintained its superiority in reaping and harvesting machines. To C. H. McCormick, of Illinois, was the gold medal awarded, and was given to the same machine which took the first premium at the London exhibition.

Twenty-six premiums were awarded to the United States, which, considering the small number of articles on exhibition from our country, was our full proportion. Silver medals were taken by Seymour, Morgan & Co., of New York, and by Thomson & Avery, of Pennsylvania. Bronze medals by John Kelsey, of Pennsylvania; John Vanderbelt, of New York; L. P. Rose, of Michigan; J. W. Tree, of Indiana; Solomon Hubbell, of New York; James A. Saxton, of Ohio; Whittemore, Belcher & Co., of Massachusetts; B. H. Allen, of New York; Hall & Spiel, of Pennsylvania; E. C. Painter, of Massachusetts; J. Redstone, of Indiana; Windle & Co., of New York; B. P. Johnson, H. G. Hotchkiss, Sylvanus R. Ward, and Hall & Parshall, of New York; B. M. Rhodes, of Maryland; and George Campbell, of Vermont. Medals were also sent to the American prize judges, Austin Baldwin, of New York, and Daniel Needham, of Vermont. It having been decided that all the prize judges of the exhibition should be rewarded in this manner, the American delegates were each honored with a Hamburg flag, to be presented by them to the States which they represented as a complimentary testimonial.

One of the most important results of the exhibition was the establishment, at Hamburg, of a museum of American agricultural machines and implements. The German contribution from New York formed the nucleus of the museum, to which was added, by donation from Mr. McCormick, his splendid reaper, which surpassed in elegance of workmanship any machine upon the ground. Mr. Kelsey, of Pennsylvania, also donated his harrow.

A contribution was made by the merchants of Hamburg, and a building sufficiently large to receive, for many years to come, specimens of American skill and industry, has been secured and consecrated to the purposes of our American museum of agricultural implements and machinery. All inventors and manufacturers of American machines are invited to contribute to this collection, which will perpetually remain a free exhibition to the people of the world.

This article would be incomplete should it fail to mention the name of James R. McDonald, an American merchant at Hamburg, who, from the day the fair was first suggested until its close, was unremitting in his labors in behalf of America and Americans.

At the close of the exhibition an opportunity was given to the American delegates publicly to thank the executive committee, not only for the opportunity the fair had given America to show her sheep and her agricultural implements, but for the uniform kindness and courtesy which had been extended to the delegates from our country. The meeting was held in front of the American shed, all the members of the executive committee and a large number of spectators being present. At the close of this meeting a formal leave was taken of each member of the committee.

Thus closed one of the most important and memorable exhibitions the genius of man has ever enabled him to hold

MINNESOTA.

BY O. H. KELLY, ITASCA, MINNESOTA.

The sudden transition of Indian hunting ground into an organized Territory, and then taking a stand in the front rank of northwestern States, directed much attention to Minnesota. The change has been so rapid that even the actors in the great work are surprised at the success of their labors. Immigration commenced pouring in in June, 1849, following the footsteps of Governor Ramsey, who issued, in that month, the proclamation declaring the Territory duly organized, and entitled to a delegate in Congress; and there was an overwhelming flood of people, of all nations and from every clime, who found homes within our limits. The tide increased yearly until 1862, when the outbreak of the Sioux upon our frontier checked its progress, and the wave moved back with such force that, until this date, (March, 1864,) its effect is still visible. Probably in the growth of States, with only agricultural and manufacturing resources to attract the attention, Minnesota's prosperity will never be equalled; and I purpose, after fifteen years' residence here, to give a sketch of the advantages we possess, by which we shall offer inducements to the immigrant not to be found elsewhere. And yet it will be far from my object to picture Minnesota as a paradise, for it has some disadvantages also; but these may be overcome, while the advantages cannot be reduced, and can be much enhanced in value. The great attraction to the first immigrants was our vast pine districts, and the State of Maine was well represented, during 1849 and 1850, among our population. In fact, during those years it was estimated that more than one-half of the residents of our Territory were from the lumbering districts of the Penobscot. Our high range of latitude made it questionable with some whether Minnesota could be an agricultural State, and many statements were published detrimental to our agricultural reputation. It was considered an experiment, and the sequel shows that it has been a successful one. My observations in this paper will be chiefly confined to that portion of our State tributary to the Mississippi, above the Falls of St. Anthony.

TOPOGRAPHICAL FEATURES.

Minnesota has an area estimated at 83,531 square miles, or 53,459,840 acres of land. Below the falls, the shores of the Mississippi are skirted with precipitous and rocky bluffs, while the country above presents a lower and more even surface, making a great and pleasing contrast to the eye of the traveller. We have here fine rolling prairies, oak openings, and extensive forests, well watered by lakes, and by small streams—tributaries of the great river. No mountains, and but few hills even, worthy of notice by a New Englander, are found. While at the falls and below, the country is well supplied with vast ledges of limestone, we have no ledges for a distance of seventy miles above, when a ledge of granite crops out, extending twelve miles to Sauk Rapids, the head of steamboat navigation above the falls, at an ordinary stage of water, although a steamboat has been up to the Falls of Pohegema.

SOIL.

On the eastern shore, extending back from one to five miles, and as far north as Fort Ripley, the soil is quite sandy, with gravelly subsoil, yet productive.

Beyond this, towards and on Run river, a clayey soil predominates. On the west shore, and extending to our own State line, both north and west, clay and black loam of unsurpassed fertility invite the husbandman to deposit his seed with good promise of rich rewards. I presume that the country north and west of the Falls of St. Anthony, as far as the British possessions, presents a greater variety of soil, and better adapted to the real wants of the farmer, than any like portion of the country in the west. It is often said by travellers that three-fourths of the farms in this region are well supplied by nature with wood and water.

PRODUCTIONS.

Both spring and winter wheat are raised in perfection; also oats, corn, rye, barley, buckwheat, hemp, flax, and tobacco; in fact, we never hesitate to plant any crop usually considered reliable in the New England States. Potatoes and all other root crops excel, in this part of the State, any like products I have ever seen elsewhere, particularly in quality.

STOCK-RAISING.

Relying chiefly upon the wild grasses for hay and pasturage, we are at present making good progress in this branch of agriculture. Stock, generally, is allowed to roam on the prairies and in the timber, picking such food as best pleases their taste, the result of which is good, wholesome beef, and the rich butter and cheese that such food produces. Diseased livers in animals raised here are, I believe, unknown. As to the quality of the stock now seen, there has been the most rapid improvement; in fact, Minnesota has some of the best blooded animals that can be found in the western country.

WOOL.

Probably in no branch of stock-raising shall we be more proficient and successful than in sheep. Our peculiarly dry and cold winters make our State every way adapted to the business, and immense numbers, and of every breed yet introduced into this country, are to be found here. There is every reason to believe that in five years the clip of Minnesota will equal that of any other State in the Union.

FRUITS.

A State that but fourteen years ago was inhabited wholly by Indians, without a single Protestant church, or a village containing two Yankee families, within its limits, cannot be expected to boast of noble orchards. They have been planted, however, and though some have proved failures, others have brought forth fruit, and two hundred bushels of apples is the estimated crop of our State for 1863. Hundreds have given their opinion that this would never be a fruit-raising country; but when we take into consideration the fact that the same opinion prevailed regarding the first attempts in all the northern States that now export fruit, we may well take courage from our present success and persevere. Among our wild fruits we find apples, grapes, wild cherries, haws, sand plums, gooseberries, thimbleberries, whortleberries, blueberries, raspberries, black currants, checkerberries, blackberries, strawberries, and cranberries. Of wild plums we have some fifteen varieties that I am familiar with, and I learn that there are still more. The greater part of those I have eaten are of superior flavor. Certainly, if such a variety of fruit yields in abundance, and endures our extremes of heat and cold, why have we not good reason to believe that we are in a fruit region? In the eastern and middle States I notice that they are under the necessity of covering raspberries and grapes in winter. I venture to say that our wild raspberries, that never see covering, bear more and better fruit, and I have gathered many a quart of blackberries which averaged each an *inch in diameter.* Some attention has been given to the cultivation of the Isabella, Delaware, Concord, and other choice grapes, and with fair success, which offers sufficient inducements to warrant every cultivator of the soil to plant a vineyard for family use at least.

TIMBER.

Pine stands first, and of this we have enough to supply all the demands that may be made upon the forests for a hundred years. Its quality is unsurpassed, and it is easy of access. Our list of hard timber comprises sugar and white maple, ash, black and white hickory, elm, butternut, black walnut, red, white, black, and live oak, basswood, birch, wild cherry, hackleberry, dogwood, hornbeam, poplar, spruce, and tamarack, of which latter we have swamps extending for miles. This is much used for fencing and building purposes, making good and durable frames for houses and barns. Without going so much into detail as the interest of the subject naturally would lead me, and the limit of my notes requiring that I should touch but briefly upon the various topics that need to be mentioned in making such a sketch, I will next refer to our

MANUFACTURING FACILITIES;

and on this point I can safely say that we have in the rivers above the Falls of St. Anthony, including the Mississippi, a sufficient available water-power to propel all the machinery now in motion in the United States. In fact, what we term the upper Mississippi is navigable only for light-draught steamboats, on an average of three months in the year, and during that period, at present, only used for a distance of seventy miles. This river might, by means of dams and locks, be made an available steam canal for a distance of at least four hundred miles, and thus connected with Lake Superior, it would extend through the most fertile region of the northwest, and furnish all the power necessary for any machinery that would be called for, and also furnishing any quantity of water for the irrigation of our soil. The tributaries of the upper river also furnish valuable water-power, and are already occupied by the enterprise which was early displayed by our first settlers. Timber and grist mills are found on every stream, while at the Falls of St. Anthony, water-wheels are turning every kind of machinery the business of our State requires; and I do not believe that there exist in the United States greater inducements to the mechanical genius of our country than would be furnished by the improvement of this river as I have suggested, and I believe the time is not far distant when that improvement will be accomplished. The steps of progress now being taken, through the enterprise of our leading men, mark a future for our State that even the most sanguine hardly dare anticipate. Every year has opened some new source of wealth; and where we first sought our income from two saw-mills and the Indian trade, we now draw wealth, in part, from inexhaustible mines of copper, iron, and coal, while salt lakes and petroleum springs remain unused, which must shortly increase our exports, and give to us what we desire—a permanent and active population.

CLIMATE.

This is an interesting topic, and the chief feature of attraction to all who visit Minnesota. Strangers consider our State a cold region, from the fact that during the winter the mercury sometimes falls to forty degrees below zero, Fahrenheit. These are really cold figures, but their force is much modified by attending circumstances. I may be excused, therefore, for going so minutely into the subject as to sketch each month in the year, commencing with

March.—This with us corresponds with the same month in the New England States. Our farmers engage in making maple sugar and preparations for spring work.

April.—Ploughing and sowing grain is performed during this month.

May.—By the 15th of this month we usually get our corn planted, and not unfrequently the mercury rises to 80° or even 90° Fahrenheit in the shade.

June and July.—These are very hot, and vegetation makes rapid growth, especially in June; but in July the nights are cool, without, however, diminishing the noonday heat.

August is the most agreeable of our summer months. During this hot weather we have fine breezes daily, without which our summers would be oppressive. Generally we have a cold storm in this month, but very seldom frost severe enough to injure anything.

September.—By the middle of this month we look for our first frost, which, however, touches us very gently.

October is a glorious month in Minnesota. About its commencement we usually have a killing frost, after which we seldom have another for about ten days.

November.—The air cools down, and we are ready for winter by the middle of the month. Ice usually forms in the river the latter part of the month, and occasionally we have a flurry of snow.

December gives us our first taste of winter, and the thermometer has a decided downward tendency, until, in

January, it ranges about zero, though still oftener above than below. In January we usually have one week of severe cold, during which the mercury falls to thirty-five or forty degrees below zero. I have yet to see it there three successive mornings, or remain at that point more than four hours after sunrise.

In *February* we have a cold "snap" for a few days also. In fact I have seen the thermometer at thirty-five degrees below zero at sunrise, and at two o'clock thirty-two degrees above, so that it may safely be said that these extremes are attained in this latitude, but are only of a few hours' duration. We have generally a week each, in January and February, of excessive cold. But our peculiarly dry atmosphere deprives our cold of the power of inflicting the suffering which is experienced in the eastern States, with the mercury only at zero.

This review of *one year* will answer, as an average, for nine out of ten in Minnesota. It seldom rains here from October to March. Our snows are dry, and it is seldom that more than six inches fall at one time. I have never seen the snow over two feet on a level during a Minnesota winter. Generally we have from six weeks to two months of good sleighing, but for two years past have had hardly six weeks each winter. During the summer months we have generally frequent rains, and exceedingly heavy dews. For the past two years, however, there has not been, in this portion of the State, sufficient rain for vegetation, and last year our crops were nearly a total failure from dry weather. Ten years ago we used to have the most terrific thunder-storms, but for several years past thunder and lightning are great rarities. We have fine bracing air, pure water, and (unless previously ruined) a resident of Minnesota has a good constitution and a glorious appetite. Thousands of invalids resort here to regain health, and many succeed. Fever and ague do not originate here, neither are there any local miasmal affections. In fact, we can recommend our State as very healthy.

POSTAL FACILITIES.

In no portion of the States are the people more highly favored by govern ment in post office facilities than in Minnesota. The enterprise of our first settlers demanded frequent communication, and there is hardly a settlement of half a dozen families that has not the most valuable of all public favors—a daily, tri-weekly, or weekly mail

EDUCATION.

Exhibiting a natural trait of character, the pioneers of our Territory secured in the organic act a permanent appropriation for schools, whereby twelve hundred and eighty acres of public lands are set aside in every township for school purposes. The fund now accumulating from sales of these lands begins to assume gigantic proportions, the result of which, if properly used, will be a free and liberal education to every child in the State. Independent of the common school fund is the State University, where we shall send our young men to become ornaments to our noble State and the pride of the people. The counties are divided into school districts, and each of these has its well-built school-house, where teachers are required by law to be employed at least three months annually. Except in the more thinly settled districts, schools are maintained both winter and summer. Our teachers are well qualified for their duties, and hold the rank in society to which they are entitled. In connexion with this subject I would mention the facilities enjoyed for religious worship. Nearly every denomination is represented in our State, and in most of the communities services are held every Sabbath. Our clergy rank with the first in the States, and the Sabbath is well observed in Minnesota. The church and school-house go hand in hand with our progress, exerting those influences upon the rising generation which, impressed on the youthful minds, grow with their growth, and secure for them in riper years honor and respect.

OUR POPULATION

comprises the mixture usually found in all new States. Every sister State has a host of representatives here, and of foreign nations the Germans predominate. These are always permanent in their locations, industrious and frugal in their habits, quiet in disposition; they are encouraged more than others to turn our vast possessions into fertile farms. As far as I have had intercourse with them, I have yet to meet the first man or woman who cannot read and write their own language. There may not be many readers of the "Atlantic" and the "Continental," yet the intelligence of the people is above the ordinary standard of new States, and compares favorably even with the rural districts of New England.

HOMESTEAD LAW.

The benefits of this law are felt quite forcibly. Our lands are being secured by actual settlers, whose improvements are enhancing the wealth of the State—quite a contrast compared with the effects of locating land warrants. Under this new law every quarter section requires an actual settler to be upon it for five years, in which time, if he is possessed of but ordinary enterprise, he can make his land worth at least five dollars per acre; while the law which allowed non-residents to patch up the country with land warrants, entailed upon some portions of our State a curse not yet removed. There are thousands of acres yet held by non-residents that have never had a farthing expended upon them for improvements, and their owners continue to pay taxes in the vain hope that the lands may yet rise in value, and then be sold to advantage. Fortunately the land warrants were located upon the most inferior portions of our State, and but very little of these portions can find cash customers at two dollars per acre until the government lands are all secured; and unless some unforeseen inflation of real estate should occur, much of the land never will bring the first cost and taxes up to the present time.

While sketching the many pleasing features of our young State, I must not omit to mention some of the serious drawbacks which we have had to contend with, and first of all were the

ARMY WORMS AND GRASSHOPPERS.

In August, 1855, our first great enemy made its appearance without any warning. First, as our oats were ready to harvest, the army worms commenced their ravages and made sad havoc in their path. Where they came from, or where they left off their labors, I never could ascertain. Their course was northerly. The next year we made the acquaintance of the grasshoppers, a more formidable enemy that came jumping down, taking a southerly direction. This vast army ate everything before it. In the forest, saplings were peeled by them, and all herbage seemed to be devoured indiscriminately. The farms on the prairies suffered more seriously than elsewhere, and, with the exception of pea vines, every crop was devoured. They laid their eggs in the ground, and there was, to those unacquainted with their habits, a question as to what would come next, but the next year solved the question. The eggs hatched, and where we had previously one full-grown grasshopper we now saw twenty. So numerous were they, in fact, that one could not walk without crushing them on the ground, while the air, as high as they could jump—some six feet—was alive with them. They turned neither to the right nor the left, but kept a straight forward course. If they came in contact with a house or other building, they would crawl up the side and over the roof, going down on the opposite side. If a window or door chanced to be open in their track, they entered, and did not hesitate to feed upon anything they came in contact with—clothing, tobacco, shoes, even thick cowhide boots were ruined by them. We had planted our crops as usual in the spring, and everything was eaten as soon as it came up, so that on ploughed ground not even a weed was to be seen. Their depredations continued until the last of June, when they all rose on the wing simultaneously, and in two hours after not a grasshopper was to be seen. A heavy rain followed the next day, and we secured that fall a good crop of corn and potatoes. So vast was the number of these grasshoppers, that on their departure there seemed to be a heavy cloud in the air which dimmed the light of the sun, then shining brightly.

These were three years of no ordinary trials. During the fall of the last grasshopper season (1857) the great financial panic came upon us with a crash that weakened the faith of holders of corner lots and paper towns most seriously. In our enterprise we had laid out towns all over the State, many of them not more than a mile apart, and thousands of us had reckoned on future wealth. Wild lands, beautifully located, which had been purchased at $1 25 per acre in the winter of 1856, were surveyed and city plats were recorded. In 1857 the lots were sold to eager buyers at fifty dollars per lot, and not even a log cabin on the section. Some improved their purchases, but nearly all purchased "on speculation." But the financial wave swept over our fair State and deluged the embryo cities, most of which, with their proprietors, were carried so far out of monetary circles that they have not been heard of since. Occasionally one passes, in travelling, the ruins of some deserted house, which, upon inquiry, proves to be a hotel of a town site which was mortgaged for treble its real value in 1857, and "thereby hangs a tale."

The sensible and energetic men now showed of what they were composed. They went to work with a good will to recover from their losses. Agriculture, the great resort for the wealthy and retired citizen, also offers a good support to the bankrupt and destitute. Industry took the place of wild speculation and town sites on unceded lands. Immigration poured in, and our young State was making great leaps for future prosperity, when suddenly there was a sound in our ears—the death-knell and savage war whoop of the

SIOUX DEPREDATIONS.

These, in 1862, spread terror in all parts of the State. In August of this year a trouble that had long been held in check reached its culminating point, and the savages, presuming that our fighting population had been withdrawn to crush the southern rebellion, drew the knife and entered upon their fiendish murders. Upwards of one thousand men, women, and children in our frontier counties were brutally murdered, and several counties were depopulated, the people flocking for refuge to the cities and towns on the Mississippi.

For two months trains of wagons passed daily, and the labor of years was in a fair way of being lost. The military resources of the State were put into the field, and this panic at last subsided. The next year the once powerful Sioux of our State found themselves driven beyond the Missouri, and the remnant of the first band in the outbreak had taken refuge in the British possessions, near the line of which a sufficient cavalry force is now stationed, in command of an officer who will not report many prisoners after a battle. Sufficient military force is now, and will hereafter be, stationed on our frontier to prevent any further depredations from Indians, and settlers can now make homes in any part of our State with perfect safety. Our excitements and disasters have subsided, and the deserted farms are mostly repeopled.

THE DROUGHT

of last year must not be overlooked, however. From October, 1862, until August 4, 1863, we had but about twelve inches of snow and three inches of rain, the result of which (being confined to the northern section of our State chiefly) cut off our grain crops on many farms. Fortunately, work being pushed on the Pacific railroad, the labor required furnished aid to many, and a very mild winter following, much suffering was prevented. With a judicious expenditure of money by our State, and perhaps a small appropriation in aid of the enterprise by Congress, the

IRRIGATION

of a large portion of this section of the State may be effected to prevent droughts hereafter, as well as bring a good return to the State treasury, and an increase of crops to the farmers who will take advantage of the enterprise. It will thus be seen that most of our drawbacks can be avoided in the future; but I have mentioned them to show that we have had a good share of trials, and yet are not discouraged.

SCENERY.

Among the attractions of our State may be mentioned the beauty of our lakes, rivers, and waterfalls. Many of our lakes are miles in extent, and stocked with pickerel, bass, and other fresh-water fish, and the delightful scenery on the shores cannot be surpassed in romantic beauty. As a resort in the summer season by the wealthy and pleasure-seekers, Minnesota is fast coming into notice. In connexion with natural attractions, I may mention that our wild flowers, both in the woods and on the prairies, claim great attention from botanists by their almost endless variety. Many of them are peculiar to this latitude.

WILD GAME.

The long residence of the Indians has been the means of destroying most of the ferocious animals, and it is but occasionally that even a bear commits any depredations. The remnants of beaver dams indicate that these valuable and industrious animals were once plenty, but they are not found, as far as my knowledge extends, by our white trappers. Fishers, otters, minks, and muskrats are plenty on the outskirts of civilization, and are at present quite a source of profit, but the present high prices of furs must soon cause them to be exterminated. Of deer, rabbits, and wild fowls we have an abundance, and the game laws of the State are well respected. Wild geese, brant, ducks, par tridges, grouse, and pigeons are plenty; quails are occasionally seen, but wild turkeys are not as yet residents here. Of depredators, we have plenty of mice, squirrels, and gophers, (pouch rats,) but the common house rat has not got, as yet, beyond the large towns; at least the farmers above the falls do not report their presence.

WILD RICE.

We have in the northern part of the State a great abundance of this article, which is much valued by the Indians as an article of food, and, when well prepared, is a palatable dish. In my vicinity, though quite plenty eight years ago in the lakes and rivers, it has disappeared, as well as the cranberries in some of the swamps. There are, however, in the State thousands of acres of both rice and cranberries.

SWAMP LANDS.

In a country whose surface is so completely dotted with lakes, there is, of course, a great quantity of swamp lands. From these a great deal of hay is annually harvested, and they are relied upon by nine-tenths of the population for all their hay. Annual cuttings, however, are causing them to run out in their productions, and the cultivation of tame grass must soon be resorted to in the old-settled parts of the State. The great majority of these swamps can be easily drained, and where they have been so treated, ploughed, and grass seed sown, immense crops of hay repay the labor expended. Timothy and clover yield well upon our prairie soil where the precaution is first taken to exterminate the gopher, which is easily done by putting a crystal of strychnine into a small potato, and dropping one in every hole where their presence is indicated. An investment of seventy-five cents in this poison, last spring, enabled me to exterminate them from five acres.

Having glanced at nearly all the items that will naturally interest a person seeking a home in a new country, I will now refer to other matters of general interest.

CITIES AND TOWNS.

The largest city is St. Paul, the capital of the State, with a population of twelve thousand inhabitants; but there are numerous other points which, though outnumbered in population at the present, are increasing rapidly, and some of them will eventually surpass it. Manufacturing interests, aided by the railroad facilities now being furnished, will bring other towns into prominent notice.

NATURAL RESOURCES OF WEALTH.

Having already mentioned the fertility of the soil for agricultural pursuits, also our vast forests of choice wood for all useful purposes, and our immense water-power, I come next to our recently discovered coal deposits. On the Big Cottonwood river, a tributary of the Minnesota, a shaft has been sunk, revealing a vein of coal over five feet in thickness. This deposit is found in place, and from the best geological opinion it is believed to extend through the entire western part of the State northward, and again crops out in Dakota Territory, at Lake Jessie. Heretofore our coal for gas and manufacturing purposes has been imported from other States. Our coal is of superior quality—bituminous.

COPPER.

Our vast deposits on Lake Superior are inexhaustible, and their extent and quality of ore are too well known to need more than a passing notice.

In the same vicinity immense veins of other valuable metals are reported to exist, consisting of

IRON AND LEAD.

A geological survey of this great mineral district has just been ordered by the State legislature, the result of which will soon be made known to the public in an authentic form, all of which will add greatly to the wealth of our young State, and tend to place Minnesota in the first rank for agricultural, manufacturing, and mineral wealth.

Already has eastern capital sought investment here, and, in consequence,

RAILROADS

are rapidly being built. As these great agents of commerce and civilization are no longer imaginary, and as we now see the iron being laid, it may not be out of place to notice such as are realities. The St. Paul and Pacific road, with its branches, contemplates a railway from Winona to St. Paul, along the west bank of the Mississippi to Hastings, where it will cross the river, thence on the east shore to St. Paul, a distance of one hundred miles. This, with connexions in Wisconsin, will place St. Paul about three hundred and seventy miles from Chicago; (our old stage route was estimated as three hundred and fifty miles from Galena.) It will then extend from St. Paul to St. Cloud, thence to Ottertail lake and Pembina, with a projection on through the British possessions, by the Saskatchewan river, to the Pacific ocean. Thirty miles of this road is already finished and cars running; eighty more will be completed the present season, and English capitalists have invested in the enterprise to such an amount as to show a certainty of an early completion of the entire line. This is the great national enterprise, in which the whole northwest feels a deep interest.

From Stillwater, on the St. Croix, to St. Paul, and from thence to Minneapolis and westward to the foot of Big Stone lake, the main line of this company, with its magnificent congressional grant, points to the gold fields of Idaho.

From Minneapolis and St. Paul the Cedar Valley road runs in a southerly direction through Northfield, Farribault, Owatoma, and Austin, to the southern limits of the State, where it makes connexion with the Prairie du Chien and Milwaukee road.

From St. Paul there is a congressional land grant road, graded for fifty miles up the valley of the Minnesota river to where it turns in a southerly direction, and connects with the Union Pacific at Sioux City. From Winona there is the Winona and St. Peter's road, with thirty miles completed and cars running. It is contemplated to extend it to the western line of the State. The Root River Valley road, also a congressional land grant road, extends from La Crescent, via Chatfield, to Rochester, where it connects with the above road. These roads are of vital interest, and no idle schemes, and show the enterprise of our young State. I must not omit the proposed road to Lake Superior. From Hudson, Wisconsin, sixteen miles from St. Paul, a road is now being built to Superior, with a branch to Bayfield. Forty miles will be completed this summer. Our road from St. Paul to Stillwater will connect us with the route, and furnish the much desired outlet to the great mining regions.

The writer has sketched roughly a picture of Minnesota as he sees it now. He came here the first week of its birth as a Territory, and has continued until the present time, noting the changes in its growth. The bulk of the population then consisted of Indians—Sioux, Chippewas, and Winnebagoes. The streets of our little settlements were alive with the aborigines, and our merchants were Indian traders. The whole of the territory on the west side of the Mississippi was occupied solely by the Indians, with an occasional licensed trader. That land was forbidden ground to any white man, but could not long remain so. The rush of immigrants soon made it evident that more room for enterprise was needed. A treaty was made and ratified with the Sioux in 1851, and the whole country west, upwards of one hundred miles, and extending from the Chippewa lands (whose southern limit was at Fort Ripley) to the Iowa line, was at once opened to white settlements, and a law of Congress made it lawful for settlers to go into unsurveyed lands. Minnesota now presented a new aspect. The spirit of adventure of the old settlers induced many of them to make voyages of discovery by land and water; every available point was at once selected and staked out for a future city, while the new immigrants turned their attention to securing one hundred and sixty acres each for a future home. The Sioux depredations have caused a large portion of the nation to remove themselves from their reservations, and the whole country now between the Mississippi and Missouri rivers, lies open to the white man; and should this section, of a great portion of which we have but slight knowledge, be as rapidly peopled in proportion as the principal part of our State has been, ten years hence will undoubtedly reveal a store of wealth, both mineral and agricultural, that will cause a greater excitement in immigration than has ever yet been known in our country. The Sioux Indians will never be allowed to re-occupy this land. They must go further west. Nothing can impede the progress of the white man. The question is often asked, what must eventually become of the races of Indians in the northwest, and many conjectures have been made in reference to the subject.

Philanthropists argue that our government does not treat the Indians as humanity dictates, and many noble and good men are endeavoring to devise some way by which to clear us from the sin of totally exterminating them. It is evident they cannot remain in their present condition as savages, and yet come in contact with the whites. The pioneers of civilization are not usually (at least of the present day) men of pure and spotless characters, nor have the efforts thus far made by missionaries among the Indians met with sufficient success to induce us to believe they can be converted to Christianity, and made to adopt the customs and habits of civilization.

In connexion with this digression from my subject I may be allowed to mention a tradition which prevails among the Sioux, that they came originally from the southwest, and occupied the entire country until they reached the limits of the great lakes in the northeast; there they tarried for a length of time, and gradually moved back to the great river and towards the northwest; thence they were, by means not given, still gradually to move on, and eventually become extinct.

But to return to our subject. Cities, towns, and villages have sprung into existence as if by magic; the iron bands are linking us with the great centre of trade; the Indian trails are obliterated, and the powerful locomotive, with its long train of cars, goes thundering by us, while the telegraph wires stretched over our heads flash thoughts as soon as conceived. It seems more a dream than reality. This may be a rather glowing and vivid sketch of so young a State, yet the statements are none the less true. Nowhere in the United States can there be found a purer and more healthy atmosphere, so free from causes of disease, and so invigorating to the human system. The laboring man or woman can here secure for himself a home and a farm of one hundred and sixty acres, and pay for it with his own hands. The homestead law gives him the land for about ten dollars in money, and a bare residence upon the land for five years secures him a clear title; or if he desires a home near old settled places, the railroad company will sell at reasonable rates from their land grants, and give ten years' time for payment. No large capital or heavy outlay is required, since with industry, sobriety, and a careful economy, (the foundation of wealth and happiness in all climes,) every man, however humble, can here become independent. When one thinks of the thousands of poor who are crowded in cities, dependent wholly upon uncertain rewards for their daily toil, often reduced to the necessity of asking aid from charitable societies, and then look upon the millions of acres of vacant land waiting for the hand of persevering industry to take them as a gift, it makes one wish for the means to bring them all to Minnesota. Many are the families living in poverty that have no knowledge of this fair land; or if they have, no means to reach it. Where they are, they live in abject poverty and sickness, while here in a few years they might regain health and have a competence. Let some way be devised to bring a knowledge of the homestead law to the notice of the poorer classes in our cities, and thus benefit those within our own country, as well as to spend thousands of dollars to spread the glad tidings in foreign lands. Let the officers of the charitable societies in every city, particularly in the east, be made familiar with the law, and, instead of dealing out bread and soup, with a meagre supply of clothing, let them aid the worthy poor to reach our State, and thereby save the young and inexperienced within the snares of city life from lives of degradation. The people of the west are generous, and willing hands are always ready to give aid to honest want. Information has just reached us of the ratification of the treaty between the Pembina and Red Lake Chippewas, which secures to us the whole American valley of the Red River of the North, opening another field for the immigrant, and presenting great inducements from its locality. It also gives us access to further exhaustless treasure that must not be overlooked in this sketch, which consists of the

SALT LAKES.

In the northwest portion of our State, extending over an immense area of country, including Devil's lake, the country is filled with salt lakes and springs. Many of these lakes are of great extent, and the time is not far distant when salt will be exported by rail from this section of country to supply all the country bordering on the Mississippi river. Devil's lake, as well as some smaller ones, are well stocked with fish of excellent quality. The salt in its crude state is said to be of excellent quality, and is reported as abundant.

A BUREAU OF IMMIGRATION

has been established by the State of Minnesota, at the head of which is Hon. David Blakely, secretary of state. Farm lands are in great request, and the State is swarming with people seeking eligible locations. The same state of things exists in other northwestern States, and the indications are that heavy emigration, from the north of Europe particularly, will continue increasingly to swell the population of this region. The northmen of Europe are particularly attracted by a climate which combines a bracing, salubrious, clear, and uniform winter climate with summers so long and hot as to produce to perfection all the products of the temperate zone; by the agreeable variety of surface and soil, with mingled forest and prairie, and numerous rivers, lakes, and islands to diversify the scene.

Such immigration will be facilitated by an act of national legislation approved July 4, 1864, which is given at length in another portion of this volume.

WEST VIRGINIA.

BY J. R. DODGE, DEPARTMENT OF AGRICULTURE.

The "Old Dominion" of our fathers, eldest in the family of States, and fairest in all that constitutes the highest natural attractions of the sisterhood, has committed the *hari kari*, or "happy despatch," under the influence of the demon of secession—is disembowelled and rent in twain. But she is immortal, and while East Virginia yet writhes in penitential agony, West Virginia not only lives, but is beginning to put forth a hitherto unknown vigor, and promises a career of glory and benefaction, a full maturity of beauty and pride, and a name of honor among the most illustrious of States in all coming time.

The new State has had her birth in the era of revolution, and has been baptised in blood, in the name of law and liberty; yet her most ardent aspiration is for a peace unsullied by cowardice or injustice—for an honorable diversion from the "war-path" to the path of progress in the arts of industry—for a higher and purer life, that shall animate and elevate every human being within her borders, and bless, with prosperity, education, refinement, and religion, myriads of happy homes.

Other States may boast of broad savannahs that bask in placid beauty, and soils of interminable depth and richness. West Virginia acknowledges a rough exterior, but claims for her hills the adornment of majestic and comely forest growths; for her vales a permeable and fruitful soil; for her rivers a wealth of water power; for her mines a heritage illimitable, and for her broad domain the insignia of strength, enduring vitality, and sturdy independence—the proud characteristics of her people.

LOCATION.

A more central and accessible location could scarcely be pointed out upon the map of the United States; not central in a continental sense, but eminently so as regards the Atlantic seaboard and the area almost encircled by the lakes, the upper Mississippi and Ohio rivers; central as regards the populous cities, the markets of the country. Harper's Ferry, on the extreme east, is but 81 miles from Baltimore, 112 from Washington, 179 from Philadelphia, and 286 from New York. Wheeling, on the northwestern border, is but 137 miles from Cleveland, and 491 from Chicago. Parkersburg, the terminus on the northwestern Virginia branch of the Baltimore and Ohio railroad, is 383 miles from Baltimore, 568 from New York, 522 from St. Louis, 544 from Nashville, and 200 from Cincinnati. It is connected with the tide-water of the Atlantic coast by railroad, 81 miles distant. The water communication by the bays and rivers of Maryland and Virginia is neither appreciated nor improved as it will be in the future, having some of the deepest and largest harbors on the continent. The shore-line of Virginia alone is made 1,571 miles by the Coast Survey. The western border of West Virginia lies 300 miles on the Ohio river, and is in immediate communication by water with the whole Mississippi Valley, permitting the exchange of products with the Louisiana planter at his doors; admitting of traffic along the banks of the Missouri in the wilds of Dakota, and allowing side-wheel steamers from the Kanawha to vex the waters of the far-off tributaries of the upper Mississippi.

The ploughs and automaton harvesters, which will hereafter garner the annual wealth of western prairies, may be transported to all those plains in vessels fabricated by the labor of West Virginia from her own oak and iron, and the metal of those implements may there be mined, the ore heated by adjacent strata of coal, the requisite flux obtained from the same hill, and all compacted into a perfect machine, with timber found growing on the surface, which has been manufactured by a perpetual water-power that leaps the crags of the summit and falls gently into the vale below, meandering towards the Ohio, quiet as the meditative ox that fattens on the sweetest of perennial herbage upon its banks.

Where, in the wide world, lies so broad a network of water communication at the very feet of a State so full of the varied treasures of the forest and of the mine? That such a country, with an elevation above the malarias of the lowlands, and never rising above the level of corn and sorghum production; within a few hours of the sea and its treasures and facilities for transit—a land peculiar for its green pastures flowing with milk, for its bright flowers laden with honey, and for its river slopes that promise to run with wine—should lack inhabitants, or the hum of industry, or the show of wealth, is an absurdity of the present and an impossibility of the future.

POPULATION.

Settlements began to extend across the mountains immediately after the close of the revolutionary war. Localities in Greenbrier and Berkeley, and other counties, were settled before its close. Virginia, in 1781, had already a population of 567,614—almost double the present population of West Virginia. It was rapidly increasing, doubling its population in twenty-seven years, this rate of increase having long existed with great regularity. Jefferson, assuming the same ratio of advance, predicted the attainment of a population of 4,540,912 in 1863. This he regarded as a "competent population," which would be 73 to the square mile, and less than the present population of Massachusetts, Rhode Island, Connecticut, New York, and New Jersey, and equal to that of Maryland. In 1790 the population was 748,318, verifying Jefferson's calculations. In 1808 it should have been 1,135,228; it was actually but 1,065,129 in 1820, and in 1860 it was 1,596,118, little more than one-third of Jefferson's assumed population.

This calculation was by no means unreasonable. If Virginia had continued to be the most densely populated State in the Union, its population would, in 1860, have been 9,683,186. Nor is it due to superior natural resources that a half dozen other States have a denser population than Jefferson expected for his native State, for Virginia exceeds them all in natural wealth, and stands upon an equality with the most favored in point of climate.

It is fair, then, to ask, why has not West Virginia been peopled? When the last census was taken, there were found 389,809 inhabitants of other States born in Virginia. How many, in the past, had died away from their native soil, and how many children of these and of living Virginians are now aiding to swell the population of other States, cannot be known; were it exhibited, it might show the prediction of Jefferson to be an approach either to prophetic accuracy or exact mathematical calculation. It may be said with some truth that the superior facility for getting prairie lands into cultivation in regions farther west has drawn emigrants over the summits and down the western slopes of the Alleghanies. The swinging of the woodman's axe and the climbing of hills may have been distasteful; and the deep river bottoms and broad alluvial plains may have had their attractions, despite the discomfort of chills and fever and the annoyance of mud and mosquitoes.

A second reason may truthfully be given in the evident fact that this region is peculiarly adapted to special enterprises, both mineral and agricultural, involving either capital or association, or both, such as coal mining, iron working, salt-making, oil-working, wine-making, fruit-growing, dairying, and sheep husbandry; and hence its development has been retarded.

But the most potent cause of delayed development, after all, as a matter of fact which cannot be ignored or refuted, is the instinctive feeling in all unprejudiced minds that free labor is more profitable and honorable to all living upon its product than servile, yielding more comely social results and sweeter moral fruits; that it is more conducive to the general health and happiness, and more productive of mental culture and general intelligence; and hence that its associations and consequences, in the distant future, are infinitely more desirable surroundings to that posterity for which it is the business of life to provide.

Nor are Virginians, upon this point, practically unbelieving. Whatever of prejudice, so naturally begotten, inbred and instilled by habit and education, may have swayed them, the suggestive fact remains that more of them have sought homes in the free than in the slave States. In opposition to the powerful control of habit and early association and inculcation, and oftimes even in apparent violence to expressed opinions, humanity and self-preservation have instinctively asserted their power, as will be seen by the following figures, which designate the States in which persons born in Virginia were living in 1860:

SLAVE.	
Alabama	7,598
Arkansas	6,484
Delaware	171
Florida	654
Georgia	5,275
Kentucky	45,310
Louisiana	2,986
Maryland	7,560
Mississippi	6,897
Missouri	53,957
North Carolina	9,899
South Carolina	1,117
Tennessee	36,647
Texas	9,081
Total	193,686

FREE.	
California	5,157
Connecticut	302
Illinois	32,978
Indiana	36,848
Iowa	17,944
Kansas	3,487
Maine	116
Massachusetts	1,391
Michigan	2,176
Minnesota	849
New Hampshire	71
New Jersey	880
New York	3,650
Ohio	75,874
Oregon	1,273
Pennsylvania	11,026
Rhode Island	138
Vermont	30
Wisconsin	1,983
Total	196,173

This emigration would naturally be to Kentucky and Missouri. Those States include 99,267 persons from Virginia; and Ohio, Indiana, Illinois, and Iowa, extending precisely the same distance west, contain, almost exclusively in their southern portion, 163,644 of this population.

Population of the counties comprising West Virginia by the census of 1860.

Counties.	Free.	Slave.	Total.	Counties.	Free.	Slave.	Total.
Barbour	8,863	95	8,958	Monroe	9,643	1,114	10,757
Berkeley	10,875	1,650	12,525	Morgan	3,638	94	3,732
Boone	4,682	158	4,840	McDowell	1,535	....	1,535
Braxton	4,888	104	4,992	Nicholas	4,473	154	4,627
Brooke	5,476	18	5,494	Ohio	22,322	100	22,422
Cabel	7,715	305	8,020	Pendleton	5,920	244	6,164
Calhoun	2,493	9	2,502	Pocahontas	3,706	252	3,958
Clay	1,766	21	1,787	Preston	13,245	67	13,312
Doddridge	5,169	34	5,203	Putnam	5,721	580	6,301
Fayette	5,726	271	5,997	Pleasants	2,930	15	2,945
Gilmer	3,707	52	3,759	Raleigh	3,310	57	3,367
Greenbrier	10,686	1,525	12,211	Randolph	4,807	183	4,990
Hampshire	12,700	1,213	13,913	Ritchie	6,809	38	6,847
Hancock	4,443	2	4,445	Roane	5,309	72	5,381
Hardy	8,791	1,073	9,864	Taylor	7,351	112	7,463
Harrison	13,208	582	13,790	Tucker	1,408	20	1,428
Jackson	8,251	55	8,306	Tyler	6,499	18	6,517
Jefferson	10,575	3,960	14,535	Upsher	7,080	212	7,292
Kanawha	13,966	2,184	16,150	Wayne	6,604	143	6,747
Lewis	7,769	230	7,999	Webster	1,552	3	1,555
Logan	4,790	148	4,938	Wetzel	6,693	10	6,703
Marion	12,659	63	12,722	Wirt	3,728	23	3,751
Marshall	12,968	29	12,997	Wood	10,870	176	11,046
Mason	8,797	376	9,173	Wyoming	2,797	64	2,861
Mercer	6,457	362	6,819				
Monongalia	12,947	101	13,048		358,317	18,371	376,688

EDUCATION AND PROGRESS.

The people of West Virginia are departing from the wisdom of the fathers of the early days, when Sir William Berkeley, the proprietor of a large tract in Shenandoah valley, eighty years ago, wrote of the new country as follows: "I thank God there are no free schools nor printing, and I hope we shall not have these hundred years, for learning has brought disobedience and heresy and sects into the world, and printing has divulged them and libels against the best government. God keep us from both." But this departure leads in the direction of a superior wisdom, and a school system has been adopted since the organization of the State, modelled upon the best State systems in the country, the results of which will soon be manifested in general educational improvement.

Schools of a higher grade are beginning to be organized—academies and high schools, and seminaries, for young ladies—and the impetus already given to popular progress in mental culture will soon occasion a further demand for superior educational facilities.

There is awakened throughout the State a spirit of lively interest in the construction of roads and the improvement of river navigation, in new enterprises that develop its varied resources, in all measures essential to its security, and the happiness and thrift of its people, and to their mental and moral advancement.

There is a feeling of relief from an irksome and heavy burden in separation from Virginia, whose malign influence has long rested like a nightmare upon this region. Its system of taxation was unequal, discriminating against the free mountain section, taxing lightly those interests which the west did not possess, while expensive internal improvements, adding greatly to local property values, were only undertaken in the east. Railroads, of greatest feasibility and utility, surveyed and brought into notice by public-spirited individuals, were procrastinated and killed by the same determination to override the interests of this region.

STATE OF IMPROVEMENT.

The farm lands embrace at least four-fifths of the area, amounting to 10,896,394 acres, or 17,025 square miles, and they average a value of $8 03 per acre. The State of Virginia, before division, comprised 31,014,950 acres in farm lands, worth $11 91 per acre. In view of their central location, access to eastern markets, and connexion with all parts of the Mississippi valley by river navigation, munificence of forest and field, and greater wealth of minerals beneath, this is cheaper than any lands of similar position and value in the country. With a little improvement in each county, of a character that shall be an earnest and guarantee of progressive and steady advancement in material development, eight dollars per acre will become twenty, and eighty-seven millions in the aggregate will become more than two hundred millions. And such improvements will nearly pay for themselves as they are made, leaving fully one hundred millions of dollars, in a very few years, to burden the pockets of the people who have the industry and patience to make them.

The population of West Virginia is, by the last census, 376,688. It thus stands the twenty-seventh State in the order of its population, with eight below it, namely: New Hampshire, Vermont, Rhode Island, Minnesota, Florida, Delaware, Kansas, and Oregon.

New Hampshire, the next below in point of numbers of its inhabitants, contains 35 to each square mile. West Virginia has 16, as nearly as can be calculated in the imperfect condition of her surveys. To realize more fully the present material status of this new member of the family of States, let a comparison be instituted with this older member of the family. It will be found useful, in the future, in illustration of the growth of a region blessed with marvellous resources, when relieved of the incubus of dwarfing and degrading caste, and fairly started in the race of improvement.

	New Hampshire.	West Virginia.
Population	326,073	373,321
Acres of improved land	2,367,039	2,346,137
Acres of unimproved land	1,377,591	8,550,257
Cash value of farms	$69,689,761	$87,525,087
Average value of lands per acre	$18 58	$8 03
Value of farming implements and machinery	$2,682,412	$1,973,158
Horses and mules	41,111	87,536
Cattle	264,067	310,089
Sheep	310,534	453,334
Swine	51,935	327,214
Value of live stock	$10,924,627	$12,382,680
Wool, pounds of	1,160,212	1,073,163
Potatoes, bushels of	4,137,543	746,606
Barley, bushels of	121,103	60,368
Buckwheat, bushels of	89,996	342,518
Wheat, bushels of	238,966	2,302,567
Rye, bushels of	128,248	71,263
Indian corn, bushels of	1,414,628	7,858,647
Oats, bushels of	1,329,213	1,649,090
Orchard products, value of	$557,934	$234,273
Market-garden products, value of	$76,256	$44,299
Butter, pounds of	6,956,764	4,760,779
Cheese, pounds of	2,232,092	131,585
Hay, tons of	642,741	154,136
Home manufactures, value of	$251,013	$502,671
Animals slaughtered, value of	$3,787,500	$2,124,869

Though the area of the Granite State is but forty per cent. of that of West Virginia, the improved land is equal in extent, while the unimproved farm lands are little more than one-seventh as extensive; yet the average cash value in the State so generally improved. is but $18 58 per acre, against $10 03 per acre in the State which has but one-fifth of its land under improvement. New Hampshire has, of live stock, fewer horses and mules, cows and young cattle, sheep and swine, but more working oxen. Her excess of working oxen, of higher value than cows and young cattle, in part offsets the superior numbers of the horses of West Virginia, so that the proximity of the White mountains to the fine markets of manufacturing cities, and the famed Cambridge market, is really little superior in position to the western slope of the Alleghanies, so accessible to Cincinnati and Louisville on one side, and Baltimore and Washington on the other. New Hampshire has the advantage of quite fifty per cent. in the value of animals slaughtered, but West Virginia can offset something in her sales of horses. With a smaller number of animals to feed, more than four times as much hay is used by New Hampshire farmers; and it is not altogether owing to the consumption of a greater amount of corn in feeding stock that so little hay is used by West Virginia farmers, but it is due to the comparatively short and mild winters, and the abundance of excellent pasturage. This fact adds greatly to the comparative profit of stock-keeping in the new State, and will eventually add to the market value of her broad acres.

The bushels of corn and wheat, and other grain, plainly point to the fertility of the soil, having been produced by imperfect and slovenly culture, the blemish and disgrace of southern, western, and, in fact, American farm husbandry.

The item of a half million dollars of home manufactures is creditable to the habits of rural simplicity and to the self-reliance of the women of West Virginia.

To show this to be a low estimate of profits to be derived from enhanced values, let the valuation be placed on the basis of that of adjoining States—Pennsylvania and Ohio. In intrinsic wealth of soil and minerals combined, aside from the accidents of settlement or position, West Virginia can scarcely be said to be inferior to either. The present farm valuation is $87,525,087. At the Ohio valuation, $32 13 per acre, it would amount to $350,101,139; at the Pennsylvania valuation, $38 91, it would be $423,978,690. The impetus given to improvement by inaugurating the policy of voluntary labor, with all of its tendencies to material and moral development, is sufficient to give instantly one hundred millions of dollars additional value to the farming lands of the State, and when the war is over this enhancement will at once be seen in improvement in prices.

FOREST LANDS.

The following statement of a correspondent, C. S. Richardson, of Briarport Mines, in the Kanawha valley, illustrates the character of the virgin soil:

"Comparatively unknown, and seemingly uncared for, there are extensive tracts of rich and fertile lands in the wilderness, whose capability of productiveness, when developed, would astonish the dwellers in the open country if they were made acquainted with the facts. Isolated from general view through the absence of any roads, the traveller has but little chance of making their acquaintance. The dwellers in these solitudes are not of a very communicative disposition; hence so little is known of their real value. During a series of topographical and geological surveys on the Elk and Coal rivers, my attention was drawn to numerous spots that I conceived would make beautiful farms. Gentle slopes, flat-top ridges, and level dells were frequently met with. These were primitive forests, and a stranger to the woodman's axe or the saw of the lumberman. Being interested in the mineral resources of Kanawha, and having in view one of its fundamental principles of development—population—I determined to try an experiment to ascertain the truth or fallacy of my ideas. With this end before me, I selected a spot scarcely ever trodden by the foot of man. It is called 'Ginseng Hollow,' and lies between the main Briar creek (Coal river) and the Davis creek ridges, in Kanawha. As an inducement to my first pioneer tenant, I offered to let him have fifty acres of land, rent free, for five years. and after he had got his log house burnt, fields enclosed, and a road cut for a way out, he should have a lease for twenty-one years at thirty dollars a year rent. I soon found a tenant, and thus far I can report the experiment eminently successful. It has been two years in cultivation. The first year was chiefly devoted to clearing, or rather girdling the trees, fencing, breaking up the ground, and building his house and barn; but, nevertheless, several acres were cultivated, and yielded a very fair crop of corn. Last year, the ground being tolerably well cleared of roots and underbrush, the trial commenced. The summer was unusually dry; scarcely any rain fell for three months; but the soil being new, and a humid atmosphere, which always prevails in the dense woods, keeping the heated air cool, the crops grew vigorously; and when the harvest came, my tenant had the pleasing satisfaction of being able to report he possessed the *finest crop of corn in the district*. Even on our bottom lands there was nothing superior.

"I have since visited another spot, although not quite so isolated, where similar results were obtained. This small trial shows very conclusively that if immigration is judiciously encouraged, and land-owners induced to be more liberal in their concessions to the industrious laboring classes, thousands of acres of our back forest lands may be brought into a profitable state of cultivation, thus creating a new field to agricultural enterprise, increasing our population, reducing our taxation by distributing its burden over a greater number of contributors, and materially augmenting our nation's wealth, prosperity, and greatness. Many persons will be inclined to remark: 'This is all very well in theory, but in practice will it pay?' Now let us see. These lands, on an average, can be purchased for less than $4 per acre. Fifty acres, then, cost $200. Add five years' interest on this before any rent is received, which is $60, and $40 for miscellaneous expenses, making $300. The rent on this, at $30 a year, (which is about half of what is usually asked,) produces ten per cent. Now these lands I speak of are mineral lands, and as soon as the country is intersected with railways, (which we all hope it soon will be,) then every acre in proximity to such lines will be worth from $25 to $100."

CLIMATE.

A study of the causes affecting the climatic condition of West Virginia will be found interesting. In its latitude, lying as it does mainly between 37° and 40° north, it is neither suggestive of hyperborean blasts in winter, or a torrid temperature in summer, of pent-up valleys, blockaded with drifted snow and solid ice for weary months, or sweltering plains, parching and baking under a brazen sky. It has neither the saturated and leaky canopy that overhangs old England, or the rainless sky of a California summer, but a pleasant medium, giving a covering of snow in winter just sufficient to protect the grass and grain, a rainfall in seed-time ample for the proper preparation of the soil, and a diminished supply in gentle showers during the later growth and ripening of vegetation. Its mountains, unlike those of Europe, or the Rocky mountains in the west, do not very materially affect the conditions of climate, except to reduce the temperature in proportion to altitude. There are local differences, to be sure, the result of peculiar position, but the interior valleys of the Alleghanies have nearly the same temperature as the broad slopes on either side, and these opposite slopes scarcely differ in their climatic peculiarities. Unlike the mountains of Europe, however, the Alleghanies in this latitude have less rain than the plains below.

ALTITUDE.

The average altitude of the highest summits is 2,500 feet in this section of the Alleghany range, increasing southward. The upper valley of the Kanawha, instead of being an arid desert like the Colorado and other elevated plateaus, is luxuriant in verdure, differing comparatively little in humidity and temperature from the Atlantic coast and the Ohio valley in the same latitudes; indeed, the elevation of the Kanawha is but 2,500 feet in southern Virginia near its source, descending more than one hundred miles before it bursts its Alleghanian barrier in Monroe county, West Virginia, where it ranges between 1,800 and 1,300 feet, thence rapidly falling to little more than 600 feet at the foot of the falls near the mouth of the Gauley, whence it flows gently, with the slight descent of a few inches to the mile, to the Ohio river. The following table exhibits the elevation of the Alleghanies and their slopes in this section of that great mountain range:

Summit elevations.

Summit in latitude 37½°	2, 650 feet.
Summit at crossing of Baltimore and Ohio railroad	2, 620 feet.
Western plateau at White Sulphur springs	2, 000 feet.
Source of Cheat and Greenbrier rivers	2, 400 feet.
Blue Ridge, near Harper's Ferry	1, 800 feet.

Elevation of the valley of Virginia.

Near the Potomac	800 feet
At Covington	902 feet
At Staunton	1, 222 feet

Elevations west of the mountains.

Cheat river, valleys of western declivity	1, 375 feet
Mouth of the Greenbrier	1, 333 feet.
Tygart's valley, lowest within the mountains	1, 000 feet.
Ohio river at Pennsylvania line	675 feet.
Ohio river at Kentucky line	550 feet
Kanawha river at Charleston	600 feet

The first of these divisions, the summit and table-lands of the Alleghanies comprises a narrow strip little more than the average width of a county, and extends from the Alleghanian backbone to the chain of mountains which are really a continuation of the Cumberland range, and known as Cotton Hill, Gauley, Laurel Hill, &c. The valley between these two ranges lies at a level of 1,350 to 2,000 feet above the sea; the Greenbrier valley, for instance, for a length of 150 miles, having an average elevation of 1,500 feet. Much of the cultivated land of Greenbrier county, which is one of the summit counties, lies at a height of 1,800 to 2,000 feet, and yet ripens corn and sorghum without difficulty, and enjoys a winter climate of great mildness.

The second division includes the valley of Virginia or the Shenandoah valley, averaging, perhaps, fifty miles in width, and extending through the old State of Virginia in a southwestern and northeastern direction. Only the mouth of the valley is embraced in West Virginia. Its average elevation in this section is, perhaps, 1,000 feet.

The third section, which may be said practically to represent the elevation of the State, containing at least 16,000 square miles, or two-thirds of its entire area, including and almost bounding on the east the great coal basin, lies between the altitudes of 600 and 1,500 feet. The uplands, a few miles from the Ohio, with an elevation differing considerably at different points, may be averaged at 800 feet. In the Kanawha valley, below the falls, the river is little more elevated than the Ohio from Parkersburg to Point Pleasant, but the river bluffs rise precipitously, giving the surrounding country an average of at least 1,000 feet for sixty miles, with a considerable increase towards the falls. The average for the entire section is, perhaps, 1,100 feet. By a comparison with other points in the Mississippi valley, this elevation will not be found to indicate a region particularly mountainous in its altitude:

Bellefontaine summit (highest land in Ohio)	1, 400 feet.
Hillsboro', Ohio	1, 131 feet.
Portsmouth, Ohio, (Ohio river)	540 feet.
Columbus, Ohio	762 feet
Northern Indiana, sources of Maumee	850 feet
Prairies of Illinois and Wisconsin	950 feet.
Blue mounds, southern Wisconsin	1, 640 feet

Chicago, Illinois	590 feet.
Central Kentucky	800 feet.
Louisville, Kentucky	441 feet.
St. Louis, Missouri (Upper)	480 feet.
Knoxville, Tennessee	960 feet.
Chattanooga, Tennessee	643 feet.
Huntsville, Alabama	600 feet.

Thus the greater portion of West Virginia, though appearing so mountainous from the broken character of the surface, is of less elevation than Logan and Hardin counties, in Ohio, which are so level in districts of highest elevation as to present the appearance of swamps, and suggest to the agriculturist the necessity of surface drainage, while the ascent has appeared like a continuous plain from the Ohio river.

The slope of the Alleghanies on the west is more abrupt than on the east, making a rapid descent for the rivers for a short distance, whence their flow is gentle, with grades not unlike those of rivers upon the eastern side of the Ohio, the only essential difference being the greater rapidity of the Alleghanian streams near their sources.

TEMPERATURE.

The mean temperature of West Virginia, for the year, as may be seen by an examination of the isothermal lines, is lower than any other locality in the same latitude east of the Missouri river. It lies between the lines of 50° and 54°, which embrace the southern and central portions of Ohio, Indiana, and Illinois, with contiguous portions of Missouri and Iowa; on the Atlantic, deflecting northward to include the coast line between New York and Baltimore. The isothermal, indicating a mean temperature of 55°, passes through Baltimore and Washington, circles round the southern boundary of West Virginia, intersects the northern border of Kentucky, and strikes St. Louis, leaving Philadelphia and Cincinnati a very little north of the line. The line of 52° would come very near the centre of West Virginia. This would make the average temperature slightly lower than that of those two cities. The following table, prepared from the Smithsonian record, shows the highest, lowest, and mean temperatures for each month of 1859, of Philadelphia and Cincinnati, with two points on the Kanawha, one near the top of the Alleghany range, the other nearly on a level with the Ohio river.

Month.	Kanawha county, West Virginia.			Lewisburg, West Virginia.			Philadelphia, Penn'a.			Cincinnati, Ohio.		
	Highest deg.	Lowest deg.	Mean temperature.	Highest deg.	Lowest deg.	Mean temperature.	Highest deg.	Lowest deg.	Mean temperature.	Highest deg.	Lowest deg.	Mean temperature.
January	62	6	35.14	62	-2	32.55	54	....	30.79	60	7	36.11
February	66	18	41.69	64	13	38.40	62	20	36.44	68	14	40.32
March	75	30	51.58	72	30	47.68	70	22	48.12	70	31	50.19
April	80	31	53.98	85	25	51.96	78	33	50.28	78	31	52.37
May	86	48	65.62	82	48	68.03	85	48	64.65	86	54	70.03
June	91	42	68.51	90	38	69.93	95	49	70.65	98	52	72.87
July	95	57	74.67	92	50	75.93	95	58	76.00	100	56	79.52
August	92	52	73.38	92	60	74.33	95	55	74.53	94	54	75.64
September	84	50	65.93	79	34	61.29	81	48	66.18	86	56	68.36
October	80	25	50.99	69	20	48.35	80	32	52.32	80	32	54.37
November	79	20	46.91	70	14	44.23	68	30	47.49	74	20	49.30
December	76	17	34.97	71	5	33.33	70	11	33.00	68	2	30.18

The lowest monthly points reached average the same in Philadelphia and Kanawha county; the highest monthly temperatures average, for the year, the same in Philadelphia and Greenbrier county, while the average of the lower extremes is less in the latter locality. Kanawha county and Cincinnati show very similar extremes, the former being slightly more moderate in high temperatures, with a still greater depression in low temperatures, giving a pretty wide thermometrical range, though the mean temperature is very nearly the same as that of Cincinnati. As elsewhere in the interior or continental area, or basin of the Mississippi, the extremes are greater than on the coast of lake or ocean. Thus the table above, as might be expected, gives Philadelphia a temperature less liable to extremes.

The following table includes a record of temperature, as furnished by authorities and in periods as follows: Lewisburg, two years, (Agricultural Report;) Richmond, four years, (Darby's U. S.;) Washington, thirteen years, (Army Meteorological Register;) Baltimore, four years, (record, Fort McHenry;) Philadelphia, thirty-two years, (Daily Inquirer;) Cincinnati, twenty years, (Ray;) St. Louis, twenty-eight years, (record, Jefferson Barracks.)

Period.	Lewisburg, W. Va.	Richmond, Va.	Washington, D. C.	Baltimore, Md.	Philadelphia, Pa.	Cincinnati, Ohio.	St. Louis, Mo.
January	35.4	33.7	34.1	32.8	31.8	33.1	32.6
February	34.2	39.8	36.7	34.2	32.3	34.1	35.1
March	44.4	47.1	45.3	42.3	41.0	43.5	45.1
April	53.8	54.7	55.7	52.7	51.8	54.1	57.1
May	64.9	65.4	66.3	63.1	62.5	63.6	66.3
June	69.0	73.8	74.4	71.6	71.5	71.4	74.1
July	77.1	77.6	78.3	76.7	76.0	76.5	78.0
August	73.9	74.8	76.3	74.7	73.2	74.2	76.4
September	68.8	67.1	67.7	67.8	63.8	66.0	68.1
October	53.5	57.5	56.7	55.7	54.5	53.2	55.7
November	45.0	44.2	44.8	45.1	44.0	42.5	43.1
December	35.4	38.1	37.3	35.6	34.5	33.8	33.8
Spring	54.4	55.7	55.8	52.7	51.8	53.7	56.1
Summer	73.3	75.4	76.3	74.3	73.6	74.0	76.2
Autumn	55.8	56.3	56.4	56.2	54.1	53.9	55.6
Winter	35.0	37.2	36.1	34.2	32.9	33.7	33.8
Year	54.6	56.2	56.1	54.3	53.1	53.8	55.5
Altitude	1,800 ft.	120 ft.	80 ft.	10 ft.	40 ft.	543 ft.	472 ft.

The mildness of the winter and spring temperature at Lewisburg is remarkable, and must result in part, at least, from the prevalence of southerly and southwesterly winds at that season. It will be seen that the summer temperature is lower than that of any other point named. The purity of the summer air at this point modifies the effects of the heat, and relieves it of sultriness and the depressing influence of a vitiated atmosphere.

The average of the five hottest days in five years, from 1832 to 1836 inclusive, according to the record of J. H. Diss Debar, taken in Doddridge county, very near the geographical and thermal centre of the State, is 90° Fahrenheit, and the average of the coldest days, for the same period, 6° Fahrenheit.

From the extremely broken character of the surface there are sheltered localities upon which the summer sun must pour a merciless flood of fiery beams, and high plateaus, or elevated slopes, over which the wintry wind must sweep in fury. This very fact of unevenness furnishes a choice of pleasant sites for comfortable residences, of localities for vineyards and orchards, and of a general adaptation of situation to circumstances.

RAINFALL.

The distribution of rain in West Virginia is admirably calculated, in quantity and seasonableness, to insure success to husbandry and give facility to all its successive operations. The spring opens early, and with its opening come gentle and frequent showers. The summer, with less humidity than any surrounding State, is not subject to long-continued droughts. The grasses spring green and fresh upon the summits of the loftiest mountains during all the summer.

The amount of rain precipitated in West Virginia is from 32 to 36 inches only, as indicated by partial records kept in different parts of the State, and especially in the vicinity of Lewisburg and the White Sulphur springs, where the same quantity was indicated on both sides of the Alleghanies. The mean annual rainfall decreases to some extent southward from Pittsburg, and its minimum quantity is found in summer. No complete record of the rainfall of localities in West Virginia for a term of years being at hand, it is fair, from partial data at different points, from general statements in Blodgett's Climatology and other works, and from expressed opinions of the most intelligent residents, to take Pittsburg, in Pennsylvania, as a basis of comparison between western Virginia and other localities, with the balance of authority in favor of a slightly lower figure for the average throughout the State than is given in the following table for that city:

Place.	Spring.	Summer.	Autumn.	Winter.	Year.
Cambridge, Massachusetts	10.85	11.17	12.57	9.89	44.48
New York city	11.69	11.64	9.93	10.39	43.65
Philadelphia, Pennsylvania	10.97	12.45	10.07	10.06	43.56
Pittsburg, Pennsylvania	9.38	9.87	8.23	7.48	34.96
Washington, D. C	10.45	10.52	10.16	11.07	41.20
Cincinnati, Ohio	12.14	13.70	9.90	11.15	46.89
Hudson, Ohio	9.76	8.87	6.16	8.00	32.79
Milwaukie, Wisconsin	6.60	9.70	6.80	4.30	27.20
St. Louis, Missouri	12.86	14.09	8.71	6.29	41.95

The only region here shown to be of like humidity is that of the lakes, of which Hudson, Ohio, is a representative. From data believed to be reliable, the Kanawha valley is characterized by a rainfall almost precisely similar to that of the country bordering upon the southern and western shores of Lake Erie.

SALUBRITY.

It would scarcely need the corroboration of sanitary facts to prove the healthfulness of this region. The altitude, the irregularity of surface, the absence of marshy plains, so peculiarly characteristic of West Virginia, would give, in connexion with its medium temperature, assurances of health and longevity to her population. The following is an exhibit of the yearly per-centage of mortality, for twenty years past, in the different sections of the country:

Place.	1850.	1860.
Mississippi valley, proper	2.38	1.81
Southern Atlantic coast	1.45	1.34
New England	1.25	1.24
Interior areas	1.19	1.32
Alleghany region	.96	1.08
Northwestern States	1.01	.98
Pacific coast	.92	.95

Thus the sections of greatest salubrity are the Alleghanian, northwestern, and Pacific; yet, in view of the fact that the northwest and Pacific are virgin settlements, filled with a youthful and middle-aged population, while the Alleghany region has a homogeneous and home-staying people, we must conclude, if we accept the above per-centages as an accurate basis of calculation, that the highlands of the Alleghanies are of equal, if not superior, salubrity.

This mountain range extends nine hundred miles, nearly parallel with the sea-coast, consisting of ridges fifty to one hundred miles apart, and parallel with each other, watered and wooded to their summits, with extensive and fertile valleys between. The Blue Ridge, Alleghany, and Cumberland, with many other subdivisions, as North Mountain, Laurel Hill, and Greenbrier, are but parts of the great Alleghany system. That portion of this section embraced in West Virginia abounds in many a plateau, with an elevation just sufficient to insure a pure and bracing atmosphere, and all conditions essential to vigorous and healthy growth, both in animal and vegetable life.

SURFACE AND SOIL.

THE VALLEY COUNTIES.

The lower part of the valley of Virginia, from Harper's Ferry west to the summit of the Alleghanies, embracing the counties of Jefferson, Berkeley, Morgan, Hampshire, Hardy, and Pendleton, is included in West Virginia. For the variety and fertility of its soils, fine water-power, central position, salubrious and delightful climate, beauty and grandeur of scenery in plain and on mountain, it can literally, and with severity of truth, be said to be unsurpassed, if equalled, in the United States, as a farming region in which to make homes of comfort, opulence, and refinement.

This district is a little more than three thousand seven hundred square miles in extent, and is bounded on the east by the Shenandoah, and on the north and northwest by the Potomac and its north branch. The eastern front ridge of the Alleghanies is near the western boundary; Hampshire, Hardy, and Pendleton are intersected by parallel ridges and valleys of the Alleghany range; the Branch mountain range extends in a similar direction, and the North mountain forms the eastern boundary of Hardy county.

Pendleton, the most southerly of these counties, is very mountainous, has a mean elevation of 2,000 feet above the sea level. North mountain is on its southeastern boundary, and Jackson mountain intersects it. The north and south forks of the south branch of the Potomac, and the south branch itself, drain this county, and afford some fine alluvial soil for corn and wheat and the most luxuriant pasturage. The mountains are covered with the densest timber.

Besides the north and south branches, this section is drained by the Cacapon and the Lost river. The Opequon forms the southeastern boundary of Berkeley county. Lost river is one of the wonders of nature. After coursing through a fertile valley for twenty-five miles, it breaks through the Lost River mountain and bursts the barriers of Timber ridge, and then encounters a new obstacle in Sandy ridge, which it passes by a curious piece of fluvial strategy, mining its way among the loose rocks of the underlying strata, but loses itself in its subterranean meanderings of three miles, coming to the light again rather in the capacity of strong springs, than as the powerful current of a river which has lost its way, to become anew the sources of a considerable stream—the Cacapon.

Ice mountain, in Hampshire, 26 miles northwest from Winchester, is another natural curiosity worthy of mention. At the western base of the mountain, which is here some 700 feet high and very precipitous, is an area of 100 yards in length, and a breadth of 30 feet up the mountain side, covered with loose rocks, under which, at all seasons of the year, blocks of ice of several pounds weight may be found. Snakes passing over the rocks stiffen and die, and flies perish in the same way Butter or fresh meats are preserved here almost indefinitely. At the base of this bed of ice flows forth a spring of intensely cold water; and yet these rocks are exposed to the rays of the sun after 9 o'clock in the morning.

The hanging rocks near Romney, 400 feet high, are notable curiosities.

In Morgan county, two and a half miles from St. John's run, on the Baltimore and Ohio railroad, and thirty-six miles from Winchester, are the Berkeley Mineral springs, much frequented, as they have been since the days of 1777 when Generals Washington and Gates, and Charles Carroll, of Carrollton attested their virtues, and built cottages there for summer residence. Twelve hundred gallons per minute are said to flow through the bath-rooms of the present establishment. The baths are much celebrated from their character and quantity and agreeable temperature, (74°,) and the scenery around is highly picturesque. The Maryland Gazette, in 1784, said of it: "In Berkeley county five bathing-houses, with adjacent dressing-rooms, are nearly completed. An assembly room and theatre are also constructed for the innocent and rational amusements of the polite who assemble there." Near these springs is a fountain of chalybeate waters, which stimulate like strong tea.

In Hampshire county are the medicinal waters known to travellers as the Capon springs, four miles from the Cacapon river, on the west side of the North mountain. The Shannondale springs, near the Shenandoah river, a few miles above Harper's Ferry, have been celebrated for their efficacy in scorbutic affections. Several ebbing and flowing springs exist in this region, and a subterranean river, an affluent of the Shenandoah, is said to furnish a winter resort for millions of the finny tribe, multitudes being caught in fall and spring as they enter and return.

The valley is mainly of a limestone formation, with some sandstone and patches of red and black slate. The Opequon runs through a narrow strip of slate soil, of inferior fertility to the fine limestone region on either side of it, in Jefferson and Berkeley. These counties, it has been said, "contain a greater portion of fertile lands than any other section of the State." The surface of the mouth of the valley between the Blue Ridge and Little North mountain was originally a broad rolling prairie, with fringes of timber on water-courses. Some portions of this district towards the mountains contain a proportion of what is termed "liver soil" by the farmers, productive in wheat and grasses. The South Branch valley has a soil noted for its fertility, its superior wheat, and the perennial freshness and succulence of its summer verdure. The markets of Baltimore and Washington and the stock-dealers of Maryland and Virginia attest the fatness and the flavor of stock reared and fattened in this mountain valley.

The valley lands of this section, in various locations and states of improvement, have commanded from $30 to $150 per acre; highlands under cultivation, from $5 to $50; wild lands, from 25 cents to $10 per acre. The highlands are in high esteem as sheep farms, and have contributed much in this branch of husbandry to the wealth of this region.

Table of farm lands and farm stock in the valley counties in 1860.

Counties.	Acres of improved lands.	Acres of unimproved lands.	Price per acre.	Value of farms.	Value of farm implements.	Number of sheep.	Value of live stock.
Jefferson	85,735	24,348	$51 84	$5,652,143	$119,176	7,269	$466,168
Berkeley	90,892	41,231	26 84	3,547,566	79,976	7,057	335,757
Morgan	27,147	48,116	6 37	479,987	27,931	2,992	111,439
Hampshire	172,690	376,640	7 18	3,947,900	166,316	21,287	763,454
Hardy	85,564	200,927	9 00	2,579,581	57,753	11,378	453,768
Pendleton	81,184	220,642	5 32	1,606,532	47,838	14,143	371,228
	543,212	911,904	12 24	17,813,709	498,990	64,126	2,501,814

Table of farm products.

Counties.	Bushels of wheat.	Bushels of rye.	Bushels of oats.	Bushels of Indian corn.	Tons of hay.	Pounds of butter.	Value of slaughtered animals.
Jefferson	422,514	15,198	54,798	358,267	6,259	131,684	$110,221
Berkeley	237,576	18,672	76,176	275,525	8,031	160,069	93,555
Morgan	19,404	16,082	10,122	47,575	1,576	61,152	21,325
Hampshire	106,310	75,257	49,259	375,090	11,366	239,360	109,834
Hardy	39,946	28,043	20,200	286,618	4,688	102,603	71,698
Pendleton	11,475	11,927	16,516	122,997	4,165	101,838	45,319
/	837,235	165,179	227,071	1,466,072	36,085	796,706	451,952

This exhibit indicates what may be done for West Virginia by immigration, facilities for intercommunication, and development of her resources of forest, soil, minerals, and water-power. A portion of this territory is more precipitous and rough than the country west of the mountains; very little is richer in soil than the arable lands of the State generally; and yet the whole tract, to the summit of the Alleghanies, is valued at $12 24 per acre. Jefferson county, with an average of $51 34 per acre for farming lands, almost double the average for the State of Ohio, illustrates well the market value of a central position, contiguous to great markets, over the richest prairies thousands of miles away.

With two and a half millions of dollars in live stock, nearly half a million dollars yearly in butchers' meat, almost a million pounds of butter, three millions of bushels of grain of all sorts, little less than two hundred thousand pounds of wool, and other wealth of the farm in like proportion, in six small counties, let it not be said that West Virginia is a poor locality in which to find a rural home.

THE MOUNTAINS.

The mountain section proper has an elevation from 1,300 to 2,500 feet above the sea level, including Preston, Tucker, Randolph, Hardy, Pendleton, Pocahontas, Greenbrier, and Monroe counties. Those north of Greenbrier and west of the summit of the main ridge may appropriately be considered together. They are covered with heavy timber, with isolated patches of improved lands, including but 226,632 acres in the four counties. Springs are abundant, though comparatively scanty in summer, and fall abruptly over precipitous ledges near their sources, and expand into quiet rivers, with occasional rapids in the lower valleys, forming valuable mill seats.

The soil is excellent for grasses, much of it containing a good admixture of clay. With indifferent culture it produces from thirty to fifty bushels per acre of corn; in some cases a much larger yield. Wheat usually gives fifteen to twenty bushels. But the greatest value exists beneath the soil, in iron and bituminous coal, and other minerals.

High among the western ridges of the Alleghanies, south of the Cheat mountains, and between the Alleghanian backbone on one side and the Black and Droop mountains on the other, lies Pocahontas county, 76 miles in length by 17 to 20 in breadth. The mountain springs of this elevated region contribute to swell the waters of the James, Potomac, Mengetia, Elk, and New rivers, while the Greenbrier flows through the entire length of the county, at certain points through a beautiful valley.

In their rough mountain heights, remote from railroads and navigable rivers, dwell 3,958 hardy mountaineers, occupying 828,921 acres in farms, (less than ten per cent. improved,) worth $2,051,780. Sheep husbandry flourishes here, (numbering 10,338 animals, producing 23,041 pounds of wool,) and cattle abound. The total value of live stock is $328,002. The production of 121,310 pounds of butter and 6,225 pounds of cheese, in addition to liberal supplies of milk for prolific households, indicates no mean capacity for dairying. Of Indian corn the product is 48,229 bushels; rye, 10,778 bushels; wheat, 8,933 bushels; flax fibre for the supply of the old spinning wheels, 1,684 pounds; and of home-made sweets, 65,725 pounds maple sugar, 2,559 gallons molasses, and 866 pounds of honey. The value of their animals slaughtered is $41,554; of their home manufactures, $14,846. These few figures are given merely to show that the Alleghany mountain tops, among the most remote and inaccessible portions of West Virginia, may and do contain the homes of comfort and plenty, and sturdy independence.

The mineral resources of Pocahontas are valuable. Iron ore is found, said to produce 83 per cent. of pure metal; and lead, copper, and silver exist. Coal crops out along the ranges of mountains on the western boundary, which is the eastern border of the great coal basin.

The heavy and valuable timber of this region, and abundant water-power everywhere at hand, will at some time combine to add materially to the wealth of this mountain region.

Randolph is the next county north, upon the western declivity of the Alleghanies. It is still large, though its former proportions are much reduced, having now, in farms, 48,249 acres improved, and 278,083 unimproved, with a population a little less than five thousand. It has, of course, immense tracts of wild lands not included in farms. The soil is productive in grasses, and the few patches in cultivation support 8,103 cattle and 7,565 sheep. The live stock is valued at $244,857. Of maize there is produced 55,225 bushels, 20,248 bushels of oats, besides wheat, rye, potatoes, &c.; of maple sugar, 43,692 pounds, and 1,351 gallons molasses, and 1,370 pounds of honey.

The headwaters of the Cheat and Tygart's Valley rivers drain this county The valleys produce good wheat and corn, and the mountains make fine pasturage to their summits when denuded of their heavy timber. Coal, iron, and limestone are abundant, and other minerals exist.

Tucker county lies between Randolph and Preston, south of the Baltimore and Ohio railroad; has a small area, containing farm lands, 11,101 acres improved and 43.559 unimproved, with but 448 houses, and producing 19,955 bushels of corn, 6,049 of oats, 4,346 of potatoes, (and even a few sweet potatoes,) 2,483 pounds of honey, and other products in proportion.

Preston, the most northern of these mountain counties, wild and comparatively inaccessible as it is, and undeveloped in its vast mineral resources, still shows, from slight beginnings of improvement made in the last few years and the recent opening of railroad communication through its borders, what comfort and beauty and wealth will one day be added, by labor and skill and enterprise, to the wild attractions of these highlands. Let the reader compare the facts of its progress and production with the exhibit made by other mountain counties equally favored by nature.

The population is 13,312. It has 92,663 of improved land in farms, and 195,351 acres of unimproved, worth $2,257,314—nearly eight dollars per acre. Its flocks number 19,084 sheep; cattle, 11,430; horses and mules, 3,367; animals slaughtered yearly, $80,407; wool, 47,493 pounds; butter, 340,988 pounds; cheese, 9,142 pounds; and value of live stock, $461,133. With all these twenty-three thousand domestic animals, so mild is the winter of these mountain valleys that but 5,308 tons of hay are cut, and 104,317 bushels of oats harvested. Of corn there is produced 71,063 bushels; wheat, 8,933 bushels; rye, 10,778 bushels; potatoes, 44,655 bushels; and buckwheat, 95,357 bushels. Flax is grown to the extent of 5,355 pounds of lint; maple sugar, 16,723 pounds; honey, 15,474 pounds; maple molasses, 1,721 gallons; and (strange as it may seem for mountain regions) sorghum sirup, 539 gallons.

With abundant water power, there is as yet little manufacturing done. There are four small woollen factories, several shops for the manufacture of "shooks," (stuff for barrel staves,) tanneries, &c.

The following extract from correspondence of the department is furnished by H. Hagans, of Brandonville, in Preston county:

"Preston county, geographically, lies in the right angle formed by the Maryland and Pennsylvania lines, and is several miles west of the main Alleghany range, though east of, and bounded on the west by, Laurel hill, the most western member of the great Apalachian chain. The county has an average width, from east to west, of twenty miles, and is traversed by Cheat river from its south end north some twenty miles to the mouth of Muddy creek, within fifteen miles of the Pennsylvania line, where it deflects to the northwest, forcing its way through lofty hills, and Laurel hill itself, and debouches into the Monongahela just within the limits of Pennsylvania. Sandy creek, rising in Pennsylvania, east of Laurel hill, takes a southerly course, and joins Cheat river before that stream passes through the mountain. Thus, Preston county is chiefly included in a basin, bounded on the west by Laurel hill, and by a coterminous range on the east, called Briery mountain, which mountain, however, runs several miles west of, and nearly laterally with, the Maryland line, and the space between the said line and mountain is occupied chiefly by a part of the region called the 'Yough Glades.'

"Although our county lies principally in a basin, it is for more than two-thirds of its length, from north to south, geologically more elevated than the mountains on either side, which is shown by the eastern declination of the great limestone vein which crops out on the west, at the crest of Laurel hill, and the western declination of the same stratum cropping out at the crest of Briery mountain on the east, other rocks and minerals conforming substantially thereto. A fine illustration and proof of this fact is afforded where Cheat river cuts its way through Laurel hill. In the centre of this rugged passway, this great calcareous stratum is seen eight hundred feet above the troubled river, and, travelling up the struggling stream, it declines eastward at the rate of about two and a half degrees, and at a short distance below the mouth of Muddy creek, where the river has made its course northwest, the limestone plunges under the river bed, and is seen no more until it rises and makes its eastern out-crop, as above stated. Above this great limestone seam are found nearly all our minerals—that is to say, a six, a four, an eight feet, and some minor seams of bituminous coal, all of which, however, vary in thickness, as well as in quality, in different localities. In the southern section of the county, and especially at Tunnelton and Newburg, on the Baltimore and Ohio railroad, and its vicinity, has our mineral coal wealth been most developed, as well as its superior quality, yielding, as is proved by analysis, about 10,000 cubic feet of gas per ton of 2,240 pounds. The seams worked at these localities are from six to eleven feet in thickness, and the same are found to range through all those neighborhoods.

"Our whole county is underlaid by these bituminous seams, though in most parts eight feet is the heaviest vein that has yet been developed. Cannel coal has also been found, and manufactured to some extent into oil.

"Interspersed with our coal measures are corresponding veins of iron ore, of nearly all the varieties and forms of the hematite class found in the Alleghany range. These ores are diffused, more or less, through every farm in the county, and are found in many localities in strata, pure or intermingled, ranging from one to four feet in thickness, and yielding about thirty-three per cent. iron. But little attention has been hitherto bestowed upon this great and indispensable element of our wealth. The see-saw policy that has resulted from the prevalence of antagonistic parties has at one time encouraged, and at another discouraged, enterprise in the manufacture of iron, and finally ruined thousands who had engaged in it. These are among the reasons why our rich iron ores have not been better developed and turned into the great channels of commerce. I believe but four blast furnaces have ever been built in the county. Two of them, many years since, near the northern section, and distant from water transportation, have fallen into dilapidation. Two others have been erected about eight years, and are now in successful operation—one near Independence, on the Baltimore and Ohio railroad, with hot blast, producing some seventy tons per week; the other on Muddy creek, near Cheat river, cold blast, capable of producing forty to fifty tons per week. These are moderate sized half-stacks, supplied with inexhaustible beds of rich ores, and all the elements for the manufacture of iron, in close proximity. Though on a small scale, these two furnaces prove the richness of our ores, as the ore at Muddy creek produces one ton of good foundry iron from two tons of roasted ore, and I believe the other yields nearly the same. Such establishments, and more extensive ones, might be multiplied indefinitely through the county. I have no doubt that there are some locations in other parts of our great country more favored with means of transportation or proximity to a ready market than is this, but such fortunate places are generally occupied, while we have abundance of the best elements of iron yet inviting the hand of industry and enterprise.

"Of timber we have all the varieties common to our latitude and altitude, but the different kinds of oak, of the finest quality, predominate. Pines are rare, and spruce and hemlock are seldom met with, except near the 'Glades,' or on the borders of our small mountain streams. No country can furnish superior wild cherry, and walnut and butternut abound on our alluvial and richer soils. The magnificent flowering poplar is found in great abundance on our better class of soils, surpassing all our forest trees in magnitude, and is in great request for lumber. We have, also, hickory, ash, sugar maple, and the minor species of timber in ordinary and sufficient supply.

"Our soils run through every grade of fertility, from the argillaceous to the silicious, but a generous loam, with a substratum of clay, slate, or sandstone, predominates. A light stratum of limestone is found near the surface in most sections of the county, varying in thickness from one and a half to four feet; but the great vein before spoken of ranges from forty to sixty feet in thickness, and is of superior quality. Our river bottoms, though limited in extent, are very fertile, which, with much of our higher lands, especially in the central and southern portions of the county, are well adapted to the growth of Indian corn, while every part at all susceptible of cultivation would produce abundantly all the cereals and lighter grains, if treated with fair and liberal cultivation. Even with our present wretched system of culture our soils yield remunerative crops. Our agriculture has been slightly improved within the few past years, but it is still miserable and exhaustive. But ours is pre-eminently a grazing country, and already much success has rewarded those who have engaged in it. Dairies are springing up and yielding large returns. Sheep husbandry has already enlisted the attention of very many of our citizens, and, although in its infancy, it is probably the most remunerative pursuit of our people. This element of our wealth will undoubtedly, at no distant day, stand pre-eminently above all others, our minerals excepted."

THE "PANHANDLE."

The little point upon the northwestern boundary, entering as a wedge between the Keystone and Buckeye States, is regarded with careless wonder by casual map observers, who cannot account for so strange a freak in surveying, yet it is easily accounted for when it is recollected that Virginia once owned the territory west of Pennsylvania and north of the Ohio river, and that that river became the line between Virginia and Ohio, leaving the four small counties, Marshall, Ohio, Brooke, and Hancock, between Pennsylvania and Ohio. They comprise little more than the area of an average county, and contain 169,626 acres of improved land, and 111,513 unimproved, or 281,139 in farm lands, valued at

$9,088,077, or $32 14 per acre. Marshall, the largest, averages $20 46; Ohio, $44 17; Brooke, $44 11; and Hancock, $34 12.

From these figures it may be seen that this region, so broken and irregular in surface by the upheaval which the forces of nature have wrought in the lapse of ages, may become, through the agency of intelligent and persistent labor, a blooming and fruitful garden.

Marshall county, named in honor of Chief Justice Marshall, has a river front of thirty miles, and an eastern border of twenty miles on the Pennsylvania line. With the Ohio bottoms, and those upon small local tributaries, Fishing and Grave creeks, the county has a fair share of alluvial soil, much of which is very productive, yielding 80 to 100 bushels of corn under judicious and careful culture. It was here that William Alexander, a few years since, produced 288 bushels of corn upon two acres, for which he received a premium. One field, to which the attention of the writer has been directed, has been in cultivation in corn for sixty consecutive years, without manuring, and the yield has been reduced to twenty bushels by the gradual depletion of the soil. One of the old-line farmers here gives as the accustomed system of husbandry a twenty-one years' course, namely, twenty years in corn, and a *rest* of one year in wheat, to be followed by twenty years in corn again.

The uplands, which are slopes of hills and small valleys, with comparatively little of level land, are generally rich, as is indicated by an abundant production of cereals and grasses, and exports of stock, corn, wheat, and fruit, especially apples. Good crops of potatoes are usually secured, variable in quality, with soil, season, and culture, from 50 bushels upwards, a yield of 800 bushels per acre having been known, and even 1,000 bushels of the large reds.

Excellent crops of wheat are usually obtained. Hon. James Burley has more than once secured 40 bushels per acre, and others have had similar success, while the usual average is about the same as for the State of Ohio, scarcely more than a third of that quantity. Oats and barley do very well, and good meadows produce from two to three tons of dry hay per acre.

Farmers formerly threw their manure into the river; they are now learning something of its value, and are beginning to husband carefully their resources of fertilization. As a means of enhancing fertility, the value of sheep is beginning to be appreciated. An instance may be given of an old field grown up in briers, which, with no other manure than the droppings of sheep, aided a little by the folding of mules, gave a return of 100 bushels of corn per acre.

This county forms the junction of the "Panhandle" with the great Virginian pan itself, and partakes largely of its characteristics, a diversified surface, slopes sometimes gentle and sometimes abrupt, alluvial formations in valleys, and a soil of more than average general fertility, whether in valley or upland.

Ohio county, in which Wheeling is situated, is in a high state of cultivation, supporting, from 37,487 acres of improved land, amounting to less than two townships of the government surveys, 1,441 horses and mules, 1,408 milch cows, 246 working cattle, 1,380 other cattle, 40,050 sheep, 3,244 swine, worth altogether, $253,090; and producing 20,048 bushels of wheat, 5,639 of rye, 138,430 of corn, 82,101 of oats, 22,072 of barley, 4,372 of buckwheat, 21,449 of Irish potatoes, 823 of sweet potatoes, 128,448 pounds of butter, 102,032 pounds of wool, 6,479 tons of hay, besides the value of $14,420 in garden products, $10,174 in fruits, $26,930 in slaughtered animals, and a variety of other productions.

The vine has been cultivated with uniform and very gratifying success in the vicinity of Wheeling, both on the hill slopes, at the top or near the bottom, and also on the islands of the river. Low lands, especially islands, have been avoided in other localities as sites for vineyards, but a look at the islands of this vicinity will suffice to solve the mystery of their adaptedness. If subject to overflow, it is only at rare intervals of winter or spring floods, the water soon subsiding, and settling through the gravelly substratum with a rapidity almost coincident with the subsidence of the river itself. If the vine were potted by a skilful gardener, the drainage would scarcely be superior. In such a soil a great expense for trenching is an entirely unnecessary part of the labor of preparing ground for a vineyard. The island at Wheeling, known as Zane's island, and owned by descendants of the original owner and pioneer of that name, has a large vineyard, which gives annually a yield greater than the average yield of American vineyards. When new vines are added, the ground is broken thoroughly sixteen inches deep, with three horses, then furrowed, and holes dug one foot deep in the furrows for the reception of the vines. C. L. Zane, one of the proprietors, claims an average product of 500 gallons of wine per acre.

A fine vineyard of J. B. Ford and others, a few miles below Wheeling, on the breast of one of those heavy slopes, is a good illustration of the capabilities of the bluff lands for grapes. Being covered with a heavy forest growth, the expense of starting the vineyard was much higher than it otherwise would have been. The timber felled, and the stumps dug out, a furrow of twenty inches deep was cut with a mammoth plough, and the roots so effectually eradicated that no sprouts have ever appeared. The soil was a clayey loam, with an admixture of shale. The vineyard comprises 14½ acres, and with enclosures and building improvements cost about $500 per acre exclusive of the land, which overlies a coal mine. The product of the fourth year from planting was 2,000 gallons of wine, mainly Catawba; the fifth year (1863) yielded 4,000 gallons, or nearly three hundred per acre.

Few localities in the country can claim so large and sure results of vine culture during ten years past as are shown in this county. It is an interest rapidly growing here, and evidently destined to continue in prosperity.

Other fruits succeed here admirably. Among pears, the Bartlett, Seckel, and Duchess d'Angouleme seem to be favorites, and some, when asked to name six most desirable varieties, would duplicate the three already given. The Winter Nelis gives high satisfaction as a winter pear.

The favorite apples are the Yellow Bellflower, Rambo, Putnam, Russet, Rome Beauty, and Northern Spy. The Rambo is the most productive on the bottom lands. For early marketing, the Yellow June-eating is highly regarded, being a heavy bearer every year.

The fertility of the soil is plainly shown by the size of forest trees, and the rapidity of their growth. The writer has noticed in the grounds of L. Lunsford, a tree twelve years old, which is twenty-two inches in diameter. From the ashes of log heaps spring up locusts with great rapidity. A sedate and truthful man alleges that they have been known to grow to the height of one foot before the log heap had done burning. An opening in the woods, with the least exposure of the surface to the sun, is immediately covered with a carpet of green. Vegetation is everywhere luxuriant as the farmer could desire.

Brooke county lands are of equal fertility and value, and show a similar range of products, with a larger yield of wool, corn, and wheat, and a greater value of live stock and slaughtered animals.

Of the peculiar adaptation of the mountain slopes and valleys of Virginia to sheep husbandry, there is abundant evidence. Where circumstances have favored population, this interest, by inevitable gravitation, has settled down into a permanent and prominent place in farm industry. The "Panhandle" furnishes a notable illustration:

Counties.	Farm lands.	No. of sheep.	Lbs. wool.
	Acres.		
Hancock	49,132	21,402	60,214
Brooke	55,488	40,620	112,774
Ohio	54,840	40,050	102,032
Marshall	121,679	10,022	27,385
Total	281,139	112,094	302,405

The area of a county of average size, little more than five hundred square miles, with 281,139 acres in farm lands, supports 112,094 sheep—one for every three acres of the entire tract, inclusive of wild or waste lands; one for every two and a half acres of the actual farming lands; and in the three counties above Wheeling, one for every acre and a half. In fact, for 110,490 acres of improved land in Hancock, Brooke, and Ohio, those counties have 102,072 sheep—almost an acre to each sheep, rivalling England itself in numbers compared with area, and far distancing Ohio, whose productive acres are more populous with sheep than any State in the Union, having eight acres to each sheep in 1860, with a great increase since.

This would look like giving up pasture and field to sheep, and leaving no place for cattle or grain; but, no—there is undoubtedly more of these products than if the sheep were absent, the flocks of the farm adding more to its fertility than they subtract from it. The following table shows that sheep husbandry tends to no diminution in price of lands, or extent or variety of farm products:

Counties.	Value of farms.	Price per acre.	Value of live stock.	Bushels of wheat.	Bushels of Ind. corn.
Hancock	$1,676,745	$34 12	$182,746	16,423	61,346
Brooke	2,447,903	44 11	282,439	23,490	142,122
Ohio	2,423,520	44 17	253,090	20,048	138,430
Marshall	2,489,909	20 46	280,860	74,759	241,911
Total	9,038,077	32 14	999,135	134,720	583,809

It is a curious fact, that lands of Brooke and Ohio (one with a large city, the other having no towns) are almost precisely alike in price, in exact proportion to the number of sheep kept; while those of Hancock, with flocks 40 per cent. less numerous, lose ten dollars per acre in value; and those of Marshall, with one-fourth the number of sheep in twice the area, have less than half the value, or twenty dollars per acre.

It cannot be said here that sparseness of population accounts for diminished values and products. Hancock has a population of 4,445, and Marshall of 12,997, giving a slight advantage to Marshall; Brooke has 5,494, and Ohio 22,422; yet the price of their lands is the same. It would seem that the population of Wheeling have less influence than the flocks of the neighboring farms in raising the price of the lands of the county!

The mountain regions are unexcelled as sheep walks, and are beginning to be improved as such. Preston has 19,084, Monroe 12,288, Greenbrier 16,067, Pendleton 14,143. The whole State is waking up to the fact of its peculiar adaptation to this business. Yet it is only a beginning that has been made. The number of sheep already there (453,334 in 1860) is but a moiety of the number that will at some time contribute their triple munificence of fertilization to the soil, and food and raiment to the people, to bless this new Alleghanian State.

THE RIVER COUNTIES.

The river counties, excepting those of the "Panhandle," and those south of the Kanawha, are Wetzel, Tyler, Pleasants, Wood, and Jackson. They contain a great variety of soil, from light silicious to deep alluvial of the river bottoms, with hill-tops of decomposed shales in a large admixture of humus, and slopes with a sufficiency of lime and clay for certain and heavy crops of cereals. Some of the bottoms have a sandy, others a clayey subsoil. In some localities the uplands along the Ohio river have a sandy loam, admirably adapted to fruit and market-garden culture, seemingly quite light, but of a fine and silty texture, richly intermixed with vegetable mould. It is a quick soil, and highly productive, and is easily worked, but free, becoming exhausted rapidly, yet easily kept "in heart" by annual dressings of manure, green manuring, or other modes of fertilization. It is a soil that richly repays the labor of the skilful and industrious husbandman. There is a fine body of such soil in Wood county, above Parkersburg.

The counties of Tyler and Wetzel have a small proportion of bottom lands, except upon the Ohio river. The streams are small and unimportant. The hill lands, as yet brought into cultivation to a very limited extent, are productive, and a very small per-centage of worthless or waste land exists.

Unlike the "Panhandle," this section has a much larger amount of unimproved than improved farm lands. In Wetzel the acres of each stand relatively: 124,821 to 31,332; in Tyler, 39,794 to 97,922; in Pleasants, 15,809 to 36,798; in Wood, 46,199 to 94,229; in Jackson, 36,457 to 102,881. This difference in improvement, with perhaps a little difference in quality, occasions a great diminution of the average value, as is shown by the following table of values and products:

Counties.	Value of farms.	Av. price per acre.	Bushels of wheat.	Bushels of corn.	Pounds of tobacco.
Wetzel	$1,176,511	$7 53	31,652	180,150	84,989
Tyler	1,500,003	10 89	43,729	182,239	11,225
Pleasants	649,220	12 36	22,785	102,172	27,930
Wood	1,673,864	11 92	27,488	115,046	166,365
Jackson	1,355,201	9 72	88,338	219,377	74,691
Total	6,354,799	10 14	213,992	798,984	365,200

Considering the proportion of unoccupied lands, the proximity to the Ohio river, and the sparseness of population, this section must speedily receive the benefit of progressive and high development, and its land owners the advantage of corresponding enhancement of prices. It is a successful tobacco region, producing (in 1860) 365,000 pounds of tobacco. Nor has the troubled state of the country prevented its culture during the war, as is shown by the fact that the tax on what has been manufactured in Parkersburg during thirteen months amounts to $15,881.

An examination of the census returns shows a good variety of products, and a yield indicating a quick and fertile soil. In noting the quantity, it should be remembered that the population of the five counties is but 35,517, divided as follows: Wetzel, 6,703; Tyler, 6,517; Pleasants, 2,945; Wood, 11,046, and Jackson, 8,306. Comparatively a wilderness, it is one which flows with milk and honey, yielding 409,050 pounds of butter after feeding the population, and giving 16,077 pounds of honey, in addition to 44,266 gallons of sorghum sirup. A profitable trade in fruit, principally apples, is carried on by means of the river—a trade which has extended even to New Orleans, a distance of eighteen hundred miles, and which has been conducted with scarcely more expense than for one hundred miles by railroad. Nor has live stock been neglected. A fair proportion of sheep and wool have been produced, and horned cattle are profitably grown and fattened. A few of these products are given in the following table:

Counties.	Gallons of sorghum.	Pounds of honey.	Pounds of butter.	Bushels of potatoes.	Products of orchards.	Value of slaughtered animals.
Wetzel	6,270	5,507	124,342	14,430	$7,510	$28,182
Tyler	11,900	6,014	130,527	23,733	11,997	35,150
Pleasants	4,514	1,711	30,500	7,747	5,868	15,284
Wood	7,266	690	12,175	33,166	2,460	51,682
Jackson	14,316	2,155	111,506	32,630	9,281	40,260
Total	44,266	16,077	409,050	111,706	37,116	170,558

The price of lands in this section varies wonderfully with the state of improvement, fertility, and accessibility. Farms on the Ohio river, mostly improved, with timber for fuel skirting the adjacent hills, an orchard in bearing, and comfortable farm buildings, command from fifty to one hundred dollars per acre. The upland, nearly all susceptible of cultivation, with a surface undulating, rolling, or hilly, in some places with ridges marking a very sharp outline, if brought under good cultivation, in favorable localities, brings twenty-five or thirty dollars per acre. Less improved, further from railroad or river, or rougher or poorer, can be bought for ten and fifteen, and some even for five dollars.

The Ohio bottom lands produce corn, as do the best prairie and bottom lands in the country, more according to culture than to difference in quality, at the rate of fifty to one hundred bushels per acre. The average of wheat, which is grown on the hills, more generally in loam than upon aluminous soils, among stumps and roots, and sometimes rocks, and greatly exposed to the raids of innumerable inhabitants of adjacent forests, is about the same as in Ohio, perhaps fourteen bushels per acre, while occasional fields produce two or three times that amount.

Wood county has a great variety of soils. The northern portion is a sandy loam, productive, excellent for fruit and vegetables, easily kept in condition with light dressings of manure and judicious culture. On the Little Kanawha the soil is pretty stiff with clay, and in the southern portion of the county a limestone soil is found. A fair crop of corn here is about fifty bushels per acre.

The surface of Jackson county is rolling. Many of the hills have a limestone soil; some localities are characterized by heavy clay. Some of the bottom lands are clay, and others alluvion based on sand or gravel.

A considerable trade in grain has been carried on with New Orleans; and apples have been a source of revenue in the same trade, the Roxbury, Golden Russet, and Yellow Bellflower being favorites, and producing abundantly. Tobacco is a lucrative crop here. The soil is well adapted to the growth of a superior quality. Corn and grass are the principal crops. There is a tendency to a greater prominence in sheep husbandry. Five hundred sheep have recently been introduced from Brooke county, notwithstanding the unsettled state of the country, and the exposure to loss from guerillas. A beginning has been made in grape-growing, which promises to be successful.

THE KANAWHA VALLEY.

There are few localities promising more attractions to industrial enterprise, or higher rewards to free labor, than the Kanawha valley of West Virginia. Climate, soil, timber, fuel, (wood above and coal below,) minerals in variety, water power, navigation two thousand miles to the Gulf of Mexico, and to all the tributaries of the Mississippi, conspire to render this valley, even now animated with the earlier sights and sounds of developing industries, the future home of mechanic skill and intelligent labor, and consequent refinement, wealth, contentment, virtue, and happiness.

Its climate is mild and agreeable, with heat less intense in summer than at Washington or Baltimore, and a winter temperature comparing favorably in mildness with that of Louisville and St. Louis.

The distribution of rain through the different seasons is remarkably uniform, being not far from eight inches rain-fall in each of the seasons—spring, summer, and autumn—and scarcely more than ten during the winter, or about thirty-six inches for the year.

The centre of the lower valley, or basin of the Great Kanawha, is in latitude 38°. The extreme length of the river is about four hundred miles. It rises in Ashe county, in North Carolina, and traverses or forms the boundary of six counties in Virginia and eight counties in West Virginia, viz: Mercer, Monroe, Greenbrier, Raleigh, Fayette, Kanawha, Putnam, and Mason. It first flows between the Blue Ridge and Iron Mountain, and in the northern part of Grayson county, Virginia, it bursts the barriers of the Iron Mountain and continues in a northeastern direction through Carroll, Wythe, and Pulaski counties, where it turns abruptly to the northwest, winding through several ridges of the Alleghanies, as if instinctively seeking association with the future of "*la belle riviere*," Ohio, and the great "Father of Waters." After crossing the Greenbrier range, and passing through Fayette county, West Virginia, it receives the Gauley river from the right, spreads into a broad expanse of five hundred yards, and assumes the dignity of the Great Kanawha. Right here, two miles below the junction, and more than a hundred miles from the Ohio, the stream is precipitated twenty-two feet over a ledge of rocks, with a total descent of fifty feet, including rapids and perpendicular falls, placing a limit to steamboat navigation, and also furnishing one of the best water powers in the world.

The area drained by this noble river is stated to be more than ten thousand square miles—a territory a little larger than the State of Massachusetts.

Kanawha, the first of the three counties below the falls, has an area of 1,176 square miles, beautifully diversified with mountains, hills, and fertile valleys, the highlands inexhaustible with coal, and the valleys salt, with abundant saline springs. This area is intersected by the Elk, Coal, and Pocotalico rivers, which afford enlarged facilities for manufacturing and transportation of the mineral treasures beneath the soil, the products of its cultivation, and the timber which towers above it. Its population was nearly 16,150 in 1860, and its assessed valuation about three and a half millions.

The river empties into the Ohio at Point Pleasant, above Gallipolis, Ohio. The four lower counties of the valley, immediately connected with the river, have a population of nearly forty thousand, of whom little more than three thousand were slaves in 1860.

The counties of the Kanawha valley exhibited a population, in 1860. as follows:

Counties.	Whites.	Inc. of free pop'ln since 1850.	Slaves.	Agg. population.
Mercer	6,428	2,410	362	6,819
Monroe	9,536	464	1,114	10,757
Greenbrier	10,500	1,950	1,525	12,211
Raleigh	3,291	1,562	57	3,367
Fayette	5,716	1,936	271	5,997
Kanawha	13,785	1,786	2,184	16,150
Putnam	5,708	1,015	580	6,301
Mason*	8,750	....	376	9,173
Total	63,714	11,034	6,469	70,775

The following is a statement of the agricultural statistics of the Kanawha valley of West Virginia, comprising the above eight counties:

Area in square miles	4,746
Acres of improved land	426,235
Acres of unimproved land	1,352,802
Acres of unassessed or waste lands	1,256,403
Value of farms	$16,093,679
Average value of farm lands per acre	$9 03
Value of farm implements	$334,455
Number of horses	14,220
Number of cattle	55,588
Number of sheep	65,589
Number of swine	70,350
Value of live stock	$2,303,280
Bushels of wheat	476,286
Bushels of rye	33,852
Bushels of buckwheat	30,659
Bushels of Indian corn	1,487,828
Bushels of oats	335,556
Pounds of flax	26,866
Pounds of tobacco	1,247,365
Pounds of wool	134,416
Bushels of Irish potatoes	95,442
Bushels of sweet potatoes	12,112
Pounds of butter	658,562
Pounds of cheese	20,144
Tons of hay	19,529
Gallons of wine	478
Pounds of maple sugar	153,362
Gallons of maple molasses	14,730
Gallons of sorghum molasses	7,902
Pounds of honey	74,896
Value of orchard products	$28,404
Value of home manufactures	$139,481
Value of slaughtered animals	$477,589

* Decrease in free population, 89.

It appears from the above that scarcely half the area is included in farms and about one-seventh in actual cultivation. A great variety of products is shown, embracing almost everything cultivated in temperate latitudes. It seems liter ally a land of milk and honey, wine and oil.

The organization of West Virginia as a free State will give a great impetus to enterprise when industry resumes its wonted channels. The salt and iron, and coal, and coal oil, which exist in almost fabulous abundance, will occupy the ready capital and willing labor of tens of thousands of thriving citizens; and manufactures will flourish, and agriculture advance, and the wilderness of the past, full of floral beauty, and lavish with wild profusion as it has been, will blossom with a sweeter fragrance and a richer magnificence under the magic touches of the hand of free and intelligent labor.

With coal at forty-five cents per ton, iron in almost equal cheapness, the best of timber for the cutting and hauling, coal oil defying facilities for cooperage, abundant harvests from fertile soils, and a magnificent river to float the products of industry to a market—what a region in which to manufacture the sugar mills and reapers and other implements of western agriculture!

The Department of Agriculture, which has been interested in witnessing and fostering the spirit of improvement now springing into activity in this valley, has received gratifying assurances of promised success in sorghum and in cotton and other prominent products of industry. It is a soil and climate peculiarly favorable to those products which now claim especial prominence.

A letter received at the department from a correspondent in this valley reports a prevalent absorbing interest in the development of its resources. He is interested in manufacturing, and says that nowhere in the United States can steam power be so economically obtained. So abundant is the coal, in such proximity to the factory, that it can be run into the engine-house at a cost of *forty-five* cents per ton. Of this coal there are "four seams above water level, within a vertical distance of 240 feet, giving an aggregate thickness of 17 feet, or 25,000 tons of coal to the acre, consisting of gray splint, rich bituminous, block splint, birdseye cannel, steam and smiths' coal." This is within ten miles of Charleston, on navigation.

With such mines of undeveloped wealth, above and below the soil, and in water power, and in facilities for a highly developed agriculture, what shall hinder the progress in population and wealth of this southern section of the now free and regenerated West Virginia?

Greenbrier county has been settled for eighty-three years. It occupies a depression of the Alleghany range, the mountain summits scarcely more than two thousand feet high, and the mean elevation of the arable lands of the county fifteen hundred. The soil is, much of it, strongly impregnated with lime, and consists mainly of a rich, black, friable loam. Such soils, in the southern slopes of hills and in the valley of the Greenbrier, produce abundant crops of maize, ordinarily from thirty to fifty bushels per acre, with careless culture, and seventy-five to one hundred bushels on the best locations, with skilful management. The soil and climate peculiarly adapt this region to the purposes of the grazier. If a ray of sunlight can reach a spot in the densest forest, that surface soon becomes green with the blue-grass sod. Thousands of cattle yearly depasture those mountain plains and slopes.

In Greenbrier are the famous "White Sulphur Springs," among the most renowned of all the fashionable watering places of the continent. Their waters are impregnated with carbonic and nitrogenous gases, sulphates of lime, and magnesia, and carbonates of lime, iron, iodine, and phosphorus. This whole region is interspersed with fountains of high medicinal virtues. The "Blue Sulphur" is also in Greenbrier. In the adjoining county, Monroe, are found the "Red," "Sweet," and "Salt Sulphur."

It is not alone to its mineral waters that the attraction of this region is due.

The balmy breath of spring invades the atmosphere of summer; pleasurable exhilaration tempers the sultriest of July days; the blue grass maintains its rank luxuriance through the dryest season; and scenes of rural beauty, outspread upon those elevated plains and mountain slopes, fill the eye with their unpretending magnificence. Thousands in each summer season gather here from the poisoned atmosphere of cities.

Eighty years ago Jefferson wrote of a "burning spring" as follows:

"In the low grounds of the Great Kanawha, seven miles above the mouth of the Elk river, and sixty-seven above that of the Kanawha itself, is a hole in the earth of the capacity of thirty or forty gallons, from which issues a bituminous vapor in so strong a current as to give to the sand about its orifice the motion which it has in a boiling spring. On presenting a lighted candle or torch within eighteen inches of the hole it flames up in a column of eighteen inches diameter, and of four or five feet in height, which sometimes burns out within twenty minutes, and at other times has been known to continue three days, and then has been still left burning. The flame is unsteady, of the density of that of burning spirits, and smells like burning pit coal."

This "spring," so called because it contains water after a rain, is yet in existence; the gas, still issuing to some extent, is carbureted hydrogen. It is on land entered by General Washington, one acre of which is reserved by his will for the use of the public. The flame resembles that of burning whiskey. It was sometimes turned to useful account in clothes-washing, the water boiling till evaporated, and the gas, which bubbled through small orifices in the sand, continued to burn till extinguished by wind or other agency.

Twenty years ago, or more, in boring in this vicinity to the depth of nine hundred feet for salt, similar streams of gas were struck, which poured forth a dense volume, and were employed in a salt furnace for heating purposes, being equivalent to eight hundred bushels of coal. These have ceased to flow, but two others are still used, supporting combustion in a salt furnace equal to two hundred bushels of coal.

Charles S. Richardson, of Briarport Mines, on Coal river, has experimented this season with cotton, tobacco, sorghum, and other seeds from the department, with reasonable success, under unfavorable circumstances. The tobacco, which was planted very late, and was therefore partially destroyed by frost, yielded 800 pounds per acre, of superior quality, compensating fully in price for the deficiency in quantity. The sorghum, planted when it should have been in vigorous growth, had ripened no seed when attacked by the notable frosts of early autumn, and yet 160 gallons of sirup per acre of excellent quality were made—a quantity greater than the average throughout the best sorghum districts. Besides, a miserable wooden mill was employed, with an estimated loss of 80 gallons of sirup per acre.

He produced in thirteen weeks, from the seed, well-formed specimens of the French long turnip, weighing $3\frac{3}{4}$ pounds, $10\frac{1}{2}$ inches long, and $5\frac{1}{2}$ inches in breadth.

The cotton, which came up about the middle of June, was, of course, deficient in its proper season for growth, yet yielded a few open bolls. No portion of southern Illinois or Kansas could have done better.

SOUTHERN COUNTIES.

The counties south of the Kanawha, Mercer, Raleigh, Boone, Cabell, Wayne, Logan, Wyoming, and McDowell, are isolated from markets, mountainous, covered in great part with original forests heavily timbered, well watered by the Guyandotte, Sandy, and other rivers, and exceedingly rich in iron, coal, and other minerals. The minerals will at some future day be valuable, and the soils available for the production of fruit, wool, and butcher's meat. It is intersected by mountains in continuation of the Cumberland range, and nearly all of it included in the great coal measures of the Ohio valley.

Mercer county, perched upon the slope of the Alleghanies, is drained by the New or Kanawha river and several small tributaries. Great Flat-top mountain extends along the northwest border. Excellent pasturage exists wherever forests are girdled or felled. But one-sixth of its farms are improved, yet its yearly exhibit of animals slaughtered is $58,132, and its corn amounts to 131,654 bushels, wheat 43,131 bushels, and oats 55,843 bushels.

Raleigh, with 116,945 acres in farms, has but 11,632 acres which are improved; consequently the average value is reduced to $3 54. Its cereals make a proportionally small exhibit. Quite a prominent place is given to tobacco, of which 34,827 pounds are cured. Of flax, 2,002 pounds are prepared. It is drained by the head streams of Coal river, and bounded on the east by New river, and slopes toward the northwest.

Boone county is drained by Coal and Little rivers and Laurel creek. It was named in honor of Daniel Boone, and is yet to a great extent as wild a forest as that adventurous pioneer could desire. Yet it has 15,054 improved acres, and 218,873 unimproved in farms, valued at $2 22 per acre. Its live stock is valued at $120,589; its corn yields 143,808 bushels, about ten bushels to every acre of improved land, in addition to a variety of other farm products, including hay and some pasturage, although woods and pastures are adequate to a fair support of stock in summer, and a partial supply of winter feed. A good idea of the dependence placed upon winter pasturage and corn fodder may be had from the fact that only 74 tons of hay are cured for the use of 8,994 farm animals—a surfeit of 16 pounds to each animal for the winter. This certainly does not indicate a poverty of pasturage, or extreme severity of weather or depth of snows. Again, there is produced $30,879 from slaughtered animals, about two dollars per acre for the entire area of improved lands, exclusive of forests, in addition to other farm products.

Cabell county, on the Ohio river, is intersected by the Guyandotte river, and has more improved lands than Boone; this degree of improvement, small as it is, with somewhat better facilities for transportation, makes the assessed value of farms about ten dollars per acre. It has some fertile lands; is a fine region for fruit, and already derives some revenue from orchards; grows sorghum finely, sweet potatoes, &c. This county is also very rich in minerals.

Wayne county occupies the southwest corner of the State, and is separated from Kentucky by Sandy river. The surface is much broken, well covered with valuable timber, affording some excellent soil; and the earth beneath is rich with a variety of coals, including cannel. It is here that the enterprise of Eli Thayer was inaugurated, at Ceredo, which terminated in failure from causes having no connexion with the intrinsic value of the resources there ready for development.

Logan, Wyoming, and McDowell are drained by the tributaries of the Sandy, and by the Guyandotte, and occupy the extreme south of West Virginia. This region is rough, but fertile, rich in woods and mines, scarcely available or valuable at present for want of water or other cheap transportation. It is immediately valuable, however—aside from the close proximity of rebel territory and the danger of rebel marauding—for wool-growing. Lying between the latitude of 37° and 38°, on the same parallel with the southern point of Illinois, and yet elevated above miasmatic influences—a country of genial sunshine and bracing air, of trout brooks and running streams—it is eminently a fit and healthful locality for sheep. Ample pasturage for extensive flocks is afforded in the openings of the forest, in which nutritious grasses spring up spontaneously, and grow vigorously. A commencement has been made, and this district, of eight counties, unsettled as it is, and comparatively unpeopled, had, in 1860, 36,983 sheep, producing 65,183 pounds of wool. This does not fairly exhibit the wool-producing ability of the region, as the sheep, roaming in the forests, are little cared for, and lose much of their wool upon bushes and briers when warm weather comes, and the proper shearing time is neglected or delayed. It is acknowledged by all acquainted with this section that the cost of keeping sheep here is merely nominal, and their growth and condition as favorable to profit as could be desired.

THE CENTRAL COUNTIES.

Having traversed the borders of the State, let the reader glance at the broad area embraced in the interior counties, which are drained by the Monongahela and its branches, the Little Kanawha, the Elk, and the Gauley, with numerous smaller streams, which mingle with the waters of the Ohio or the Kanawha. It is here that the prices of lands are yet reasonable; that general agriculture promises to be most remunerative; that improvement is rife; and here, too, abundance of coal and iron and coal oil is found in addition to the wealth of the surface. The capital of the State must be located here; the Baltimore and Ohio railroad cuts this section in two directions, and a road cutting the State longitudinally is already contemplated, and its commencement and completion cannot be far in the future.

The surface of this section is varied. Like most of the State it is uneven, hilly, broken, and declivitous, in different localities, with a small per-centage of level bottom lands and smaller still of level uplands. The soil is good, coming naturally into grass, and yielding all farm products well. The northern slopes of the hills contain more of humus than the southern, and produce most of the corn, while the southern slopes are stiffer and more tenacious, as though partially denuded of vegetable mould by washing, by some old-time abrasion, or other cause, and therefore suited best to wheat culture.

Some items relative to this section have been kindly furnished by J. H. Diss Debar, of St. Clara Colony, Doddridge county, commissioner of emigration for West Virginia, who has enjoyed the advantages of years of close and intelligent observation and experience. This colony is itself an illustration of the remunerative character of agricultural effort and industry expended upon these lands. In a few years a few straggling pioneers have given place to fifty thriving families; and Irish and German immigrants, with means enough to procure a plough and a single cow, have been able to stock and pay for their farms, and live in peace and plenty. The following extracts show the price and character of farm lands in this district:

"The main valleys of the west fork of Tygart's Valley river, both being branches of the Monongahela, and to some extent the valleys of both Kanawhas, contain bottom lands equal in quality, though not in breadth, to those of the Ohio, and on the former stream, in the counties of Lewis, Barbour, Upshur, Harrison, Taylor, Marion, and Monongalia, the hills in many instances rise from the valleys in more gentle slopes, and present a greater and superior arable surface than those along the Ohio river. Farms in those counties, with about one-third timbered land, range from $25 to $50 per acre, and are amply worth it.

"On the smaller valleys of tributary streams the price of farms in the above named counties, similarly proportioned as to cleared and unimproved land, vary from $15 to $25 per acre; and further towards the heads of streams, and more remote from thoroughfares, from $10 to $15 per acre.

"Many farms, chiefly hill land, but all fit for grazing and sufficiently watered, with primitive home improvements, can yet be had at from $5 to $10 per acre, with twenty to twenty-five acres in a hundred, more or less, prepared for cultivation.

"Large tracts of wild land are not found in any of the above named counties, except in Upshur and Lewis, where timbered mountains, containing some table land fit for small grains and grass, can be bought at from $2 to $4 per acre. In the other counties very little timbered land, fit in part for the plough, can be bought for less that $5 or $6 per acre, and some of it not under $10 to $12.

"The counties of Wirt, Ritchie, Doddridge, Roane, Calhoun, Gilmer, and Braxton, are not watered by streams presenting extensive bottoms, but contain very little land absolutely worthless. The surface of these counties varies from undulating or rolling to hilly, and the proportion of bottom to hill may be safely set down as from five to fifteen per cent. As a general rule, lands of the same quality are rated lower in the latter than in the first named counties, on account of their inferior state of improvement.

"Farms with about thirty per cent. cleared can be bought here for $6 to $10 per acre, according to quality or proximity to market or roads. Wild lands, in lots to suit purchasers, from $2 to $8 per acre. Lands near the Northwestern Branch railroad bring comparatively high prices, in part from the value of the timber, which is generally of superior growth and quality. Mineral lands are higher.

"A correct statement of the average amount of grain produced per acre, in any given county of the State, would not give an accurate estimate of the producing capacity of our soil, because on all recently cleared land, stumps, roots, and loose stones on the surface, and also the vermin of the adjacent forest, materially contribute to diminish the yield to be expected from the quality of the soil; while on the other hand there is a wide difference in professional skill and industry among our farmers. We have still among us a goodly number of the old hunter pioneers, or of their immediate descendants, who are content to live almost from hand to mouth, and never used any other plough but the one-horse shovel.

"The bottoms of rivers, with few exceptions, yield. under good cultivation, from fifty to one hundred bushels of corn, and an average of about twenty bushels of wheat, from twenty to thirty-five of rye and oats, one hundred and fifty to two hundred bushels patotoes, and from two to two and a half tons of timothy hay. Turnips sown on fresh cleared land, barely scarred by the shovel-plough, have been known to produce near 800 per acre. Tobacco, on new-made land, also proves to be very remunerative, and certainly grows most luxuriantly, though I have not at hand any figures under this head to show cash results.

"Hillside lands of the same quality of those bottoms, except in depth, must naturally yield less on account of their unadaptedness to the same thorough cultivation, and also because of the diminished number of plants growing on declivities, yet a great portion of those lands, when lying towards the sun, produce for many years in succession from fifty to sixty bushels of corn, and other grain in proportion. In the yield of grass, this difference is not so sensible, and rolling or steep lands are generally sown in grass after two or three grain crops and devoted to grazing.

"The yield of wheat, which does not average over thirteen or fifteen bushels per acre in the rougher portions of the State, would be greater if its cultivation was confined to limestone land or to dry upland or table land. As it is, wheat is sown there on rich porous soil, in order to get in sod, the grass seed being generally sown with it, and on such soil, particularly on hill-sides, and when put in late after cutting up the corn, wheat is exposed to freeze out during a severe winter.

"When devoted to grazing and in good sod, more or less mixed with blue grass, which comes up spontaneously on limestone land and old grazed pastures, from two and one-half to three acres are allowed for the fattening of a three-year-old steer per season, say from 1st of April to middle or end of August, and the weight thus gained by the animal is estimated at a minimum of $10, ranging from that to $15, while the latter figure is realized on many cattle grazed from March till June only, when properly cared for during the preceding winter."

The grain produced is uniformly consumed upon the farms, with few exceptions, in localities favored by river transportation with good facilities for reaching good markets and high prices. Feeding surplus grain to stock is wisely preferred to selling it, not only because it thus transports itself to the railroad and a market almost without trouble or expense, but because a large per-centage of its value is returned to the soil as manure, furnishing one of the surest, most feasible, and valuable modes of fertilization known. This mode of manuring must ever commend itself to West Virginia, with its uneven surface and liability to wash, which will tend to increase with increasing thoroughness in pulverization. It is fair to say, however, that the excessive liability to wash existing in some soils does not characterize those under consideration. The rearing and fattening of stock is destined to be the principal business of the farmer, as it is the most profitable everywhere—a fact attested by the dependence placed upon it in England for paying the high rents of that country. The yield of the cereals is equal to the average throughout the west, but they are less remunerative than hay and grass, except in very rare instances of accidental fluctuations in price.

Mr. Debar refers to numerous instances in his knowledge in which the fertility of the soil has been tested by annual products for fifteen years of 50 to 75 bushels of corn per acre, without manure; then, after clover two or three years, and ploughing ten or twelve inches deep, and one good crop of wheat, it has yielded from two to two and a half tons of hay per acre.

West Virginia, in fine, though particularly adapted to meat and wool producing, dairying and fruit-growing, is suited to the production of almost every product natural to the temperate zone, while, in certain grades and mountain heights, buckwheat, oats, potatoes, and grass are the main reliance; yet throughout almost the entire area the soil is well adapted to corn, wheat, oats, buckwheat, potatoes, roots, hemp, flax, tobacco, sugar-cane, fruits, and grasses.

Monongalia county lies upon the Pennsylvania line. Laurel ridge rises on its eastern border, and the Monongahela and Cheat rivers intersect it. The county seat is Morgantown. Among its exports are cattle, lumber, flour, and iron, which are transported both by railroad and steamboat. It is an enterprising, productive, and improving section of the State.

Marion, the next county south, is also drained by the Monongahela, formed here by the confluence of Tygart's Valley and West Fork rivers. It is a small county, rich in coal and iron, with abundant water-power, magnificent forests, and fine pasturage. Fairmont, a pleasant village on both railroad and river, is its capital.

Taylor is a very small county, embracing an area less than that of four townships of government surveys, and formed from Harrison, Barbour, and Marion. It is prominent as the point at which the Baltimore and Ohio railroad bifurcates to Wheeling and Parkersburg. To the traveller its surroundings are picturesque, but very forbidding in the eye of the prairie farmer wandering eastward. It has a population of only 7,463, yet its railway facilities have given to land valuation something like its intrinsic worth, the average of farms being already $16 01 per acre. Among these mountains grow yearly 78,001 bushels of corn, 80,357 pounds of butter are produced, and 3,160 tons of hay are made, and animals are slaughtered to the value of $22,383.

Barbour county lies further up Tygart's Valley river, and is also drained by Buchanan river and Elk creek. Philippa, famed as the opening scene of the war of the rebellion in the State of Virginia, is the county seat. Its assessed valuation averages scarcely half as much as that of Taylor, simply because it is less favored in facilities for transportation. The fertility of its soil is well attested by 197,450 bushels of corn, and $377,693 value of live stock, $53,452 value of slaughtered animals, and large figures generally for farm products, considered with reference to its population of only 8,958.

Taking the west fork of the Monongahela, the reader will come to Harrison county, of which Clarksburg is the principal town, situated upon the northwestern Virginia railroad, a branch of the Baltimore and Ohio. It possesses a limestone soil, fertile and durable. It is perhaps the most improved of the inland counties, and has a farm valuation of $4,642,794, exceeded only by that of Greenbrier and Jefferson. The value of its live stock is $644,325, exceeded only by Hampshire and Greenbrier. With such figures, the value of slaughtered animals, $75,883, will not be deemed extraordinary. In corn, of which the product is 320,946 bushels, it is exceeded only by Hampshire and Jackson. Clarksburg is the seat of a fine trade in coal.

Lewis is immediately south of Harrison, higher up on the same stream; produces 4,416 tons of hay, considerable quantities of grain, possesses excellent pasturage, and many good and productive farms.

Doddridge is another railroad county west of Harrison. Its staples are also corn and grass. Cattle thrive for six months of the year with no other pasturage than the range of the forests. Nutritious grasses spring naturally wherever the surface is denuded of timber. Its proportion of improved to unimproved land is 25,114 acres to 217.543; its average valuation, by the census of 1860, $4 14.

Ritchie county, next east of Jackson, upon the railroad, has a variety of surface, which is broken into very abrupt ridges in places, exhibiting in dislocated strata the effects of violent upheaval; the soil, too, is variable, but generally productive. It was named in honor of Thomas Ritchie, editor of the Richmond Enquirer. It is drained by the Hughes river. But a small portion of farm lands are as yet improved. It is in the midst of the oil formation, which extends south from western Pennsylvania in a nearly straight line to the Kanawha. The famous lubricating oil, used by the Baltimore and Ohio railroad, is pumped from shallow wells near Petroleum, 22 miles from Parkersburg.

Upon Oil Run, a little valley winding through rocky hills, whose disarranged strata dip in every direction, at every angle of inclination, may be seen a marvel of nature and a curiosity of industry—the Virginia oil works—owned by a company of which John Handlan, a prominent business man of Wheeling, is managing agent and one of the proprietors. The works are located two miles north of the northwestern Virginia railroad, very nearly in a direct north and south line with the oil springs of Wirt county and of western Pennsylvania.

The oil is the heaviest known in the country, almost destitute of benzole and naphtha, and a superior lubricator. The Baltimore and Ohio railroad uses, as the best lubricating oil attainable, about one hundred barrels per month.

Eleven wells were working at the date of the writer's visit, all operated by a rude but effective as well as novel system of mechanism, driven by a single engine of fifteen horse-power, with ample power to spare for the working of many more wells. It is called a "telegraph," its continuous line of rough scantling, suspended by iron hangers between duplicate telegraph-like poles, being somewhat suggestive of such a name. The entire system, connecting the different wells throughout the narrow valley and in the ravines that make into it, requires more than half a mile in length of this telegraphing, and is operated by an alternating horizontal motion—forward perhaps twenty inches and back the same—which keeps in continuous action all of the pumps at the same time. A dirty, greenish stream flows forth, and is borne in troughs to large wooden reservoirs, with stop-cocks near the top for drawing off the oil, and at the bottom for discharging the water. Nearly all the labor required is in running the engine and obtaining fuel for it, boring wells, making fixtures, and barrelling the oil. The oil is brought from the recesses of the earth, separated from the water, and conveyed to the barrellers absolutely without manual labor.

The wells are from 28 to 200 feet deep, the shallowest producing the heaviest and best lubricating oil; but Mr. Handlan is now engaged in boring deep wells, thus far with very good success.

Wirt county, south and west of Ritchie, is in the second tier of counties from the Ohio, upon the Little Kanawha. It is also declivitous and oil-yielding, and is the location of the oldest and most extensive system of oil wells to be found in the State. Their discovery was attended with much excitement, and the proprietors of the soil are deriving immense revenues as rental, and the operators are variously meeting with returns ranging from the fullest success to the most decided failure. Some wells are improving, others failing, and after temporary suspension are again worked. A singular geological phenomenon of the oil region has attracted attention in this vicinity. A soft black substance, resembling coal, inflammable and soluble, a kind of solidified petroleum, fills a chasm between vertical strata, from four to six feet in width. How far it extends vertically it is impossible to say. The business of extracting oil from it would long since have been undertaken, but that the pure oil, in immense quantities, possibly resulting from precisely similar fissures, has spouted forth by thousands of barrels, almost without the aid of man, in its immediate vicinity. (See description of these works in another part of this volume.)

A large portion of its land is unimproved, but naturally productive; its assessed value averages $5 11. Its crop statistics show an average yield of farm products.

Calhoun is a small county, also intersected by the Little Kanawha, containing farms of average fertility, assessed at nearly the same value as those of Wirt, and occupied mainly for the rearing of live stock.

Gilmer adjoins Calhoun on the east, is drained by the Little Kanawha and its tributaries, has fine forest ranges for cattle, and a comparatively small area of improved land.

Roane, south of Calhoun, abounds in steep hills and grassy valleys, through which flow the waters of the Pocotalico and other streams, tributaries of the Great Kanawha. It is a fine region for cattle and sheep, and unwillingly furnished ten thousand dollars' worth of horses for the cavalry of the rebels. The number of sheep was rapidly increasing in 1862; but the raiders having a taste for good mutton, it is presumed that losses and gains have left the flocks as they were in 1860. Tobacco does well in this as in the adjoining counties, yielding a product that commands a fine price for its excellent flavor. In one instance last season twenty-one acres, with indifferent culture, brought $2,000. When such results can be attained with so little labor on lands which average but a few dollars per acre, it should not be said that the soil here is unproductive or farming unprofitable. Fruit is usually abundant. Good peach crops have been enjoyed for a succession of years past. The fruit is often sold at 25 cents per bushel.

In evidence of the adaptation of this soil to tobacco, a statement of a correspondent may be referred to relative to the crop of a neighbor, Martin W. Kidd, of this county. The land was in forest, and cost to clear twenty acres and cultivate the crop $1,100, and $153 more to get it to market. Though he lost considerable of it for want of sheds sufficient to cure it properly, he sold 13,500 pounds for $2,674. This gave a profit of $1,421, or $71 05 per acre—amply sufficient to buy a large farm of unimproved land.

Braxton county is more nearly than any other the geographical centre of the State. It is intersected by Elk, Little Kanawha, and Holly rivers, and Bird creek. It is well watered and fertile. Little more than an eighth of the farm lands are improved. Average assessed valuation $4 28. This is very low in comparison with their intrinsic value. It is midway between Clarksburg and Charleston, and on the line of the proposed central railroad route. Sutton is the county seat.

Webster county, drained by the headwaters of the Elk and Gauley rivers, is a new county, with resources very little developed and lands cheap—averaging $1 61 per acre.

Nicholas, upon the south, intersected by the Gauley, has a promising future. It contains 1,460,228 acres of farm lands, of which but 34,941 are improved; average valuation $2 51 per acre. It has clear, running streams, filled with the speckled trout, and fine forest pastures and grassy glades. Though only two and a half per cent. of its farm lands are improved, its live stock is valued at $334,820, its flocks of sheep numbering 9,093; and while it lies well up towards the mountains, there is required for the winter support of 20,536 farm animals but 2,035 tons of hay. Winters cannot be very severe if 100 pounds of hay will suffice for each animal.

Clay county lies south of Braxton, upon the Elk river. It is a small county, with but 5,565 acres of improved land. Its location is eligible, and much of its land productive.

STATISTICS OF PRODUCTION.*

A statement of the farm products of West Virginia will not indicate an extraordinary production in proportion to population, nor will it show so meagre

*The statements in this chapter, as well as those interspersed in descriptions of the several counties, are based upon the census returns of 1860. Returns made to the State Auditor, if they could be made complete, would show advancement in many of the counties even during a civil war.

a result as most people in other States would have predicted. In view of the fact that a large element of the population has been that of the forerunner of civilization, the pioneer, who desires nothing more than elbow-room and a wide forest range for game, and is content to lead a primitive life, knowing few wants and those easily supplied, these figures prove incontestably a fertile soil.

A statement of the farm products, &c., of West Virginia, compiled from the census returns for 1860, *by permission of Commissioner Kennedy.*

Acres of improved land	2, 346, 137
Acres of unimproved land	8, 550, 257
Cash value of farms	$87, 525, 087
Value of farming implements and machinery	$1, 973, 158
Horses	85, 862
Asses and mules	1, 674
Milch cows	100, 154
Working oxen	18, 696
Other cattle	191, 239
Sheep	453, 334
Swine	327, 214
Value of live stock	$12, 382, 680
Wheat, bushels of	2, 302, 567
Rye, bushels of	71, 263
Indian corn, bushels of	7, 858, 647
Oats, bushels of	1, 649, 090
Rice, pounds of	1, 163
Tobacco, pounds of	2, 180, 316
Ginned cotton, bales of, 400 pounds each	125
Wool, pounds of	1, 073, 163
Peas and beans, bushels of	31, 332
Irish potatoes, bushels of	746, 606
Sweet potatoes, bushels of	68, 081
Barley, bushels of	60, 368
Buckwheat, bushels of	342, 518
Value of orchard products, in dollars	$234, 273
Wine, gallons of	2, 368
Value of produce of market gardens	$44, 299
Butter, pounds of	4, 760, 779
Cheese, pounds of	131, 585
Hay, tons of	154, 136
Clover-seed, bushels of	7, 230
Grass-seeds, bushels of	10, 571
Hops, pounds of	3, 018
Hemp, dew-rotted, tons of	407
Hemp, water-rotted, tons of	1, 020
Other prepared hemp	1, 599
Flax, pounds of	183, 498
Flax-seed, bushels of	8, 430
Silk cocoons, pounds of	69
Maple sugar, pounds of	667, 178
Maple molasses, gallons of	71, 425
Sorghum molasses, gallons of	174, 318
Beeswax, pounds of	30, 459
Honey, pounds of	423, 359
Value of home-made manufactures	$502, 671
Value of animals slaughtered	$2, 124, 869

The value of live stock is $12,382,680, a sum exceeding the value of the same interest in New Hampshire, Connecticut, Delaware, Florida, Kansas, Minnesota, and other States, and exceeded in Massachusetts by only $355,064.

The value of slaughtered animals, $2,124,869, exceeds the income from the same source in Delaware, Florida, Kansas, Louisiana, Mississippi, Rhode Island, and Oregon. It is exceeded slightly in Maine, ($2,780,179;) Maryland, ($2,821,510;) Massachusetts, ($2,915,045;) and Vermont, ($2,549,001.)

The product of butter exceeds that of eleven States, among them California, Kansas, the Carolinas, Mississippi, and Louisiana. Maryland makes but 494,516 pounds more.

In flax, greater results are shown than in any of the States, with the exception of Kentucky, New York, Pennsylvania, North Carolina, and Virginia proper, the latter of which is far exceeded by West Virginia in proportion either to population or area.

More of maple sugar is found than in a score of the States, and this product could be increased more than ten-fold. Sorghum is also a growing interest.

The following is the order of precedence of the several counties in the several items indicated:

In farm implements, Hampshire, Barbour, Jefferson.
In value of farm lands per acre, Jefferson, Brooke, Ohio, Hancock.
In horses, Hampshire, Harrison, Monongalia.
In cows, Hampshire, Preston, and Marion.
In working oxen, Wayne, Kanawha.
In sheep, Brooke, Ohio, Hancock, Hampshire, Preston.
In swine, Jefferson, Hampshire, Berkeley, Harrison, Greenbrier.
In corn, Hampshire, Jefferson, Harrison.
In wheat, Jefferson, Berkeley, Mason, Hampshire.
In oats, Marshall, Monongalia, Greenbrier, Preston.
In barley, Ohio, Brooke, Hancock.
In buckwheat, Hampshire, Pendleton, Marshall.
In butter, Pocahontas, Hampshire, Marion, Monongalia, Berkeley.
In hay, Hardy, Hampshire, Berkeley, Barbour, Monongalia, Jefferson, Marion.
In tobacco, Putnam, Kanawha, Mercer, Wood, Monroe, Fayette.
In flax, Nicholas, Upshur, Mercer, Barbour, Logan, Marion.
In cheese, Harrison, Upshur, Preston, Barbour, Monroe, Marion.
In potatoes, Marshall, Preston, Hampshire, Wood, Jackson, Jefferson.

Statement of the number and value of different kinds of live stock, according to the United States census of 1860.

Counties.	Horses.	Asses and mules.	Milch cows.	Working oxen.	Other cattle.	Sheep.	Swine.	Value of live stock.
Barbour	3, 059	81	3, 726	418	7, 715	11, 673	9, 916	$377, 693
Berkeley	3, 510	19	2, 728	12	3, 687	7, 057	13, 469	335, 757
Boone	787	9	1, 444	428	3, 078	3, 248	7, 653	120, 589
Braxton	976	19	1, 395	197	1, 826	6, 108	5, 040	109, 456
Brooke	1, 399	18	1, 319	169	1, 513	40, 620	3, 309	282, 439
Cabell	1, 350	66	1, 475	856	3, 780	5, 764	8, 408	195, 674
Calhoun	484	10	741	242	1, 491	2, 412	2, 956	74, 651
Clay	286	10	538	150	637	1, 608	2, 412	41, 824
Doddridge	1, 182	2	1, 664	232	3, 147	5, 377	4, 332	142, 269
Fayette	1, 266	20	1, 767	471	2, 467	6, 998	7, 723	177, 440
Gilmer	815	8	1, 197	205	2, 392	3, 967	3, 864	113, 722
Greenbrier	3, 714	128	3, 984	686	8, 163	16, 067	10, 971	676, 298
Hampshire	5, 222	27	5, 522	6	11, 355	21, 287	14, 619	763, 454
Hancock	1, 109	4	1, 127	140	1, 657	21, 402	2, 465	182, 746
Hardy	2, 526	54	2, 561	142	8, 244	11, 378	7, 032	453, 768
Harrison	4, 404	35	4, 501	681	12, 163	13, 202	11, 496	644, 325
Jackson	1, 330	23	1, 541	504	2, 513	6, 615	6, 538	173, 354
Jefferson	3, 421	128	2, 316	135	4, 071	7, 269	15, 044	466, 168
Kanawha	1, 402	153	1, 889	1, 047	3, 282	4, 936	10, 135	197, 224
Lewis	1, 617	12	1, 902	364	5, 452	8, 250	4, 554	225, 500
Logan	885	23	1, 595	827	3, 513	1, 673	9, 197	161, 490
Marion	3, 762	54	4, 629	654	5, 680	9, 029	9, 985	466, 254
Marshall	2, 413	2	2, 501	573	3, 113	10, 022	8, 447	280, 860
Mason	1, 355	75	1, 254	616	3, 266	5, 582	8, 294	252, 063
Mercer	1, 552	37	2, 218	199	4, 128	10, 225	11, 308	244, 954
Monongalia	3, 904	32	3, 881	680	7, 090	10, 945	8, 028	454 070
Monroe	3, 216	47	3, 058	407	9, 181	12, 288	10, 172	500, 268
Morgan	972	6	1, 036	16	1, 709	2, 992	3, 300	111, 439
McDowell	222	8	573	25	785	866	2, 463	33, 785
Nicholas	1, 358	52	1, 728	505	4, 523	9, 093	12, 390	334, 820
Ohio	1, 441	3	1, 408	246	1, 380	40, 050	3, 244	253, 090
Pendleton	2, 543	1	3, 423	11	6, 372	14, 143	5, 744	371, 228
Pocahontas	1, 688	53	2, 447	246	5, 471	10, 338	5, 099	328, 002
Preston	3, 326	41	4, 993	591	5, 846	19, 084	8, 854	461, 133
Putnam	1, 229	114	1, 507	924	2, 891	5, 924	8, 084	185, 995
Pleasants	646	1	725	211	1, 300	2, 837	2, 386	84, 275
Raleigh	486	5	744	128	1, 311	3, 569	3, 663	69, 038
Randolph	1, 189	17	1, 760	237	6, 106	7, 565	3, 267	244, 857
Ritchie	1, 724	36	2, 117	392	3, 409	7, 925	7, 891	213, 147
Roane	783	26	1, 011	247	1, 625	5, 190	4, 380	86, 180
Taylor	1, 137	30	1, 347	219	2, 721	4, 788	3, 710	162, 864
Tucker	448	6	536	78	1, 337	2, 651	1, 291	58, 850
Tyler	1, 484	20	1, 644	476	2, 829	8, 748	5, 942	202, 707
Upshur	1, 955	5	2, 508	305	4, 690	9, 821	5, 078	271, 523
Wayne	1, 240	113	1, 524	1, 297	2, 642	7, 405	8, 898	175, 008
Webster	356	2	693	89	972	2, 474	1, 691	44, 304
Wetzel	1, 502	4	1, 806	365	3, 056	6, 244	6, 293	169, 639
Wirt	874	14	1, 086	310	1, 589	5, 032	4, 188	110, 417
Wood	1, 899	6	2, 197	658	2, 706	7, 360	7, 258	214, 077
Wyoming	414	15	868	99	2, 365	1, 233	4, 733	81, 992
	85, 862	1, 674	100, 154	18, 696	191, 239	453, 334	327, 214	12, 382, 680

The writer has endeavored to procure more recent returns from the office of the State auditor of West Virginia, and has succeeded in obtaining a partial record of the condition of live stock; but the southern and southwestern and some of the mountain counties have been so infested with guerillas and in so unsettled a condition that the statement would be too partial and incomplete to be satisfactory.

In some counties great losses have been incurred in live stock from marauding, particularly in horses. Yet the State returns for 1862 give an increase in horses, over 1860, in the counties of Barbour, Brooke, Cabell, Doddridge, Harrison, Hancock, Jackson, Kanawha, Lewis, Monongalia, Marshall, Ohio, Preston, and several others. In some cases this increase is extraordinary, as in Kanawha, from 1,402 to 5,222, doubtless due to a great influx from Fayette and Greenbrier, on the great highway to rebeldom, and from which there is no report. The same disturbing causes have affected other stock to some extent. Sheep had already increased, in 1862, in Brooke, from 40,620 to 46,200; in Hancock, from 21,402 to 29,932; in Harrison, from 13,202 to 17,991; in Monongalia, from 10,945 to 17,594; in Marshall, from 16,022 to 22,197; in Preston, from 19,084 to 25,980. Since that date there has been a still heavier increase.

Statement exhibiting the quantity and value of some of the principal items of farm produce, according to the census of 1860.

Counties.	Wheat.	Rye.	Indian corn.	Oats.	Tobacco.	Irish potatoes.	Butter.	Slaught'ed animals.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Pounds.*	*Bushels.*	*Pounds.*	*Value.*
Barbour	37, 835	4, 794	197, 460	29, 680	596	17, 256	161, 627	$53, 452
Berkeley	237, 576	18, 672	275, 525	76, 176	....	18, 962	160, 069	93, 555
Boone	15, 278	1, 118	143, 808	7, 994	18, 729	10, 620	59, 262	30, 879
Braxton	22, 366	604	122, 749	17, 695	15, 534	8, 300	43, 772	20, 327
Brooke	23, 490	3, 506	142, 122	64, 984	....	20, 488	140, 326	36, 763
Cabell	65, 715	356	248, 210	18, 717	68, 578	11, 119	45, 230	49, 736
Calhoun	10, 734	56	69, 847	6, 423	7, 882	6, 088	61, 050	13, 455
Clay	4, 433	410	44, 310	6, 150	26, 229	4, 269	27, 868	12, 597
Doddridge	16, 514	569	124, 133	6, 765	7, 025	13, 724	66, 554	24, 848
Fayette	25, 693	2, 403	131, 425	28, 433	127, 713	10, 223	82, 082	44, 107
Gilmer	18, 609	168	126, 944	11, 800	61, 104	7, 836	77, 274	21, 167
Greenbrier	52, 017	10, 610	231, 479	112, 055	3, 000	24, 858	151, 156	114, 265
Hampshire	106, 310	75, 257	375, 090	49, 259	75	41, 773	239, 360	109, 834
Hancock	16, 423	5, 117	61, 346	46, 716	....	26, 002	125, 446	26, 396
Hardy	39, 946	28, 043	286, 618	20, 200	1, 450	18, 534	102, 603	71, 698
Harrison	55, 411	936	320, 946	37, 501	11, 715	15, 357	155, 419	75, 883
Jackson	88, 338	228	219, 377	11, 878	74, 691	32, 630	111, 506	40, 260
Jefferson	422, 514	15, 198	358, 267	54, 798	6, 700	31, 876	131, 684	110, 221
Kanawha	76, 305	198	274, 943	45, 430	338, 264	12, 352	59, 196	56, 345
Lewis	27, 191	579	136, 677	12, 418	82, 910	9, 822	66, 230	28, 817
Logan	11, 025	530	199, 385	11, 067	13, 545	9, 794	48, 247	30, 559
Marion	50, 894	1, 159	214, 706	86, 409	25, 012	12, 618	226, 852	55, 990
Marshall	74, 759	2, 830	241, 911	133, 617	10, 590	46, 634	146, 715	44, 944
Mason	108, 839	330	264, 813	6, 462	21, 996	11, 873	67, 337	55, 706
Mercer	43, 131	5, 021	131, 654	55, 843	182, 554	10, 533	81, 454	58, 132
Monongalia	49, 124	4, 909	239, 024	126, 198	1, 380	10, 586	171, 876	46, 994
Monroe	84, 805	13, 422	216, 513	59, 265	132, 019	12, 692	112, 753	78, 506
Morgan	19, 404	16, 082	47, 575	10, 122	2, 234	7, 806	61, 152	21, 325
McDowell	1, 041	285	20, 445	2, 215	1, 275	1, 410	6, 407	8, 138
Nicholas	12, 894	6, 128	103, 193	26, 613	14, 470	16, 528	110, 453	64, 227

6 A

Statement exhibiting the quantity and value of farm produce, &c.—Continued.

Counties.	Wheat.	Rye.	Indian corn.	Oats.	Tobacco.	Irish potatoes.	Butter.	Slaught'ed animals.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Pounds.*	*Bushels.*	*Pounds.*	*Value.*
Ohio	20, 048	5, 639	138, 430	82, 101	....	21, 449	128, 448	$26, 930
Pendleton	11, 475	11, 927	122, 997	16, 516	2, 073	13, 366	101, 838	45, 319
Pocahontas	8, 774	9, 787	48, 229	26, 612	190	12, 090	121, 310	41, 554
Preston	8, 933	10, 778	71, 063	104, 317	185	44, 655	340, 988	80, 407
Putnam	78, 796	43	197, 700	16, 355	406, 992	9, 192	81, 940	57, 165
Pleasants	22, 785	319	102, 172	7, 395	27, 930	7, 747	30, 500	15, 284
Raleigh	6, 700	1, 825	39, 301	11, 713	34, 827	3, 719	22, 644	13, 363
Randolph	7, 675	2, 126	56, 225	20, 248	1, 117	8, 349	57, 332	24, 883
Ritchie	27, 582	369	147, 785	14, 978	18, 606	19, 490	92, 337	35, 763
Roane	21, 897	705	100, 074	8, 743	10, 268	6, 593	44, 116	20, 571
Taylor	20, 811	898	78, 001	25, 610	3, 139	4, 294	80, 357	22, 383
Tucker	1, 103	1, 147	19, 955	6, 049	710	4, 346	17, 057	7, 721
Tyler	43, 727	283	182, 239	28, 512	11, 225	23, 733	130, 527	35, 150
Upshur	27, 765	1, 719	149, 496	20, 337	50, 000	13, 639	126, 350	35, 217
Wayne	35, 319	362	224, 044	13, 077	55, 628	8, 898	71, 514	40, 241
Webster	1, 586	791	25, 602	3, 100	....	2, 194	11, 587	6, 439
Wetzel	31, 652	1, 529	180, 150	26, 775	84, 989	14, 430	124, 342	28, 182
Wirt	27, 488	202	115, 046	5, 096	44, 074	8, 769	41, 602	22, 749
Wood	74, 236	244	227, 223	19, 158	166, 365	33, 166	12, 175	51, 682
Wyoming	5, 601	962	62, 420	9, 515	4, 778	4. 024	22, 855	14, 740
	2, 302, 567	71, 263	7, 858, 647	1, 649, 090	2, 180, 316	746, 606	4, 760, 779	2, 124, 849

MINERALS.

Whatever may be said of the capacity of this new mountain State for general agricultural industry, or for the special rural enterprises of so much promise as fruit-growing, wine-making, dairying, or wool production, it cannot be denied that untold wealth is awaiting development in the hillsides, upon the river banks, and in their beds, and deep in the bowels of the earth. Among the minerals may be named coal, iron, lead, copper, silver, antimony, nickel, borax, soda, alum, salt, lime, petroleum, and fire-clay. The denuding of the surface by water or other agencies, and its excavation in deep and sometimes precipitous ravines, through which its drainage is secured, lays bare the several strata of rocks and minerals, brings to view the hidden treasures of the earth, and renders mining easy, and facilitates the removal and distant transportation of the precious deposits sought.

A word or two, at the outset, should be bestowed on the great variety and remarkable character of

MINERAL SPRINGS.

Mineral waters, in remarkable variety, exist in all portions of the valley, and others still more noted and valuable are scattered among the mountain glades of Greenbrier county. These, with those in Berkeley, are in West Virginia. There are thermal, saline, carbonated, and sulphuretted waters, acidulous waters, impregnated with carbonic acid, in some instances combining gas equal to one-half of the amount of the water itself. Sulphur, iron, lime, magnesia, and other elements, variously mingled, give these waters their peculiar characteristics of color, taste, and medicinal effect. Professor William B. Rogers, former State geologist, thus refers to them: "Viewed singly, in relation to the number, variety, and high reputation of its mineral waters, this region is well entitled to be proud of the vast resources of which it is possessed. Grouped, as these springs are, at moderate distances apart, presenting within the same district a variety of medicinal character, for which, in other countries, regions remote from each other require to be visited in succession, placed at a point equally accessible to the inhabitants of the seaboard and the great valley of the west, and situated in a region of grateful summer temperature, of salubrious climate, and of picturesque and diversified natural beauties, they are now rapidly attaining a celebrity for powerful and varied remedial qualities, as well as for the refined social enjoyments which are annually gathered around them, destined ere long to eclipse the older reputation of the famed fountains of the northern States, and to vie even with the long-established character of the most noted of the watering places of the Old World."

TRAVERTINE.

In Jefferson county, and in all portions of the valley to a greater or less extent, exists a deposit of marl, in beds of considerable thickness. It is found in the beds of nearly all the streams, being formed by a precipitation of calcareous matter from the limestone waters. It is known to geologists as travertine. From it a very pure lime is obtained, commanding a high price in the market, and its value to agriculture, from its general diffusion and attainment without the labor of quarrying, is not liable to undue appreciation. Much of it is obtained in a state so friable that it may be applied, as it is in Europe, directly to the soil, like marl, obviating the expense of burning. Calcareous manures have proved of incalculable benefit to eastern Virginia, and have been applied with benefit to the calcareous soils of the valley. Each section of country, in all the States, has natural elements of fertility which, with skilled husbandry, in co-operation with the ameliorations resulting from stock-growing, are ample for all the demands of high culture. This chalky deposit is only one of many elements of fertility existing in Virginia.

LIMESTONE.

This mineral is generally diffused throughout the State. The valley counties are largely of a limestone formation, interspersed with layers of slate. The mountain pass at Greenbrier exhibits everywhere limestone, interspersed with slates and shales. Throughout the mountain region, and everywhere among the iron and coal deposits, abundance of limestone is found. In the lower Kanawha, below Charleston, arenaceous and argillaceous rocks are presented, with thin layers of limestone of different degrees of purity, in some cases containing sufficient alumina to give it a hydraulic character. Interposed between seams of coal, thick beds of limestone occur on the Ohio river at Wheeling and vicinity. Associated with the coals of the Monongahela and Tygart's valley and other branches are beds of limestone and sandstone, both increasing in thickness as the coal diminishes. There is little lack of this material, so valuable to agriculture, iron-working, and the building arts.

Specimens from Patterson's creek, in Hampshire, are of grayish drab color, compact texture, moderately fine grain, structure slaty, bearing 93 per cent. of carbonate of lime.

From Muddy Creek mountain, near the blue sulphur spring, of a light gray color and fine grain, containing 98 per cent.

From east side of Laurel Hill, in Monongalia county, of a light yellow and gray color, partially sub-crystalline, 90 per cent.

From the Cheat river, in Preston county, light gray, with blue stripes, 68 per cent.

From Red creek, in Randolph county, of light gray color and compact texture, 82 per cent.

From Morgantown, in Monongalia, dove-colored and sub-crystalline, and very hydraulic, 57 per cent. carbonate of lime, 19 per cent. magnesia, and 9 per cent. alumina.

A great variety exists in quality, color, and texture. Hydraulic limestone is very abundant in Ohio, Harrison, Preston, Monongalia, Hampshire, and other counties, and in the Kanawha valley.

SALT.

The saline formation has been little explored, except in Mason and Kanawha counties. It is associated with the vast strata of sandstone that underlies the whole of this section and the southwestern counties of Virginia, in some of which large quantities of salt have of late been manufactured in the interest of the rebellion. The inference has been deemed reasonable, from the western dip of the white sandstone from which the Kanawha brine is obtained, that salt might be reached in the mountains up the river much nearer the surface; and salt has actually been manufactured upon New and Greenbrier rivers, but with comparatively little success as yet.

The works on the Kanawha, a few miles above Charleston, are extensive and productive. The wells are several hundred feet in depth, yielding a brine of remarkable purity, almost absolutely free from sulphate of lime or gypsum, and therefore evaporated and crystallized with fewer difficulties than usual, and brought to market as muriate of soda of nearly absolute chemical purity. A specimen received from General Lewis Ruffner, of the Kanawha salines, may be seen at the Department of Agriculture. Experience has demonstrated the superiority of this salt over any other manufactured in the country. Meat cured with it has kept, while that put up with foreign and American salts, under similar circumstances, has spoiled.

Extensive salt works exist in Mason county, making a product of excellent quality. The total manufacture of 1865 is stated as follows: Mason County Mining and Manufacturing Company, 8,081,300 pounds; Mason City Salt Company, 8,613,600 pounds; Union Salt Company, 4,553,050 pounds. Total, 21,247,950 pounds, or nearly a half million bushels.

Immense quantities of coal are annually used in salt-boiling, and millions of bushels of salt produced. The Kanawha works have been much interrupted, since 1861, by rebel incursions and dearth of labor, but last year produced a million of bushels.

IRON.

The iron ores of West Virginia are destined to prove prolific sources of wealth when capital shall organize labor for their reduction, and avenues of communication to commercial centres are somewhat increased. Furnaces exist in the valley and in Preston county, and possibly other sections of the State. The ores are hematites of various aspects, many of them yielding a high per-centage of metal of the finest character.

The ores of Laurel Hill have long been worked. They occur in two groups upon the western slope, (according to Rogers,) the upper one above the second seam of coal resting upon a lead-colored sandstone, and overlaid by silicious slates. The ore occurs in large nodules, variable in size, sometimes fine-grained, but generally coarse, and much resembling sandstones, giving indications of its existence only after burning. Underlying the lowest coal seam are two bands of ore, each about a foot in thickness, separated by shales, and consisting chiefly of the per-oxide of a shaly texture. Next below comes a layer of white sandstone; then a bed of ore six or eight inches thick, undecomposed, a compact proto-carbonate; and lower still among the shales lies another thin band of ore, underlaid with limestone, from which the flux is obtained for iron furnaces.

Furnaces have recently been erected in Preston county, which are producing from ore bearing a high per-centage of pure metal large quantities of iron of a superior quality. The enterprise, it is understood, has been attended with a large measure of pecuniary success. In the Kanawha coal fields there is an inexhaustible deposit of iron ore of good quality.

The iron of West Virginia is almost coextensive with its coal, and may be said to exist literally throughout the State, and may be worked to advantage at least throughout the mountain districts.

Specimens of ore from the north branch of the Potomac have yielded some 68, and some 78 per cent.; in Monongahela several specimens from 60 to 93 per cent.; in Preston county 65, 69, 71, and 82 per cent.

COAL.

Of the coal of West Virginia it is useless to attempt a description. It is found in immense beds in the Panhandle; it crops out at different elevations on the banks of the Monongahela and its numerous branches, away up among their sources; the hills of the Cheat River region are black with seams that are in some cases ten to twelve feet thick of solid coal; small quantities are found in the coal-oil region east of Parkersburg. The coal fields of the Kanawha valley are scarcely excelled, and perhaps not equalled, in variety and quantity, upon the continent; while in the eastern slope of the mountains, among the head-waters of the Potomac, great deposits of bituminous and semi-bituminous are successfully worked.

The following items relative to coal, from the geological report of Professor Rogers, made long since and previous to the opening of many successful mines, will give a hint merely of the great wealth of these Alleghanian coal fields:

"At Clarksburg and northward down the valley of the Monongahela, there exists one of the richest coal deposits in the State. One of the seams in some places in the neighborhood of this town is from ten to twelve feet in thickness, below which, and separated chiefly by a heavy bed of sandstone, there lies a thinner stratum of a more highly bituminous character." * * * "We may form some idea of the vast extent of these coal seams from the fact, that from some distance above Clarksburg they may be followed with scarcely any interruptions throughout the whole length of the valley of the Monongahela down to Pittsburg.

"On the Great Kanawha the exposure of coal is one of the most extensive and valuable anywhere in the United States.

"In Hampshire county, upon a stratum of valuable iron ore not less than fifteen feet in thickness, there rests a bed of sandstone, upon which reposes a coal seam three feet thick; above this another bed of sandstone, then a two-feet vein of coal, then sandstone, then another coal seam of four feet; again a stratum of sandstone, and over it a seven-feet vein of coal; over this a heavy bed of iron ore; and crowning the series, an enormous coal seam of from fifteen to twenty feet in thickness."

Benjamin H. Smith, United States district attorney, resident in Charleston, writes to the department upon this subject:

"Four-fifths of West Virginia lies on the western slope of the Cumberland range, and nearly all the country west of it abounds in coal; but in that part of the State on the Great Kanawha and its tributaries, Elk and Coal rivers, and on Guyandotte river, coal is found on a magnificent scale. It exists in numerous strata of different thicknesses, rising from the base of the hills to their tops, all nearly horizontal and slightly dipping to the north. This place is sixty miles above the mouth of the river. Here the hills become lofty, and increase in elevation to Cotton hill or Gauley mountain. Ascending the river a distance of thirty-six miles, coal of all varieties, except the anthracite, is found of superior quality—the cannel, spliut, bituminous, and all varieties of each. Geologists and others report, in those thirty-six miles at different points, workable strata of good coals, amounting in all to from sixty to one hundred feet in thickness, aggregating the several strata. These strata are severally from three to fourteen feet thick. They extend over the whole country for miles, running from creek to creek, and river to river. They are readily made accessible to the Great Kanawha, Guyandotte, or Big Sandy rivers." * * * "The amount of coal on the Kanawha and its tributaries, Elk and Coal rivers, is incredible. There is nothing equal to it anywhere."

C. S. Richardson, of the Briarport mines, writes thus of the coal in the vicinity of Charleston:

"In the vicinity of Charleston, to the northeast and northwest, the strata is nearly level, the rise and dip being mere gentle undulations; they consist of gray, brown, red, and white sandstone, the latter highly fossiliferous, narrow bands of blue clay slate, beds of clay and sandy shales, thin seams of iron ore, and isolated patches of limestone. Above the slates are found thin seams of very rich hematite, many stones of which I have found that will assay up to 60 per cent. in metallic iron; but the prevailing ore is the carbonate of iron found in the kidney or nodular form, in uneven segregated beds in a strong ferruginous sandstone. At Davis's creek, about midway between Coal and Kanawha rivers, are two seams of coal, one of cannel, two of iron, and two of limestone, all within three hundred feet above water level. The general contour ot the country presents a series of narrow mountain ridges and ravines, varying from 300 to 500 feet in height; in these, and all above the water levels, are five workable seams of coal, one a very rich bituminous, somewhat friable, two of compact splint, and two of cannel, the latter being the uppermost of the series. The bituminous, or square-jointed seam, is 3 feet 6 inches thick, of rich quality. One splint seam, called the 'twin seam,' is divided into two parts by a parting of argillaceous sandstone 18 inches thick; the entire stratification, or bed, is from 12 to 15 feet; it gives 7 feet of working coal. In some places both these beds are merged into one, where the coal is found from 5 to 6 feet thick. The next splint seam is 4 feet, and in working gives about three feet of merchantable coal. The upper cannel seam is 4 feet, and contains about 2 feet 6 inches of pure cannel; it is of a slaty, or partially laminated structure; it is not very good for domestic fuel, but excellent for gas and oil-making purposes, as also for steamboat uses, as it burns entirely away in flame. The second cannel seam varies in thickness from four to six feet, and gives from two to four feet of fine cannel; it is not always found uniform in character, but where perfect it is a hard coal, conchoidal in fracture, very dense, black and clean, burns with a bright white flame, is very rich in oil, makes an excellent domestic fuel, particularly that part of it called the 'birdseye cannel.' When this coal is used no other light in the room is needed, as candles or oil lamps look dim in the glare gioen off in its combustion. This seam is, however, a very unreliable one; in some estates it is found changed entirely, or nearly so, into bituminous coal; in others half cannel and half bituminous. It appears best, or more regular, when imbedded in shales or laminated argillaceous sandstone, and is much easier wrought. In some mines it is between two hard rocks, without any vein of clay or shale for a 'bearing in,' which makes it difficult to mine; in this case it is excessively hard, and breaks before the pick like a piece of black flint; but the coal is very fine, and sells at a high price. I believe it is undergoing a state of transition, and eventually would bear the same relation to common cannel as anthracite does to splint coal. If we take an average yield of the cannel seams, we may compute them safely at 4,000 tons to the acre; but in some places they are giving over 9,000 tons, in others less than 3,000. The bituminous coal will average 16,000 tons to the acre over about two-thirds of the surface base of the mountain lands. Cannel coal is now selling on the Ohio at $4 50 per ton, and the best bituminous at $2 50 per ton. The mining cost may be put down at $1 50 per ton, average; but that would be materially reduced if the mining companies could be persuaded to adopt modern improvements in the mode of working the mines. The time, however, has not arrived when such can be done, although we are in great hopes another year will not pass without some example being set, which when once done efficiently, others will speedily follow. Coal and cannel selling at the above prices, a good estate, properly wrought, will realize $58,000 per acre, one half nearly being profit."

This description was prepared several years ago for the Mining Journal in London. The cannel coal is now worth $12 in Ohio, and the bituminous from $5 to $7. The cost of mining is also largely increased.

INTERNAL IMPROVEMENTS.

The State of Virginia has undertaken many enterprises, and expended much money, obtained by general taxation, for the construction of roads and the improvement of rivers; but that portion of the State now constituting West Virginia has shared little in those benefits. Her interests have been ignored, her mineral treasures left inaccessible, her farm products isolated from market. Some State improvements in this quarter were, at times, feebly essayed, to silence the rising murmurs of popular discontent, and partially completed or wholly abandoned at the caprice of the State oligarchy.

ROADS.

The neighborhood roads, in a sparsely-settled and hilly country, cannot, of course, be in a high state of improvement; yet much labor has been expended upon them, and many of them are in favorable seasons quite passable thoroughfares, and some are in excellent condition. Since the existence of the new State organization, a thorough and stringent law has been enacted relative to the construction and working of roads, which is expected to answer all the requirements of a most effective system, and secure convenient means of local communication.

Numerous turnpikes add to the facilities for travel in all the more densely-settled portions of the State. Parkersburg has long been connected with Staunton, and also with Winchester, in the valley east of the Alleghanies, by turnpike routes; and there has also been maintained a daily stage line between Guyandotte, at the mouth of the river of that name, and Covington, *via* Charleston and the White Sulphur Springs. These were all long lines, and involved considerable capital and enterprise in their management and maintenance.

IMPROVEMENT OF RIVERS.

The Monongahela is navigated by steamboats in a good stage of water to Fairmont, in Marion county. Slackwater improvements have been made upon it at intervals through its entire course to Pittsburg. It has proved of immense benefit to the adjacent population in affording facilities for transportation of iron from the furnaces in the vicinity of the river, coal from its banks, the produce of the farmers, and supplies of the merchants.

The Great Kanawha is navigable to the falls near the mouth of Gauley river, a distance of nearly one hundred miles. Millions of bushels of salt, immense quantities of coal, and large quantities of merchandise, have thus found a market, and a large passenger trade has been accommodated. Like the upper Ohio, this river sometimes has its navigation obstructed; in the summer only steamers of light draught can ply; but, with a little deepening and clearing of the channel, it may be made entirely navigable at all seasons. Some dredging has been occasionally done, and slight improvements in its navigation effected, but reliance has generally been placed on the ordinary natural facilities afforded by the stream itself. The fact that through this avenue cannel and other coals, in unlimited quantities, can be obtained for the markets down the river with one hundred miles less of transportation than from Pittsburg, should stimulate improvement in this direction, and aid in developing the magnificent coal interests of the Great Kanawha.

The Guyandotte river has enjoyed slack-water navigation to a certain extent. Dams were built, but no very substantial or permanent works constructed. They have fallen into neglect, especially since the commencement of the war, and are now nearly if not entirely useless.

The Little Kanawha could easily be made navigable for a distance sufficient to add considerably to the convenience and wealth of the communities in proximity to it, and the wants of the oil region will soon, without doubt, accomplish successfully the improvement. In a good stage of water the oil is now either boated down in bulk, or floated in barrels, in large quantities, to Parkersburg. Large rafts of barrels filled with oil present a novel and peculiar aspect of river transportation.

RAILROADS.

The Baltimore and Ohio railroad, with its branches, furnishes the only railway facilities enjoyed by West Virginia, with one small exception. It is to the enterprise and invincible determination of this company, and not to aid from the State of Virginia, that the partial development of the resources of the northern counties of the new State is due.

The construction of this road was commenced on the fourth of July, 1828; it was opened to Ellicott's Mills, twelve miles from Baltimore, May 22, 1830; its opening to Washington was celebrated in August, 1834. Westward its construction was pushed for many weary years, through and over mountains, across yawning abysses and over wide rivers, moving now with celerity on the surface of level glades, and then with a progress labored and slow, boring through the solid rock, until at last the waters of the Ohio and of the Chesapeake were united, the Alleghanies were surmounted, and shrill pæans to the triumph of steam in intercontinental transportation were screamed by a thousand iron throats from the seaboard to the mountain summits, and from the vine-clad banks of the Ohio to the cane fields on the alluvial plains of Louisiana.

It was one of the first railroad enterprises undertaken in the United States, as it is one of the most extensive. The length of the main stem, from Baltimore to Wheeling, is 379 miles; that of the Washington branch, 31 miles. Other branches increase its total length to 520 miles. Of sidings and second main track there are built nearly 300 miles more. The original cost of the entire work is thirty-one millions of dollars.

Its heaviest permanent grade on the eastern declivity of the Alleghanies is 116 feet per mile for 17 miles; its greatest altitude, 2,620 feet. It has 12 repair stations, 33 repair shops, 98 water stations, 30 telegraph stations and 2 lines of wires, 14 tunnels, 12,694 feet of tunnelling, 186 bridges on the main stem, 15,088 feet of bridging, about 4,000 cars and nearly 238 engines, and gives occupation to 5,000 officers and employés. Its annual income, in good times, has been five millions of dollars.

The road-bed is probably superior to any line of considerable length in America. It is rock-ballasted, and laid with heavy rail strongly secured. The first rail used weighed fifty-five pounds per lineal yard, for which rail of seventy-five and eighty-five pounds was substituted, and recently it has been increased to one hundred pounds.

Astonishing activity has characterized the repair of portions of the line damaged by raids during the war, and remarkable exemption from accident is noticed, as, during the entire existence of the road, it has suffered but one serious accident, and that was due to an unavoidable circumstance when the road was new.

Several years ago it was estimated by an officer of the road that an army of 10,000 men could be transported over it in thirty hours. The prediction is more than verified in the following, received from W. P. Smith, the well-known and efficient master of transportation of the road:

"The heaviest movement that we have made, or that has been made by any railway in the country, was of the 23,000 men in Hooker's two corps, in September last, from Washington to Chattanooga. This great body of men, with all their artillery, equipage, wagons and effects, including the cavalry horses, occupied about 1,000 cars, and were carried from Washington to Benwood, on the Ohio river, (400 miles,) in about forty hours."

The scenery of West Virginia along the line of this road has been the astonishment and admiration of travellers from all quarters of the globe.

From Harper's Ferry, where the road has broken a rough passage through the frowning mountains of the Blue Ridge, to the crossing of the Potomac again before Cumberland, a distance of ninety-eight miles, the road passes through the eastern section of western Virginia, a mingled scene of rough ravines, river rapids, widening plains, and mountain barriers, which push forth encroachingly upon the river, compelling a detour not made by the stream without a noisy yet unavailing murmur.

After a run through Maryland of little more than twenty miles, a corner of Hampshire county, in West Virginia, is struck at New Creek and Piedmont, the terminus of the first division of the road and site of extensive machine shops. From this point a rise of about nineteen hundred feet is accomplished in seventeen miles, the steepest railroad grade in the country. Passing the glade lands of the summit, which are in Maryland, the traveller is again introduced into West Virginia just as he commences the western descent of the Alleghanies, and views a beautiful panorama of mountain peaks piled upon receding mountains. Soon the most sublime of railroad scenery is in view; the passage of the Cheat river, the winding along the almost perpendicular sides of the mountain, with the chocolate-colored stream far down at its base, and a similar range on the opposite side, presenting to a distant observer a scene aptly represented by a walk furrowed around the spire of a towering steeple. Cheat river is crossed by a viaduct based upon abutments and a pier of solid freestone. A mile further westward, Kyer's run, 76 feet deep, is crossed by an embankment of solid masonry; then Buckeye Hollow is bridged by works 108 feet in depth; and last, but not least, the famous Tray Run is crossed, at the height of 150 feet, by a viaduct 600 feet long, a huge net-work of iron upon a massive base of masonry. At the west end of the viaduct, from a broad ledge overhanging the precipice, an impressive view of the great chasm of the Cheat river is obtained, with the stream itself three hundred feet below, winding northward and disappearing among the mountains.

Soon another barrier is reached. Projecting spurs have been circumvented, deep ravines overleaped, aspiring knobs bisected, and the height thus perseveringly overcome; but here confronts the road a peak yet 220 feet higher still, and nearly a mile in breadth, of solid earth and rock. The work of tunnelling progressed three years; a year and a half more was consumed in arching it with brick and stone, and it was finished—the Kingwood tunnel, 4,100 feet in length, costing one million dollars—a monument of engineering skill and a triumph of patient labor.

Grafton, nineteen miles further on, is the point of intersection for the Parkersburg branch, which is 104 miles long, while Wheeling is 100 miles distant by the main stem. Near Fairmont, just below the junction of the Tygart's Valley and West Fork rivers, forming the Monongahela, is an iron bridge 650 feet in length, which has been destroyed during the rebellion and since rebuilt.

The mountain scenery of West Virginia can better be appreciated by actual vision than described by the pen of the traveller.

The Hempfield railway is completed and running from Wheeling, east, to Washington, Pennsylvania, thirty-five miles. It is to be continued to West Newton, fifty-six miles from Wheeling, on the Pittsburg and Connellsville road, and thence to Greensburg, on the Pennsylvania Central road, seventy-six miles. In the route to Philadelphia, this will save the distance from Greensburg and twenty miles additional—in fact, nearly half the present distance between Wheeling and Greensburg. It will also shorten the route from Ohio, especially eastern Ohio, to Philadelphia.

These are the only railways at present in operation. Others are in contemplation, and will undoubtedly be built at an early day after the return of peace. One has been organized and partially constructed.

The Covington and Ohio railroad, designed to connect Richmond with the Ohio river, was completed in 1860 from Covington to the White Sulphur springs. The work upon the road was continued, and a large sum of money expended in grading, tunnelling, and piers for bridges. The tunnels between the springs and the Gauley were approaching completion, and from Charleston to the Ohio the road was in an early state of forwardness. It was designed to connect at Catlettsburg, on the Kentucky line, with the road thence to Lexington, which was graded and intended to be promptly finished as a section of a through line to the west and southwest. A road through the Kanawha valley, without reference to through business, was recognized as a necessity in the development of the interests of this inexhaustible depository of natural wealth, and credited as a paying investment. In a normal condition of affairs the road would, at the present time, have been completed and in receipt of a heavy trade. It must eventually be built; when, it would scarcely be safe, just now, to predict.

Another, and, under present circumstances, more important line, may first be built—a line intended to intersect the State centrally and longitudinally, to connect the Ohio river and Kanawha valley with the Baltimore and Ohio railroad, and eventually with the Pennsylvania Central, west of Harrisburg, *via* Charleston, Buckhannon, Phillippa, Independence, Kingwood, and Brandonville, or by some parallel line connecting Preston county with Charleston. It is intended to strike the Pittsburg and Connellsburg road at the mouth of Casselman's river; thence, by Somerset or Bedford, to Huntingdon on the Pennsylvania Central. It would develop a region rich in all the minerals of the State, passing over coal and iron mines almost every step of the route, infusing life into all the veins of industry, and rendering plethoric with wealth this youthful and vigorous Commonwealth.

POLITICAL ORGANIZATION.

On the 13th of May, 1861, twenty-four days after the adoption of secession by the convention at Richmond, delegates from twenty-five counties met at Wheeling and passed resolutions in condemnation of the traitors and the treason of Richmond, and providing for a convention of all the counties adhering to the Union.

On the 11th of June, representatives from forty counties assembled at Wheeling, on invitation to all loyal men of Virginia, and declared independence of the action of the State convention, announced an interregnum in the State government, and took measures for the establishment of a provisional government.

On July 2d the legislature, duly elected, convened at Wheeling, and elected United States senators, passed a stay law, and voted $200,000 for carrying on the war, and the same amount for the operations of the State government. October 24th the action of the legislature was approved by the people in a vote almost unanimous.

A convention met at Wheeling, November 26, 1861, and framed a State constitution, and on the 3d of May, 1862, that constitution was approved and adopted by the qualified voters of the proposed State. On the 13th day of May, the legislature of Virginia gave its consent to the formation of a new State within the jurisdiction of Virginia.

On the 31st December, 1862, the President approved the act of Congress for the admission of the State of West Virginia into the Union, to comprise the counties of Hancock, Brooke, Ohio, Marshall, Wetzel, Marion, Monongalia, Preston, Taylor, Tyler, Pleasants, Ritchie, Doddridge, Harrison, Wood, Jackson, Wirt, Roane, Calhoun, Gilmer, Barbour, Tucker, Lewis, Braxton, Upshur, Randolph, Mason, Putnam, Kanawha, Clay, Nicholas, Cabell, Wayne, Boone, Logan, Wyoming, Mercer, McDowell, Webster, Pocahontas, Fayette, Raleigh, Greenbrier, Monroe, Pendleton, Hardy, Hampshire, and Morgan, to which have been subsequently added Berkeley and Jefferson, making fifty counties, including a total area of about 24,000 square miles.

This act took effect in sixty days after the proclamation of the President stating the fact of its ratification by the people, and the adoption of the following in place of the clause in the Virginia constitution respecting slavery:

> "The children of slaves born within the limits of this State after the fourth day of July, eighteen hundred and sixty-three, shall be free; and that all slaves within the said State who shall, at the time aforesaid, be under the age of ten years, shall be free when they arrive at the age of twenty-one years; and all slaves over ten and under twenty-one years shall be free when they arrive at the age of twenty-five years; and no slave shall be permitted to come into the State for permanent residence therein."

CONCLUSION.

In conclusion, the writer would observe, in justice to himself, that he has endeavored to make as full and impartial an exhibit of the resources of West Virginia as circumstances would permit in an article designed to be only superficial and preliminary. In the absence of official documents, records of agricultural or scientific societies, local addresses, and newspaper articles of a statistical or descriptive character, the territory has been almost a *terra incognita*, to be explored in person, and its peculiarities gleaned from the mouths of living witnesses. Some portions of the State were thus visited, and very hastily observed; portions had been traversed years before; still much of the State was left to be appropriately characterized, if possible, by careful analysis and judicious weighing of the statements of those whose opportunities for observation have been ample.

The acknowledgments of the author are respectfully tendered to all those who have so promptly co-operated in this work, especially to his excellency Governor Boreman; to Hons. W. T. Willey and P. G. Van Winkle; to Hon. K. V. Whaley, of the third congressional district, whose zeal for the welfare of his district and State has been unabated; to Hon. John M. Phelps, president of the State Senate, and Senators Burley, of Marshall, Carskadon, of Hampshire, Stevenson, of Wood, and Young, of Pocahontas; to members of the House of Delegates, McGrew, of Preston, McWhorter, of Roane, Ruffner, of Kanawha, and Crawford, of Hancock; to Messrs. W. P. Smith and J. B. Ford, of the Baltimore and Ohio railroad, H. Hagans, of Preston, J. H. Diss Debar, of Doddridge, C. S. Richardson, of Kanawha, District Attorney Smith, of Kanawha, A. W. Campbell, of the Wheeling Intelligencer, J. E. Wharton, of the Parkersburg Gazette, E. M. Fitzgerald, of the Point Pleasant Register, and others.

THE CULTURE AND MANAGEMENT OF TOBACCO.

BY L. J. BRADFORD, AUGUSTA, KENTUCKY.

THE success of a growing crop of tobacco depends much upon early planting. The selection of such situations for plant beds as will insure a proper exposure to the sun is all important. The eastern or southern slopes of hills, near their base, afford the best locations, the beds so situated being free from sobbing, and the warmth of the sun greater than upon a flat surface.

Regard should also be had to the character of the soil. It should be sufficiently close to render it retentive of moisture, and yet contain sand enough to give it quickness. Made earths and puffy soils are unfit for tobacco, being too arid, and liable to heave.

Seed may be sown from the 1st of January to the 10th of April in a hot-bed, or commonly on a patch of ground prepared by burning on it a quantity of brush.

Beds prepared in the early part of the season require more burning than those at a later period. There is little danger of burning too hard, however, at any time, as the plants generally succeed best on beds most thoroughly burned. After the beds are burned and cooled off, they are dug up with a common sprouting hoe deep enough to afford the plant a loose soil in which to extend its roots. In the preparation of the beds care should be taken to leave the surface soil as much on top as possible, as it will promote a quicker and better growth of the young plants. After the beds are well pulverized by hoeing and raking, the seeds mixed with dry ashes are to be sowed as evenly as possible over the surface, at the rate of a common table spoonful to every eighty square yards, the bed lightly raked over or trod evenly with the feet, well covered with leafless brush, and protected from the intrusion of stock. As soon as the plants attain the size of the silver dollar of former days the brush may be removed, though, if the weather is dry, it will be an advantage to have it remain longer, and when removed it should be taken off in the evening. The land designed for the crop should be fertile, and if not naturally so, should be well manured, as tobacco is a plant that delights in rich soil. Any common manure will answer the purpose. If possible the land should be deeply and thoroughly ploughed in the fall or winter. There is twofold advantage in this: first, it destroys many insects that would be injurious or destructive to the young plant; and secondly, it renders the ground more friable and more easily cultivated.

As the season approaches for transplanting, which is here from May to July the land should be ploughed again, and kept clean. It is then to be laid off with a plough three and a half feet each way, and a small hill made in or on the check, as may be preferred, for the reception of the plant. The size of the hill may be according to the fancy of the planter, as it is not a matter of consequence. When the plants are large enough they may be drawn from the beds and placed in the hills whenever there is moisture enough to prevent their dying. The best time is soon after a shower, unless the land is very wet, in which case it should be left to dry or settle some. After transplanting, no further attention is required till the weeds and grass make their appearance; these should be at once subdued with the plough and hoe. If the earth becomes dry and hard about the plant it should be lightly scraped with a hoe, which will greatly facilitate growth. As soon as the plants are of size to permit it without injury, the ground should be deeply and thoroughly ploughed, care being taken not to disturb the roots, and the plant hilled up by following with a hoe. In land that has been kept clean this may be the last ploughing, the hoe being all that is needed to keep down the few weeds that may appear. When the plants are large enough to top, the leaves nearest the ground are to be broken off and the bud taken out, leaving on the stalk the number of leaves designed for the crop. This number is much a matter of fancy, yet it has more to do in forming the character of the future tobacco than most planters seem aware of. Experience has fully proved that ten or twelve leaves are sufficient for a plant, and this is almost the universal number among our best planters. If the crop has grown well, twelve leaves may be allowed at first; the next topping it may be ten, and the number thus lessened as the season advances, or as the appearance of the crop may indicate. This saves much labor, insures more uniformity in maturing, and adds to the value of the crop, making it more uniform in quality.

At this stage the attention of the planter is almost constantly required in protecting the crop from the worms and insects that prey upon it, and in breaking off the suckers which soon appear at every leaf along the stalk. This will give ample employment to all idlers about the premises.

As the plant approaches maturity it begins to thicken, and assumes a stiff, sleek, and motley appearance, which the most unpracticed eye will readily observe. Should the weather be dry and favorable, the first ripe plants may remain standing till a sufficient quantity matures to make a regular cutting; but if the weather is unpropitious it is best to cut as fast as matured, as it is liable to injury if allowed to remain too long.

The harvest time of the crop is an important period, as any neglect then on the part of the planter will result in depreciation of its future value. In cutting the plant a sharp knife is to be used, and the stalk to be split about half its length, taking care not to break the leaves or otherwise injure them. The plant is then to be set with the butt of the stalk up, exposed to the sun. When it is wilted enough to handle without breaking, it should be taken up and laid in heaps of from seven to nine in a place, and then hung as soon as possible to prevent its being scorched by the sun. The latter part of the day is best for cutting; there is less danger of the plant getting sunburnt.

The sticks on which the plants are hung are small pieces of timber about four feet long, and of sufficient strength to support them. These, when filled, may be taken to the barn on a cart or wagon, or may be placed on a scaffold in the field. If the weather is fair it is best to sun the crop, as it aids the curing and adds to the strength and elasticity of the leaf after it is cured. Care should be taken not to place the sticks too near each other if the weather is damp and warm, as there is danger of injury. After remaining on the scaffold a few days it assumes the color of a leaf in autumn; it must then be taken to the barn or curing house and placed away, keeping the sticks far enough apart to secure a free circulation of air through them. If the weather is wet, it is best to take the plants to the house at once and let the following process take place there rather than risk it in the field, as rain is always injurious to tobacco after it is cut, and especially so after it becomes yellow.

The curing process is of the utmost importance to the future value of the crop, and too much care cannot be given to it. If the weather is dry, and the tobacco is not too much crowded in the house, the action of the atmosphere should be assisted by furnaces instead of fires. Smoke from fire is very injurious to fine manufacturing and cutting tobacco; all lovers of the weed greatly prefer its natural flavor. Many accidents happen yearly from the use of fire. The difference in the sale of one good, ripe, furnace-cured crop will pay for all the outlay for furnaces and fixtures for twenty years. The heating is more uniform, and less fuel is used. Where furnaces are not to be had, a small fire will effect the object. If the weather is warm and damp the atmosphere will not aid materially in curing the plant, and unless firing is resorted to it is certain to be more or less injured. It is always safer after a house is filled with green tobacco to rely mostly on the action of fires for curing. These should be small and slow at first, and continued so until the moisture engendered by the fire is dried out, and then increased till the leaf is nearly cured. Then the fires should be allowed to go out, and the tobacco to come in case, or get soft again. The quality will be much improved by permitting it to come in case once or twice before it is thoroughly cured in leaf and stalk. Dry sound wood is best for the fires.

If the planter desires to make a piebald or fancy article, care should be taken never to permit the leaf to get very soft during the curing process. To make a really fancy article, the tobacco must be thoroughly yellowed first, and then be cured entirely by fire. This particular description, however, is not more desirable or valuable to consumers, as the essential properties of the plant are frequently destroyed by the action of the fire. As a general thing, it is better to cure the weed by the natural process of the action of the atmosphere, and where the planter has room enough to house the crop without crowding too close, the object can be attained without much fire, saving wood and avoiding much danger.

Having now reached the point when it is supposed the crop is secured and cured, we proceed to give some directions in regard to its future management and preparation for market, as many, after all their care and labor, lose their profits to a great extent by want of knowledge in this respect, or by inexcusable carelessness.

When the tobacco is thoroughly cured it is ready for the process of stripping, or taking the leaves from the stalk. The plant first passes through the hands of the most experienced laborer on the farm, who takes off the bad or injured leaves and ties them neatly in bundles of eight or ten. The plants thus culled are given to others, who strip off the remaining leaves and tie them in bands of six or eight, wrapping tightly with the tip of the leaf, used as a tie, so as to form a head of one and a half inch in length. These bundles should be as uniform as possible in size and color, as it adds to the beauty of the sample by which it is to be sold.

When the day's work is done, let the bundles, neatly pressed through the hands, be put in a winrow—that is, laid straight in a bulk or pile long enough to hold the work of one or two days, and only the width of one bundle and a half, reversing each course so as to have the heads of the bundles out. Here it may remain till stripping season is over.

Cold, winds, and frosty weather injure the texture and rich flavor of the leaf. The first good drying weather after the stripping get the smoothest and smallest sticks upon which the tobacco was hung, and hang it up again to dry. When the weather becomes moist enough to bring it in case, take it down and carefully bulk away as before directed, only taking more pains to straighten the bundles and make the bulk much wider; this is done by lapping the bundles over each other like shingling a roof, the bulker having his knee upon the bulk, carefully laying down the tobacco as it is straightened and handed to him. When the bulk is finished, weigh it down heavily with logs or some heavy weight.

Care must be taken that the tobacco does not imbibe too much moisture, or get too high in case before it is bulked, as it will injure. Whenever it is soft enough to handle without breaking it may be put in bulk; and should the stems break a little under the pressure of the bulker's knee no material damage will be done, provided the leaves do not crumble. A little attention will soon teach the most ignorant the proper order for safe-keeping. The tobacco will be safe in bulk, and will wait the planter's convenience to prize it in hogsheads.

In prizing, the different qualities should not be mixed, and, if proper care has been taken to keep them separated, no trouble will be had in assorting them. In packing, every bundle should be kept straight, and every leaf to its bundle. From a well-packed hogshead any bundle may be drawn without injury or disturbance to others. The usual way of packing is to commence across the middle of the hogshead, placing the heads of the first course about eight or ten inches from the outer edge, and running the course evenly across; the bundles of the next course are placed in the same direction, the heads against the side of the hogshead, and follow the circumference till the heads of the two courses come in contact. After that course is completed, the other side is finished by placing the heads against the cask as before, so as to have three courses across the cask, the bundles all laid in the same direction. The next layer is reversed, the packer carefully laying each bundle as it is handed to him. When filled, it is subjected to the press or screw and pressed down.

Our hogsheads are from forty-four to forty-eight inches across the head, and fifty-eight inches deep. From 1,800 to 2,000 pounds can easily be prized in them. If the tobacco is large, rich, and oily, the harder it is pressed the better, and the better price it commands. These remarks are especially applicable to those heavy kinds of tobacco grown where the soil and climate are peculiarly adapted to its production; such as is known in Virginia as heavy shipping leaf, and in the west as Clarksville tobacco. In climates and soils not so well adapted to it, the same variety will assume a different character, the texture of the leaf being changed, being more light and bulky, and destitute of oil and substance. Tobacco of this description should be managed as above directed, but prized lightly in the casks, so as to admit of a free and open leaf, such being mostly required for cigar leaf.

The writer has been a close observer of tobacco sales for many years, and has seen a difference of two to five dollars per hundred weight in crops grown on adjoining farms, cultivated in the same manner and sold on the same day. The buyer must take the tobacco as it comes from the planter's hands; he can only use a certain part of it per day. That in safe condition he can keep for future use, and is always willing to pay for it the full market rates; that out of condition he must keep till he can use it, and, if he considers his interest, buys at what it will be worth to him when he shall be ready to work it up;

thereby throwing on the planter the injury and loss in the tobacco from the time of purchase to that of manufacturing. This loss is considerable. The planter has to bear it; it is right that he should. He has no cause to complain of the manufacturer. If he feels like doing so, let him come here in September or October, and walk into one of our large factories and take a look at a hogshead then being pulled up, bearing his own name on its head, and sold by him in the spring. He would feel sympathy for the manufacturer, rather than blame him for the low price he gave, and would congratulate himself that he and that tobacco had parted company.

But planters can remedy this liability to loss. It is useless for them to talk about a bad season for striking, bad winds, cold winds, too much or too little rain, and so forth. This will not help the matter, or exonerate them from a duty they owe themselves. These bad seasons are not universal. They do not affect every planter. There are men who always manage their crops properly, in defiance of too much season, or too little season, or no season at all. They are men of reputation as planters, and men who will sustain their reputation. Examine their crops year after year, and they will invariably be found in good condition, and will always command the highest price.

HEMP CULTURE.

BY L. J. BRADFORD, AUGUSTA, KENTUCKY.

The culture of hemp is an interest of great and growing importance in the west, its production heretofore being mainly confined to Kentucky and Missouri; but there can be no reasonable doubt in the minds of those who have given the subject any attention, that in the production of hemp, Iowa, Minnesota and Wisconsin have vast advantages over the above-named States.

Many writers have advanced the idea that hemp, like cotton, could not be grown by free white labor, and that its production would, for some time at least, be confined to the slave States. Nothing can be further from the truth; the climate the very best adapted to hemp growing is found far north of the home of the negro, and where he would absolutely suffer from its effects. Hot, short, quick forcing seasons of growth are best adapted to the plant. Growth of this great staple in a climate such as the region referred to actually possesses, makes the day not far distant when these will be as noted hemp-producing States as Kentucky and Missouri ever were. It is to be regretted that in our census returns hemp and flax have been confounded; it may, however, be safely assumed that its growth and preparation are so far below the actual consumption of the country as to assure the agriculturist of a continued good demand and paying prices for many years to come; and the experience of Kentucky and Missouri has fully proved that the production even of an inferior staple has been and is yet remunerative. The reader must bear in mind the fact that American hemp is almost exclusively what is technically called "dew-rotted"—that is, spread upon the surface of the earth and there rotted by the slow process of the elements. France grows more hemp than flax for the linen manufacture and the finer grades of cordage and twines, the fibre being greatly superior to American, from the fact that her climate is of a lower temperature than that portion of this country that grows hemp, and the additional fact that she has abundant supplies of pure soft water for steeping in the rotting process; and the same is true of the Russian production.

The soil of Kentucky is as well adapted to the growth of this plant as any in Europe or America, but there her adaptation ends; her general temperature is too high, and she is entirely destitute of water of the proper quality for the steeping process; hence all attempts to furnish our navy from this State have been failures, notwithstanding that department has offered great inducements to her growers to water-rot.

Iowa has, with a climate much colder than Kentucky, and pure soft water in her small lakes and streams, a soil certainly equal in fertility to any on the globe; why may not, then, her enterprising people reach forth their hands and lay hold of this prize, so well adapted to her soil, climate, and situation? In the process of dew-rotting, the fibre, especially in warm climates, is materially deteriorated, and in some cases so far injured as to produce a very low grade of lint, unfit for anything but the coarsest and lowest kinds of bagging. This is especially the case when exposed to the dew process in open, wet winters in Kentucky, thus proving that the true hemp latitude is north of this State.

Cold, snowy winters, on the contrary, universally produce an improved quality of lint, always brighter and stronger.

CULTURE OF SEED.

The first step in hemp culture is the production of good, sound, plump seed. Land intended for seed must be in good tilth and well prepared by early corn planting; it should be laid off in straight rows, four feet apart each way, and planted in hills seven or eight seeds to the hill; the same rules observed for cultivating corn will apply in the after culture of hemp seed; when the plants reach the height of six or eight inches, they should be thinned to from three to four plants.

Hemp plants are divided into male and female, the former producing the pollen or impregnating powder, the latter bearing the seed. A very little observation will enable the grower to distinguish between them. As soon as the distinction can be made, the male should be drawn up by the root, except here and there a solitary one left that the female plant may be properly impregnated; the female is to be retained until its seeds are perfected, when it is to be harvested by cutting at the ground and removal to cover; when cured, detach the seed with a stout stick of convenient length, winnow and put up in barrels or sacks, perfectly dry, and out of the way of rats and mice.

PREPARATION OF LAND.

The soil for hemp must be a strong, calcareous, deep, warm, loamy, and perfectly dry one, deeply and thoroughly prepared by ploughing and cross-ploughing, until a fine state of tilth is produced, more or less, according to its previous condition.

PUTTING IN THE CROP.

The ground having been faithfully prepared, the grower must hasten the operation of seeding with the utmost despatch, as, generally, the earlier the seeding the heavier the lint of the plant. Mark off the land with a small plough, and very shallow furrow, or it may be marked off by a drag made of a small log of wood—anything to make a line to guide the sower accurately; then proceed by hand to broadcast your seed evenly at the rate of fifty pounds of seed per acre as the minimum, or even up to seventy pounds as the maximum quantity, varying with the strength of the land, the object being to produce as thick a growth of plants as the land will sustain. If set too thin on rich soil, the stalks grow too large, producing a coarse and inferior lint; on the contrary, if seeded too thick, the growth proves so short as to materially affect the value of the crop.

In the latitude of the hemp-growing section of Kentucky the seeding is mostly done from the 1st to the 15th of April, and the land generally ploughed the fall before.

In Iowa the seeding should be done as soon as the ground proves to be in good dry working order. Although the seed itself seems very tender, its vitality easily affected, and its germination after sowing often seriously disturbed by unfavorable circumstances, yet when once above ground, and fairly set, no ordinary frosts that destroy other vegetation seem to affect it; hence but little danger need be apprehended from late frosts, that prove so destructive to corn.

The seed being sown, proceed to cover them up with a light harrow by running both ways to secure uniform results; the more shallow the seed is covered in a moist soil the more certain the vegetation. If the season and soil be dry, a somewhat deeper covering may be necessary. Under favorable circumstances, the crop makes its appearance in a few days, and with proper sun and moisture it rapidly covers the ground. From seed time until harvest, the laborer has only to watch its almost magic growth from day to day.

After having once covered the ground, the crop is generally considered safe by the grower; yet he is sometimes doomed to disappointment. Hail-storms prove very destructive to the tender watery growth of the young hemp plant; high winds damage the yield, but never entirely destroy the crop.

RIPENING AND HARVESTING.

The maturity of the crop is indicated by a change of color in the leaf, it gradually fading from a deep green to a paler hue; also a shedding of the leaves, beginning at the bottom, and gradually extending up the stalk.

The male plants ripen fully ten days earlier than the female, and in some countries, where labor is worth next to nothing, the male is first harvested by being drawn up by the roots, and the female is left standing. In our country such a mode of harvesting is impracticable; hence the American grower must divide the time as near as may be between the earlier and later ripening, and thus secure the best results possible under the circumstances.

The male plant is covered with very minute pods bearing pollen, which, at maturity, burst and fill the whole atmosphere: and the pollen may be seen rising in immense clouds, and floating away from the field. This, in addition to the indication previously named, shows the crop is ready for the knife. This instrument is of a peculiar shape, perfected by long experience, and need not here be described, as it can be purchased in the hemp region of Kentucky at almost any smithy.

The ancient manner of harvesting was pulling, as with flax, but this mode has long since been abandoned in favor of the hemp hook, as the knife is called.

J. B. McCormick, esq., of St. Louis, Missouri, and Versailles, Kentucky, has patented hemp-cutting machinery as an attachment to the McCormick reaper. The writer has used the attachment, and considers it a perfect success. It will supersede the hook in all level lands, and must prove well adapted to Iowa.

In Kentucky some of the best hemp lands lie so rolling and rough as to perhaps preclude its use. If the crop is to be cut with the hook, the operator is required to cut at once through a width corresponding to the length of the hemp, and as close to the ground as possible, spreading his hemp in his rear in an even, smooth swath, where it remains exposed to the sun's rays until it is properly cured, and the leaves sufficiently dried to detach easily. This last operation is sometimes omitted by careless growers, and, some contend, without injury.

The hemp can be shocked or stooked (as the Yankee would say) with more compactness without the leaves than with them, and any operation having an influence upon the future security of the staple from dampness or atmospheric influence is certainly important; the perfect detachment of all the leaves should, then in nowise be omitted. No time should be lost, after the stalk is cured, in getting the crop up and into neat shocks; every additional day's exposure to sun, wind, rain, or dew is deteriorating its quality and subtracting from its quantity. The brighter the stock can be secured the better.

The same rules will apply to hemp that obtain in securing good hay. The operator, in taking up the hemp, uses a rude stick cut from the branches of the nearest tree, about the length and weight of a heavy hickory walking cane, having at the end of the stick a small branch making a hook. With this primitive but very effective tool he can rapidly draw the stalks into bunches of the proper size for sheaves. In operating he throws his rude hook forward to its full length, and suddenly draws it towards him, each motion making a bunch. This he raises quickly from the ground, and with his hook, by a few well-directed strokes, divests the plant of its leaves. He then binds his sheaf with its own stalks, and passes on to repeat the operation. Other laborers follow, and place the hemp into neat, close shocks of convenient size, securing the top by a neat band made of the hemp stalks themselves, after the manner of shocking corn. Here it is suffered to remain until the whole crop is thus secured as soon as possible, selecting clear, dry weather for the operation. The whole crop is to be secured by ricking or stacking. The same rules to be observed in stacking as with grain, the object being to keep the crop secure and dry until the proper time for rotting arrives. In the latitude of Kentucky about the middle of October is the proper time. The crop must be retained in the rick or stack until the summer heats and rain have passed, and frost appears instead of dew. The whole crop is then removed from the rick, and hauled back to the same ground on which it grew, there to be spread in thin swaths for rotting, where it remains without turning until properly rotted. This is indicated by the fibre freely parting from the stalk, and the dissolution by the action of the elements of the peculiar substance that causes it to adhere thereto.

This stage is only to be learned to perfection by practical experience; yet the novice must have some information to enable him to begin, and it is easily acquired by a little observation.

When the operator finds his hemp sufficiently rotted, the wooden hook is again brought into requisition for once more drawing the swaths into convenient bunches. The hemp will have lost much of its weight, and can be bunched and shocked with less labor than at first; besides, at this last shocking, the binding is to be omitted entirely, the hemp is to be carefully and neatly handled, all tangling to be avoided, and placed again in shocks, and firmly bound at the top.

Then comes the last and crowning operation—breaking and dressing the fibre or lint for the market. The peculiar break to be used, like the knife or hook for cutting, needs no description, being manufactured in the old hemp regions, at a cost of about five dollars each, and from long experience has been found perfectly adapted to the uses required. The beginner would save time and money by ordering a sample break, from which any carpenter can manufacture as desired.

The crop is broken in this climate directly from the shock in the open field by the removal of the break from shock to shock as fast as broken. In Iowa, owing to the severity of the climate, it would probably be necessary to remove the rotted hemp to the barn, where the labor of breaking could be more certainly performed. The coldest and clearest weather is the best for this operation; in fact, excess of dampness in the atmosphere suspends this labor altogether. The breaking process is laborious, yet more depends on the skill than on the strength of the laborer.

I have endeavored to describe the whole process as practiced by the best growers in Kentucky. The same mode will certainly apply to Iowa up to the rotting process. With her advantages, steeping in soft water is entirely practicable, by which she will produce an article of water-rotted hemp perhaps in no respect inferior to the highest-priced Russian, which is fully double the value of American dew-rotted, the only sort produced in this State.

The writer apprehends that the season is too short in Iowa for the successful growth of seed—a want easily supplied by the purchase of seeds grown in more southern latitudes; but no shadow of doubt exists in his mind that she can, at the very first effort, produce better hemp than any territory south of her. Time, he thinks, will demonstrate that Iowa, Minnesota, and Wisconsin compose the true hemp region of the American continent.

ROOT CROPS.

BY T. H. LEVERETT, KEENE, NEW HAMPSHIRE.

THE cultivation of the root crop, generally, throughout the United States, and particularly in New England, is of vastly more importance to farmers than they are aware of. In the raising of stock in Great Britain the root crop comes in for a large share of attention as a cheap and profitable article of food. There is no lack of expenditure, both in manure and labor, in order to secure the largest possible yield of this crop. In Canada West, land adjoining our own, the good and thriving farmers grow large crops of roots for their sheep and cattle, and make them profitable. It is universally admitted that the growing of grain in the New England States cannot be made remunerative to the farmers generally; that particular branch of agriculture is more profitably attended to by the farmers at the west. The western States must grow the grain for the east, therefore New England farmers should turn their attention more to the cultivation of roots, which they can make profitable, for they can buy grain cheaper than they can raise it. There is no farmer in New England that makes any pretension to raising cattle, sheep, and horses, but should have from one to five acres of roots of various kinds, and the farmers in the middle and western States would find it greatly to their advantage to make a special business of raising roots to feed their sheep and cattle during the winter months; and, with such land as they have, it is wonderful what amount can be grown upon an acre.

MANGOLDS.

I will give my experience in growing mangolds the last few years, and the feeding of them, with the results I have observed.

The mangold is a great lover of rich land, and the more manure the larger the crop. I have usually sowed the seed early in May, using about four pounds of seed to the acre, and have used land that had been planted with corn and potatoes the year previous, and had been well manured; then I plough in about forty horse-cart loads of manure to the acre, plough eight inches deep, then harrow thoroughly, and level the piece as well as I can with horse-power. The best piece I ever planted was ploughed and harrowed, then cross-ploughed and harrowed the second time, making the soil fine and mellow, and mixing the manure most thoroughly with it.

I will here remark, that I have invariably found the largest crop when I ploughed and harrowed my old ground twice before planting; it will pay the extra expense. How can the small roots of the plants find nourishment in lumps of manure and earth? they run off a long distance for support, and will go round any lump of manure or hard substance which they cannot penetrate; and, unless it is worked over so as to be free from lumps, the farmer might as well leave it in his barn-yard as to think of getting any good from it in such a state. The great secret in growing large crops of roots, or any crop on new ploughed land, is in getting the soil fine—as the old saying is, as "fine as an onion bed." That remark applies to the growing of all kinds of grain and roots, as well as to onions.

In 1863 I spread upon an acre of land (before ploughing) that had been in grass for several years, about eight cords of strong manure from my barn-cellar, and ploughed eight or nine inches deep with my Michigan or double plough, leaving the sod well covered with the soil, then rolled and harrowed it well, and made it as level and smooth as possible. I then furrowed it out at a distance that would let my horse go in one furrow, and the wheels of the cart in the other two; spread fine manure directly from the cart in the furrows; had a man follow with a rake and bring back the soil which the plough turned out when furrowing out for the manure; if any lumps of earth or turf were in the rows they would be removed at that time. Then, as soon as possible, after covering the manure, the man would sow the seed upon this ridge. Much time was spent upon this acre in preparing the land, manuring, &c., thinking I should get a large crop, but the season proved bad for all kinds of roots. There was too much rain. The soil is a sandy loam, and was in good order, usually called rich land. I did not have more than a quarter of a crop, and attributed the failure to the mode of culture more than to the season. I think green sward is not suitable for growing mangolds; they grow chiefly out of the ground, and need richer soil nearer the surface. This was the second time I had failed in planting them in this way, and I shall not try it again. One reason why I attempted this mode of culture was to keep the land as free from weeds as possible. Old ground filled with manure is more inclined to grow weeds than new ground.

In 1862 I planted an acre of land upon which I had grown a hoed crop well manured, ploughed in about twenty four horse-cart loads of manure from my barn-cellar, then cross-ploughed it, harrowed it well, and sowed to mangolds and sugar beets. The sugar beets did not come up well, and I ploughed that part up, about one-quarter of an acre, and sowed to turnips of the purple top variety, (it was rather late for beets,) sowed the seed in drills, and kept them well weeded and thinned out. The result was a very large crop of both mangolds and turnips. I never saw such a growth on an acre. I had about 800 bushels, costing me about seventy-five dollars, (charging one half of the manure to the crop, and nothing for the use of the land, which was worth twelve dollars,) making the cost of the crop about eleven cents per bushel. There were probably more than twenty tons on the acre. Mangolds are heavier than carrots per bushel, and English turnips not so heavy—and who would not rather have that crop of 800 bushels, than an acre of corn of 40 bushels, which is more than an average throughout New England? The weight of mangolds in the fall is about 60 pounds. I have weighed them in April and found they had shrunk only 8 pounds, while my carrots had shrunk from 51 pounds to 40; los on mangolds is $13\frac{1}{3}$ per cent; loss on carrots is $21\frac{1}{2}$ per cent.

TIME OF HARVESTING.

This should be done before the cold and frosty nights arrive, as the freezing of the tops injures their value for feeding purposes; besides, the men can then remain in the field in pulling and topping the roots. The tops at that time are invaluable to feed to milk cows when the pastures are failing, and the cows need to be kept with a full flow of milk and not allowed on the mowing fields, thereby saving all of the manure and getting more milk.

This has been my practice for ten years past. I have some years kept four cows for four weeks entirely upon the tops of the carrot, mangold, and turnip, the cows being in the barn and barn-yard all of the time. Some years I have turned them on to about two or three acres of land, and spread the tops of the roots round the field for them to pick up; but in so doing I lost most of the manure, all of the liquid portion, and the solid was of little use to the land, as all observing farmers will testify. The turnip top should be fed sparingly to cows giving milk, as it imparts the turnip flavor to the milk and cream more readily than other root tops, and more than the turnip itself.

THE FEEDING OF MANGOLDS.

This should never be commenced till January, or, as they practice in the old country, till Christmas, as "they are not ripe and not safe to feed," frequently causing stock to "scour" if fed too early. In feeding them to cows and young cattle I have found that it has been very much to my advantage over grain, taking all things into account. I have grown better looking heifers and calves without any grain, and cheaper than upon grain and hay. All young animals should have something more than hay while growing; they will keep in better health, have better appetites, will eat up coarse fodder cleaner. Their hair is always sleek and glossy; they are in good spirits, always feeling well. Cows that are with calf, and are "coming in" in the spring, are in better condition, and my cows never have any trouble at that time; make better bags, and are less likely to make a miscarriage. I have known many cows that have had trouble, and frequently died when they were in high condition, having been fed with grain during the winter with no exercise; they were not in a good healthy condition. Cows that are in milk during the winter, eating one peck of roots per day, will eat no less hay, but will look better, although it is but a small quantity to feed. When I have a large supply of roots I practice giving from half a bushel to a bushel each day, directly after milking, and never found the roots imparting any unpleasant taste to the milk or cream. Then I have found they would not eat so much hay, but would grow fat, and it has been remarked to me, that "you give considerable grain to your cows: what kind do you feed, &c.?" I can say the same in feeding roots to sheep; they would not eat so much hay. I have had a very good trial of that the past winter. Not having so many roots this last year, I have been obliged to be more economical with them, and have fed them to the ewes and cows that are to come in this spring. I find my other sheep are not doing as well as they did the two previous winters. I have lost more than ever before, have had more ailing, and they do not look as well. I have a regular hospital for feeble sheep, where I can give them better feed and more attention. During the winter of 1862–'63 I fed out to my sheep and cows seven bushels a day, and am satisfied that had it not been for my roots I should have been obliged to have bought several tons of hay to have kept my stock out, and they would not have been in so good condition, nor looking as well as they did.

In taking care of the mangolds during the season, it is of great importance to keep them free from weeds, and the ground often cultivated and ploughed between the rows. When they have grown to a tolerable size, say in August and September, care should be used in not injuring or breaking them down, though I have seen it suggested that the leaves might be broken off and fed to cows, &c. I am sure that such practice would injure the crop materially. I had an acre or two one year, and, after haying, the weeds began to show themselves above the mangolds. My man went through the line and pulled up the large weeds, and in getting them out there was a large quantity of leaves broken off, which he raked out. On another part of the field he did not go, and those roots continued to grow late and large, when, upon the first-mentioned piece where he had raked out the weeds and leaves of the mangolds, they stopped growing and seemed to look like blasting, and never recovered their usual bright green and thrifty look. I can say the same in cultivating late in the season among the roots generally; it injures their growth, breaks down and bruises the leaves, and causes them to blast and grow brown, from which they never recover.

TURNIPS.

The most valuable crop of the root kind, I think, is the Swedes or ruta-baga, but the most difficult root to keep in large quantities, unless one has a barn cellar well ventilated. They are quite a sure crop; do not need quite as rich ground as the mangolds. They will grow to a very large size, and more weight to an acre than any other crop of roots; are better adapted to feeding to sheep and young cattle than to cows that are in milk. The seed needs to be sown early in June, using about one pound to the acre, in drills at least two feet apart, and, if the ground is rich, not less than one foot in the rows. When they first come up, or soon after, when the plants are small, it is a good practice to take common wood ashes and sprinkle them all along in the rows and on the plants. There is sometimes a small fly that will destroy a whole field of them, but I have never been troubled with them, using ashes, as above described, when my neighbors complained that "the fly" had eaten theirs all up, and they were obliged to plough up their ground and sow to something else; and the same I can say of using ashes on my beets.

A sandy or gravelly loam is the best adapted to the growing of this root. It should be well ploughed, harrowed, rolled, and made free from lumps. The manure should be well worked over and made fine before using it, and then if well ploughed in, harrowed, then cross-ploughed, it will surely increase the crop. The ruta-baga should be treated, in the season of its growing, like the mangold. Many careless men think it no harm to jam through a field of roots, corn, or potatoes, stepping on the hills, breaking down the stalks, &c., leaving their mark as they go. It does the growing crop a great deal of injury. Those young and tender plants cannot stand such harsh treatment, and flourish and yield a good crop. The ruta-baga has more fattening quality in it than any of the root kind. They will fatten a bullock quicker and cheaper than anything else, not excepting grain. The meat will be more juicy and tender. The best piece of beef, I think, I ever had was from a three-year-old heifer, fed with these roots; after coming up from the pasture in the fall in good condition, feeding twice a day upon roots and what hay she would eat. She was fed in this way till within two weeks of the time of slaughtering her; then she was fed upon corn-meal and less roots till the last week; then she was fed upon clear meal and hay. Being fed in this way the last part of her life, prevented the turnips from imparting any unpleasant flavor to the meat. If our New England farmers would plant only a small piece for this crop, for this especial purpose, they would find their beef fattening better and at less expense. I intend growing enough of ruta-baga the coming season to fatten all the beef and mutton that I shall want to turn in the fall and winter. The fattening of animals in the winter, and keeping them late, till February and March, without giving them much grain, and getting a high price for them, as is usual at that season of the year, makes it a paying business in the matter of dollars and cents; and then, too, the manure made from these animals is of great importance to the farmer, and he will find his account in the practice.

FLAT OR ENGLISH TURNIPS.

My experience in growing the flat turnip has always been satisfactory. They are grown in drills, and large crops are gathered; but my usual practice has been to sow from three-quarters of a pound to one pound of seed to an acre in my corn fields. At the last hoeing of corn, after going through the fields with the cultivator, sow the seed as though there was no corn growing there; then hoe the corn as usual. In this way I have grown from 250 to 300 bushels an acre, of large, clear, and clean purple-top turnips, free from worms, which find a ready sale at thirty-three cents per bushel at retail, or twenty-five dollars per hundred. I have sometimes sowed one pound of seed to the acre, but have thought it too much. Last season I had an acre of grass land, where the grass was very light—not more than one ton—which I cut the last of June, then put my team to ploughing it with a Michigan plough; spread upon it about fifty bushels of leached ashes and a few loads of fine manure that were left after planting; sowed six quarts each of herds-grass and clover-seed, and one pound of purple-top turnip seed; harrowed it well before sowing the seed, then rolled it. The rain began to fall in two days after I finished the piece. The turnips very soon began to show themselves, and grew finely; also the grass-seed came up, and soon both the turnips and grass covered the ground. This piece of land I had well manured one year and a half before, and sowed to winter wheat; had a fair crop, being a dry piece of land. The grass all dried up, and I thought I would try this experiment; and now for the result. As I said before, the grass and turnip seed came up well, so that in some of the richest places on the acre the clover grew from two to two and a half feet high, and I mowed a good crop of grass in August, taking the turnip tops as I mowed, and to my surprise the turnips grew to a very good size. On the rest of the piece I had a large crop of grass and turnip tops, which I mowed, leaving the turnips all ready to pull, which the men did very readily, all of those of good size, leaving a larger quantity on and in the ground than they pulled. What was left was all eaten up by my sheep when they were brought from the pasture. I gathered over one hundred bushels, that did not cost me more than three dollars, which I am now feeding to my sheep, (February,) and shall have enough to last three weeks into March. There are many acres of land that can be treated in this way, and yet the land be well laid down to grass for a large crop of clover next year, if one has manure at that season of the year to spread after ploughing. The purple-top turnip is the best, I think, to grow; they do not grow so large tops by one half, and bottom better and mature earlier.

The feeding of turnips is best adapted to fall and early winter feeding; then sugar beets come in next for feeding, then ruta-baga, and then mangolds.

I would earnestly recommend to all farmers a more general sowing and raising of the various kinds of roots, thereby saving a great deal of hay and keeping their stock in better condition.

SUGAR BEETS.

The cultivation of this root is considered by some farmers to be preferable to mangolds. If the land is made rich there can be a large crop raised upon an acre. They need the same kind of treatment as the mangolds, are sowed in the same manner, and harvested about the same time.

These roots are better adapted to early feeding than mangolds or ruta-baga. Milch cows are extremely fond of them, and they will produce as much milk as any other root. I have kept store hogs through an entire winter upon them, giving the hogs what slops were made in the house, and sugar beets, cut up and fed raw, given to them at noon. If there was no swill for them from the house, I gave them roots at night. If the hogs are not fed too bountifully, they will eat them as freely and with as good relish as they would corn. If hogs are kept for manure-making, this is the best and cheapest food they can have from early fall to late in the spring or summer, throwing a handful of corn occasionally into the manure for them to dig after. To any farmer thinking of growing roots, that has no experience, I would suggest that he should prepare an acre of ground that had been planted the year previous, and had been well manured by ploughing in a good supply of fine manure about six inches deep, harrow and make it in a fine condition to receive the seed; then sow to the various kinds of roots; divide it off into sections—say one-eighth of an acre to carrots, one-eighth to sugar beets, one-eighth to ruta-baga, and one-eighth to turnips—one-half to mangolds, some of the long red and some of the yellow globe, and to cabbages; and if he will take good care of them, I venture to say he will have the most profitable crop from this piece of any upon his farm.

CARROTS.

It will be useless for me to repeat what has so often been said, that the carrot is a most valuable vegetable to raise for the horse and cow. It has been cultivated for centuries, and always regarded as a most important root crop; but the question to decide is, whether it is a sufficiently profitable crop for the farmer to give much time and attention to its culture in the United States, where labor is high and scarce, particularly that kind of labor (children's) that is needed and best adapted to weeding and thinning out the plants.

My experience has not been in favor of carrots over other roots; the comparative value for milk-making is not equal to mangolds or the sugar beet; their weight per bushel is less at the time of harvesting than that of mangolds; their shrinkage during the winter is greater, and they do not keep as long into warm weather as the mangolds. I have kept the mangolds till the 10th of August, feeding to my cows and hogs, they remaining sound and brittle as at any time during the winter.

The carrot is a slow grower; the seed should be sown as early as the ground will permit, about two pounds to the acre. If not put in early, the weeds and grass will start first and grow faster; consequently the very small carrot plants will be overpowered by them, and, unless immediate attention is given, it will cost more to weed them than they can possibly be worth. If the planting of the carrot is deferred till corn-planting is over, when the soil is warm, the weeds and grass will cover the ground long before a carrot plant will be seen. If I were to make an effort to see how great a crop I could raise at the least expense, I should prepare a piece of sward land by spreading liberally of manure in the fall, (late;) plough it eight or nine inches deep; then spread on ashes or guano, or some fertilizing substance of that nature, (that will not grow weeds all over the piece,) immediately before sowing the seed, and harrow it well, raking and making it as free from lumps as possible. It is customary for farmers to sow but a small piece of land to carrots, and they must be sowed when they can find time after more important planting is done upon the farm. This is a great mistake. To insure success in growing a good and profitable crop more time and care are necessary than for any other hoed crop. In summing up my experience in the matter, I should never recommend the cultivation of them on old land made rich with manure, (particularly in New England,) except upon a small scale for a farmer's own use for his horses and colts. My experience in feeding carrots to cows as well as to colts and young cattle is in feeding a peck each day to the animals; they never eat any less hay; their appetites are sharper, more regular, and the cattle look and feel a great deal better; their hair is more glossy and sleek. I can say the same of other roots as to the effect upon their appetite.

In the spring of 1862 I spread upon the grass of one-eighth of an acre ten horse-cart loads of manure, and ploughed it in full eight inches deep. After ploughing, spread a light dressing of compost manure, and gave it a thorough harrowing; raked it, sowed the seed, and had them well attended to; they came up well, and I harvested 63 bushels of carrots, 30 bushels sweet turnips, that were set out where the carrots had failed, about 20 heads of cabbage, and 3 or 4 bushels of potatoes that grew on one edge of the piece. I called the crop equal to 100 bushels of carrots. The cost was less than ten dollars. They were selling for twelve and a half dollars per ton. Forty bushels to the ton would give me thirty-one dollars for the crop, or twenty-one dollars for the use of one-eighth of an acre of land. In the spring of 1863 (having had such good success the year previous) I thought I would try an acre for the profit of it. I measured off an acre, including the piece that I planted the year before. I spread and ploughed in forty horse-cart loads of manure from my barn cellar full eight inches deep; then spread on twenty-four loads of the finest manure I had that had been previously worked over; harrowed the piece with a revolving tooth harrow, raked off all the lumps and pieces of turf, and made a very nice-looking piece of land. It was rather a formidable job to rake and get off all the lumps, &c., from so large a piece, but I told the men the crop in the fall would pay the bill. Sowed the seed the 12th of May in drills eighteen inches apart, which I found during the season, in taking care of them, was altogether too near. I think twenty-two or twenty-four inches for the rows is near enough. Sowed two pounds of seed upon the piece. Notwithstanding my early sowing, the weeds and grass came up first, and I was obliged to stop all other work to attend to the carrots, which made the cultivation much more expensive. The plants being so small the weeds and grass overshadowed them, owing to the manure I had spread and harrowed in near the surface. After being hoed and the weeds got out, I thought I never saw a nicer looking piece of carrots growing, and should have had a large crop, but the dry weather came on in June and everything suffered severely, my carrots as well as all my other roots. In July it began to rain, and then the rain was too much for them, and the whole season was bad for the root crop generally. The last of July the tops began to blast and grow yellow, and my crop I thought was spoiled, as it afterwards proved to be.

The fore part of September the tops revived; the dead leaves had disappeared; the new leaves from the centre began to show a beautiful growth, but to no purpose; the bottoms never grew to any size.

TIME OF HARVESTING.

This should be done before the severe cold and frosty nights, in order to save the greatest amount of tops, as they are very valuable for feeding to the cows that are giving milk. I commenced with a plough and a pair of horses; ploughed round the piece, turning the furrow from the rows of carrots; the men would go along, pull up and pick the carrots as the plough turned them out. This is a very cheap and expeditious way of harvesting them. The ploughing out of the carrots left my land in a beautiful condition to get in an early crop of grain the next spring. From the acre I only gathered 120 bushels of carrots—and quite small they were, too—about 100 heads of cabbage, one cart load of pumpkins and squashes that grew near the edges, and about 5 bushels of potatoes around the piece; they, too, failed in giving me a fair crop for the amount of seed planted. So my carrot crop was a failure this year; and, as I have said before, I would not recommend the cultivation of them for a market crop, but would cultivate only a small piece for one's own use. I consider the carrot crop the most uncertain of the root kind; ordinarily there is no money made in growing them.

EXPENSE OF GROWING CARROTS.

I kept on hand an exact account of the time of each man, horse, and the manure used. Charging twenty-five dollars, or about half the value of the manure, and I find it cost me $89 06, which is ten or twelve dollars more than usual, for they were more weedy than ever before. If my crop had been an average crop, I should have received at least $195 for them, giving me more than one hundred dollars for the use of one acre of land. I call an average crop five to six hundred bushels; a large crop, eight hundred to the acre. I see it stated sometimes that from ten to fifteen hundred are raised from one acre. These cases are very rare, and upon a very small piece of land, and they should be no guide; neither should it induce any man to attempt to grow the crop for market, as he surely will be disappointed, if he is obliged to pay the price for labor that is demanded at the present time. The most profitable kind for cultivation is the long orange. I have grown this kind and the long white on meadow land that had been well drained, to a very large size, and a large crop per acre, but found the manure that was harrowed in nearer the surface would bring in the weeds. I prefer this kind of land to any other. My horses are doing better this winter, as I am feeding them with less grain than ever before. I give them one pint of meal each morning and night with dry hay, half a peck of carrots at noon and a little hay. They are not at work much now, but they will be in much better condition in the spring, when the hard work upon the farm comes on, and the grain then will do them more good than if they had been eating grain all winter and no work. One of our best livery stable men told me he preferred giving carrots to his horses that were hard at work every day—half a peck every other day at noon, omitting their grain those days—than to give them all grain. He found by several years' experience that this practice was a great advantage to his horses in the way of keeping them in better health, better appetite, and their hair showing evident signs that this kind of feeding was preferable to his former practice of giving grain entirely and no change of food.

I don't intend to discourage any one from growing carrots; they had better have some land sowed with them for their own use. If farmers could always be sure of the seed coming up well, when sowed on good land, they then could be made a profitable crop; but there is so much uncertainty about it that I consider it a very hazardous business to attempt to grow them for a market crop on a large scale.

FLAX

Is flax in its various uses more profitable than other farm products? Of the value of its fibre for cloth the civilized world from the earliest dawn of civilization is sufficient evidence. For strength, for beauty, and durability, it so far surpasses cotton as to be indispensable for certain uses in defiance of all competition. It is grown in a wide range of temperate climates in various soils, while cotton is circumscribed in climate, soil, and conditions of labor. Flax has met with royal encouragement and protection for centuries in Europe, while cotton assumed kingly prerogatives of its own. Yet flax has not rapidly advanced in production, though it has been and is a source of wealth in its fibre, the oil of its seed, and the expressed refuse, so useful in the feeding economy of the farm.

Ireland has long been a prominent flax-growing country. It has long been the home of pauperism, but the two facts have no connexion as cause and effect. The flax of the "Green Isle" is one of its most valuable and profitable products. Scotland produces little of it, and England less; yet the few who do grow it find that it pays liberally. It is not that England desires flax the less, but that she needs bread the more. With her dense population, while flour is a necessity, beef and mutton are indispensable.

If flax is not largely produced there, it is extensively manufactured, and the initiatory processes of its manufacture in the rural districts have been of immense value in the economy of British industry in particular localities. Observers have noted the renovation, through the potent influence of flax industry, of parishes filled with wretched town hovels, virulent with typhus fever, festering with indecency and crime, and consumed with pauperism. Each family became able to occupy a commodious cottage, disease was banished, pauperism subsided, illegitimacy became unknown, schools flourished, industry prevailed, and the condition of residents was immeasurably bettered, through the social and physical amelioration from the profits of flax-growing and preparation of fibre.

It afforded profitable labor to children, women, and aged and feeble persons, whose wages increased the common fund instead of preying upon the earnings of able-bodied members of the family, and who would otherwise have been compelled to eat the bread of idleness and charity. Persons accustomed to depend for supplies upon the "union houses," were enabled to live comfortably on their own industry, and to accumulate respectable savings.

These examples have not made England proper a great flax-growing region, mainly because English proprietors, who rent to farmers, have entertained the idea that the crop is an exhaustive one. This impression is now wearing away, and the objection will henceforth be comparatively inoperative.

The same necessity does not exist in the United States for employment suited to children and infirm persons who are compelled to labor. Labor of all kinds is here in demand beyond the ability of the country to supply. Abundant testimony exists showing that the crop has always been profitable. It is now far more profitable. The advance in seed from one dollar to three per bushel, and a general demand for fibre that was formerly thrown away in a large section of the country, has given an impetus to production, and an enhancement of profit gratifying to the political economist, who desires the success of present efforts to make this a great staple, feeding an extensive manufacture.

Among instances of successful culture that may be referred to, is one in Henry county, Illinois, where, upon two acres of prairie, well ploughed, and sowed with one bushel of seed, thirty-five bushels of clean seed and two tons of straw were produced, the straw yielding eight dollars per ton. It was cut by a machine, and the seed separated by the trampling of horses.

In Boone county, Illinois, three and a half acres yielded thirty-five bushels of seed, and five tons of straw, at a cost of \$47; proceeds of seed, \$96 25; of straw, \$50—a total of \$146 25. Net profit, \$99 25, or \$28 35 per acre.

These specimens of prairie culture, with no more expenditure of labor than in cultivating and marketing wheat, producing net returns equal to two-thirds of the gross receipts, are certainly more encouraging than the yield of fifteen bushels of wheat costing at least two-thirds of its highest returns. That careful culture and proximity to manufactories will secure better results is shown from an experiment in Worcester county, Massachusetts, where 136 square rods, or a trifle more than five-sixths of an acre of old, sandy pasture, with the aid of 130 pounds of guano and 13 loads of barn-yard manure, gave a total product of \$148 20, at an expense of \$54 58—a profit of \$93 62. This is almost identical in gross and net returns with the three and a half acres of prairie, and shows that laborious culture and adequate fertilization are sufficient compensations for superior fertility.

It would seem, then, that at present prices flax should be considered largely remunerative. The great drawback now, as heretofore, is the amount of labor required in the preparation of the fibre. For the progress made in processes of manufacture and improvement of flax machinery the reader is referred to the report of the flax commission, soon to be published. It is certain that flax must henceforth be cut instead of pulled, either by the reaper, and carefully disposed in gavels, or by the mower for gathering, after the manner of hay. If a profit of $50 to $60 per acre has in former years been made in England, with former processes and machinery, requiring tillage, pulling, steeping, beetling, breaking, and scutching, cannot Americans be expected to thrive on its simple culture and harvesting, the manufacturer quickly and cheaply transforming the straw into strong and beautiful goods? If we get less of seed and fibre here—400 pounds of the one, and 10 bushels of the other per acre—we do it with far less labor.

CULTURE.

In the cultivation of flax in this country consideration must be given to the question of labor, however necessary clean culture and good tilth may be. The Belgian practice of hand-weeding by women and children on all fours, with coarse cloths interposed between their knees and the damp ground, is not admissible. Our husbandry is not yet so systematic that we may place flax, as in Flanders, in the third year of a seven years' course, or the fifth in a ten years' rotation; nor can we imitate the clumsy and slow processes of the Russians, whose labor is abundant and cheap; nor can we, except in regions remote from factories, and in quantities suited to the wants of home manufacturing, indulge in the costly pastime of pulling flax and preparing the fibre in the old way. Flax soil must be well pulverized, but by a rapid as well as thorough process; it should be free of weeds, but by clean culture by horse or ox power, (or by steam,) of the previous crop mainly; and it must be cut by the machine mower, cured, and delivered to a neighboring manufactory at as little expense as hay is made and marketed. Farmers will never increase very materially the flax product, at least in the present generation, if they are compelled to add to the business of legitimate farming the special knowledge and manipulative skill of the manufacturer. And the most encouraging feature in the flax business is the fact that advancing progress in manufacturing has already offered a good market to flax fibre thus prepared. Such fibre, "in the rough," farmers stand ready to supply in unlimited quantities and at tow prices.

SOIL.

Flax grows well in a variety of good soils; that which has been usually recommended is a deep, lively loam, with a clay subsoil. If the subsoil is stiff, or near the surface, it should be thoroughly subsoiled and properly drained. The rich loams of New York, that give a vigorous growth of barley, are there preferred for a flax crop. Timber clearings, with a rich soil, free from acids, are good; and pasture lands of the better quality are frequently chosen. The conditions requisite are good drainage—that the atmosphere, rather than stagnant water, may occupy the interstices of the soil—that the roots of the plant may seek moisture instead of being drowned by it; and a climate of medium temperature, free from aridity on the one hand, and unexposed to excessive moisture on the other, as in some low bottom lands of our western rivers. Alluvial soil produces a fine crop, if somewhat silicious, and not subject to flooding in spring and drought in summer.

DOES IT IMPOVERISH THE SOIL?

This is an important inquiry, which has been answered in the affirmative without due consideration of obvious facts. As its seed is saved for oil and its fibre for textile fabrics, it has been hastily assumed to be, like tobacco, (a vigorous grower, which is removed *in toto* from the soil,) very exhaustive. Its most valuable inorganic elements are phosphoric acid and the alkalies. An average product of flax requires about the same amount of phosphoric acid as wheat, and nearly twice as much of alkalies, the former withdrawing from a rood of land (according to McAdam, in the Royal Agricultural Journal) 12.21 pounds of alkalies, and 5.94 pounds of phosphoric acid, and the latter taking (according to Way) 7.5 pounds alkalies, and 6.9 pounds acid. This would show it to require more potash than wheat. But there is a consideration that should not be ignored here. Wheat becomes food for man, and is generally lost entirely to the soil; flax is largely composed of woody structure, which is returned to the soil. The seeds contain much of the remaining inorganic matter; the fibre is mainly obtained from the atmosphere, but about five pounds of mineral matter existing in the fibre from a ton of flax; so that if the refuse or cake is fed to cattle, most valuable manure is obtained, and flax may assume a place in the rotation of crops with positive advantage to the soil it occupies.

It would be a positive benefit in another respect. It is a crop that absolutely compels clean culture. It is an extirpator of weeds. It is usually grown after a root crop, and in Holland and Belgium hand culture is employed to keep down the weeds. If careful culture is given it, and the cake or its equivalent is fed upon the farm, flax will not be found to be either exhaustive or unprofitable.

If grown only for fibre, and cut when in flower, it will be seen to be less exhaustive than wheat.

ROTATION.

The Belgians, Dutch, and Irish are very systematic in their rotations of crops, as we are not; they obtain one flax crop in seven or ten years, usually after a "corn" crop, generally oats, such grain crop invariably following grass or clover. It is held to be an error to make flax follow a potato crop, though it was often grown in New England after corn and potatoes, and did well on old pasture land, well broken, planted in potatoes, and afterwards sown with flax. If planted for the fibre, it is essentially a green crop, and should not, as a general rule, immediately follow one. Hoed crops best precede it, because likely to secure clean culture.

Double cropping is sometimes practiced with flax, which requires only about ninety days to perfect it. Carrots are frequently sown in drills with it in Belgium, and being carefully weeded with the flax, they are in vigorous condition when the flax is removed, and come rapidly to maturity. Again, after the harvesting of flax, some farmers in Ireland plough and harrow in a mixture of guano and gypsum, and sow with rape. In this country barley has frequently been sown with flax. One instance is recollected in which two bushels of barley and one of flax were put into an acre, the product harvested together and threshed by machine, yielding thirty bushels of barley and fifteen of flax. Other land on the same farm, of equal fertility, yielded but thirty bushels of barley alone. In another instance the past season one bushel of seed sown with barley over five acres produced fifteen bushels of seed without apparent injury to the main crop. These double crops are only desirable in a labor and land-saving point of view, and when additional fertilizers make good the excessive draught on fertility. With niggardly supplies of manure the farmer would lose by it; with skilful and high farming, he might grow two crops at the cost of cultivating one, and thus save by it.

PREPARATION OF THE SOIL.

The soil should be as fine, deep, and clean as possible. It should, of course, be ploughed only when free from excessive moisture. The amount of ploughing and harrowing must depend not only upon the nature, but upon the condition of the soil, and should stop only when the ground is in good tilth. On a very friable loam one ploughing might answer, two would be better; on very stiff soils three are received. It is well to plough stubble in the fall, throwing it into ridges to secure the amelioration of freezing, with surface drains to let off the water; and then plough and harrow early in the spring, and again before sowing if possible. It should be rolled to give consistency and an even surface. While such preparation is necessary, in most instances, the actual fact is that many American farmers only plough once in the fall and harrow in the spring.

MANURES.

The principal reliance for manures is in the application for the previous crop; yet many apply well composted manures directly, and special fertilizers, such as ashes, plaster, and salt, and sometimes phosphates. One bushel each of plaster, salt, and ashes per acre has given satisfactory results. These ingredients, with somewhat larger quantities of bone-dust and sulphate of magnesia, constitute the formula of Dr. Ure. These special manures are often given as a top dressing after the flax is up.

SEED.

Riga seed is best. Ours is apt to make coarse and bushy plants. We sow in rich soil, and do not use seed enough. It will be a long time before we outgrow this habit of producing heavy seed and worthless fibre. It should be plump, bright, and glossy, and be thoroughly screened free of all weed-seeds. Instead of a half bushel to a bushel, as in the west, or a bushel to a bushel and a half, as in New York, it will be necessary, for the production of such fibre as is produced in Holland, if we ever make it, to seed still more liberally. To produce such fibre as our manufactories are now working, the New York measure is quite small enough.

SOWING.

The seed should be put in as soon as the soil is dry enough to work well, unless danger is apprehended from frosts. In compact soils, the seed, evenly sown, may be harrowed in; if prairie, it may be rolled in; in loose soils in New England it is bushed in. The seed should not be placed more than an inch in depth.

OTHER FIBRES.

Few people not engaged in the trade or manufacture of fibres are aware of the immense quantity of coarse fibrous material now used for cordage, for bagging, for various heavy fabrics, and even for admixture with silks and the finer class of goods. Of the different kinds of raw material from which cloths have been manufactured, only a few of the most common will here be indicated.

HEMP.

Cannabis sativa, known popularly as hemp, is, next to flax, the most extensively used of this class of fibres for cordage, bagging, sail-duck, and coarse goods.

Our product of hemp in 1850 was 34,871 tons; in 1860, 104,480 tons. Our imports of "hemp"—not exclusively hemp proper, but "Manilla" and other substitutes—have recently been as follows:

	1859.	1860.	1861.
Burlaps	$106,396	$77,810	$63,215
Bagging	24,202	12,258	21,992
Osnaburgs	731	595	....
Duck	3,387	20,952	16,748
Other manufactures	298,030	657,520	490,537
Unmanufactured	405,173	325,846	253,601
Tow	13,719	7,857	15,063
Total	851,638	1,102,838	861,156

In 1862 the import of Russian hemp was $264,356; Manilla, $871,017; jute and coir, $122,369; Sisal grass and other cordage material, $23,635; yarns of different fibres, $32,144; cordage, $29,195; gunny cloth and bags, $234,201; hemp carpeting, $42,114; burlaps, $537,911; sail-duck, $228,606; Russia sheetings, $126,060; grass cloth, $47,505; other manufactures, $254,796. Total, $2,813,909.

JUTE,

the use of which has increased wonderfully in the past year or two, is a fibre produced by the *Corchorus olitorius* and *C. capsularis.* It is grown mainly in India. It is an annual, with smooth stems, growing five or six feet, and sometimes attaining a height of ten or twelve feet; has small yellow flowers, succulent leaves, sometimes used as pot-herbs. They are thus used in Egypt and in Asia Minor; hence the name "Jew's mallow." It has a low habit in Judea compared with its magnificent proportions in India. It is sown in April or May, flowers in the rainy season, and ripens its seed in October and November. It has long been cultivated in India and China for its fibre, which is separated by maceration, and used not only for cordage and gunny-cloth, but for paper-making. It produces from 400 to 700 pounds per acre, and a winter crop of tobacco or mustard-seed follows it, when the soil and elevation are suitable. It was formerly sold at a very low price, realizing in the English market about $75 per ton.

The export of jute from Calcutta in 1851 was 29,000 tons, valued at $875,873, and of gunny-cloth an amount still greater in value, or nearly two millions. The increase since that date has been very rapid. Our jute imports (as seen in the paragraph on hemp) amounted in 1862 to about one-third of a million of dollars. The imports of jute into England for the same year were 969,943 cwts., valued at $4,698,730, or $96 per ton. Besides, imports of jute manufactures amounted to $1,154,605. Thus a fibre almost unknown a generation ago has increased its products from thousands to nearly as many millions. Jute and its manufactures have almost attained the magnitude, in the English schedules of imports, of the hemp interest.

The price of jute in England, at last advices, ranged within $100 and $145 per ton.

SUNN.

The true hemp is little grown for fibre in India, except to some extent in the mountainous region. It is everywhere cultivated, however, for its intoxicating quality. By "hemp" is sometimes meant sunn, *(Crotolaria juncea,)* and sometimes the brown hemp, or *Hibiscus cannabinus.* The latter is the "Indian hemp," though this name is incorrectly applied to sunn. The exports from Calcutta are mainly of the *C. juncea*; from Madras and Bengal, *H. cannabinus* mainly, and the western shores of India. The flowers of the latter are large, of a sulphur yellow, with a brown centre, having a resemblance to those of the mallow, the hollyhock, and the cotton plant. Its fibres are sometimes five or six feet in length.

The sunn is a leguminous plant which bears a close general resemblance to the Spanish broom, with leaves usually from four to eight feet, and often attaining ten to twelve feet in height.

It requires a rich upland soil, without clay; sown in June, and cut in August and September; sometimes sown in October and cut in April. The yield is from three to ten hundred weight. It is steeped, and then beaten and washed in water. Twenty years ago, in England, it sold at £18 per ton when Petersburg hemp was worth £38, Indian brown hemp £20, and jute £12. Ten years since the prices were: Petersburg, £60; Indian brown, £40; sunn, £30; jute, £23.

MANILLA.

The Manilla "hemp," which figures so largely in commercial tables, is a species of wild plantain, *Musa texilis*, grown mainly in the Philippine islands. It is very durable, and lighter and cheaper than Russian hemp. In 1862 more than ten thousand tons were imported into this country at an average cost of $104 per ton. The natives find in its preparation a source of comfort and comparative wealth. All of the plantain and banana tribe abound in fibre, which is obtained from the leaves by scraping away the pulp, washed, and boiled in an alkaline lye.

The Sisal hemp, a fibre somewhat resembling Manilla, is a cheap product, and is an aloe which grows wild in Yucatan.

CHINESE GRASS CLOTH.

The fibre of *Urtica nivea*, (or *Bœhmeria nivea*,) called *Rheea* in the commerce of the east, is stronger than common hemp. It belongs to the branch of the nettle family known as "stingless." It is rapidly propagated by parting the roots, when numerous shoots are thrown up, which may be successively cut down, and three crops obtained, the last of much finer fibre than the others. Beautiful silk-like cloth is manufactured from it. It is so fine as to rival the best specimens of flax. There are different varieties of these nettles, known by different names, in various portions of southern and eastern Asia, which are furnishing increasing quantities of fibre for export.

The New Zealand flax, one of the liliaceous plants, *Phormium tenax*, a flaglike grass, yielding twice the amount of strong fibre as flax, is a common article of commerce. The leaves are perennial, from five to seven feet in length, sword-shaped. They are cut, macerated in water, and passed under a weighted roller.

COIR AND OTHER FIBRES.

This name is prominent in the commerce in fibres. It is from the husk of the cocoa-nut, or *Cocos nucifera*, and is extensively used for matting, coarse sail cloth, and a light and elastic description of cordage.

The pine apple tribe affords fibre from its long, thorny-edged leaves, which is woven into the finest fabrics and twisted into fishing lines. One variety is used in the West India islands for making fences for fields. It is much used for fishing nets, and as cordage, is superior for holding anchors. In the Philippine islands there is wrought a variety so fine as scarcely to be visible, from which a muslin-like fabric is woven and beautifully ornamented.

The Agaves or aloes, especially the *Americana*, are growing into importance as fibre-making plants. A machine for separating pulp from the fibrous portion of the leaves is in successful operation.

The *Asclepias*, a very extensive family, abound in fibre, but little used as yet. *A. tenacissima* is a small climbing plant, from which bowstrings have been made that have lasted five years under exposure to the weather. It is held to be fifty per cent. stronger than hemp. *A. gigantea*, a plant with broad, fleshy leaves, growing in India. Like the common milk-weed of this country, it gives out a milky juice when wounded, which has been used medicinally as an alterative in cutaneous affections. From it sugar is also obtained, and a very good substitute for gutta-percha prepared. It will grow where nothing else can thrive, requiring no culture or water on dry sand. The fibre is obtained with some difficulty by peeling by hand and manual manipulation only, water being injurious. It is of unusual fineness and strength, and great value.

The Chinese make paper of rice straw, young bamboos, and the bark of the mulberry. The agaves, plantain, pine apple, and the straw of the cereals, and husks of maize, are among the many materials useful for paper-making.

The *Esparte*, of Spain, or *Stipa tenacissima*, is the most successful fibre-producing grass known, assuming a growing commercial importance. It is used for sandals, mats, baskets, ropes, sacks, nets, hurdles for sheep, and paper-making.

Bromilia sylvestris, the silk grass of British Honduras, grows spontaneously in great profusion. It has soft, green leaves, one and a half to four inches wide, and five to ten feet long, with sharp curved thorns along the edge, the upper side of the leaf soft and pulpy, and under side hard and ligneous. Its annual product has been valued at fifteen millions of dollars.

Many other plants, possessing fibrous qualities of value, might be named. The domain of nature is filled with fibres, differing greatly in tenacity, lightness, fineness, and color, and in other particulars. Their practical value depends more upon the facility of separation of fibres than upon ease of culture or amount of product.

SEED OILS.

The demand for seed oils has rapidly increased of late, notwithstanding the vast expansion of the production of petroleum and coal oils, which are to some extent used for the peculiar purposes of linseed oil.

Our own seed product increased from 562,312 bushels in 1850, to 611,927 in 1860. In the latter year the import was 2,754,060 bushels, which was an average import for the four years preceding 1861, though considerably larger than the average for ten years. The export of foreign seed in that year was but 13,642 bushels, and the domestic export 3,810 bushels, figures too insignificant to be taken into the account. Leaving 61,927 bushels for seed, the domestic oil product, at two gallons per bushel, would be 1,100,000 gallons, the imports (being from the British Indies, with the exception of 217 pounds, and rich in oil) at 2¼ gallons, 6,196,635 gallons, making a total of 7,296,635 gallons of domestic manufacture. Including 402,908 gallons imported, and deducting 26,799 gallons exported, there is left for home consumption 7,672,744 gallons.

Since 1860 the supply of seed produced at home has been constantly augmenting, while the imports have dwindled to a small point, 186,347 gallons in 1861, and 51,212 gallons in 1862. The price continued at a moderate figure during 1861; in 1862 the domestic product was higher by at least twenty-five per cent. The average price of seed and oil fluctuates greatly from year to year. The official statement of seed exports shows that the average in 1856 and 1861 was \$1 73 per bushel; in 1859, \$1 44; in 1860, \$1 40; in 1855, \$1 03. In 1862 the returns show but fifteen bushels were exported, valued at \$59.

The following statement shows the average prices at the place of shipment for exported and imported oils, and for exports of domestic seed during eight years past:

Year.	OIL.			SEED.
	Foreign.	Domestic.	Re-exported.	Cts. per bush.
1855	$0 62	$0 87	$0 85	$1 03
1856	51	91	82	1 73
1857	65	93	63	1 50
1858	58	74	70	1 66
1859	57	81	57	1 44
1860	69	70	75	1 40
1861	66	65	74	1 73
1862	65	83	77	3 93

In England both the demand and the supply of oil-seeds have increased, but the supply has by no means sufficed to meet the wants of oil-crushers. France, Germany, and Italy are enlarging their manufacture of oil, and bidding against England to secure it. British imports of oil-seeds (principally linseed and rape) have averaged 11,000,000 bushels per annum for three years past. In 1847 the import was but 3,896,280 bushels.

A great variety of seeds are used, most of them to a very limited extent, for oil-making. Cotton-seed, within ten years, has grown into much importance for oil-crushing, the amount used having increased ten per cent. in a few years. A sort of gourd growing in western Africa yields a valuable oil from its seeds, called eguse oil, of a rich golden color and pleasant taste. It burns with a clear flame, is an excellent lubricator, and a good salad oil. These seeds are white, ovate, compressed, about an inch long, having a nutty flavor resembling a hazel nut or young almond. The natives dry, parch, bruise in a mortar, grind into a paste, and manipulate them by repeated heating and squeezing, until the oil is exhausted, which they sell at fifty cents to one dollar, according to produce and season. The trade in African ground-nuts is assuming a magnitude of which few are aware. Gambia alone exports 12,000 tons, worth $675,000. Sunflower-seed is produced in Russia to a certain extent. It yields at a fair average fifty bushels of seed per acre, capable of producing as many gallons of oil, and an oil-cake said to be worth more than that from linseed. Seeds of mustard, colza, hemp, and gingelly, and poppy are brought from the East Indies to some extent for oil. Among other seeds producing oil may be named niger-seed, castor, and camelina; among fruits, the olive, walnut, palm, cocoa, wohwa, etc., the latter salad oils or vegetable butters.

CONTINENTAL SUPPLIES.

Russia stands at the head of flax-growing countries. Austria, France, Ireland, Prussia, Belgium, and Holland follow in order. It is estimated that in Russia one and a quarter million of acres are devoted to flax-growing. Fifteen years ago the exports of dressed flax amounted to 84,745 tons; in 1860 it was but 72,901 tons. The diminution of exports is due to the increase of manufacturing at home; and the recent cotton famine has increased this home demand for textile fibres, and rendered Russia a precarious dependence for British flax mills.

The extensive shore-lines of Russia, with a moist atmosphere and rich, loamy soil, and the abundance of cheap labor, give advantages to Russia which scarcely any other nation enjoys for the production of flax. Yet it must not be supposed that Russian material is the best; at least two causes unite to render it inferior either to that of Belgium or Ireland. The climate and soil of Russia are better adapted to coarse fibre than either of those countries; and the ex-serfs are very unskilful and careless flax-growers, leaving both seed and fibre in a dirty state.

The annual flax product of Russia has been officially estimated at 361,156,068 pounds, at 333 pounds per acre, in addition to a considerable quantity in the south of Russia grown for seed and for fuel. Almost one hundred fold the amount of our flax-fibre product is thus produced in Russia.

The exports of seed from Odessa alone are reported for 1860 at 1,182,574 bushels, valued at $1,748,715, or $1 48 per bushel. The price has formerly been from $1 to $1 25 per bushel. The total exports for 1860 were 9,771,666 bushels. Riga flax for seed was exported in the same year to the extent of 682,120 bushels, sent mainly to Belgium, France, Ireland, and the German states.

The Russians have recently imported large quantities of first-class spinning machinery, and engaged skilful foreigners to manage it. They are obtaining almost a monopoly of the trade in ships' cordage. As early as 1824 the linen manufacture in Russia amounted to $2,338,300.

The culture and manufacture of flax have long been important branches of Austrian industry. The manufacture is mainly done by hand in the houses of the peasants, and is a more extensive interest than any other manufacture. The annual product of fibre is about 190,000,000 pounds.

In France, Holland, and Belgium flax culture has attained its highest elevation, and the finest fibre known to the manufacture is produced. The soil is reduced to a uniform texture, with all the care and labor applied to the preparation of garden plots. Manures are supplied, through the highest skill of practical chemistry, to supply deficiencies and equalize excesses of the various ingredients.

The Irish acknowledge that a better system of cultivation must be secured, or they can never expect to compete with Belgium in the production of fine fibre for the cambric manufacture.

The exports from Belgium and Holland have of late greatly increased, with a corresponding increase in manufactures. England received from Holland, in 1859, 4,429 tons; in 1860, 7,441 tons; in 1861, 6,170 tons; from Belgium, in 1859, 4,971 tons; in 1860, 6,273 tons; in 1861, 6,501 tons.

The home product of Great Britain is mainly the growth of Ireland, a country, in climate, soil, and conditions of labor, well suited to flax culture; yet the business is subject to sudden and wide fluctuations. When grain is high, the acreage in flax is diminished; when low, the farmer sows more flax. It is the crop of the small farmer, pulled, steeped, scutched, and cleaned by his wife and children, its proceeds serving to keep the wolf from the door of his lowly cabin, and to add to the comforts of his home.

Not only is there fluctuation in the acreage, but the yield per acre is quite as irregular as the extent of area sown, as may be seen by the following table:

Year.	Acreage.	Yield per acre.
1854	151, 403	526 pounds.
1855	97, 075	395 pounds.
1856	106, 311	321 pounds.
1857	97, 721	429 pounds.
1858	91, 646	443 pounds.
1859	136, 282	556 pounds.
1860	128, 595	....
1861	147, 957	....
1862	150, 070	....
1863	214, 092	....

The yield of the Irish crop, in 1863, is estimated at 60,000 tons, the increase in acreage being 41 per cent., and the product per acre unusually large, making an aggregate at least double the annual average for ten years past. Its value is estimated at $20,000,000, at $333 per ton. There are now 650,000 spindles in operation there, which will use 40,000 tons, leaving 20,000 tons for the English mills.

Continued efforts will be made, while the special demand for textile fibres exists, to increase the amount of the Irish crop, which is not only more skilfully cultivated and prepared than the Russian, but is a stronger article.

A hint at the value of this interest to a community is illustrated by the fact that in the province of Ulster, Ireland, last year, the flax product realized $20,000,000 to the farmers, and when manufactured within the province, $165,000,000. The province has a population of two millions.

In Ireland, as in this country, the hinge upon which flax production turns is the success of improvements tending to diminish the cost of preparing the fibre. In 1847, when the processes of Schenck and others led to the hope that scutching machinery would be dispensed with, there was a *furore* for flax-growing, and a subsequent disappointment when those improvements failed to supersede tedious hand operations. For several years there was a disinclination to extend the business. The desired facility of preparation is not yet attained, though great improvements have been made in machinery. The Rowan machine for scutching dispenses with the skilled labor necessary with the old machines, and has been operated successfully by a little girl.

At present prices flax culture is found extremely profitable in Ireland. It has, in fact, always been profitable there. At a meeting of the tenantry of the Earl of Erne, on his estate, in the county of Fermaugh, Ireland, during last winter, the earl read a letter from a tenant showing the receipt of $400 from 24 cwt. 2 qrs. 20 lbs. of flax grown upon a little more than two acres and a half. He also introduced the following, furnished by Mr. Weir, his manager of a distant estate, as the cost of cultivating one Cunningham acre of flax:

Two ploughings and harrowings	£1	0	0
Sowing, rolling, and weeding	0	2	6
Pulling	0	8	0
Carting to steep and placing in ponds	0	10	0
Taking out to steep and carting to spreading ground	0	8	0
Spreading	0	5	0
Lifting and stacking	0	5	0
Scutching and breaking	1	15	0
Carting to mills and market	0	6	6
Seed	2	0	0
	7	0	0

An average product would be 5 cwt., worth $60 to $100, according to fineness. Deducting $35 as the cost of culture, a very fair margin is left both to tenant and proprietor.

England grows but little flax, her whole agricultural energies being directed to the production of mutton, beef, and breadstuffs. The condition of Scotland is essentially the same, 3,000 to 6,000 acres only being devoted to flax culture. Dorset, Somerset, Norfolk, and Yorkshire have been engaged sparingly in flax culture. An effort has recently been made to increase it, but Englishmen are well aware that their main reliance is upon their colonial possessions, or Ireland, rather than England, for increase of flax-growing, and hence efforts have been directed to Canada, northern India, and Australia. Little has been done in the latter country, yet it is said that thousands of acres of wild flax are growing there, on river banks and alluvial bottoms, so thickly that it is difficult to tell whether grass, rushes, or flax predominate. It is believed that proper cultivation will produce there as fine an article as is grown in Belgium. In India a promising beginning has been made, and an Indian flax company has been organized in Belfast, Ireland. A fibre worth $300 per ton has already been obtained in northern India.

HOME STATISTICS.

Statement of imports of flax manufactures.

Year.	Manufactured.	Unmanufactured.	Seed.	Oil.	Total.
1855	$8,617,165	$286,809	$1,009,381	$776,097	$10,689,452
1856	11,189,463	132,461	1,741,260	1,063,771	13,126,955
1857	11,441,542	220,738	3,003,824	958,200	15,624,304
1858	6,579,014	197,934	3,243,174	164,757	10,184,879
1859	10,340,784	146,707	2,415,792	695,172	13,598,455
1860	10,736,793	213,687	2,754,060	402,908	14,107,448
1861	7,827,626	171,905	71,786	123,538	8,194,855
1862	4,049,672	175,870	513,585	33,531	4,772,658

The following statement embraces most of the flax products imported in 1863 :

Linens, 35,526,380 yards	$6,348,823
Thread and twine	1,154,876
Drills and Damasks	118,193
Thread lace and insertions	54,933
Other manufactures of flax	365,601
Unmanufactured flax	427,907
Flaxseed, 1,268,554 bushels	1,712,408
	10,182,741

The following are the imports of unmanufactured flax since 1858:

Year.	Flax.	Tow.	Total.
1858	$197,934	$29,691	$227,625
1859	146,707	179	146,886
1860	213,687	458	214,145
1861	171,905	4,961	176,866
1862	....	....	175,870

Statement showing our exports of flax products since 1855.

Year.	MANUFACT'S.	FLAXSEED.	OIL-CAKE.	OIL.	
	Foreign.	Domestic.	Domestic.	Domestic.	Foreign.
1855	$278,850	$6,016	$739,589	$49,580	$11,155
1856	179,666	18,043	1,136,970	57,190	21,793
1857	92,930	525	1,186,980	54,144	38,745
1858	63,770	....	1,435,861	48,225	13,429
1859	71,582	8,177	1,198,581	34,194	8,297
1860	180,611	3,810	1,609,328	26,799	2,639
1861	26,372	49,609	1,386,691	27,982	2,087
1862	23,200	59	875,841	20,893	3,729
1863	....	96,805	1,277,735	29,861	....

The average price of seed has fluctuated from year to year. In 1856 and 1861 it was $1 73 per bushel; in 1859, $1 44; in 1860, $1 40; in 1855 it was but $1 03. From this latter period until the first year of the war the extremes are found to meet in 1855 and 1856. The following is an exhibit of the prices of seed and oil at the port of shipment:

Year.	OIL.	OIL.	EXPORTS.	SEED EXP'TS
	Imports.	Foreign.	Domestic.	Domestic.
	Per gall.	*Per gall.*	*Per gall.*	*Per bush.*
1855	62 cents	85 cents	87 cents	$1 03
1856	51 "	82 "	91 "	1 73
1857	65 "	63 "	93 "	1 50
1858	58 "	70 "	74 "	1 66
1859	57 "	57 "	81 "	1 44
1860	69 "	75 "	70 "	1 40
1861	66 "	74 "	65 "	1 73
1862	65 "	77 "	83 "	3 93
1863	....	....	....	....

Imports of flax into England.

Place.	1859.	1860.	1861.
	Cwts.	*Cwts.*	*Cwts.*
Russia and Prussia	1,167,297	1,143,516	1,031,044
Holland	88,589	148,839	123,404
Belgium	99,421	125,474	130,216
Other countries	76,730	46,981	49,015
	1,432,037	1,464,810	1,333,679

The imports of 1862 were 1,798,351 cwts., valued at $26,029,560, or $290 per ton. Those of 1861, as above, were valued at $17,115,685, or $256 per ton.

The following statement shows the imports of flax and similar fibres into England in the last three years, exhibiting a steady increase, except in flax in 1863, which was extensively manufactured at the sources of supply, and hence could not be obtained to meet the demand:

	1861.	1862.	1863.
	cwt.	*cwt.*	*cwt.*
Flax fibre	1,333,679	1,798,351	1,458,962
Hemp	792,054	981,765	1,038,159
Jute	932,638	969,943	1,252,787

OIL-CAKE AND ITS USES.

The consumption of oil-cake for fattening purposes has reached an extraordinary point in Great Britain. It is not easy to ascertain how much of their imported oil-cake is linseed, but it is estimated by good English authorities at one-half. The average importation for eight years past has been 93,000 tons, one-half of which is 46,500 tons. The manufacture of cake from seed has been more than three times as much. The imports of linseed have averaged for eight years 198,000 tons per annum, of which one-fourth is oil and three-fourths cake, leaving 148,500 tons of domestic cake, which, added to the estimate of linseed cake, gives a total of 195,000 tons, valued at more than nine millions of dollars. Including other oil-cakes, the total would be increased to 241,500 tons, swelling the entire consumption of oil-cakes to at least eleven and a half millions of dollars. And this is the average for eight years past, which is much ess than more recent figures, as will be seen from the following statement:

	Oil-cake.	Linseed.
1859	95,208 tons.	10,167,288 bushels.
1860	108,826 "	10,644,984 "
1861	113,725 "	9,282,160 "
1862	101,156 "	8,707,776 "
1863	88,566	8,836,624

The average of linseed for eight years (198,000 tons) is placed at 8,529,232 bushels; of oil-cake, 93,000 tons.

The graziers and the feeders are distinct and separate classes in England, as they are beginning to be in this country. While the former must sell, the latter, with heavy turnip crops ripening and broad acres crying for manure, yield to the more imperative necessity of buying, and it sometimes happens that prices of "beasts" and sheep are high, and beef and mutton at the same time low, leaving a small margin for grain and oil-cake, and some prospect of ultimate loss. But these facts do not beget the reasoning that expensive oil-cake must be dispensed with as unproductive; on the contrary, speedy conversion of turnips, straw, and grain into meat—rapid fattening—are regarded as the only means of escaping loss, and oil-cake is more than ever required to give wings to that speed

The noted Alderman Mechi represents the extreme of high feeding there. His recent recommendation of twenty-eight pounds per day for each fattening bullock is laughed at by moderate men, who regarded four, six, and eight pounds as amply sufficient.

WEEDS IN FLAX.

Weeds are the bane of all agriculture. So wonderful is their power of reproduction, and so rampant is their growth, particularly in the fat corn lands of prairies and second bottoms, that, (the "last ploughing" being over, and the crop "laid by,") how often the isolated stalks of maize are surrounded and intertwined and choked with dense masses of weeds, not merely impeding locomotion through the cornfield and covering the rash interloper with adhering seeds and insinuating burs, but absolutely, in many cases, barring all progress through the field. How many fields there are in which weeds obtain as much of nutriment from the soil as is drawn by the legitimate crop! How many bushels of seeds of weeds are ofttimes produced per acre! The prolificacy of these freebooters of the farm is astonishing; the red poppy will ripen 50,000 seeds, the wild mustard 8,000, and the common corn cockle 2,500. Is it strange, with so foul a style of farming as obtains in this country, that weeds should abound, that wheat will not average fifteen bushels per acre, and corn is only half as productive as it should be? Even if the farm fields are kept comparatively clean, as a few prompt and persevering farmers do keep them, there are roadsides, and manure heaps, and fence corners that furnish a liberal supply of seeds, while the free winds are busy and successful in sowing them. If a damage to corn and wheat fields, weeds are still worse in garden products, and utterly incompatible with flax culture in any degree. And this, which should be an inducement to grow flax if but to extirpate the weeds, is probably a prominent reason why it has been so little cultivated. The task is too herculean for the industry and perseverance of many farmers, when natural disinclination is abetted by the high price of labor. The flaxseed that comes from abroad is very "dirty," having a large per-centage of seeds of noxious weeds which have crept in through the slovenly culture of the Russians, and their imperfect means of separating seeds. Common among the weeds found with flax are the small and great "bindweed," respectively, *Convolvulus arvensis* and *C. sepium*. It is of a twining habit, its roots penetrating deeply and spreading rapidly, and maintaining their vitality under severest persecution. It has been cut down to the ground repeatedly during a season, only to be luxuriant as ever in a month. It is allied to that beautiful climber, the cypress vine, and to the "morning glory."

Cuscuta Europœa.—Dodder, "devil's gut;" *C. epilinum*—flax dodder, found in all foreign flaxseed. It is a small, yellow, leafless vine, sometimes known as "goldthread vine," twining around weeds in damp places, in tangled masses like bunches of threads of yarn. Its effect is very deleterious upon flax, stunting the stem and impairing the fibre. The *Europœa* is common in clover.

Camelina sativa.—"False flax"—"gold of pleasure." The large yellow seeds found in flax, with some resemblance to flaxseed.

Sinapis arvensis.—Charlock—wild mustard. It is found in a loamy soil, such as flax delights in. Sheep eat it with a relish when turned out in the spring, apparently as a condiment. It has long been a pest of the fields. A local English poet, of the olden time, was inspired to sing of it:

> "The kerlock plant is a zite to zee,
> As it zhines in the vilds like gold."

But in obedience to his instincts, which led him to betake himself rather to poesy than the plough, he despairs of all attempts to eradicate it:

> "But he zays, zays 'e, 'It aint no use
> Vor to go to a girt expense,
> Vor 'twill come agen, whate'er thee does,
> Nor a year or two vrom hence.'"

It is very prolific, and has been known to produce 8,000 seeds from a single plant. It has, too, a very enduring vitality; having been extirpated by years of clean culture, on ploughing a little deeper it has again taken possession of the field. An instance is recorded, in which the turf of a very old pasture having been pared and burned, there sprang up one of the finest crops of mustard.

All seeds of weeds flourishing in a rich loamy soil suitable for flax, may, of course, be expected to usurp the soil and surface wherever their seeds are brought in contact with it, unless the greatest care and cleanest culture are arrayed against them.

Professor Voelcker found in one sample of refuse or cake, in seeking adulterations of linseed, twenty-nine different kinds of weed-seeds, among which are prominently named the common darnel, corn-cockle, (very pernicious in its effects upon animals,) the pungent wild radish, wild grape, (a sort of mustard,) and charlock, or common wild mustard.

THE FLAX COMMISSION.

In accordance with the provisions of a law approved February 25, 1863, appropriating $20,000 "for investigations to test the practicability of cultivating and preparing flax and hemp as a substitute for cotton," the Commissioner of Agriculture appointed Hon. J. K. Moorhead, of Pittsburg, Pa., Dr. John A. Warder, of Cincinnati, Ohio, and William M. Bailey, of Providence. R. I., a commission to make investigations and conduct experiments. Subsequently, Mr. Bailey having resigned, the vacancy was filled by the appointment of Hon. Charles Jackson, of Providence, R. I. The commission has had several meetings, received a large number of specimens, investigated various processes of manufacture, and examined models of machinery, and will embody the results of their researches in a report to be presented to Congress at its next session.

CULTIVATION AND USE OF THE TEASEL.

BY Z. MOSES, MARCELLUS, NEW YORK.

OUTSIDE of the eastern States, it is presumed that a large number of farmers are unaware of the existence of the article, although it is used in the manufacture of all woollen cloth, from the coarsest army blanket to the finest broadcloth.

The writer having been engaged for a number of years in growing and deal ing in this truly valuable product, believes that a few words relating to its culture and use would not be uninteresting to the reader of the agricultural reports.

Until within the last fifteen years the factories were mostly supplied with teasels imported from England and France. At present the American teasel, of better quality than the English variety, nearly supplies the market. The first teasels grown in Onondaga county, New York, were raised about thirty years since by an Englishman; and at present, it is believed, they are but little cultivated in this country outside of Onondaga, Madison, and Wayne counties, New York, and some portions of the New England States.

The wild teasel found at our roadsides in certain localities is of foreign derivation, and by some botanists is thought to be the original of the cultivated teasel; but it differs from it in this respect, that the points of the burs are straight and flexible, and are useless to the manufacturer, while the plant itself is a great annoyance to the careful farmer who would have his premises in a neat condition.

The teasel of commerce *(Dipsacus fullonum)* is a European plant greatly improved by cultivation. It is biennial; has a fleshy root which branches and tapers; an erect, furrowed, and prickly stem, branching near the top, five or six feet high; entire leaves springing on the margin and surfaces, those on the stem opposite and joined at the base, and generally filled with water. Scales, recurved at the apex, surround each of the florets, which are aggregated on burs from $1\frac{1}{2}$ to 4 inches long; when the flowers have faded, these receptacles, having dried and hardened, and possessing elasticity, give the mature heads the value for which the plant is cultivated. The harder and more elastic the heads, the better the quality of the teasel; hence the farmer should select a stiff, strong soil, which is found to be most desirable for the purpose. Good wheat land is generally good teasel land.

Teasels are liable to be winter-killed in extreme cold weather unless protected by a covering of snow. From present appearances, it seems probable that in the State of New York one-third of the teasel plants were killed during the past winter from this cause. When the plants are very small they are sometimes in danger of drying or burning up from extreme hot weather. Continued warm wet weather is unfavorable to this crop in July, after the blossoms have set, softening and rusting the burs.

The seed is planted from April 25 to May 20 in drills $3\frac{1}{2}$ feet apart, and covered by rolling or brushing. They are cultivated and hoed for the first time about June 10, and should be kept free from weeds during the season. The first year they spread out near the ground, similar to the bull thistle. (Teasels were formerly called "fuller's thistles.")

The second year they are hoed once during the month of May, and thinned from eight to twelve inches apart; where the plants have been winter-killed, the spaces are sometimes filled by careful transplanting. The plant rapidly shoots up and soon attains a height of from five to six feet, branching out in different directions, bristling with teasels, which blossom and ripen from the first to the last of August; those at the top of the stalk, and the largest, are called "kings," and are cut first; the "middlings," or "mediums," grow on the end of the branches, and are cut next; the "smalls" at the sides of the main branches, and are cut last.

The cutting may be done by men and boys, gathering into baskets, using small hooked knives. Stout clothing and long leather gloves should be worn. An expert man will cut ten or twelve thousand per day of the first and second cuttings.

The crop must be carefully assorted and cured in barns or sheds by spreading them on rails, and should be frequently handled with large wooden forks to prevent heating, and also to clean them from seed, which falls out easily; they are then packed in boxes four feet square at the end and ten feet long.

Before using, the spurs and stems are clipped with shears; this can be done with boys' labor at an expense of about 20 cents per thousand. The manufacturers then set them in rows on the periphery of a large broad wheel, which is made to revolve at a high speed, and in such a manner as to bring them in contact with the surface of the cloth which passes over rollers in an opposite direction.

Many substitutes have been contrived of wires and springs, but nothing has been found which possesses the peculiar qualities of the teasel for raising the nap on woollen fabrics, the teasel points breaking off when meeting with knots or irregularities in the cloth, which the metallic cards would tear out. It would almost seem as if Nature had created this otherwise useless plant for this express purpose. The beautiful symmetry and regularity of the points on the teasel heads, and their wonderful elasticity, seem to mock at the skill of man.

"For art may err, but nature cannot miss."

"King" teasels are used on heavy coarse cloths for overcoating and blankets; "medium," or middlings, are used the most, and on any of our medium grades of woollen cloth; and the "smalls" are used on the fine pant stuffs doeskin, shawls, &c.

The following table shows the labor expended per acre in raising an aver age crop of teasels:

	Days horse labor.	Days man labor.
Preparing ground and sowing	2½	1½
Cultivating and hoeing first year	1	7
Cultivating and hoeing second year	1	3
Harvesting an average crop	1	14
Assorting, handling, and boxing	....	1
Total number of days per acre	5½	26½

An average crop is 130,000 per acre, of 10 pounds per thousand; instances are known where 225,000 have been raised on an acre.

A few years ago 75 cents or $1 per thousand was thought to be a very good price; now, owing to the greatly increased manufacture and consumption of army cloths, and the increased price of the imported article from the increase on gold exchange and the high tariff, the American teasel brings triple the price it formerly did.

As will be observed from the foregoing table, the crop is an expensive one, but at the present high prices it pays exceedingly well. The demand, however, must always be uncertain and limited, depending almost wholly upon the condition of woollen manufactures in this country.

It is to be regretted that no reliable statistics can be found either of the amounts of teasels consumed, imported, or grown in this country.

POPULAR VARIETIES OF THE APPLE, PEAR, AND GRAPE.

BY F. R. ELLIOTT, CLEVELAND, OHIO.

In the Annual Report of the Department of Agriculture for 1862 descriptions of some of the leading varieties of apples and pears were given, and so favorably have they been received by the people that the Commissioner has deemed it advisable to continue the article. Accordingly descriptions of the following additional varieties have been prepared by the same author, to which are added descriptions of some of the most popular and valued hardy out-door grapes. Another year probably cherries and some other variety of fruit will be introduced, to the end that in a few years the department will have issued descriptions and drawings illustrative of all our leading best varieties of hardy fruits.

DESCRIPTION OF APPLES.

BELMONT.

Synonyms Gate, Mamma Beam, White Apple, Kelly White, Waxen.

Fruit.—Size, medium to large; form, irregular, usually roundish, sometimes oblong rounded; skin, thin, smooth, glossy or oily; color, rich clear light yellow, and, when grown exposed to sun, with a clear vermilion red cheek, having mingled many carmine specks, occasionally russet marblings; stem, medium length, projecting slightly beyond the surface, always slender; calyx, varying from small and close to open and reflexed; basin, from shallow to rather deep, always furrowed; flesh, yellowish white, fine-grained, very tender, juicy, sprightly, sub-acid; core, rather large; seeds, ovate pointed, abundant, brownish red; season, November to February.

Tree.—Healthy, vigorous, spreading; wood, yellowish; a good bearer. In the northwestern sections of our States this is one of the apples regarded as almost indispensable, no matter how small the collection; but when grown in the rich alluvial bottom soils of the southern section, the trees are comparatively tender, and the fruit, although increased in size, loses its sprightliness of texture, and much of its outward beauty. It is little known throughout the New England States. Its origin was probably Virginia.

DYER.

Synonyms: Pomme Royal, Golden Spice, Tompkins, Beard Burden, Pomme Water, Bullripe, Mygatt's Bergamott, Bard Apple, White Spice, Smithfield Spice, Coe's Spice.

Fruit.—Size, medium; form, round or roundish, flattened; color, clear yellow, with russet marbled more or less over the surface; stem, long, slender; cavity, deep; slightly furrowed; calyx, with long recurved segments; basin, medium; flesh, yellowish white, spicy, sprightly, tender, mild sub-acid; core, medium; seeds, small; season, September to November, but often continues until December. As a table fruit it has few, if any, superiors; but for market purposes its delicacy of skin prevents its carriage without bruising.

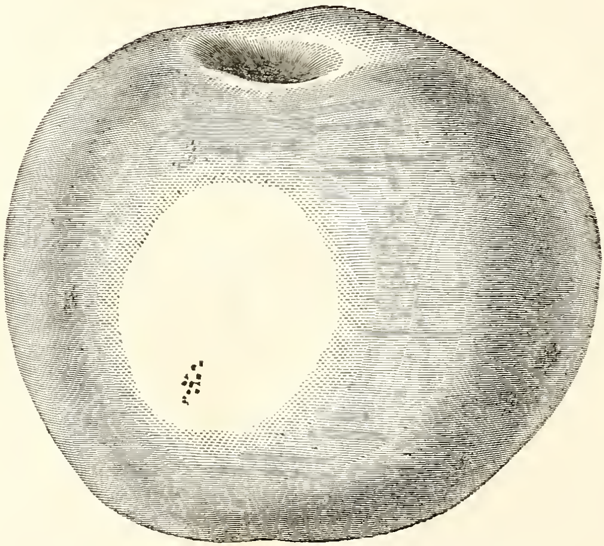
Tree.—A fair grower, not strong, shoots spreading irregular, moderately but annually productive; an old French variety originally described as Pomme Royal; but its name having been lost on its introduction to this country, it was christened "Dyer," by which name it is now generally known.

GARDEN ROYAL.

Fruit.—Size, rather below medium; form, roundish, inclining to flat, very regular; color, yellowish ground, with dull red stripes, becoming bright when grown fully exposed to the sun; stem, short, slender; cavity, narrow, acute; calyx, medium to large, open; basin, shallow; flesh, yellowish white, fine-grained, tender, mild sub-acid, rich vinous; core, small; season, last of August and September.

Tree.—Upright, healthy grower, very regular in form, slender, fine-grained, hardy wood, a regular annual bearer. Originated in Massachusetts. As a market fruit its size is the only objection. It is as yet comparatively little known, but wherever known, its superior quality renders it a favorite.

PLATE II.

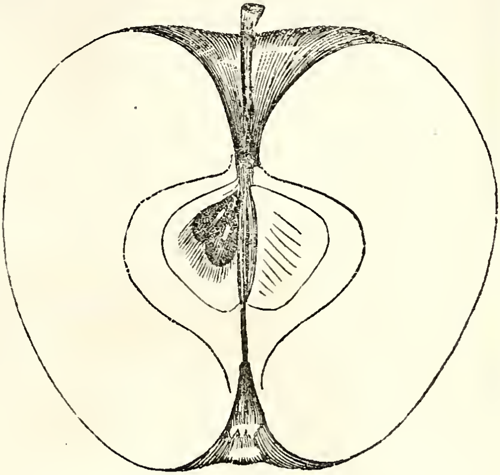


SWAAR.

JONATHAN.

Synonyms: Philip Rick, King Philip.

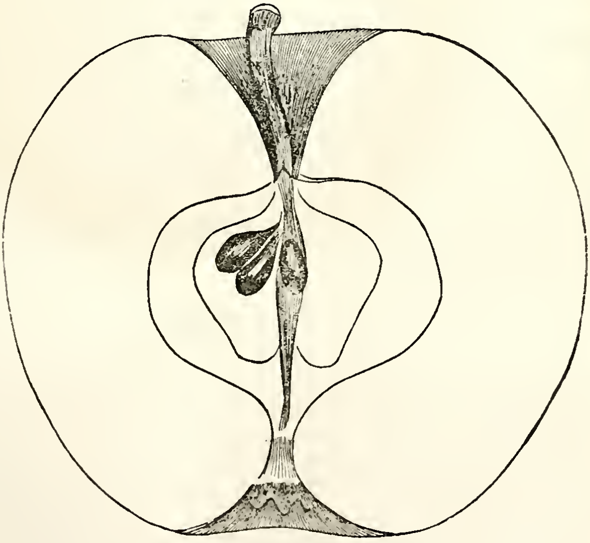
Fruit.—Size, medium; form, roundish conical, regular; color, light yellow ground, mostly overspread, streaked or stained with rich light red, and with a few minute white dots; stem, rather long, slender; cavity, open, wide; calyx, small, nearly closed; basin, shallow, slightly furrowed; flesh, yellowish white, tender, juicy, slightly acid until fully matured, when it is sprightly subacid; core, medium; seeds, full, dark brown; season, December to February.



Tree. — Hardy, slender, spreading slightly, pendulous branches, productive. Originated at Kingston, New York. As a dessert or market apple, the Jonathan adapts itself well to all soils, and is deservedly popular wherever known.

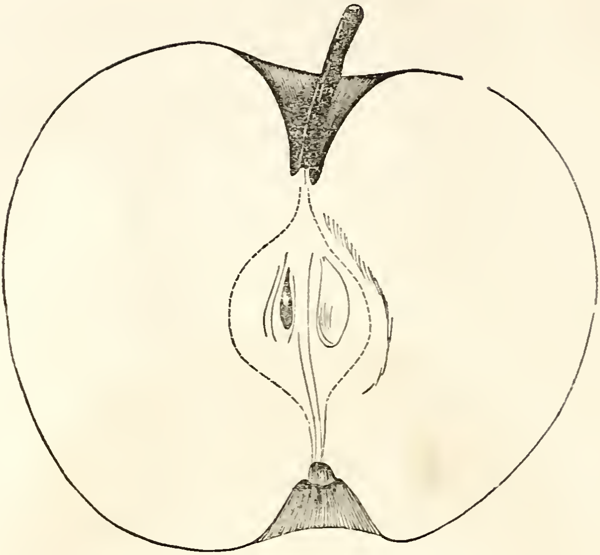
SWAAR.

Fruit.—Size, medium to large; form, roundish; slightly ribbed or unequal on its surface, and often a little angular; color, greenish yellow at first, becoming a dull rich yellow, dotted with distinct brown specks, sometimes marbled with gray russet on the side and around the stem, and often tinged with dull red; stem, slender; cavity, round, deep; calyx, small, half closed; basin, shallow, somewhat plaited; flesh, yellowish, fine-grained, juicy, tender; spicy aromatic perfume; core, small to medium; seeds, broad ovate; season, January to March.



Tree.—Moderate grower, spreading, healthy, adapted to warm, light, and rich soil. Unsuited to cold, stiff clays; regularly productive, and exceedingly valuable either for the table or market. Originated on the banks of the Hudson river.

WAGENER.



Fruit.—Size, medium; form, roundish, flattened, slightly ribbed at base; color, yellow ground, mostly covered with deep glossy red, with stripes and splashes of light red, and marked with irregular light russet specks; stem, slender; cavity, wide, deep; calyx, small; basin, broad, open; flesh, yellowish white, fine-grained, crisp, juicy, sprightly, vinous, sub-acid; core, small, oblong, ovate; seeds, light brown, ovate, pyriform; season, November to March, but keeps often until May and June.

Tree.—Thrifty, healthy, upright grower, requiring careful and judicious pruning until it comes into bearing, after which it needs little pruning; young wood, pale green; old wood, dark red. Originated at Penn Yan, Yates county, N. Y. An exceedingly valuable variety that has been comparatively unnoticed during the past few years, but sustains a very high character whenever trees have come into bearing.

PEARS.

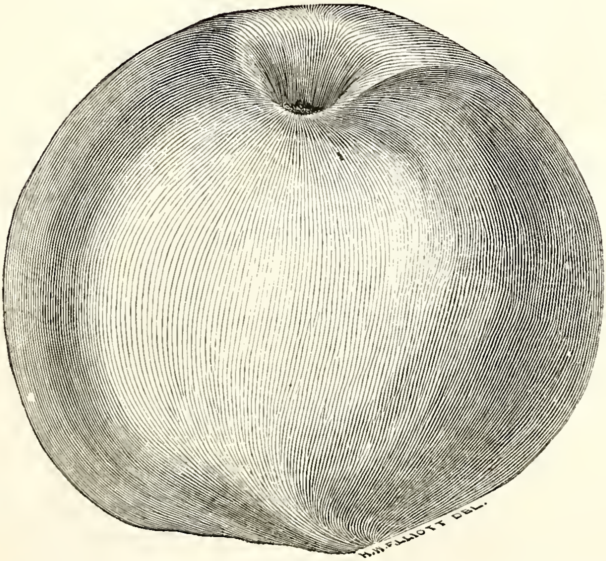
BEURRÉ GIFFARD.

Fruit.—Size, medium; form, oblong, pyriform; color, yellowish green to pale yellow; red in the sun, with pale russet specks; stem, medium length, slender, curved; calyx, open; basin, shallow; core, small, flesh white, melting, juicy, vinous; season, late in summer.

Tree.—A healthy but straggling grower, with long, slender shoots, requiring careful pruning while young to form it into good shape; a good and constant bearer, succeeding either on pear or quince roots. Foreign origin.

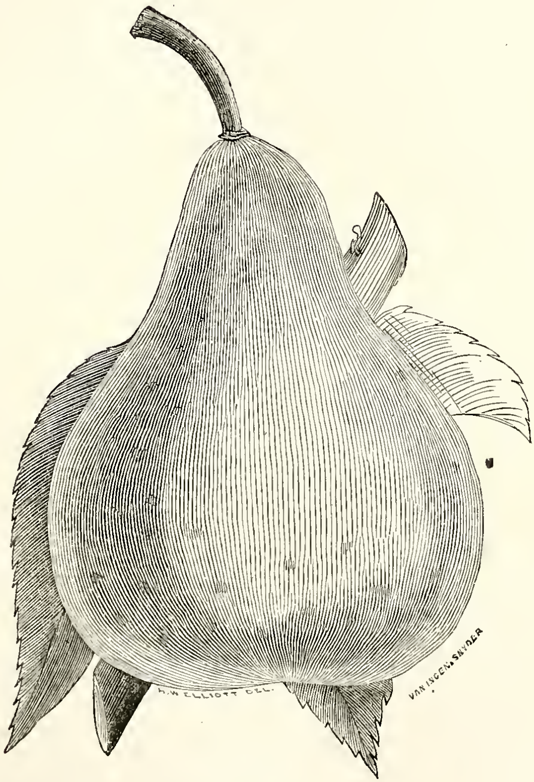
BEURRÉ SUPERFINE.

Fruit.—Size, medium or above; form, oblate, depressed, pyriform; color, yellow, slightly shaded with crimson on the sunny side, and partially covered with russett, and thickly sprinkled with minute dots; stem stout, rather long, inserted without depression by a fleshy enlargement; calyx, closed; basin,



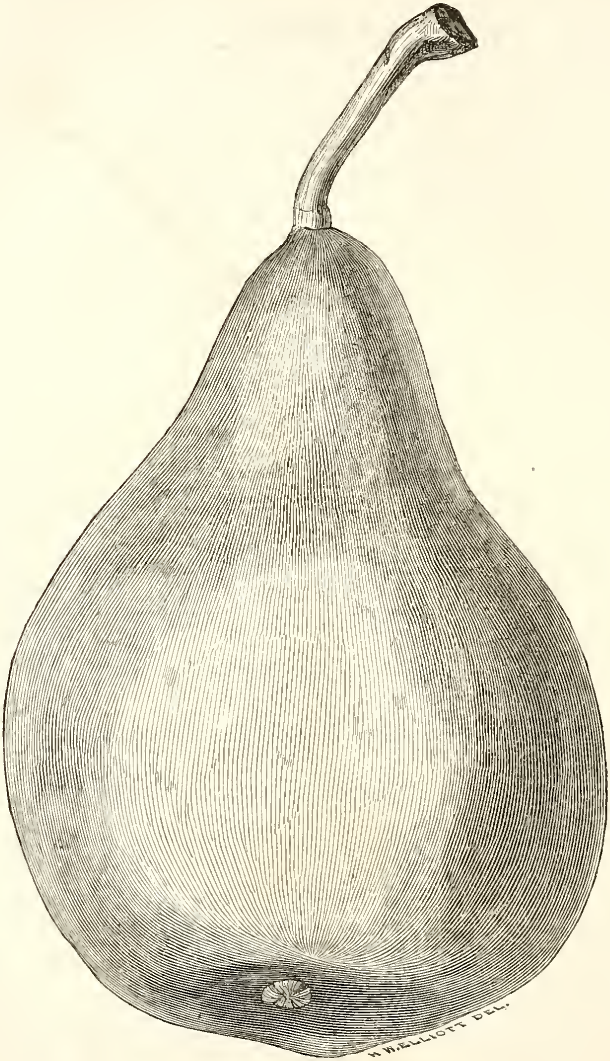
WAGENER.

PLATE IV.



BUERRÉ GIFFARD.

PLATE V.

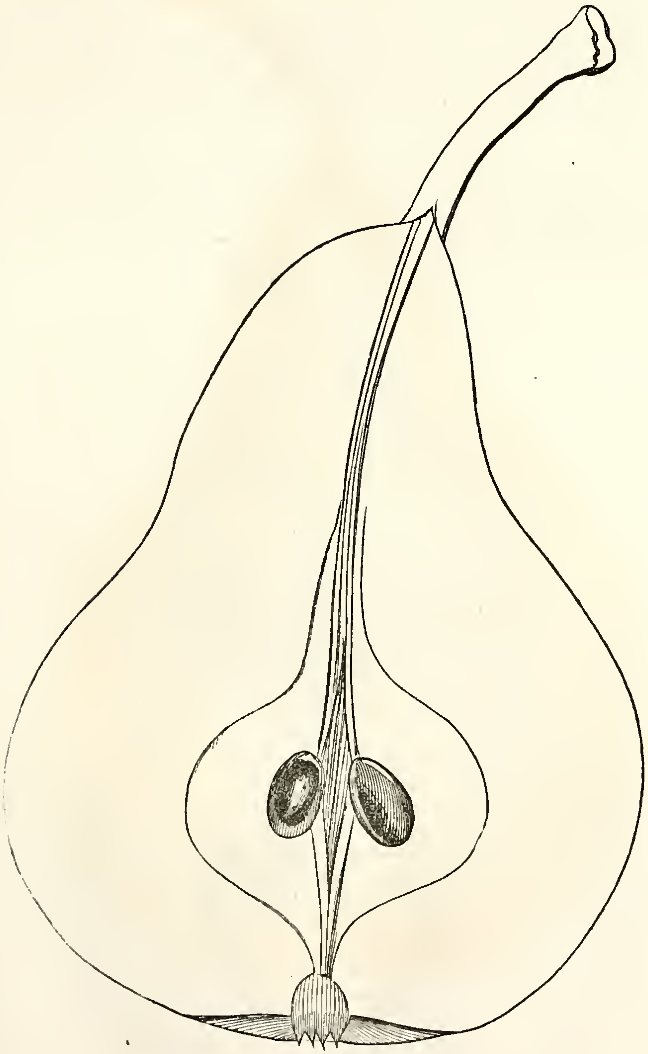


BUERRÉ BOSC.

abrupt, small; flesh, juicy, buttery, melting; with a brisk vinous or sub-acid flavor; season, October.

Tree.—Vigorous, healthy grower, succeeding on pear or quince roots; young wood, brown, inclining to a fawn; a good bearer. Foreign origin.

BEURRÉ BOSC.



Synonyms: Calebasse Bosc, Marianne Nouvelle, Bosc's Flaschenbirne.

Fruit.—Size, large; form, obovate, acute, pyriform, a little uneven, and tapering long and gradually into the stalk; color, dark yellow, dotted, and marbled with cinnamon russet, slight brownish red in sun; stem, usually long and slender; calyx, medium; segments, partially erect; basin, round, shallow, sometimes a little uneven; core, small; seeds, blackish; flesh, white, melting, juicy, sweet perfumed; season, October.

Tree.—Vigorous, healthy grower, with long, straggling, irregular, brownish olive shoots. Comes early into bearing on the pear roots, and produces regularly and annually fruit of the best quality. Foreign.

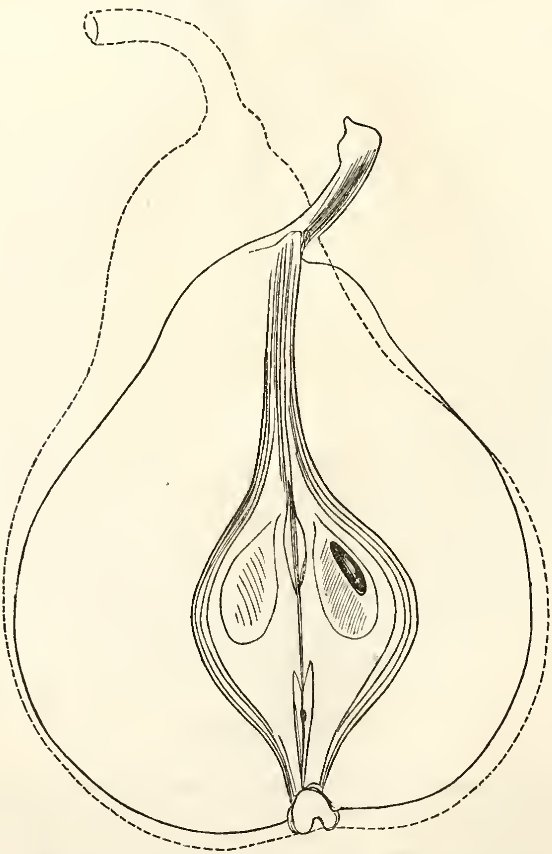
DOYENNÉ D'ETÉ.

Synonyms: Summer Doyenné, Summer Virgalieu, Duchesse De Berry d'Eté of Bivort, Doyenné d'Juliet.

Fruit.—Size, small; form, roundish, obtuse, pyriform; color, yellowish green, nearly yellow when fully mature, with a bright marbled red cheek on the side exposed to the sun; stem, rather long, fleshy at base, inserted without depression; calyx, small, open; basin, shallow; core, medium; seeds, small, dark brown; flesh, yellowish white, melting, juicy, sweet, slightly musky; season, early summer.

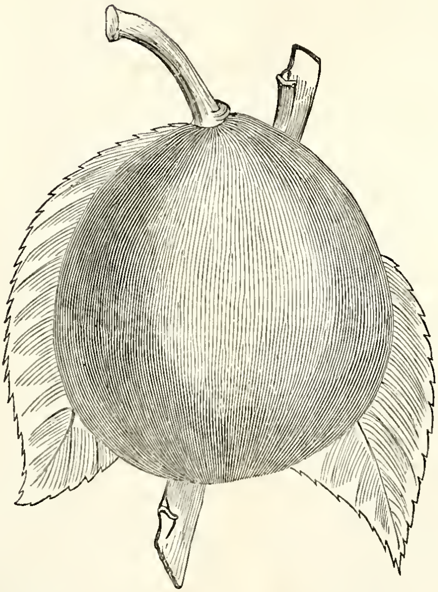
Tree.—Moderately vigorous; healthy grower, with young shoots of a clear olive yellow and pale brown specks; leaves, medium size, oblong ovate, narrow. Succeeds well on pear or quince roots; comes early into bearing, and produces abundantly. Foreign origin.

CONSEILLER DE LA COUR.

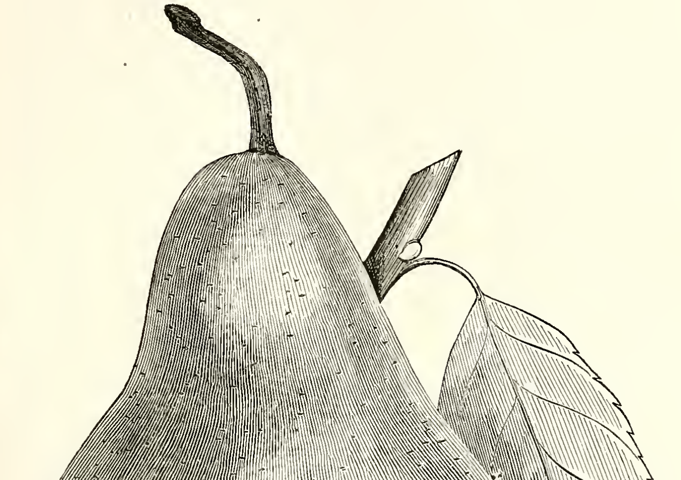


Synonyms: Marechal de la Cour, Duc d'Orleans.

Fruit.—Size, large; form, obovate, oblong, pyriform, irregular; color, greenish yellow, slightly russeted, small russet dots with green suffused around

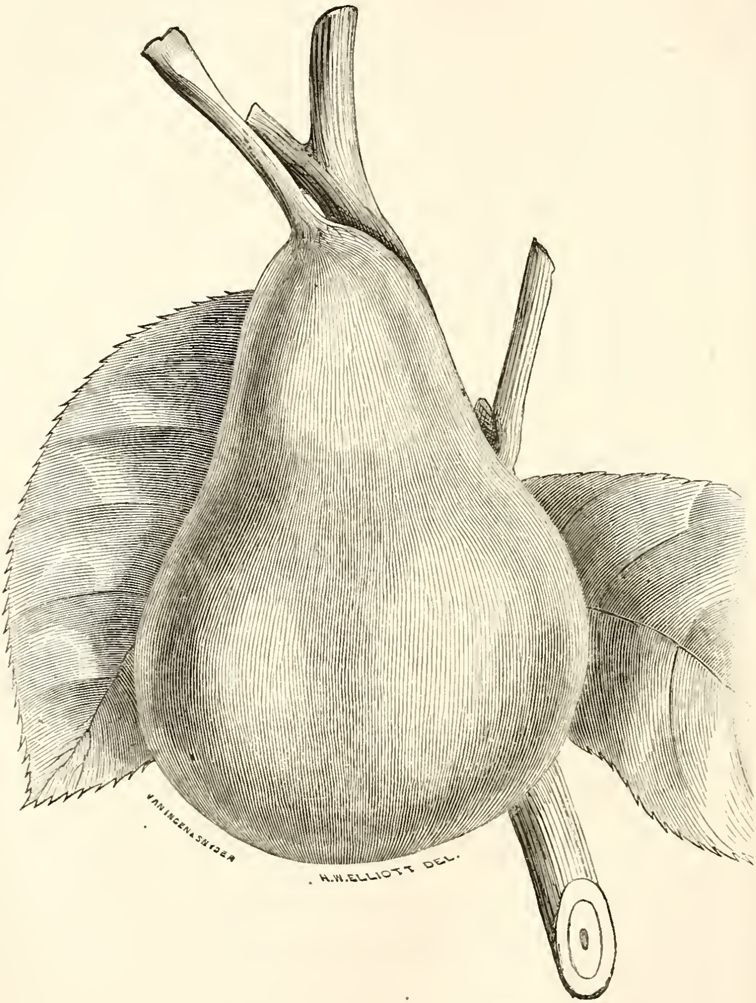


DOYENNÉ D'ETÉ.



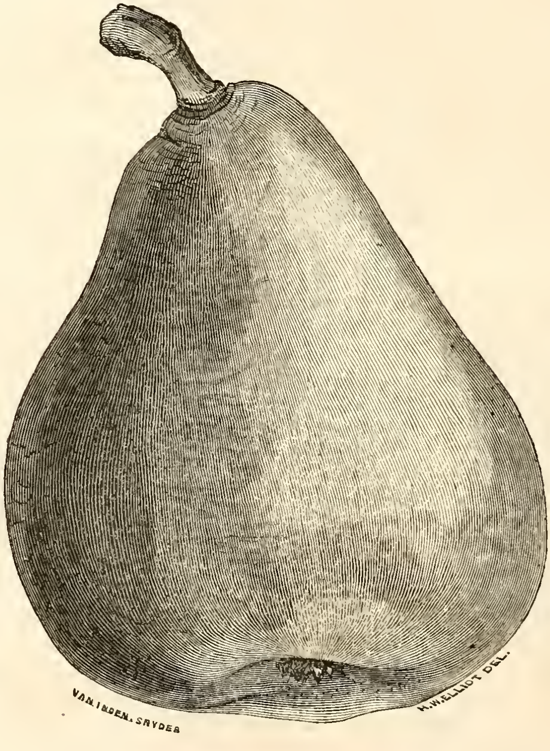
CONSEILLER DE LA COUR.

Plate VIII.



DUCHESSE D'ORLEANS.

Plate IX.



McLAUGHLIN.

them, a few patches and marblings of russet, russet at base of stem; stem, slender, inserted without depression; basin, scarcely perceptible; calyx, with closed half reflexed segments; flesh, white, melting; granulous lines around the core, and running up to the stem; vinous, sub-acid, juicy; capsules long and large; seeds, blackish, imperfect; season, November, December.

Tree.—Vigorous, healthy, very beautiful grower, holding its foliage until very late in the season. An abundant bearer, succeeding on pear or quince roots. Foreign.

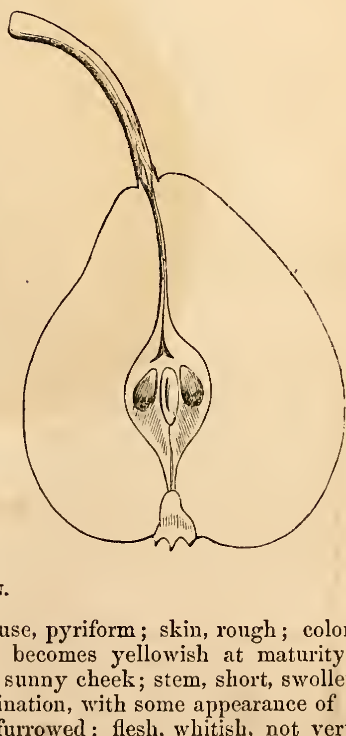
DUCHESSE D'ORLEANS.

Synonyms: St. Nicholas, Beurré St. Nicholas.

Fruit.—Size, large; form, oblong, ovate, pyriform; color, greenish, becoming greenish yellow, with stripes and patches of dull thin russet, sometimes red cheek when grown and fully exposed to the sun; stem, variable, fleshy at base; calyx, small, partially open; basin, shallow, uneven; flesh, melting, juicy, sweet, slightly aromatic; season, October.

Tree.—Moderately vigorous, healthy, upright grower, with olive-colored wood; leaves, narrow, dark blue, green. Succeeds well on pear or quince roots. Comes early into bearing, and produces a large, handsome fruit most abundantly. Foreign origin.

MADELÉINE.



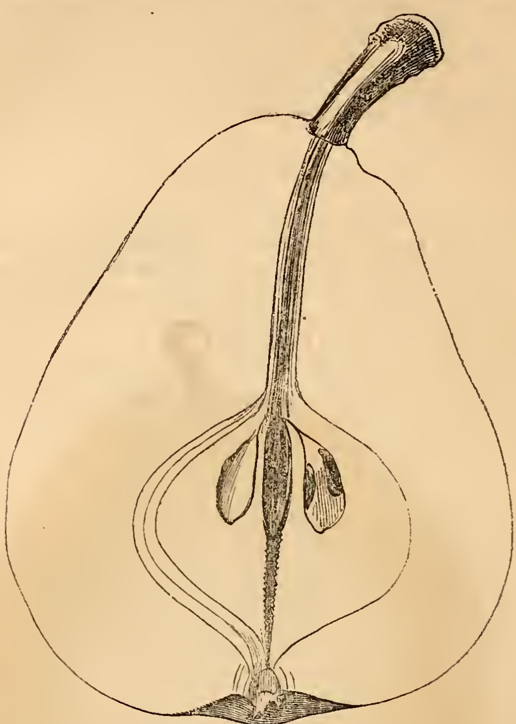
Synonyms: *Citron des Carmes*, Magdalen. *Fruit.*—Size, small to medium; form, obovate oblong, pyriform; stem, long, slender at base; one side of fruit a little enlarged; color, pale, yellowish green, a little brownish blush, and russet specks on those most exposed to the sun; calyx, with long, persistent, irregularly-placed segments; basin, obscure, slightly plaited; core, small; seeds, ovate; flesh, white, juicy, melting, sweet, slightly perfumed; season, early summer.

Tree.—A strong, upright grower, with long, erect, olive-colored branches. Its greatest objection as a tree in rich soils is the tendency to make too strong, coarse growth, rendering it liable to blight. In soils of moderate quality, and with careful and timely heading in, the trees are formed very handsomely, and once they come into bearing, produce abundant fruits of superior quality; foreign origin.

M'LAUGHLIN.

Fruit.—Size, large; form, elongated, obtuse, pyriform; skin, rough; color, greenish, mostly covered with russet, which becomes yellowish at maturity; when grown, exposed to sun, it has a warm, sunny cheek; stem, short, swollen at junction with the tree, inserted at an inclination, with some appearance of a lip; calyx, open; basin, shallow, slightly furrowed; flesh, whitish, not very fine, juicy, melting, sweet, rich, slightly perfumed; core, small; seeds, imperfect; season, December and January.

Tree.—A healthy, moderate, handsome grower, very hardy and productive; a native of Maine. From some cause, probably the great number of new pears



that have been introduced the past ten years, this valuable variety has been comparatively overlooked. It should be extensively grown.

NOUVEAU POITEAU.

Fruit.—Size, above medium; form, obovate, obtuse, pyriform, contracted on outside, toward the stem; color, pale green, with many dark green dots, and a few russet stripes and blotches; stem, about one inch long, medium size, set on, and not into, the fruit; calyx, medium, with broad segments, half reflexed; basin, irregularly contracted; core, medium; capsules, long, ovate; seeds, obovate, pyriform; flesh, white, fine-grained, juicy, melting, rich, aromatic; season, last of October and November.

Tree.—Healthy, upright, vigorous grower; an early and productive bearer, either on pear or quince roots. Foreign origin.

STEVENS'S GENESEE.

Synonyms: *Louise de Prusse*, Guernsey.

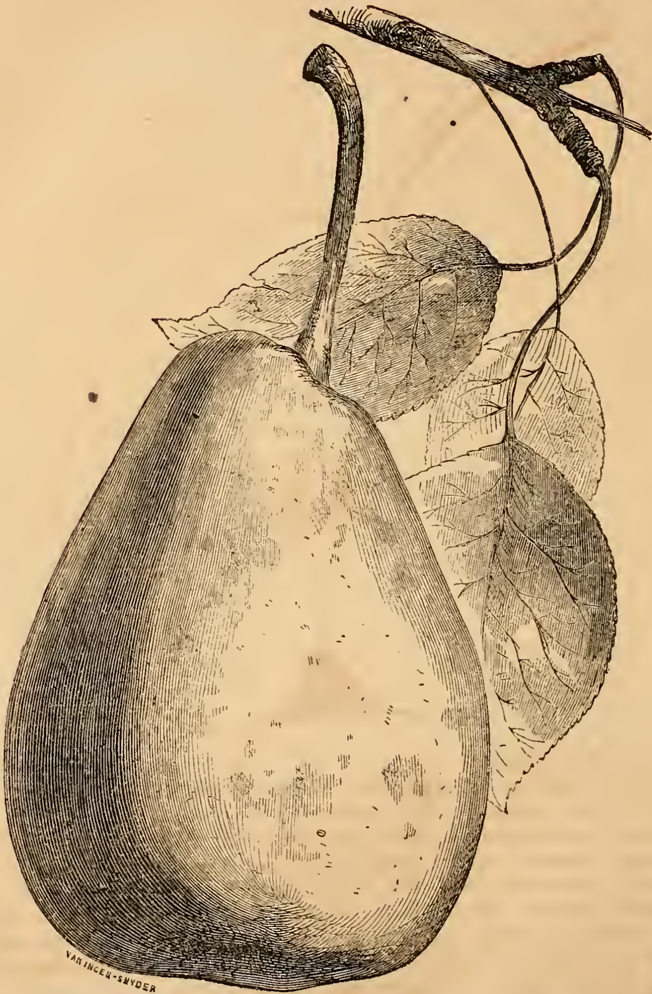
Fruit.—Size, large; form, roundish obovate; color, greenish yellow, becoming light rich yellow at maturity; stem, rather stout; cavity, narrow; calyx, with short, stiff, connected segments, half reflexed; basin, medium, regular; core, medium; seeds, ovate pyriform, blackish; flesh, white, half buttery, juicy, sweet, aromatic; season, September.

Tree.—A healthy, fine grower, with diverging dark gray shoots. Very productive, either on pear or quince roots. For light, sandy soils this variety

PLATE X.

STEVENS' GENESEE.

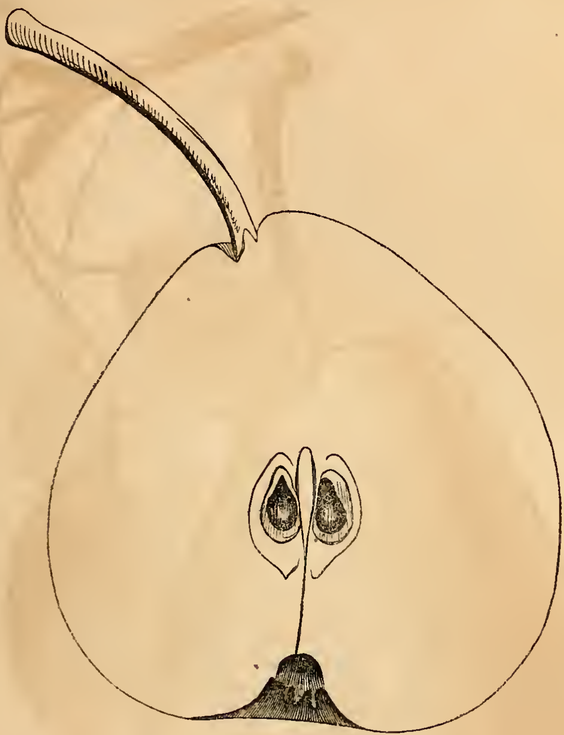
Plate XI.



WHEILDON.

proves most admirably adapted, while in all soils not wet it has long been regarded as one of the most desirable varieties, either for garden or orchard. Origin, Livingston county, New York. Like the Bartlett, windfalls of this variety are often very fine.

WHEILDON.



Synonym: McLellan.

Fruit.—Size, medium to large; form, obtuse, obovate, acute pyriform; color, two shades of dull greenish yellow, with stripes, specks, and marblings of russet; irregular, uneven surface; stem, long, largest at the end that joins the tree; cavity, acute, furrowed; calyx, large, with long segments; half closed basin, broad, open, moderately deep, with broad furrows, two or more forming the basin; flesh, yellowish white, a little coarse-grained and gritty around the core; otherwise tender, breaking, sweet, juicy, highly aromatic, not vinous, but quite rich; core and capsules, small; seeds are only in a capsule, globular ovate, pyriform; season, last of September and October.

Tree.—Spreading, upright, healthy grower; productive. Originated with W. W. Wheildon, Charlestown, Massachusetts, and is as yet but little known. It promises a superior fruit, and we doubt not, like most all our natives, will succeed everywhere.

GRAPES.

ADIRONDAC.

Fruit.—Bunch, very large; berries, large, round, or nearly so, compactly placed on the bunch; color, shining, purplish, black, when fully mature; blue bloom; skin, medium, not as thick as Isabella, but thicker than Delaware;

seeds, large, few; flesh, white, little or no hardness of pulp, tender, sweet, delicious; season, last of August and all September, or ten days earlier than the Delaware.

Vines.—Strong, rapid growers; hardy as Isabella, which it very much resembles in leaf and general habit. This variety originated at Port Henry, Essex county, New York, and more nearly resembles the Black Hamburg than any hardy grape yet known. As a table grape it has no superior.

CATAWBA.

Synonyms: Red Muncy, Catawba Tokay, Singleton, Arkansas.

Fruit.—Bunches, medium size to large; shouldered; berries, nearly round, large, pale red, becoming deep, almost black red when fully ripened in good soil; lilac bloom covering the berry; flesh, slightly pulpy, sweet, juicy, with a rich, musky aroma; skin, moderately thick; season, October.

Vines.—Hardy, strong, vigorous growers; large foliage, medium jointed, wood reddish, and with downy white spot at base of every leaf.

The Catawba is a native from the Catawba river, in North Carolina, and was first introduced to notice by Major Adlum, of Georgetown, D. C. For many years it has been regarded as the best wine grape in this country, and thousands of acres of vineyard have been planted with it. During the past few years mildew and rot have attacked it in many sections south and west, and some cultivators now hesitate, on that account, to plant it. When it is not attacked by disease, and will mature well, it is superior for wine or table use.

CONCORD.

Fruit.—Bunches, rather compact, large-shouldered; berries, large, globular, almost black, thickly covered with bloom; skin, rather thick; considerable native pungency and aroma; flesh, moderately juicy, sweet, considerable hard pulp; season, last of September.

Vines.—Very strong, rampant growers; coarse, strong foliage, roundish leaf; originated with E. W. Bull, Concord, Massachusetts. The Concord has proved perfectly hardy and healthy in all sections, and as a table sort, when well ripened, it will long continue a favorite where more delicate sorts, or those later in ripening, do not succeed. Some cultivators in Missouri advise it both as a market sort and for wine purposes.

CHARLOTTE.

Fruit.—Bunch, medium size, not shouldered; berries, varying in size on the bunch, some full medium or above, others only medium to small, roundish, slightly oblong, short peduncles, very compact; color, light, pale red, many of them a dull greenish red, with a pink, white bloom; flesh, whitish, delicate, sweet, vinous, very slight tinge of the native musky aroma, and with very little pulp; skin, moderately thick, about like Catawba; season, early in September, or same as Delaware.

Vines.—Hardy, vigorous growers, like the Catawba, which is probably its parent; leaf, like Catawba; wood, quite dark red; short-jointed; originated with Edmund Ward, Kelly island.

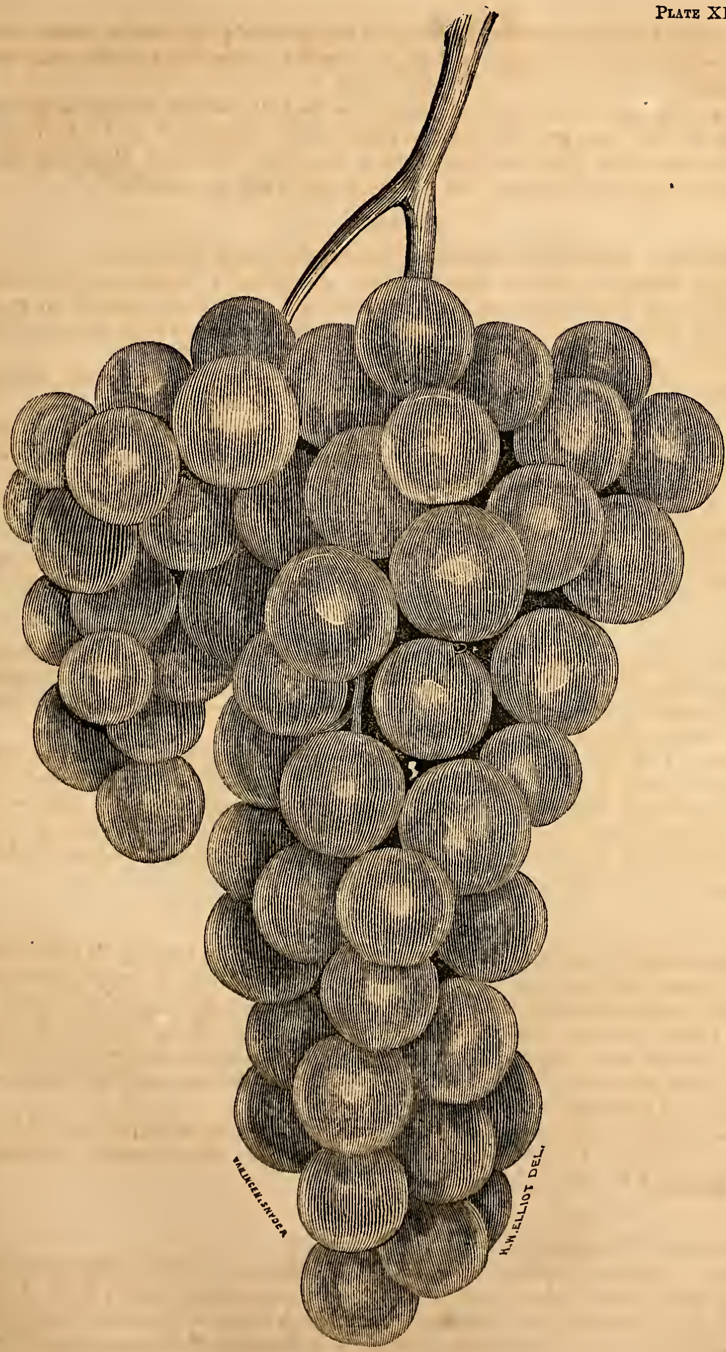
CLINTON

Synonym: Worthington.

Fruit.—Bunches, medium or small, not shouldered; berries, compact, nearly round, small; color, black, with a thin blue bloom; skin, thick; flesh, harsh, pulpy, juicy; season, last of September, although frequently gathered and eaten before this time, as it colors early, although it does not really mature until frost comes.

Vines.—Hardy, moderately vigorous, healthy; small foliage, and close-grained, short-jointed wood.

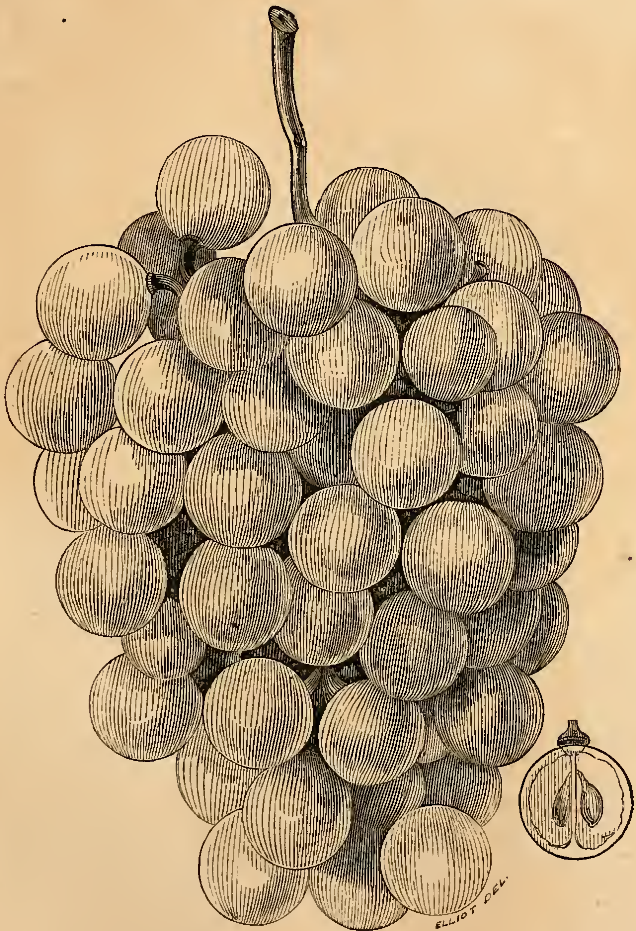
PLATE XII.



CATAWBA.

PLATE XIII.

CONCORD.

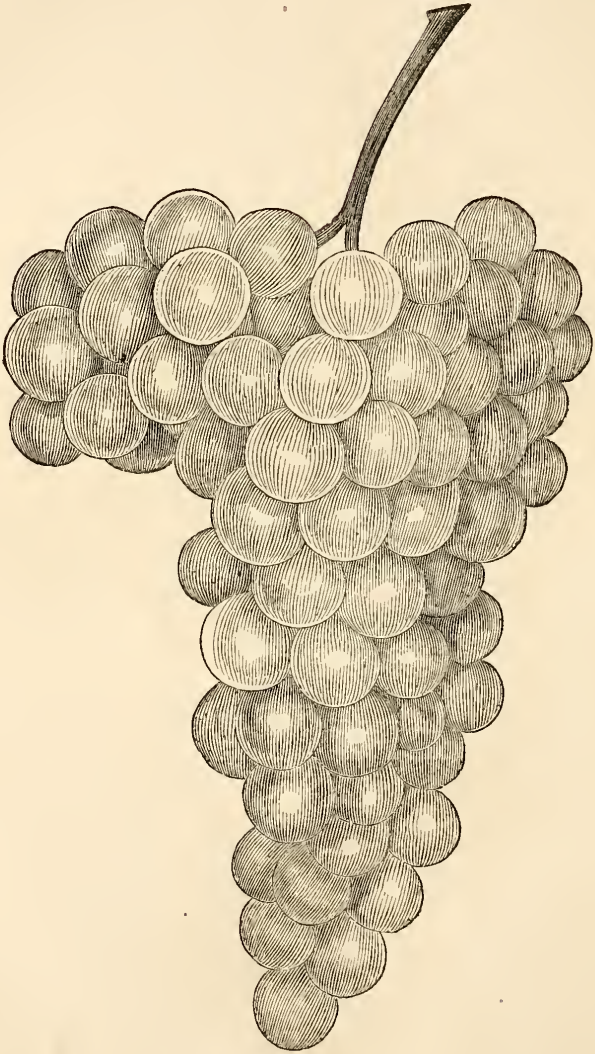


CHARLOTTE.

Plate XV.

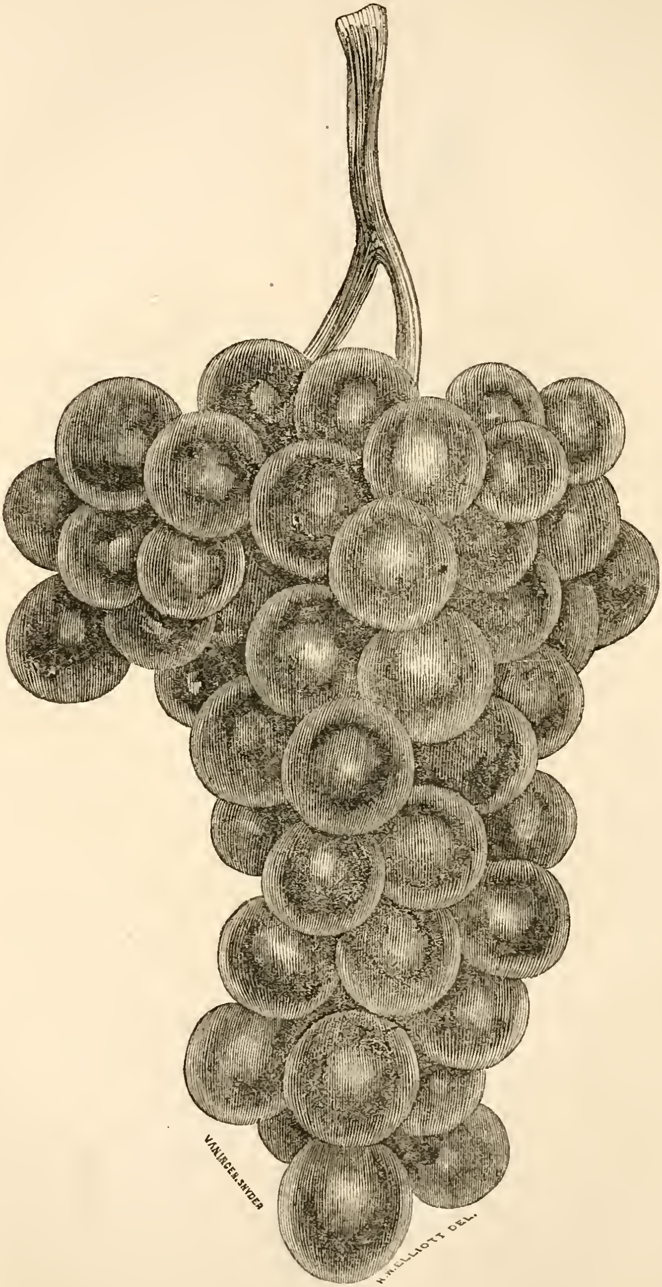
CLINTON.

Plate XVI.



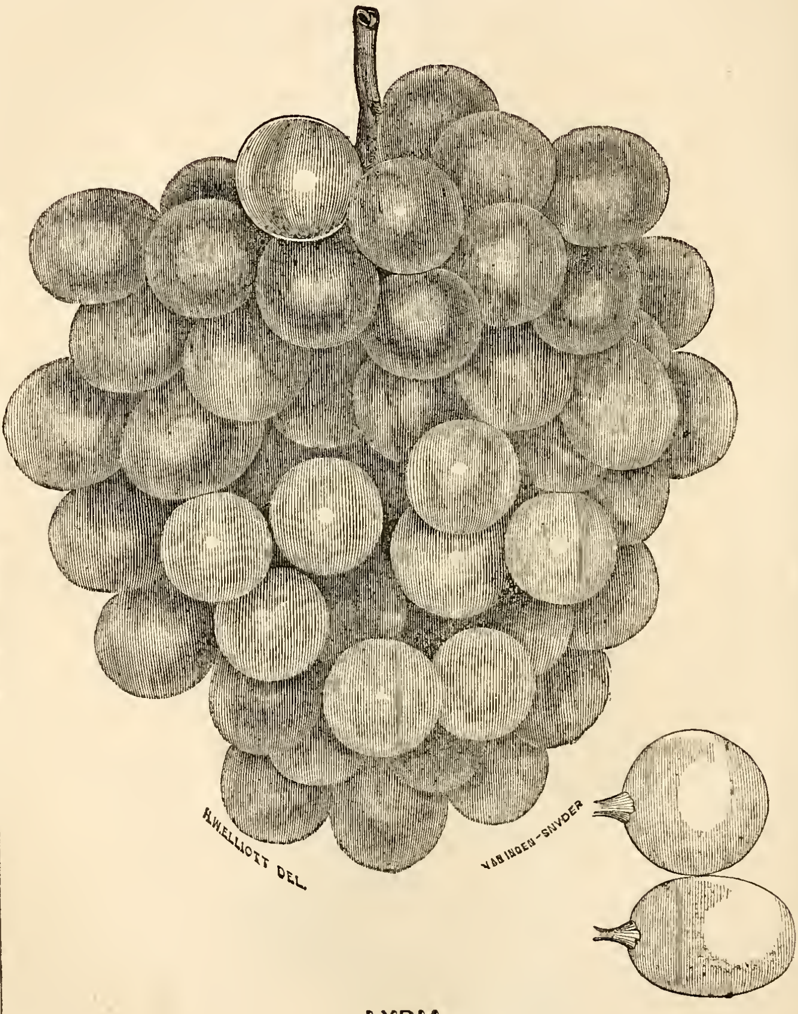
DELAWARE.

PLATE XVII.



ISABELLA.

PLATE XVIII.



LYDIA.

PLATE XIX.

MAXATAWNY.

In sections of the country where the Catawba and many other varieties can be grown, the Clinton can only be valued as a prospective parent, in part, of some variety suited, like it, to northern and unfavorable positions for grape-growing; but at this time there are many sections where this variety is deemed indispensable on account of its hardihood of vine.

DELAWARE.

Fruit.—Bunches, medium or small, compact; berries, small, round, clear pale red; delicate thin skin; flesh, tender, juicy, sweet, without pulp; season, September.

Vines.—Hardy, moderate healthy growers, short-jointed, close-grained wood. The origin of this variety is somewhat in dispute, some claiming it as a foreigner, others that it originated in New Jersey. The growth and habit, however, give evidence of its native character. It was first brought to notice by A. Thompson, of Delaware, Ohio, whence its name. As a small delicate table grape it is universally esteemed, and as a wine grape is regarded by some vignerons as superior. It makes a wine similar to the best Rhine wines.

ISABELLA.

Fruit.—Bunches, large, rather loose-shouldered; berries, oval, large, dark purple; when fully ripe nearly black and covered with a blue-black bloom: flesh, tender, with some pulp; juicy, sweet, rich musky aroma; season, last September and early October.

Vines.—Strong, not hardy in far northern localities, but perfectly so in all the middle sections. Very liable to mildew. Probably a native of South Carolina or Georgia.

LYDIA.

Bunches, large, roundish, not shouldered; berries varying, sometimes oblong, as see in our drawing; large, generally regular; color, greenish white, shade of yellowish white when fully ripened; skin, thick like Catawba; flesh, juicy, sweet, with very little of the native aroma; season, very early, or before the Delaware. A chance seedling, originating on Kelley's island, Ohio, and first introduced to notice by Charles Carpenter.

The vine is about as strong a grower as Isabella, and so far as tested proves perfectly hardy. It has all the character of a native. The fruit is large, bears transportation well, and when fully ripe has been pronounced by amateurs a superior table grape.

MOTTLED.

Fruit.—Bunch, medium size, slightly shouldered; berries, round, very compact, dark purplish red when ripe; held to the light they exhibit two shades of red, forming a mottled character—hence the name; dark blue bloom; short peduncles; flesh, when pulled from the peduncle leaves no stain; sweet, vinous, firm pulp, rich; skin, thick, like Catawba; season, September.

Vines.—Vigorous, hardy, healthy, short-jointed; leaves, upper side yellowish green, under side downy. Originated with Charles Carpenter, Kelley's island, and is extremely valuable as a wine grape, while, at the same time, it hangs well on the vine, drying like a raisin ere it will drop.

MAXATAWNY.

Fruit.—Bunches, medium, five or more inches long, usually not shouldered, and occasionally quite compact; berries, fair size, greenish white, sometimes with an amber tint when fully ripe, roundish, oval; tender, not pulpy, sweet and delicious; season, last of September.

Vines.—Healthy, vigorous, perfectly hardy in Pennsylvania, foliage large, deeply indented, quite free from disease.

This is a seedling, and originated in Montgomery county, Pennsylvania, and was first brought into notice in 1858.

NORTON'S VIRGINIA.

Synonym: Norton's Seedling.

Fruit.—Bunches, long, sometimes eight or nine inches, occasionally shouldered; somewhat compact; berries, small, round, dark purple, nearly black, skin, medium thickness; flesh, pulpy, brisk, rough; season, October.

Vines.—Strong, vigorous, hardy, healthy; foliage, medium size, coarse, free from all diseases. Originated with Doctor N. Norton, Richmond, Virginia. In the south and west this has proven one of the most valuable wine grapes grown. It is a great bearer, and makes a wine much resembling pure port.

REBECCA.

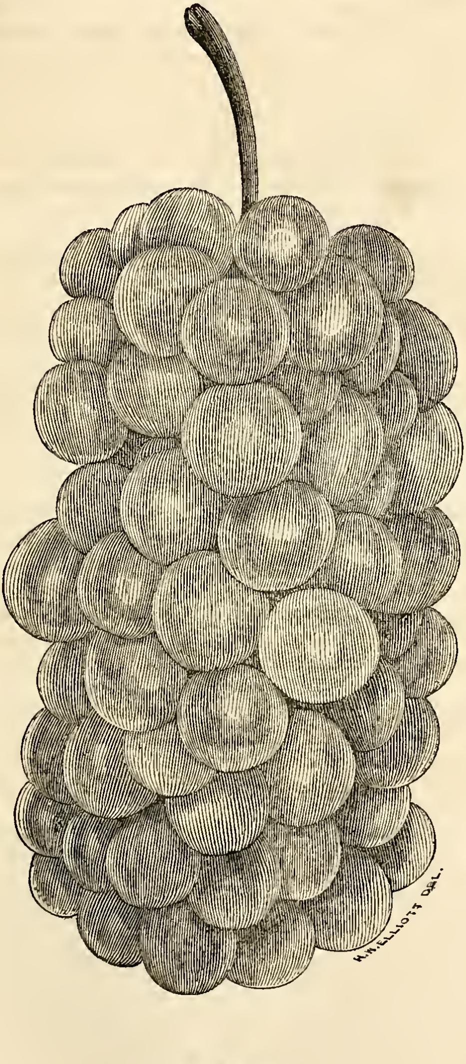
Fruit.—Bunches, nearly cylindric, very compact, occasionally shouldered; berries, medium size, oval, compressed, adhering strongly to the peduncle; color, light green or greenish white, becoming pale amber at maturity and in the sun, a light bloom partially translucent; flesh, melting, juicy, free from pulpiness; musky aroma; seeds, small; season, last of September.

Vine.—Moderately vigorous; hardy in most sections where the Isabella succeeds; leaves deeply lobed, upper surface light green, whitish down underneath. Originated in the garden of E. M. Peake, Hudson, N. Y.

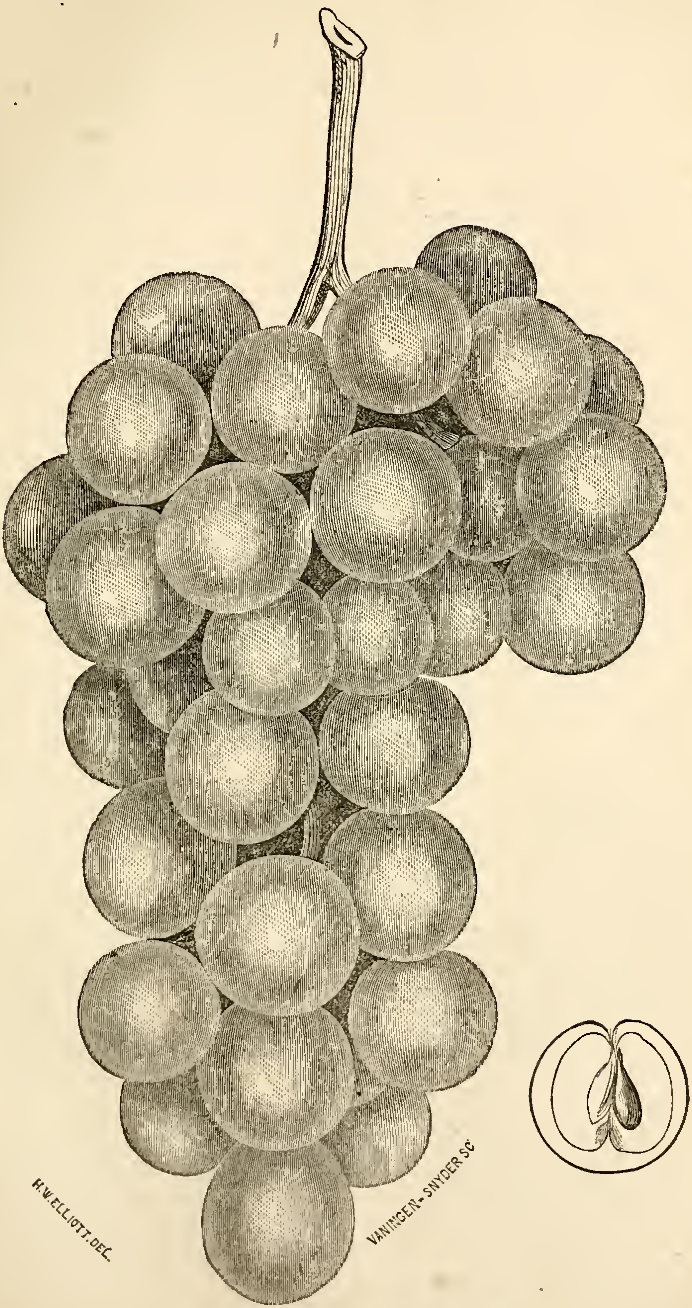
ROGERS' HYBRID, NO. 15.

Fruit.—Bunch, very large, shouldered, moderately compact; berries, large, round, slightly elongated, peduncles large, varying in length, some short, others long; color, rich dark maroon purple, with a light purplish bloom; flesh, with an outer rim of flesh next the skin, from which the pulp with seeds separates; pulp, yellowish white, a little firm, and with a slight harshness of the native fox grape, rich, vinous, sweet, aromatic; skin about as thick as Catawba; seeds, very light brownish white, obovate, obtuse, pyriform; season, middle to last of September.

Vines.—Strong, vigorous, hardy, healthy; large, strong foliage. Originated with Mr. Rogers, of Salem, Massachusetts, hybridized from a native wildling and the black Hamburg. The berries hang well to the bunch, drying almost without shrivelling, and becoming better three weeks after gathering than when first plucked.



REBECCA.



ROGERS' HYBRID, No. 15.

CRANBERRY CULTURE.

BY S. B. PHINNEY, BARNSTABLE, MASSACHUSETTS.

The cultivation and propagation of the cranberry ("Oxycoccus macrocarpus") is now largely increasing throughout the country to such an extent and importance as to merit a larger notice than can be given it in this article.

Although one species of this popular fruit is known in England and on the continent, yet it does not compare with that grown in Massachusetts, where the cultivation first commenced in this country, dating back in Barnstable more than fifty years. While there is everywhere such a large demand for this fruit, it seems really surprising that its cultivation should not have more nearly kept up the supply to the demand.

It grows on land almost valueless, with comparatively little cultivation or care after the bed is properly started; is readily enough harvested; brings a great price, and keeps a long time after being gathered.

There seem to be but two serious troubles in cranberry-growing in Massachusetts. One, the "worm," more fully described hereafter; and the other, early autumnal frosts; and both difficulties can be overcome by flooding at the proper time, if the location of the cranberry bed will admit of it.

I have personally examined a considerable number of cranberry bogs, and have been a cultivator of the cranberry since the spring of 1851, yet I do not rely so much upon the facts and information which my own experience has given me as upon the statement and collection of reliable data which have been furnished me by Amos Otis, of Yarmouth, Massachusetts, who likewise acknowledges himself largely indebted to Professor Agassiz, of Harvard University, for whatever of success has attended his investigation of this important subject.

Half a century has now elapsed since Captain Henry Hall, of Dennis, in the county of Barnstable, commenced the cultivation of the cranberry. His bog, or "cranberry yard," as he called it, has no year since failed of producing a remunerative crop. For the thirty years next after Mr. Hall commenced, many experiments were made by others, and most of them proved to be failures; but these failures had their use; they prevented others from falling into like errors. The general cultivation does not date back further than the year 1850, yet since that date there have been many failures, and many bogs recently set will never yield remunerative crops. By this term, and by "successful cultivation," I mean that the crops, including the present value of the bogs, have more than repaid the original cost, interest, and incidental expenses of cultivating, picking, and sending to market.

EXPERIMENTS AND FAILURES.

On the bog of Mr. Hall every fact necessary to be known might have been learned, yet the information to be derived from his experiments was not often sought or regarded. Almost every beginner had a theory of his own, not based on his own or the experience of others, and the result was that nine out of ten who made such experiments failed of success.

During the last fifteen years cultivators have been more discreet. Before expending much time or money they examine other bogs, collect information from those who had had experience, and thus avoid falling into some of the errors of their predecessors. Though many facts in regard to the culture, and much information has thus been obtained, yet no reliable system of cultivation has been established. The science is in its infancy, and much is yet to be learned.

SOIL.

The cranberry cannot be successfully cultivated on the "*drift formation.*" Hundreds of experiments have been tried, and all have proved to be failures. It is unnecessary to give details—they would fill a volume, and be of little practical utility. Professor Agassiz describes the "*drift formation*" as being that portion of the earth's surface which was formed by glacial action, and consisting of rocks not in place—that is, loose, and not in solid ledges—gravel, clay, and loam. This definition is plain and simple, and every farmer will understand it, and will be able to distinguish *drift* as soon as he sees it. In that formation strata of sand are often found, but it usually contains some loam, and it is better to avoid its use. Bogs naturally well adapted to the growth of the cranberry have been ruined by using *drift* material in preparing them. In some bogs where partly *drift* and partly *alluvium* was used, the exact line between the two can be traced by the difference in the growth and appearance of the vines.

The "*alluvial formation*" is the only one on which the cranberry can be successfully cultivated. Though this formation includes the most barren and the most fertile soils—the dryest and the most damp—yet its character is well marked, and it can be easily distinguished. Sand or quartz-rock, pulverized or granulated, is alluvium, separated from the drift by the waves and currents of the ocean, and elevated by the action of the winds and waves. The deltas or rich interval lands near the outlets of rivers are *alluvium*, and are formed by the subsiding of the finer particles brought down by the current of the streams. The mud found in the narrow bogs and creeks near the sea-shore is of the same character. Salt and fresh meadows, formed partly by such deposits of mud and partly by decayed vegetable and animal matter, belong to the same class. Peat differs from marsh mud only in this, one is formed in fresh and the other in salt water. There are two, if not three, distinct varieties of peat; but all peat and all mud, whether fresh or originally salt, seems to have the same influence on the growth of the cranberry, and. practically, may be regarded as the same.

The best soil for the cranberry is beach or quartz-sand, overlaid by about a foot of turfy peat. Of this character are some of the most productive bogs in Harwich. In preparing such bogs, all that is needed is to subsoil the same, bringing about three inches of sand to the surface. Underlaying the deeper peats, the sand has become indurated, but on exposure to the air, crumbles like meal or lime, and may be a useful top dressing. If the peat is deep, and covered with rushes, wild grasses, or bushes, the whole must be pared over down to the bottom of the roots and removed, and the bog covered with beach or quartz-sand from five to fifteen inches in depth.

On rich *interval* lands the same precautions must be used. If a thick coating of sand is not first spread over, it will be difficult to keep out the wild grasses, and if kept out, the cranberry vines will, as on the deep peats, make too much wood and be unproductive.

Some *interval* lands are naturally adapted to the growth of the cranberry. Such are usually found near the sources of streams or on the borders of rapid rivers. They contain much sand and fine gravel, and are easily brought into cultivation. Of this character are some of the bogs in Barnstable, and I am also informed that bogs at Franklin are similar.

On pure deep, black peat, the cranberry vine will grow more rapidly than in any other soil. A single crop will perhaps be obtained, and then the vines become abortive. The same is true of vines grown on rich intervals, if the wild grasses are kept out. The vines in such situations are very rank, the uprights of twice the length they are in productive bogs; and on comparing the two it will be found that the unproductive vines are soft and flimsy, while the productive are stiff and hard. A careful chemical analysis of the two would probably disclose this fact, that the productive vine contains more silex in its constituent parts than the unproductive. That this is so is shown by the touch alone. The productive vines are harsh, and when drawn between the fingers the silex with which they are coated grates the skin.

Though unproductive vines are somewhat harsh, there is a marked difference between the two. This shows that silicious or quartz-sand is a necessary element in the production of bearing vines. In proof of the correctness of this theory, I might cite the results of many experiments. I will refer to only one.

Many years ago Mr. Henry Hall transferred vines from his bog near the sea-shore, to which reference has been made, and set them on a deep peat bog near his dwelling-house. These vines grew very rapidly, soon covered the surface of the bog, but never bore fruit. There are some peat swamps surrounded by sandy lands, into which, in process of time, the rains have washed and the winds have blown sufficient sand to make the vines set in them productive; but such bogs are rarely met with.

DRAINAGE AND WATER.

The first point to which the attention of the cultivator must be directed in selecting a situation for a cranberry bog is drainage. If it cannot be drained at least eighteen inches below the general surface, the situation must be rejected. Flowage is not absolutely essential to success, yet to have water at command so that the bogs may be flowed or the water raised in the ditches at any time, within twelve inches of the surface, is very desirable. Bogs that are kept flowed till the 25th of May or 1st of June insects rarely trouble; and when an abundance of water is at command, the damage often caused by early or late frosts may be prevented.

Where the drainage is imperfect, it is impossible to keep out the rushes and wild grasses, and the vines become choked, and are rendered unproductive. Of this character is the bed near the county road, on the west side of White's Brook, in Yarmouth. Some of the vines have been set more than twenty years, and the soil is naturally good, but imperfect drainage has destroyed its value.

When a situation has been selected for a cranberry bog, the first thing to be done is to level it. A levelling instrument is not necessary. All that is required is a strip or plank ten or fifteen feet in length, the edges jointed and made exactly parallel; with this and a common carpenter's level the work may be quickly done. Stakes of a foot or more in length, cut off square at the top, should be provided. Begin by driving one of the stakes so that the top will correspond with the proposed surface of the bog when completed. With this as the standing point, run several lines of stakes through and across the bog. If more convenient, the tops of the stakes may be elevated six or more inches above the proposed level. This operation is important because stakes show where material is to be removed, and where filling is to be required; and by making a little calculation the earth to be removed may be made to exactly correspond with the amount required for filling. But this is not the principal advantage; it requires much less water to flow a bog that has a level surface than one that is uneven.

If the bog is extensive, and cannot, without too much expense, be reduced to one common level, there is no objection to having different grades with low dykes between them. It is said that in building railroads nothing is ever lost by spending much time in engineering. This remark has force and truth in it when applied to cranberry bogs. The money and time spent in laying out the work to be done is always economically expended. All that is to be done, and *how* it is to be done, should be known before work is commenced. In many bogs it would be economical to employ an experienced engineer, and have marked stakes put up, profiles and working plans drawn. With such marked stakes and drawings, the workman knows when he has filled his barrow, where he is to tip the contents. There will be no mistakes, no alterations to be made, and in the end money will be saved.

The depth of sand required to be spread on the surface depends upon the depth of the peat. If the latter is only a foot or two in thickness, five inches of sand is considered sufficient; if it is several feet, at least a foot of sand is required to make a good bog. The more sand there is used, the longer it requires to bring the vines into a bearing state; but when brought into that state they continue to bear for many years.

At Sandy Neck, on the north side of Barnstable harbor, the cranberry has grown in natural bogs for hundreds of years. The soil of these bogs is beach-sand, with a small mixture of peaty and vegetable matter. They prove that a large admixture of peat or mud is not essential to the growth of productive vines. Some experiments, however, have been made, showing that their productiveness is increased by spreading over them peat or marsh mud. Some of these bogs are covered with water in the winter and some are not; but in all of them water can be usually found in the dryest weather within about a foot of the surface. A few bogs have been formed there by dyking in salt and fresh meadows and covering them with sand. These have proved to be very productive.

PREPARATION OF SOIL.

At Provincetown, where the soil is very similar to that at Sandy Neck, the experiments have not been uniformly successful. A difficulty occurs there in obtaining a proper grade. In the wells of that village the water rises and falls with the tide. Further inland the same cause operates to a limited extent. During a course of high tides the water in the low lands, where the cranberry vines are set, often rises so high as to injure the crop; and during a course of low tides, if dry weather happens at that time, the vines suffer from drought. In situations not thus affected the cranberry is very productive. In the swamps, where the mud is deep, the cultivators are troubled with wild grasses and rushes, and for that reason sandy bottoms are preferred. It is also found by numerous experiments that very little peat is absolutely essential to secure a crop. The best and most productive vines are usually found on the edges of the bogs, where the sand was removed to the depth of several feet in grading. In such situations there is no peat or mud, but the water contains sufficient material in solution to promote the growth of the plants. In such situations guano and other fertilizers have a good effect.

TIME AND MANNER OF SETTING.

The spring of the year is usually considered the most favorable season for setting. The cranberry vine, however, is very tenacious of life, and will grow if set at almost any season. The usual course is to punch holes in the ground about eighteen inches apart each way, and insert therein two or three vines, and afterwards press the soil around them. Dr. Shove, who has had large experience, sets the vines in shallow furrows made with a common iron cultivator He lays the vines down in the furrows and covers them, leaving out the en of the vines.

INSECTS.

The habits of the insects that are injurious to the growth of the cranberry have not been carefully studied, and sufficient information has not been collected to enable me to speak with confidence on the subject. There are two worms, known as the vine-worm and the berry-worm, injurious to the cranberry. The first is a variety of the caterpillar, about half an inch in length, with a black head. The other, when fully grown, is of nearly the same size, and has a red head. The vine-worm destroys the leaves and blossoms, and, consequently, the crop. The bogs in which they commit their depredations appear as if they had been burnt over. The berry-worm is usually found in greater numbers in the dryest part of the bog. Like the curculio, it destroys the fruit it enters.

The cultivators who have had the most experience say that if the bog is kept covered with water till the 25th of May or 1st of June these pests rarely commit any depredations.

One-half the bogs in this county are so situated that they cannot be kept flooded till June 1. Dr. Shove, of Yarmouth, Rev. Mr. Myrick, and other gentlemen in Provincetown, have, perhaps, studied the habits of these insects more carefully than any, and have experimented with decoctions of tobacco and other articles. They have been partially successful. Professor Agassiz suggests that the following experiment for destroying the fruit-worm be tried: First, to ascertain at what season of the year it appeared in its miller state, and, having ascertained that, to build, at night of that season of the year, small fires in the vicinity of the bogs; the millers will fly into the fire and be destroyed. If every one who has a cranberry bog will watch the habits of these insects, and report his observations, much valuable information will be obtained. This should not be carelessly done. The date of every observation should be carefully noted. If building fires is the remedy, it is all important to know the exact date at which the insect appears as a miller, and how long it continues in that state. The probability is that it does not exist as a miller more than a week or ten days, and if the exact time is known, it is easy to apply the remedy. These insects are said to be unlike any described in the books. Dr. Shove says the miller of the fruit-worm appears about the time the berry begins to form. If subsequent observations confirm this, it is advisable to test the remedy suggested by Professor Agassiz. Dr. Shove further states that the miller punctures the cranberry and lays its eggs under the skin, in the same manner that the curculio punctures the plum or the cherry.

The reason that flowing till the first of June is not a perfect remedy against insects is, perhaps, this: In the fall, when the insect changes from a worm and becomes a chrysalis, it buries itself in the ground. All do not bury themselves on the bog, but on the borders. These are not affected by the flowage; but, as the vines are kept back by the water, further investigation may show that these are the only ones that flowage prevents from committing depredation. It has not certainly been ascertained that the chrysalis of these insects is destroyed by water, but the facts stated indicate that it is so.

PICKING AND PACKING.

Of late years many have been too careless in picking and packing their cranberries. This is a great mistake. They should be picked by hand, and spread not more than five inches deep in hurdles made of laths left open, so that the air can draw through them. These hurdles should be piled for three weeks in a room where the air circulates freely. If kept in this manner for a longer time, it would do no harm; the berries would become perfectly ripe, and thereafter be less liable to rot or to be injured by frost. When taken from the hurdles they should be winnowed, and every unsound berry picked out by hand. It is also important that the barrels or packages in which they are put should be dry and clean.

PROFITS.

That the cultivation of the cranberry is a profitable branch of industry is now a settled fact. Thus far, perhaps, much more has been expended than has been realized. Many have lost all they have spent for want of information and want of experience, and a few who were successful have realized large profits. Mrs. Winslow, of Brewster, in this county, realized a thousand dollars from a single acre. I might name many others who have realized nearly as large profits. At the present time the man who carefully collects the information which has been gradually acquired during fifty years of experiments may as safely rely on a profit from his investment as any farmer can from any other cultivated crop, and the facts will show it. Can a single instance of failure be pointed out where the mode of culture described has been carefully followed? I know of no single instance, and I have examined many bogs for the purpose of ascertaining the correctness of the theory and practice now recommended. I have endeavored to sift out from voluminous statements the facts that are of value, and I will now recapitulate them in a form easily retained in the memory

1. The cranberry cannot be successfully cultivated on the *drift formation*—that is, on a soil composed of clay or loam.

2. There must be the means of draining the bog eighteen inches below the general surface.

3. All bushes, wild grasses, and roots must be pared off and removed.

4. If the soil does not naturally consist of sand and an admixture of peaty matter, it must be artificially corrected; if peat, by putting on beach-sand, or sand composed of fine particles of quartz rock; and if pure sand, by adding peaty matter.

5. It is desirable but not essential to have the command of water, so that the water in the ditches can be raised within twelve inches of the surface at any time, and also in sufficient quantity to flood the bog in the winter or spring.

STATISTICS OF THE CRANBERRY CROP IN BARNSTABLE COUNTY.

The following table shows the amount of cranberries raised in Barnstabl county, Massachusetts, during the season of 1863, and the prices for which they sold per barrel:

Towns.	No. of bbls.	Price.	Amount.
Harwich	2,697	$9 50 to $11 00	$26,934 50
Brewster	611	9 00 and 10 00	6,031 00
Dennis	423	9 00 and 10 00	4,054 75
North Dennis	402	9 00 and 10 00	4,000 00
Chatham	168	9 00 and 10 00	1,640 00
Barnstable	425	10 00	4,250 00
Yarmouth	200	10 00	2,000 00
Sandwich	175	10 00	1,750 00
Provincetown	125	9 50	1,187 50
	5,176		51,847 75

Barnstable county was the earliest in the culture of the cranberry, and fro the best information to be obtained it is estimated that it now produces nearly one-half of all that are cultivated in the State. This would give somewhat over 10,000 barrels for the year 1863. There is a great increase in the consumption of the cranberry, and this fact should encourage those who possess lands of the kind pointed out to make an effort to cultivate the vine.

BELL CRANBERRY.

CHERRY CRANBERRY.

Rev. Mr. Eastwood, in his manual for the cultivation of the cranberry, says he has seen a pint of cranberries, marked "Cape Cod Bell Cranberries," sold for four shillings sterling in the "Strand," London.

Boston is the great market for cranberries, being nearest to those regions in which the vine is cultivated. The New York and Philadelphia markets within the last few years have become extensive purchasers, and Boston dealers ship large quantities to these ports. Of such profit is the cranberry that growers are visited by city dealers a month or two before the berry has been ready to pick, and they frequently purchase them thus early at prices varying from $9 to $10 per barrel.

The accompanying engravings show berries of their natural size, and are of the "Bell" and "Cherry" species. The "Bell Cranberry" is so called because of some fancied resemblance to a bell in its shape. Of this species there is but one variety. It is of good size, and almost as dark colored as blood coral when well grown and fully ripe. It grows in some sections to great perfection.

The "Cherry Cranberry," so called from its similarity in shape, size, and color to that well-known fruit, is of two varieties, large and small. It is hard; its color is very dark or a blackish crimson, when properly cultivated. Occasionally these species are known to bear seven berries on a single branch of the runner, but five, as here represented, are the more common product.

There are several other species and sub-varieties of the cranberry, both wild and cultivated, but they are not so generally known in this section of New England as those described, nor are they so valuable for market or domestic use.

CULTURE OF THE STRAWBERRY.

BY GEORGE H. HITE, MORRISANIA, NEW YORK.

In writing upon the culture of the strawberry, we will speak—first, of the preparation of soils; second, of garden and field culture; thirdly, of propagation, hybridization, forcing, &c.

I. PREPARATION OF SOILS.

The ground should always be healthy, and of a friable nature, made deep and permeable; clay loam should be trenched at least twenty inches, and the subsoil brought to the top. Well-rotted manure should be equally introduced to within six or eight inches of the top, or, if the trenching is done in the fall, fresh stable manure may with safety be used, provided the planting is done in the spring. In the above kind of land, manure can be used with impunity, provided it is kept six or eight inches below the surface, *i. e.*, where the roots of the newly set plants will not reach until they have gained some considerable degree of strength, which, by that time, will find the manure sufficiently decomposed to receive them.

A sandy loam should be deeply dug, and well-rotted manure interspersed equally throughout. All land that is not underdrained requires to be deeply dug or trenched, and a proper equilibrium of the soil obtained by being well broken to pieces. Still rains that fall will pass immediately downward, which secures a permanence of moisture that may be relied on in the season of drought.

Another method of manuring the above kind of land for field culture is to spread the manure equally over the whole surface; then, with a mould-board plough, turn the manure under in the manner sod lands are ploughed, and harrow it evenly, without bringing the manure too much to the surface,

It is by no means necessary or proper that stimulating manures should be in close proximity to the plants. If they are below the surface, as above stated, in clay lands, the effects are soon felt in the opening of spring, when the warmth of the sun acts upon the surface. All that is required at the tim of planting is to use ashes, or, if ashes cannot be had, a compost of old head lands*—soil from around decayed stumps, logs, or leaf mould, or any decomposed vegetable matter, finely screened, and sowed along in the furrow, to induce the first growth of the young plants. The top dressings which they receive in after growth will be quite equal to the necessity of the majority of plants.

II. GARDEN AND FIELD CULTURE.

Of garden culture I may be allowed to repeat, in part, what I have said in my article on strawberry culture, published in the Transactions of the American Institute of 1860, page 148, inasmuch that, after various subsequent experiments, I find nothing to alter, but considerable to add in detail.

After the preparation of the ground, as above stated, when it is raked or harrowed level, make, by line, two rows fourteen inches apart. Then, with the corner of the hoe, make miniature furrows about six inches deep, quite regular, from one end of the bed to the other. Then take two and a half feet between that and the next two rows for an alley, and so on over the space allotted for the bed. Procure some unleached wood ashes, (leached ashes are nearly as good,) or a plenty of coal ashes may be used as a last resort. (This last should not be suffered to get wet before using.) Sprinkle them all along in the bottom of the furrows, say to the depth of one inch. Then, with the end of the hoe handle, mix the ashes well with the soil without changing the form of the furrow. Next make holes fourteen inches apart with a garden trowel (not a dibble) along in the rows where the plants are to go. Set the plants carefully in these holes with the roots spread horizontally, so that their crowns will be two inches below the general level of the prepared ground, for the reason that when the plant has gained size and strength, it will admit of being hoed without drawing the earth from between the rows. This little bank or ridge of ground, in sandy soils, should at the time of planting be removed from between the rows to be drawn upon as necessity requires, as the rains are apt to wash it into the furrows too soon, and smother the plant; and in rolling lands it is also necessary to use the same precaution, as the soil left by the side of the furrow when made will, as it is from time to time drawn into the furrow during the first and second season's hoeing, enable the plant to put forth new roots above the old ones. (These newly-formed roots from the side shoots rise above those of the old plants, and become the absorbents; the matters passing through them to sustain the new side shoots do not sustain the old plant to which they are so nearly connected.) By fall the furrows will be by this gradual process nearly filled up, so that the bed will present one level surface. Meanwhile bear in mind to pinch off the runners as they appear. These runners frequently make their appearance simultaneously with a small incipient leaf, and, if not suppressed in time, will draw so much upon the root that the plant will not produce a crown, and will eventually waste the whole substance of the plant. As the plants are not expected to bear much fruit the first season, it is well to go over the ground after rains with a rake about one

* By *headlands* we mean the accumulation of leaf mould, &c., round old fences of pasture lands.

foot wide, with six-inch prongs, to destroy any weeds that may begin to appear. An instrument to be found at the hardware stores, known as the "potato drag," is the most suitable implement for this purpose that can be found. It is like a five-tined fork, bent down in the form of a rake, and answers the double purpose of fork and rake. I use it from the first, if the ground is friable.

The plants are now established, and ready to be covered over late in the fall with hay, straw, leaves, or anything of the kind which contains no seed. Over this, pea brush should be laid, to keep it from blowing off. This process of covering answers many good purposes, among which are, it keeps the fruit clean, holds the weeds in check, retains moisture longer in the ground, and last, though not least, without it, in spring, the frost coming out of the ground is apt to crack the earth around the plants, and snap the spongioles or roots, which are of essential importance to the early bearing of the plants. It is necessary to part the straw from over the plants, and crowd it around the collars of the same when the season fairly sets in, and there let it remain until they are done fruiting. This is a practice of covering, the perfection of which would be to crowd the straw around the collar of the plants, once for all, early in the fall, and a little later, before winter sets in, with a wisp of the same cover the crown and top entire. By this mode we avoid the possibility of the straw becoming matted by rains and snows, which often smothers the plants and retards their early vegetation. Of course this supersedes the necessity of parting and adjusting the straw in the spring, as by the process first mentioned. Bear in mind not to touch them with rake or hoe until they have done bearing. If weeds appear, pull them up while young.

When the plants are through bearing, the straw should be removed from the ground, and the process of raking, spading, or forking begun. Here the potato drag, or five-tined rake, plays a good part in forking in the alleys and between the rows. All we have to do is to strike the spot, and, with the handle as a ever, we raise the earth with the greatest ease, and with a lateral action of the same break and, at the same time, leave it level at one blow. I must here remark the propriety of leaving the surface of the ground somewhat rough, for the reason that the rains are apt to pack the surface too soon. This practice is most important in heavy soils. The necessity of adding earth to the plants as they require it for the side shoots, should not be forgotten, as, of course, the roots are nearer the surface of the ground. Hence the utility of planting as low in the ground, the first year, as possible, so that the addition of dirt may be made without rendering the bed an unsightly mass of hills and valleys. But, before adding this soil, sprinkle a handful of ashes around the collar of each plant. A proportion of three parts wood ashes to one part soot answers a good purpose in keeping off ants, grubs, and wire-worms; it is also of great service to the side shoots in giving them a vigorous start for the next season's bearing.

Field culture must necessarily vary from garden culture in some particulars.

After the ground is prepared and made level, we would make three rows, on the principle stated for garden culture, fourteen inches apart, and set the plants twelve inches distant in the rows, leaving twenty inches between that and three rows more. Here we must, in planting, be governed by circumstances, as some of our best varieties vary in their habit. For example, if we plant Wilson's Seedling, it succeeds best planted sixteen inches apart. Triomphe de Gand does not spread quite so much; therefore we plant them fourteen inches apart. Hooker's Seedling, Prince Imperial, Brighton Pine, and others of the so-called "shy bearers," should be planted six inches apart in the rows. Thus, by a careful attention to the arrangements of varieties, we secure profitable results. Then leave a space of about four feet for a road, that will admit a truck or carriage on two wheels, that will hold a good-sized barrel, arranged somewhat like the street sprinklers drawn by a horse, with a rose similar to a watering pot at each end of a cylinder or hollow tube of proportionable size, which in passing between the above six rows will, by this means, furnish a *bountiful* supply of water; and the twenty-inch alley will afford ample space for cultivation, gathering fruit, &c. Then from the "road" take three more rows again; then twenty inches for another alley, and so on through the allotted plantation.

In field culture we wish to retain the plants in full vigor for as long a time as possible. The principle as laid down in keeping the bank of dirt at the period of planting, must here operate largely. We will suppose that at the first year of planting this little bank of earth is only half used, or, if it is thrown in, as a winter protection to the plants. In the spring it is partly taken out again and placed between the rows equally, for convenience sake, as the hoeings of the first season have sufficiently established the plants to send out their full amount of side shoots the coming season, and to bear their fruit. Of course these side shoots have formed their roots above those of the mother plant. Then in the fall, say at the end of the "dog days," the surplus dirt between the rows is thrown in. At this time the field presents a regular level surface. By this process we are establishing the "aggregation" of plants in each hill, and at the end of the third year an increased number of side shoots have formed with their roots above those of the second year. Of course we would want more earth to fill around the plants.

Now the flat culture system is to play the useful part. As the good cultivator of corn would say, "hoe to and from." Now the time to practice the above is important.

If the field has received proper attention, as above stated, in the fall, and is mulched accordingly, there is nothing to be done until the plants have fruited and the mulch (hay or straw) is removed. Then we proceed, with the rake, to keep the ground in good order during the months of July and August. The roots grow more vigorously then than at any other time. This being the fact, the young offshoots make vigorous progress. It is important that the earth should be hoed from the plant, that these roots may make great efforts to find their way down, otherwise they will remain stationary near the surface, and will consequently require additional earth to cover them, or they will suffer from the winter freezing. Late in the fall, and before winter sets in, we return this soil, which we held in reserve, by the operation of hoeing from the plant. This makes the fourth year, with its mulch. We are still on a level plain with our plants for the fifth year. The same process of operations is continued, as before, practicing the same hoeing to and from the plants. This year we find ourselves in want of soil for their winter protection. We must, of course, resort to the earth that has been lying idle in the four-foot road. We can easily obtain therefrom sufficient soil and earth, or shovel it around the plants, the road being as useful for all intended purposes as before. Thus we are secure for the sixth year, all on a level plain with our plants only, as before. Now we have one more year, the seventh, to prepare for, which will require the earth from between the rows for protection. This is as much as we can expect the plantation to perform profitably.

We now seek a new plot of ground for a renewal. Our efforts to renew on the same plantation would prove fruitless, for, if the ground has not become exhausted, it contains a deposit of excrementitious matter that precludes all possibility of success, to say nothing of the hordes of wire-worms and grubs that infest and destroy plants. But to plant corn or potatoes for a year or two would render it suitable for a renewal.

III. PROPAGATING, HYBRIDIZING, FORCING, ETC.

In propagating from seed it is idle to calculate upon favorable results from indifferent seeds. Fom my first experiments in this way, which were in the year 1858, I obtained a large number of plants; and if a premium had been offered for the largest collection of poor berries, I should certainly have obtained it. Subsequent trials with seeds taken indiscriminately proved equally worthless. Being determined to succeed, I adopted a method of my own. The result was that twenty-five per cent. of the plants produced varieties equal, if not superior, to any I have ever seen, both in size and quality. I did not intend to make known my experiments until after another year's trial, but the plants have proved so well under the severest tests, both in their habits and hardiness, that I feel confidence in expressing my belief that those who desire to raise plants from seed can with ease produce something that will reward their efforts.

The ground should be prepared as above described. Obtain plants (young sets) from the best varieties, and, if possible, of different species. In every instance possible, plant pistillate with staminate, in pairs, twenty inches distant, with their roots interlaced with one another. Cultivate them in the usual way the first season, not allowing them to bear fruit or runners. In the second season they will send forth their foot-stalks with an abundance of fruit blossoms, and when it is ascertained that the blossoms indicate a perfect set, with a pair of scissors clip off about one-third of their number—*i. e.*, those that indicate weakness. Leave an equal number on both plants—early varieties will show blossoms first*—and when in this state proceed, with the feather part of a goose-quill, to agitate the plants by striking moderately one against the other. This operation should be repeated morning and evening, and at mid-day, during dry or rainy weather, until they have formed their fruit. To be doubly sure and certain of a cross, it is well to have a wire cover, similar to those used for covering dishes, only that the netting (or meshes) are more open—enough so to keep off the bees while the plants are in blossom—and when the berries are formed remove them entirely.

The fruit should be suffered to remain on the vines until fully ripe, when it must be gathered and immediately mixed with enough common dry sand to cause the whole mass to appear like a paste. Then place it on earthen dishes, inside a well-aired house, where it is to remain some days, to undergo a sort of fermentation in the pulp, and become cured, as it is termed. I imagine they require a certain time of rest, which is indicated by the whole mass being sufficiently dry to crumble to pieces in the hands. At this time the seed should be sown with the sand, in drills or broadcast, in a situation partly shaded, (not by trees,) and with a sifter cover the whole surface of the bed from an eighth to a quarter of an inch deep. The season, at the time of planting, is generally dry, and the dews of night will not afford moisture enough for the whole day. This, with the action of the sun, will soon dry the surface and retard early vegetation; therefore it is absolutely necessary to sprinkle the bed with a watering-pot every evening after sunset.

If the bed is made in an open exposure in the ground, it will be necessary to raise a board edgewise, six or eight inches high, at each end of the bed, and lay over it some laths, or long strips, two inches broad and about three inches apart. Thus we admit light and air during the whole day. The shade from these coverings changes, as the sun rises, till sunset. At night they may be removed to one side, to admit the full effect of the dews, or be left off in cloudy and rainy weather. The seeds will continue to germinate until cold weather, and frequently the first plants will rise, with their roots almost out of the ground. These must be pressed carefully down with the fingers, and a little soil added to them. The earth-worms are apt to infest the seed-bed, and throw the plants out of the ground. To get rid of them, holes about one foot deep

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*According to Mr. Peabody's theory we secure a point, at least. He seems convinced that the staminate blossom sheds its pollen on the ends of the unopened pistillate, which causes immediate impregnation.—See appendix, R. G. Pardee's Strawberry Manual, page 96.

and two inches in diameter must be made, at intervals of two feet, throughout the bed, and kept open for the purpose of introducing a blunt stick, say the end of a broom-handle, which can be inserted to thump on the bottom. The object is to produce a rumbling noise, like a mole burrowing. Their instinct to shun moles drives them immediately to the surface, where they can be destroyed.

On the approach of winter the whole bed should have a slight covering of hay or straw, about one inch thick, and secured in place with pea-bush. In spring, when fair weather sets in, they should be carefully set out in rows, eighteen inches apart, and will, with care, become vigorous plants, and a majority of them will yield fruit the next season; and when the first and most perfect berries ripen, gather and prepare them with sand, and plant them as above. The great probability is that the result will be productive of large berries, which will be as good as common berries, if not better, with a per cent. of something extraordinary. History teaches us that most of our best varieties have originated by hybridization of different species, also by crossing of different varieties, and, probably, with the means we have at hand, we can obtain varieties characteristic of their ancestors, with a shade of improvement. All our most approved fruits have originated from a continuous planting of improved seeds. Why not the strawberry?

Propagation by runners is by no means important. Many grave errors are committed from ignorance of the character of the plants. The strawberry, like the cabbage-plant, requires to be transplanted. From observation, it will be seen that the set from a runner has formed its roots mostly on one side, and, if not transplanted, will send out its foot-stalks on one side also, and will not produce side shoots or crowns with regularity, as a renewal of the plants. By transplanting, some of the roots are a little shortened, which is a guarantee of a well-balanced plant, and an aggregation of plants will more certainly take place to its profit. Any plant that has never borne fruit may be transplanted profitably. But older plants should not be transplanted as a renewal of bearing, unless we wish to perpetuate a special kind, and obtain runners therefrom.

Obtainment of runners or sets is not less important. When a runner advances a certain distance it takes root, and as it elongates, forms its succession of sets to a considerable distance from the parent plant. At the same time a joint is formed, about midway between each elongation, where a secondary branch will start and produce sets. These sets produce lateral branches, each forming other sets, which will grow rather vigorously to the detriment of the original. If these laterals, as well as the sets of the secondary branches, are used in the formation of new beds, they will always be behind, let the cultivation be ever so perfect. The difference is perceptible both in the bearing and the quantity of fruit, and if we propagate offsets from these plants we shall soon have a degenerate bed of the same variety—a fact which I fear has too often prevailed among honest venders of strawberry plants for want of knowledge, until most of our best old varieties are cried down as having "run out." How often has Mr. Longworth been written to to obtain from him personally the genuine "Longworth's prolific," when the applicants already have the genuine variety, though degenerated. "Hovey's seedling," early in its history, produced the finest berries we have ever had. Why has it run out? The cause is doubtless the same. I had a bed of "Longworth's prolific." Some of the plants produced berries weighing thirty-two to the pound. The renewal bed which I establishd afterwards confounded me, for there were not ten per cent. of the plants that came up to the original bed. The fruits of these were small, sour berries. I did not impeach the "honesty of the nurserymen," but determined to investigate the cause. I succeeded to the truth of the above practice. It is already perceptible in "Triomphe de Gand." "Wilson's seedling" is partly an exception; it is the only plant that readily reproduces itself from its seed or offsets. Some years since I obtained from Dr. C. W. Grant the genuine Bartlett. Some of the individual plants bore the best fruit I have ever seen of that variety. The others show signs of degeneracy. I propagated offsets from the perfect plants, and obtained uniform plants, while those that were taken indiscriminately proved irregular, although the cultivation was the same throughout. So of other varieties under this mode of practice, which establishes the facts incontrovertibly.

Persons in purchasing strawberry plants are not able to detect the difference at the time, but when the plants are in bearing it is perceived that some of the individual plants are heavily laden with large berries, equally proportioned to the capacity of the plants. Others have two or three quite fine berries; the others small, thinly set, and scattering. This difference is certainly attributable to the above cause.

It is the best practice to establish a bed of plants, for the purpose of runners, in some out-of-the-way place on the lot, and so direct the running vine that it can be readily seen as it progresses. Never allow a secondary vine to take place from the point of prolongation between the sets; and the result will be that each set, let it be first, second, fifth, or twentieth, formed on the original prolongation, will produce equally one with another.

After the first set has taken root and formed, the second set of the prolongation, with its roots, the tendril of the first, may be separated from close up to the parent, and the end inserted in the earth some six or eight inches, and the ground packed hard around it to prevent exudation of the sap. And so on with the others as they advance, thereby affording an opportunity to transplant them as often as they mature. The space left between each plant admits of its being taken up with its ball of earth attached. Thus each individual plant goes on increasing, (not forgetting to allow the mother plant to issue new separate prolongations as they appear the while,) and by fall will have grown vigorously, and will yield abundance of fruit as ample reward for the additional labor, which no lover of strawberry culture should consider a hardship.

If we wish to transplant sets obtained from a distance during the summer, we at the time of planting cover them with a board about nine inches in width, by placing blocks about six inches high at intervals along the row to sustain it in place, at the same time keeping the plants well watered. At night set the boards to one side, that the plants may benefit by the dews of night, to be replaced at sunrise, or left off in cloudy weather until they take root and recover.

The whole bed of plants in the following year of bearing will present a display of well-balanced plants, bearing fruit to the utmost capacity.

It is not the best practice to allow plants of a well-established bed to make sets for a renewal. It hinders the cultivation just at the time when it is most important. to say nothing of the unsightliness and injury to the plants.

Forcing, not unlike hybridization, if followed up to the strict directions of some authors, would be attended with considerable expense, not suited to the convenience of a great many, to say nothing of the time required to apply them. My object in this treatise is to convey to the million the most economical as well as the easiest way of accomplishing this desirable object, and at the same time not to depart from the principles by which the whole thing is governed.

First, then, if we wish to have strawberries from two weeks to a month earlier in the outdoor plantation, having the plants arranged as stated in garden culture, the rows running east and west, early in January or February we raise on the south side of the rows, on the edge of the alley, a board, six inches broad, set edgewise. On the north side we raise another board, about twelve inches high, also corresponding boards at each end, all secured in position by small stakes to keep them permanent. We then take a section of the common sized hot-bed sash and lay it over the plants lengthwise. At the same time bank some fresh manure up against the boards outside to keep the plants warm, and avoid exposure to the cold air, using matting to cover the sashes when required in bad weather, as is practiced on hot-beds. As the season becomes advanced in April, attention is required in giving air to the plants by raising the sash a little through the day and closing it again at night, not forgetting to water the plants, and covering with the mats when required as protection in cold nights. This mode of practice does not affect the plant unfavorably for subsequent bearing. They have only fruited a little earlier.

If we wish to force plants earlier we must at the proper time—*i. e.*, when the sets are forming on the runners—procure small flower-pots, fill them with good mould similar to that around the plants, and sink them just under where the set is about to take root, so as to be level with the ground, Lay a bit of clod over the vine to keep it in place until it takes root in the pot, and when the next set has rooted, separate the first one, and so on, progressively, as stated under the head of propagation. When the plants have become well established in the little pots, they are, with the ball of dirt attached, changed into a size larger, adding mould, at the same time, to fill up the pot. The pots should now be placed in a position partly shaded from the sun, and kept well watered. As soon as the roots are about to reach the side of the pot, the plant must be changed into a larger pot. This last should have a drain in the bottom, made of broken shells or small pebbles, to the depth of half an inch; and when the plant is introduced the pot should be filled up with compost made of two parts garden mould, one part leaf mould, and one part sand and pulverized charcoal mixed. By the time the plant has gained size and strength in this pot, it can be taken in the house and placed on a platform, in a position where it can receive the most light and air, not omitting to give the pots a plentiful supply of water when required.

Another way by which a number of plants can be forwarded in one pot, is as follows: Take a twelve-inch earthen flower-pot, and, after depositing a drain in the bottom, as above mentioned, fill it with a compost, as before described. Then get a smaller flower-pot, say three inches in diameter, stop the hole in the bottom with a cork, and take out as much of the mould from the centre of the large pot as will admit the small one, even with the top of the dirt, in the larger pot. Thus we have a margin of dirt between the two pots nearly four inches in width. When the young sets have formed roots in the summer, they are taken up by a garden trowel, with the earth attached and planted around, at equal distances, in this margin of soil, there to remain in some half-shaded place until fall. Meanwhile the watering must be applied through the small pot in the centre. By keeping it full the fluid percolates through the sides and bottom in sufficient proportions to keep the plants in a regular, healthy condition; and when taken in the house, it should be placed on a platform where it will receive air and light. When in full bearing it presents a beautiful appearance.

This principle of forcing plants is suggestive of many variations. For example, we may have a box, tastefully made and painted, any size to suit the desired number of plants, planting and watering the same, as previously described.

If it is desired to have plants in single pots, the principle of watering may be reversed by filling a little larger pot than the one containing the plant with sand, first stopping the hole in the bottom with a cork. Take from the centre enough to let the pot with the plant down nearly even with the top. The plant receives the water through the sand between the pots.

The latter mode was suggested to me some years since by Peter B. Mead, the distinguished editor of the Horticulturist, for the purpose of propagating herbaceous cuttings. In this margin of sand between the pots tne cuttings were placed, there to remain until calloused and rooted, at which time each cutting was taken out, with its block of sand attached, carefully potted in soil, and repotted progressively, until it became an established plant.

I am not an advocate for forcing seedling strawberry plants to obtain an early development. By so doing we are not sure of obtaining a correct test of their hardiness, much less of their quality; yet by the above method of potting, they may be forced by taking the plant at the earliest stage of growth. But bear in mind that this practice is attended with considerable risk to the plant, as it is known that all potted strawberry plants are comparatively worthless after they have once borne fruit.

It may be observed that I have not followed the custom of manufacturing compost according to professors, but rather trust to the principle of using a greater per cent. of heavy soil in the composition, inasmuch as it holds the fertilizing ingredient for a longer time, and the plants would suffer less in case of a few hours' neglect in applying water. These very light composts become exhausted by the plants much sooner; and not that alone, for the roots of the plant increase so vigorously that they soon reach the sides of the pots, which is just the thing that ought not to occur until the plant has nearly done fruiting. Furthermore, strawberries forced in this way are comparatively tasteless. On the other hand, strawberries raised in strong soil are of high flavor, both in open air and in-door culture.

For watering strawberries in the various modes stated, it is important to use potash-water once a week, the proportions of which are one pound of potash to a barrel of water.

The above is a condensed arrangement from notes made from time to time, during a number of years, of my own actual practice.

GRAPE CULTURE IN THE UNITED STATES.

BY WILSON FLINT, SACRAMENTO, CALIFORNIA.

GRAPE culture in the United States is comparatively a new occupation of our people, and, like all similar enterprises, must meet with the difficulties which attend the lack of experience in all industries where their prosecution is made the necessary subject of experiment; hence a frequent interchange of opinions and the publication of the results of individual practice will tend to a more rapid diffusion of such knowledge in vine culture as shall insure success.

INFLUENCE AND VALUE OF AN INTERCHANGE OF THE VIEWS OF VINTNERS.

Where theories are given and their discussion invited, there may be great latitude indulged in; but when statements of fact are to be made the utmost circumspection should be used lest error find its way to public credulity by reason of a high authoritative indorsement.

Whatever is embodied in the published reports of the Commissioner of Agriculture not only obtains a wide circulation in our own country, but is received to a certain extent as authority in foreign lands wherever distributed, because emanating from this important department of a great agricultural nation;

hence, where errors, either in statements of fact or of experimental demonstration have been admitted, it becomes the duty of those in search of truth to point out the mistakes and errors of the past wherever discovered. Holding these views, I trust that the criticisms I am reluctantly compelled to pass on two articles on the grape vine which appear in the report of the Department of Agriculture for the year 1862, may be understood as having but one object in view—reliable data on vine culture in the United States.

In the report of the Commissioner of Agriculture to Congress for 1862 will be found the two articles spoken of, the first entitled "Climatology of American grapes," by James S. Lippincott, Haddonfield, New Jersey; and the other, "The grape and its improvement by hybridizing, cross-breeding, and seedlings," by George W. Campbell, Delaware, Ohio; both of which are able productions, and, so far as they relate to vine culture in those parts of the United States lying in the Mississippi valley and eastward to the Atlantic ocean, are of great practical value. Both authors, however, apply the scope of their observations to the area of the United States, and one of the gentlemen to America, each affirming that the wine grape of Europe cannot be acclimated and successfully cultivated in this country. I quote the following passages from the essays spoken of.

On page 196 of the report of 1862, Mr. Lippincott, when speaking of the wine grape of Europe, remarks: "The constitution of the wine grape is not fitted to withstand these sudden changes from extreme humidity to extreme dryness, and the plant and its fruit rapidly deteriorate in our uncongenial air. To these causes may be ascribed the prevalence of 'mildew' and 'rot,' the almost universal attendants of foreign vine culture in the *United States*, and which no skill can obviate, and from which no section has been found claiming exemption." On page 197, by the same writer, are several paragraphs containing similar statements, from which I select a part of one only. Continues Mr. Lippincott: "*The only vineyards ever successful in America are those of American grapes.*" The italics are my own.

From Mr. Campbell's article, on page 209, I quote the following: "For many years the introduction of the foreign European varieties excited the hope of enthusiastic cultivators, who believed that in favored localities these grapes might be acclimatized and made to succeed in open vineyard culture. Experience has in all cases proven the delusive character of these hopes; for after a few years of partial or doubtful success, all such projects have been successively abandoned, and it is finally regarded by intelligent horticulturists as definitively settled that the different varieties of the foreign vine, or '*vitis vinifera*,' are not adapted to open air culture in this country. The physical character and constitution of the foreign varieties have been found wholly unsuited to the *climate of the United States*." Again I add the italics. Let us look at a few of the facts bearing on the culture of the wine grape of Europe in the United States. The Catholic priests, who took a prominent part in all the settlements of Spanish America, carried with them to the New World the *vitis vinifera*, or black wine grape of Spain, which they propagated extensively at all the mission establishments, where it is yet to be found, after a century of cultivation, in vigorous and healthy bearing wherever they erected the cross, from the Rio Grande of Texas to the shores of the Pacific ocean. In fact, the culture of the vine succeeded so well that about fifty years since, when the mission establishments were at their greatest height of prosperity, very extensive vineyards were cultivated, and a pure wine, the simple juice of their unequalled grapes, was so large a product of their agricultural industry that it was freely drank by all classes, even to the neophyte Indians. The rich mission wines, as well as a species of brandy called *aguardiente*, at that period, also formed quite an item in the exports from California to Manilla, Mexico, and Central America. At some of the missions records have been made of the character of each year's vintage through a period of upwards of eighty years; and there is not an instance mentioned where the grape crop was a total, or even partial, failure, or produced a wine of an inferior quality. This is more than can be said for the best wine countries in Europe, where, during the past sixty years, there have been but eleven good wine crops.

Since the settlement of California by the Anglo-Americans, fifteen years since, the old mission vineyards have been extended and new ones planted over wide sections of the State. These vineyards are almost exclusively planted with the European wine grape, and cover a list of many hundred varieties, and include the choicest and most delicate sorts; and there are at this time not less than twenty millions of the *vitis vinifera,* or wine grape, in cultivation in the State of California; while it is estimated that the wine made from these vineyards this season will reach two millions of gallons. In fine, it may be stated that the wine grape of Europe has been acclimatized over more than one-fourth part of the territory of the United States; and if an estimate of numbers is made, it will be found that there are more foreign vines in cultivation throughout the nation than of all American varieties put together.

Believing that the above facts are a sufficient apology for consuming so much of the valuable space of the Commissioner's report, and that the reader will be as well satisfied as I am myself that it was an inadvertency on the part of Messrs. Lippincott and Campbell in not making proper exceptions of those localities where it is shown that the foreign vine is in successful culture, I will now proceed to make some observations on vine culture in the United States, but more especially in the locality of California.

THE ISOTHERMAL AND METEOROLOGICAL REQUIREMENTS OF THE GRAPE VINE

This branch of the subject is that upon which success or failure in vine ulture depends, in a far greater degree, than on the constituents of the soil r the skill of the vintner. The isothermal and meteorological conditions of he atmosphere have such an immediate influence on the vine that any sudden unfavorable change will often ruin the crop, especially at that most critical period when the fruit is in the process of hardening its seeds. If the atmosphere is cold, damp, and chilly, the mildew may appear on the grape soon after the blossoms have set, and up to the hardening of the seeds, but not afterwards. The incipient grape during this period has an acetous exudation on its surface, which becomes corroded by the influence of the cold air, and forms the minute fungus called mildew. Or, to state the case more concisely, the grape mildew is an oxidization of the tartaric acid, always found on the surface of the leaves of the vine as well as the grapes during this period, but disappearing from the grape after the seeds have matured, because then the demands of the swelling pulp absorbs whatever of acetous matter is furnished by that most wonderful chemical laboratory, the leaves of the vines, while in their varied stages of growth. If during this period the atmosphere is dry, although at a low temperature, there will be far less danger of mildew than should it be a time of heavy rains. Even if there are heavy rains, the grape may escape from this great enemy if the rains are warm, with the same condition of atmosphere following.

No one will deny that the American grape is less liable to injury by sudden changes of temperature, accompanied by excessive moisture, than are the European varieties. This may be accounted for on the theory that the leaf on the foreign kinds is smooth and thin, and its acetic exudations more exposed to the weather, in consequence, than it is on the leaf of the American grape, which is thicker and stronger ribbed, and has a down on its under surface which secretes the acetous exudations, and protects it from so direct a contact with the atmosphere.

Near San Francisco, California, where the winds and fogs from the ocean are cold and moist, the foreign vine will not succeed on localities where the American sorts do quite well; hence the reasons which are conclusive against the cultivation of the foreign vine in the Atlantic States apply in all localities having a similar meteorological condition. The rot, which is never known in California, because of the absence of rains during the ripening season of the grape, seems to be the great scourge of the vintner in the Atlantic States and Europe, where rains are frequent while the grape is in an immature condition. Many are of the opinion that the grape rot is caused solely by long continued rains. This belief is true only in part. The superinducing cause of the rot arises from the fatal effects of what are designated as heated terms, when, for days, and sometimes weeks, the atmosphere becomes arid from a brazen sky, under a sunshine so intense as to scald the sap in the foliage of the vine, and parch its leaves to such an extent that the tissues shrivel up, and the free circulation of the sap is impeded or destroyed. This parching atmosphere, being succeeded by heavy rains, the leaves of the vines become saturated with an excess of moisture which they are unable to distribute, through their diseased functions, to the long famishing grape; hence decomposition takes place in the foliage, and as a consequence unwholesome food is transmitted to the grape, or sent to the terminal shoots, to produce enfeebled wood for subsequent bearing.

The American vine being capable of absorbing a greater excess of moisture than the European kind, because of the more porous condition of its glands, it follows that it is better suited to a climate where there are extremes of humidity and aridity than the latter. So far, however, as I have been able to judge, the American varieties will not as successfully withstand a dry brazen sky as will the foreign sorts. The reason of this is probably found in the fact, that the upper surface of the leaf of the foreign vine has a glazed consistency, which prevents the rapid evaporation of its sap under the intense rays of the sun.

As before remarked, the rot in the grape is superinduced by the diseased functions of the leaf, caused by sun scald, succeeded by soaking rains, when the leaves at once undergo a partial or entire decomposition, and prematurely drop from the vine, or hang on with their unsightly leprosy until the frost makes an end of them.

To me the most interesting study of the vine has been in watching the habits of the leaf. The leaf is to the vine and its fruit a combination of what all of the senses are to the human form, governing its being in all the relations of its vegetable existence as effectively as the senses do animal life. While the grape is in the acetous condition the leaf is similarly affected, and the moment the seeds have hardened so that the skins on the surface begin to have a tough consistency, it will be found that the leaves nearest the fruit on the bearing stem will also have undergone a change, and acquired a harder and drier character, and contain a less quantity of tartaric acid. So, also, as the grape advances towards maturity, the leaf will grow lighter in weight, and assume a grayish, brown tinge. Thus as the leaf ripens in ratio, under favorable auspices, will the grapes advance to luscious maturity. If the vine is denuded of its mature leaves when the grape is in process of forming its pulp its growth will be checked, or entirely stop; and although the fruit may ripen so as to become palatable it will have an imperfect color, and be insipid in flavor.

Too much care cannot be exercised in protecting the early leaves of the vine from injury; because on these we must always depend for an early and satis factory crop of grapes. If there is an excess of foliage the vintner shoul remove that on other than the bearing branches, or if this is not sufficient, then he may cut off the ends of the shoots on which the grapes are growing, but never the mature leaves in the neighborhood of the grapes, unless such leaves are diseased.

SELECTION OF VINEYARD SITES IN THE ATLANTIC STATES AND PREPARATION OF SOIL.

It may be noticed in various parts of the Atlantic States, and in the Mississippi valley, that vine growers are mostly in the practice of selecting rich land for their vineyards, and trenching this very deeply before planting their vines. This induces a rapid growth of wood, which is feeble, and subject to injury by frost.

In a country where periodical rains can be depended on there is scarcely any necessity for providing for the retention of water about the roots of the vine, and the practice of digging deep trenches and miniature wells in which to plant the vine, is to provide it with subterranean acqueducts and reservoirs where healthy action in the root is impossible under such a condition. Experience teaches that the vine, in order to be healthy, should be short-jointed, and of a "stocky" habit; a condition which it is difficult to attain on a deep and stimulating soil.

Most writers on vine culture recommend planting vineyards on a southern and eastern aspect. Such situations are very favorable in seasons exempt from heated terms; but when these occur, it will be found that a vineyard having a northwestern slope will suffer less from sun-scald, and ripen its superior fruit at an earlier day. Northwestern slopes always have a more equal isothermal condition than those facing the mid-day sun. The true source of injury to the leaf of the vine from extreme heat arises mainly from the refraction upon its under surface of the sun's rays from the earth; hence where the seasons are sufficiently long it would seem to be desirable to plant the vine on the northwestern slopes. Vineyards on such situations will be less liable to injury by late spring frosts.

With more care in the selection of soil and locality, vine growing may be made a remunerative branch of agriculture throughout the northern and western States; but it will be found a matter of some difficulty to ripen the grapes sufficiently to make a wine of commerce, without an addition of cane sugar or alcoholic spirits, which places such beverages under the classification of sophistications of the grape juice. There are many localities, however, in southwestern Missouri, southern Kansas, Colorado, Arkansas, and northwestern Texas, where the American vine, and probably some varieties of the foreign kinds, may be made to mature their crops in such perfection as to make a pure wine, free from extraneous substances. In northwestern Texas there are large tracts of gravelly, volcanic soil, with an arid climate, much resembling portions of Spain and Portugal, where, no doubt, the European wine grape could be grown successfully, if sites are selected with the same reference to soil and exposure as is customary in Europe.

SELECTIONS OF VINEYARD SITES IN CALIFORNIA, AND PREPARATION OF THE SOIL.

The season throughout the State of California, from May until November, is that of cloudless skies, under which the grape will grow everywhere exempt from mildew and rot, except on low, moist, bottom lands, or near the shore of the ocean, on that part of the coast north of Santa Barbara.

The prevailing winds in the summer are from the colder latitudes of Behring's Straits, become charged with a great deal of humidity as they seek admission upon the land through the gaps in the coast range of mountains, in the vicinity of San Francisco. Rising from the sea in immense thick mists, sometimes with the copiousness of showers of rain, these banks of fog are cold and chilly, but become dissipated upon the dry atmosphere before spreading far into the interior, though within a range of twenty miles of San Francisco they have a very deleterious effect on the leaf of the vine and the young grape. Within the sweep of these cold winds and fogs few European vines escape the mildew, and even the American grape is cultivated with unsatisfactory results.

Beyond a radius of twenty miles from San Francisco an entirely different climate is found, where the vine meets a congenial atmosphere. Excluding these localities near the coast where cold sea breezes and fogs prevail, it may be safely stated that all other portions of the State, lying under an altitude of three thousand feet above the sea level, are suited to vine culture. In the entire State there are some one hundred and fifty-five millions acres of land, one-third of which, in my opinion, is well adapted to the production of wine. Now, when we consider that in France there are but five millions acres in vine culture, and much of this of an indifferent character, we can form some estimate of what this branch of industry will some day attain in California.

There are four general distinct localities in California with isothermal and meteorological conditions as widely differing in their characteristics as there are to be found varieties of soil. A segregation of these localities will divide the State as follows: first, all that portion south of Monterey county, with the exception of the volcanic range of hills, near San Gabriel; second, all the counties lying west of the San Joaquin valley, and south of Yolo; third, the great plains and rolling slopes in the Tulare, San Joaquin, and Sacramento valleys; fourth, the foot hills of the Sierra Nevada mountains, as well as the eastern slopes of the coast range west of the Sacramento valley, and the districts already named lying north and east of San Gabriel, in Los Angelos county.

The first of these districts has long been celebrated for the abundance of its crops of large and luscious dessert grapes, and, until a very recent period, it furnished nearly the entire supply of wine for home consumption, as well as export. The vineyards in this district are mostly planted on a sandy loam, and receive copious artificial irrigation in the bearing season. To this cause, with the soft moist atmosphere which prevails in the evenings and mornings, may be ascribed the large size of its grapes, and the abundance of grape sugar which they contain, when allowed to remain on the vines until fully ripe. For the above reasons, this district of country is peculiarly adapted to the production of heavy strong wines, and the distillation of brandy.

The second district being somewhat within the influence of the cool ocean breezes, its grapes will contain less sugar; hence it is in this section of the State that we must look for light wines, and those particularly adapted to the manufacture of champagne; as these wines are naturally sparkling and somewhat effervescent, without any sophistication. The light hock and champagne of the Sonoma valley have already obtained a high reputation on the Pacific coast and will compare favorably with the best European wines of a similar character.

The third locality includes much land similar to that in the first named, but with a warmer, dryer climate, as in this district there are seldom any dews, which so greatly assist the formation of the unusually large grapes of the country about Los Angelos. This great interior valley locality will produce a rich sherry and sauterne, as well as a wine similar to the catalana, or port, of the Upper Douro of Portugal.

The fourth, or mountain district, will doubtless produce the most valuable wines of any of the localities I have named, both on account of climate, which is peculiarly different by reason of its elevation above the sea level and unevenness of surface, as well as on account of the favorable ingredient of the soil.

In all the valley or plain districts, the soil is more or less composed of argillaceous, marine debris, mixed with sand, gravel, and alkalic, washed down into what were then inland seas and lakes, from eruptive volcanoes. Below an altitude of two hundred feet above the sea level, there are the most abundant evidences to show that all the great valleys in the State, were covered by water, at no very remote period; but above this mark, the soil contains scarcely any evidence by which an opinion can be maintained that it was ever under the dominion of the sea; and the wines grown on these lands will be of a more delicate flavor, and possess a more abundant bouquet. In these mountainous districts are extensive tracts of chalky soil, where scarcely a shrub will grow. The vine, however, is made to flourish here, with a little artificial irrigation; and if we may judge the future by the present, the time is is at hand when the celebrated wines of the Johannisberg may find a worthy rival in the Sierra Nevada. The seasons being long and dry, with the same liability to heated terms as in the Atlantic States, I consider it (a locality, having a north-western slope) preferable, in California, to a site facing the south and east. Too much pains cannot be taken in breaking the ground up deep, for the reception of the vines in countries devoid of rain in the bearing season; hence I would recommend the reverse practice of that which would seem judicious in rainy localities. In most parts of the State of California, the night air is moist and moderately cool, owing to the sea breezes which constantly blow inland; and it is this phenomenon which makes the climate so favorable to the health of the vine. In the dryest situations and after months of rainless, cloudless skies, the leaf of the vine will always be found soft and full of moisture in the morning. As a matter of experiment, to test the question as to where the grape procured the bulk of its food, I have girdled the bearing branches below the fruit stems, by removing the bark for the space of an inch, entirely around it, at the time the seeds had become hardened, and yet the grapes on such branches matured quite as well as on branches where this was not done. In fact, I think they ripened earlier, and were quite as rich in flavor. Of course, such branches never renewed their leaves, and when they were in a growing condition at the time, such growth at once stopped, for the reason of a failure to exchange supplies of nutriment with the roots. I recite this experiment merely as cumulative evidence, going to show how much the grape, in its later stages of growth, is dependent on the foliage, and how little on any supposed supplies of nutriment from the roots.

It was thought, until recently, that the vine would require irrigation in California, in order to be able to mature its fruit. This notion is being rapidly exploded, because it is proved that where the soil is kept in a friable condition, by cultivation until after the close of the rainy season, the vine will make a sufficient growth of wood and foliage to mature the fruit, and furnish bearing canes for the succeeding crop of grapes.

PLANTING AND PRESERVING THE VINES.

Where it can be made convenient, it is best to summer fallow the ground intended to be planted with vines, as this will enable the vintner to commence operations, in setting the plants some weeks earlier, than if he is obliged to wait for the fall of sufficient rain to moisten the earth, so as to enable him to plow before planting. When the ground is in suitable condition, which it will be if summer fallow has been adopted, the vines may be set as early as November, even before any rains have fallen. If the planting can be done early, cuttings which are taken from strong, well matured wood will be nearly as sure to grow as rooted plants. When cuttings are used, they should not be more than twelve or fifteen inches long, and should be inserted in the ground so that the upper bud is just above the surface. By early planting, while the ground is warm, the lower buds on the cutting become stimulated, and remit to the bottom of the cane sufficient sap to form the granulations, from which it will be emitted simultaneously with the bursting of leaves from the upper bud at the opening of spring.

Where planting is delayed until spring, rooted plants only should be used; but even these will do best when planted in the fall. In moving the plants from the nursery beds to the vineyards, great care should be exercised to prevent the exposure of the roots of the vine to frost or dry cold winds. This rule is also applicable to the treatment of cuttings. No plant is more sensitive on exposure to cold dry winds, or frost, than the grape vine, when in process of removal from the nursery to the vineyard.

Much difference of opinion exists among culturists as to the proper distance apart in which to plant the vines, some contending that they should not be nearer than ten feet, while others would put them as near as three or five. This should be regulated by the character of the soil, and the manner in which it is intended to prune and train the vines.

Where the vintner intends to train his plants like dwarf trees, with heads from two to four feet from the ground, the vines must be set not less than six to ten feet apart, or the spurs which are to bear the fruit will, in a few years, so encroach upon the space that it will be difficult to get among the vines for the purpose of working the vineyard and gathering the fruit.

In a dry climate, like that of California, where it becomes an object to shade the ground, I find that close planting is best, if a system of pruning is adopted in accordance. The best managed vineyard I have ever seen is that of Martin Alhoff, Coloma, El Dorado county, California. There are in this vineyard some sixty thousand vines, largely comprising Black Burgundy, Catawba, and several Hungarian varieties. The land slopes to the northwest, and is a decomposed granite. The vines are set in rows, six feet apart by three feet, and are pruned to low heads, which are formed but a few inches above the ground. The pruning which is practiced is that known as the annual renewal system. Few canes are allowed to bear, but these are permitted to have from two to four bunches of grapes to the cane, according to the age and strength of the vine. The bearing canes, as well as those intended for the succeeding year, are tied up to a stake four or five feet high, and the surplus shoots removed from the stock near the ground, as well as the ends of the bearing canes, which has the effect of fully developing the fruit buds on the next years' canes, as well as giving great vigor to the leaves on the bearing branch nearest the grapes.

This practice of Mr. Alhoff accords with my own experience, which, long since, convinced me that the best flavored and largest bunches of grapes were always to be found on those vines which had their bearing branches nearest to the ground. The best time of the year in which to prune the vine back for bearing has been a subject of a great difference of opinion among vine growers. My experience teaches that if the object is to obtain a strong growth of wood, the vine should be cut back soon after the fall of the leaves, late in autumn. By this course the buds nearest the ends of the spurs will be stimulated by the first flow of sap in the spring, and the new canes grow with accelerated vigor by having received the entire force of the early-ascending sap. But if the object is to obtain grapes, late spring pruning is always most favorable, as by permitting the strong and copious first flow of the sap to pass along and become distributed among the terminal branches, the buds, which are the reliance for fruit-bearing, remain dormant until all danger of frost or chilling winds shall have passed, when, on cutting the vine back to the proper place, these buds will throw out large, vigorous fruit-spurs, and the entire vine get uniformly into bloom. I have never yet discovered any injury to the vine and the grape crop by what is termed the bleeding of the vine by reason of late spring amputations; but, on the contrary, believe that not only is the vine exempted from the late spring frosts by such practice, but that it is not as likely to suffer from mildew when this time of pruning is adopted. I have frequently deferred pruning until the ends of the vine had expanded the foliage so that the shoots were starting; but these same vines ripened their grapes quite as early as any in the vineyard which were pruned at an earlier season, and the grapes on the late pruned vines were almost always fairer, and the bunches larger than on those which were dressed by the vintner in the fall or winter.

THE GRAPE HARVEST IN CALIFORNIA.

This joyous festive season commences in July and continues until December, it being earlier or later according to the locality where the particular vineyard may happen to be situated. At Woolfskills, on the Putah creek, in Yolo county, the mission grape ripens in July; while in Sonoma, not more than seventy miles distant, but near the cool sea atmosphere, the same variety does not ripen until October. One of the most favorable features in wine growing in California is to be found in the dry weather, which continues entirely through the ripening season. This has the effect of ripening the grapes uniformly. When a bunch of grapes seems to be ripe, every grape on that particular bunch will be found equally ripe. So favorable is the autumn to the grape, that no signs of rot are ever discovered, and the earlier ripening bunches will often be found hanging on the vines perfectly cured raisins. This favorableness of season gives to the grape an abundance of grape sugar, which, in the process of fermentation, becomes grape alcohol, and thus accounts for the strength of California wines, making them equal to the strongest European, and not requiring any addition of alcohol distilled from grain or cane sugar, as do most European wines, as well as the wines of the Atlantic States. Having stated at some length the advantages of the climate and soil of California for wine growing, I can only add, that as there are many millions of acres of the best land on the globe in that State suited to vine culture, which can be had on the national domain for the mere occupancy, all that is required to make this one of the greatest of American agricultural industries is the fostering care of the government while it is yet in its infancy. Once open the Pacific railway from the Sacramento valley to the Mississippi, and the Golden State will supply the epicures of the populous Atlantic communities with the White, Muscat, and Black Hamburg grapes, surpassing in open field culture the efforts of the most skilful attempts under glass by the horticulturists of the east.

WINE MAKING IN CALIFORNIA.

In Europe or the Atlantic States where, on account of the unfavorableness of the climate, the grape is not well ripened, or becomes too watery on account of frequent drenching rains during the wine-making season, it becomes a science to know how to manipulate the juice of these imperfect grapes so as to make a tolerable wine which will have a general uniformity for successive seasons. For these reasons wine making in the Atlantic States and Europe must be classed as a manufacture, instead of a production, as in California, where it consists simply in expressing the juice of the grape. Indeed, wine making on the Pacific slope is a very simple operation when compared with this business in the wine countries of Europe, and it may be described in a brief sentence as follows: Allow the grapes to remain on the vines until thoroughly ripe; then press the juice into clean, sweet vats or fermenting casks, and keep these filled up from time to time, while the fermentation is going on, until the lees are thrown off; then draw off into other sweet, clean casks, and bung up not very tightly, and the work for the season is done. Close watching, care, time, and patience to wait, will afterwards accomplish the rest.

An analysis of a white and red California wine by Dr. Craig, at the laboratory of the Surgeon General, Washington, shows the following results:

Port or red wine, $16\frac{5}{10}$ per cent. grape alcohol; $4\frac{4}{10}$ grape sugar. Hock or white wine, $13\frac{4}{10}$ per cent. grape alcohol. The wines were pronounced pure.

These wines were made of the Black Mission Grape, the Hock being the juice which ran from the press before fermentation took place, with the skins and seeds in the fermenting vats. The coloring matter is obtained from the skins of the grapes, and it is also seen that where the fermentation took place, with the pulp included, a greater amount of grape alcohol was obtained, as shown in the analysis of the red wine.

WINE.

BY FREDERICK BOSSERT, NEWARK, NEW JERSEY.

THE MANUFACTURE OF GRAPE, BLACKBERRY, AND OTHER FRUIT WINES, ON GALL'S METHOD, WITH A FEW REMARKS ON THE CULTIVATION OF THE GRAPE VINE IN GERMANY, FRANCE, AND THE UNITED STATES.

It is a fact generally known at present that the juice of the grape, in order to furnish, by fermentation, healthy and well flavored wine, must contain sugar, water, and acids in proper proportion, from which it follows that grape juice deficient in this normal proportion, and consequently the wine to be made by fermentation, can be improved by corresponding additions of sugar and water. On this principle is based the method pursued for many years by French and German manufacturers of, and dealers in, wine, and subsequently published by Gall, of adding sugar to grape juice deficient in it, and of adding sugar-water to such juice as may contain too large an amount of acid. In France and Germany this mode of improving wine is principally applied to wines from unfavorable localities, and more generally during unfavorable years. But in the middle and northern States of this country, where failures of crops are more frequent in quantity than in quality, and where many grape vines are being planted which contain, when perfectly mature, a sufficient amount of sugar required for a table wine, (with, however, a surplus of acid,) this improvement of wine will always be used with some kinds of grapes, while it will never, or rarely, be needed with others.

Wine calculated for daily use should not contain more than from 8 to 12 pr. ct. of alcohol, (spirit of wine,) nor from over 5 to 6 pr. ct. of acid, and as one out of two parts of sugar are converted by fermentation to alcohol, 100 parts of the must of the grape should contain from 5 to 6 parts of acid, from 16 to 24 parts of sugar, and from 70 to 79 parts of water.

In regard to ascertaining the amount of acid and sugar, my method is similar to that of Gall. In order, therefore, to avoid useless repetitions, I refer for this and the mode of conducting the process of fermentation to the detailed extract given in the report of the Commissioner of Patents, (Agriculture,) 1860, pages 322 and 358.

The juice of the Isabella grape used by me, though satisfactory as a table grape, having a pleasant and sweet taste, contained, notwithstanding, when measured, so great a surplus of acid (11 to 12 pr. ct.) that the wine made of it would not have been palatable at all but for the addition of sugar-water.

In order to make white wine from the Isabella grape, (a method which can be applied to all kinds of dark grapes with colorless juice,) I mash the grapes, either in the bunch or the berries after being separated, remove the juice as quickly as possible from the skins, determine the amount of acid and sugar, make the required addition of sugar-water, put the must in casks of about 160 gallons, and let it ferment in a cellar with a temperature of from 60° to 70° Fahrenheit.

In order to make red wine the mashed grapes are put in fermenting vats of about 200 gallons each, covered up and allowed to ferment. The skins thrown to the surface by the process of fermentation are kept under the surface by a perforated cover. When the fermentation ceases the wine is racked into a cask; then warm water is poured upon the remains in the fermenting vat, and the same allowed to ferment. The fermentation being over, the liquid is again racked off and mixed with the wine. It depends upon the amount of acid present in this mixture whether another addition (and if so, how much) should be made in order to mix it with the wine already drawn off and the product of the first addition, and thus to obtain a wine of a normal amount of acid. Sugar-water made of one gallon of water and two pounds of sugar furnishes a pleasant, moderately strong wine, even if the grapes used should be quite destitute of sugar.

In preparing sugar-water I use only white refined cane sugar. Grape sugar, it is true, has some advantages in regard to fermentation, but the article of commerce is very impure, containing sometimes as much as 40% of gum, dextrine, &c., so that the wine frequently receives an unpleasant tang, and the advantages of using grape sugar (aside from its high price) are thus amply outweighed by the disadvantages produced by its impurities.

In the year 1862 I sent a few samples of wine, made according to this method, to Germany, with the view of having it tested by a reliable gentleman, well known for his experience and knowledge in matters of wine. He pronounced the wine to be Neckar wine of a year's growth. When afterwards informed that the wine had come from the United States, he produced from his own cellar a sample of Neckar wine of striking resemblance. He pronounced the American wine not only very good, but gave the assurance, from his own best judgment, that every wine-grower in the best wine-growing countries of Germany would be glad if he could produce, each year, an article of the same quality. It was, moreover, not only his, but the opinion of others equally as expert, that this wine would keep from ten to fifteen years—on the whole, as long as good Rhine and Neckar wines would.

In this country, too, this wine has been gaining favor on many sides, and the unjust prejudice against native wines is gradually giving way, as an impartial comparison of these wines with those imported and mixed with alcohol, or alcohol and water, and of the same price, must unquestionably result in favor of the former.

My experiments heretofore were merely confined to the Isabella, not having been able to procure sufficiently large quantities of other kinds of grapes. Should I succeed this next fall, I shall at once extend my experiments to other kinds of grapes.

From the fact that in the Agricultural Report for 1862, page 494, mention was made of the blackberry wine, I feel induced to communicate my method of making said wine in 1859. Wild-growing blackberries were mashed and allowed to ferment for three days in a covered vat; they were then pressed and the juice put in a cask, filling up two-thirds of it. Warm water (as much as the juice obtained amounts to) is now poured on the pressed remains. After the lapse of three days the infusion was pressed, and the liquid thus expressed added to the wine in the cask. White sugar, three pounds to the gallon, was then dissolved in this mixture. The cask was finally filled up with sugar-water of the same strength, (namely, three pounds of sugar to one gallon of water.) Late in the fall or in spring the wine is drawn off the dregs into a cask, and bottled the next fall.

Several prominent physicians of Newark, N. J., successfully prescribe this wine for its tonic and gently astringent qualities in cases of chronic diarrhœa, summer complaints, &c.

In the manufacture of this, as of all other wines made of fruit, it would be more correct, more scientific, and more certain to produce favorable results, first to ascertain the amount of acid and sugar contained in the juice of the fruit, and so determine the needed amount of water and sugar, so that the amount of sugar and acid of the fruit-wine shall be equal to the wine calculated to be imitated—Malaga, Madeira, &c.

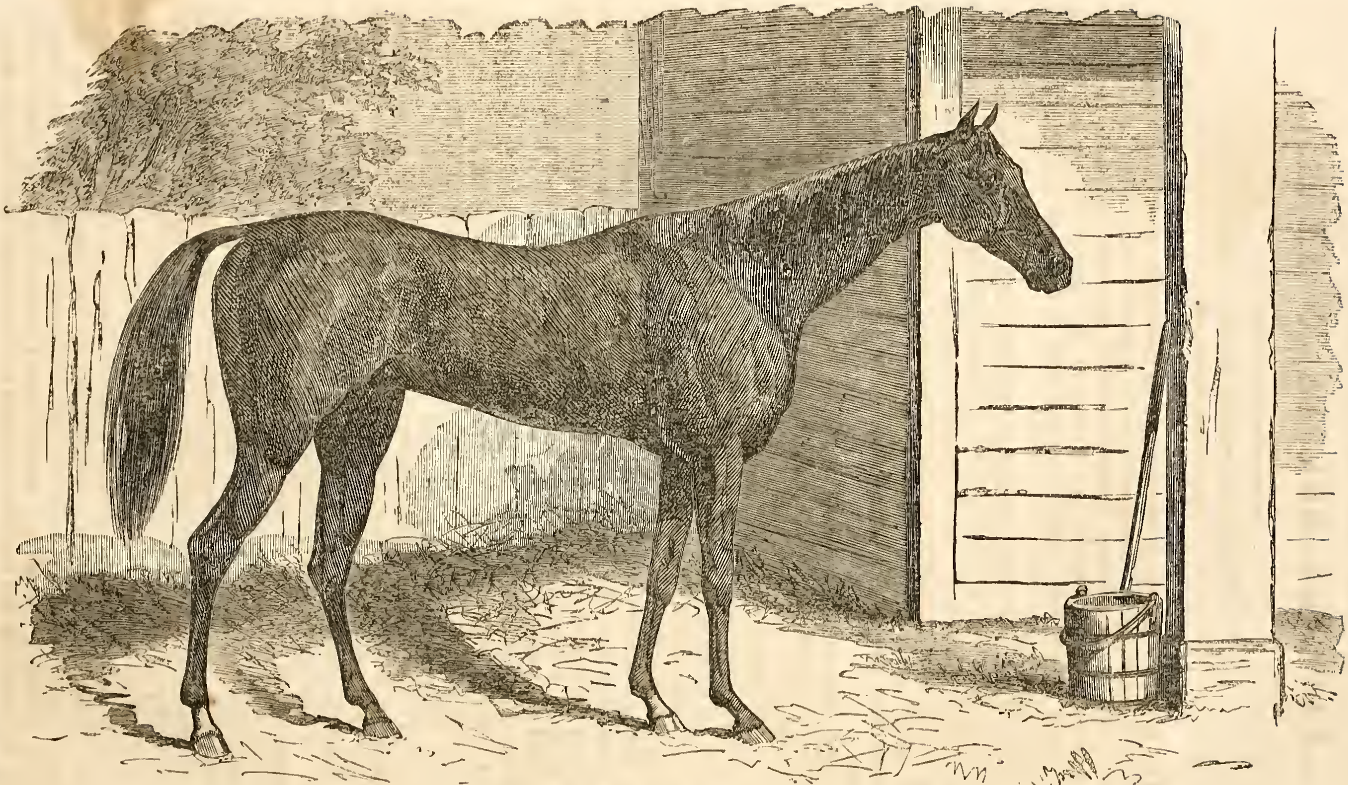
Here I wish to add two remarks concerning the culture of the grape vine in the middle and northern States.

In Germany and France the southern and southeastern hill-sides are considered as best adapted for vineyards.

The more gradual increase of temperature in spring and the proportionately short summer season, with generally warm and but few hot days, render it necessary that the vineyards should receive sufficient warmth, through the direct rays of the sun, in order to mature the grapes. But it is quite differen in this country. The warm temperature sometimes setting in for some consecutive days as early as January and February, frequently causes the grape vines on the southern sides of the hills, where the effect of the sun is most powerful, to vegetate at this early season only to be checked in its growth by later frosts. Thus they freeze and become sickly, and the crop of the year is either destroyed or reduced. On the north or northwest side of the hills, where the ground is less warmed by the rays of the sun, and where the soil remains longer cold in consequence of the action of cold winds, snows, &c., a few warm days in winter will not be able to force the plants, which, therefore, remain inactive until the approach of the regular warm season, when there is no longer any danger of their growth being injured by frosts. There is no danger from the retarded development either to the fruit or to the plant, as the hot summer and the long-continuing fall will always bring the fruit to maturity; but there is danger from every disturbance after the growth has been started. This view receives confirmation from the superior thriving condition of the grapes on the shores of Lake Erie and in the woods. There the north winds and the ice of the lake keep back the development of the grapes until summer. On a northern exposure absence of the effects of the rays of the sun performs the same object.

In Germany the leaves of the grape vines are partly removed, so as to allow the rays of the sun to act directly both upon the fruit and upon the vine. This method is made necessary by the lower degree of temperature, and there is no danger to the grape vine from the action of the sun's rays, their effects being weaker than here even during the hottest part of the summer. In this country not only the crop, but also the health of the grape vine is frequently destroyed by the removal of the leaves, as I have been assured by many German wine-growers who attempted to apply the method used in Germany. Aside from the practice pursued in warm countries like Italy, nature herself would, in fact, seem to teach us that the grape vine during summer requires protection from the hot rays of the sun, as vigorous, wild-growing grape vines are only found in forests and winding around trees. I would, therefore, recommend to grape-growers the experiment of so putting up their espaliers that the rays of the meridian sun will fall parallel with the espaliers, thus striking but a small portion of the leaves, and especially those that project furthest, whilst they will heat the soil, which, during the night, will radiate towards the grapes the rays absorbed, thus keeping up a uniform temperature day and night.

In none of the accounts given by the large number of persons who have travelled over the United States, did I ever meet with observations by which the correctness of my view in regard to both these questions might be determined. In these reports I miss especially the statements whether and in what localities vineyards are planted in positions exposed to the north and northwest.



SLASHER.

Imported Stallion, owned by Francis Morris, Esq., New York.

CAVALRY HORSES IN AMERICA.

BY FRANCIS MORRIS, OF NEW YORK.

The present civil war is unexampled in the annals of the world for magnitude and persistence. Two portions of a mighty nation divided against each other, and using the utmost efforts of warlike skill and ingenuity, render the conflict singularly interesting as a study of the arts of offence and defence. The world learns new military lessons with every year that this immense struggle continues.

At the outset the whole country was startled, and in a measure paralyzed. Our army was but a few scattered regiments, totally unfit for the gigantic task thus forced upon it. As the people awoke, the necessity for instant action was met by an enthusiastic generosity worthy of the highest praise, and men and money were offered to the government with a lavish willingness that showed how deeply the spirit of patriotism is implanted in the American bosom.

Simple earnestness, however, can accomplish little without efficient means; and, in some particulars, the armies that flocked to the national standard were quite unequal to the enemy they were called to meet. This was notably the case in the cavalry arm of the service.

As it was supposed that the outbreak was merely a local insurrection, to be quelled by a limited exhibition of military strength in a comparatively brief space of time, infantry and artillery were chiefly relied upon. But as events succeeded each other, and a few battles took place, it became painfully evident that mounted soldiery were necessary, and in formidable numbers.

It was then that the loyal men of the north were deeply mortified at the discovery that they possessed neither horses nor riders worthy of sustaining the glory of a legitimate cavalry service. The further western States alone produced good cavalry.

While dishonest contractors and knavish speculators were foisting spavined and foundered hacks upon the government, and awkward officers, fresh from the counting-house desk, were drilling day laborers to ride them, the dashing raids of the rebel General Stuart filled us with shame and dismay. He and his rough riders galloped across the country at their will, stealing and seizing whatever pleased their fancy, and frightening the peaceful farmers for miles around. Soon the brilliant but traitorous cavalry of General Forrest followed this example, and Fitz Hugh Lee, Imboden, Moseby, and Morgan followed in turn. Trains were burned, villages laid under tribute, guards taken prisoners, telegraph wires cut, and railroad tracks torn up, wherever these raiders went, to the consternation of civilians and the deep humiliation of the army.

And, referring to the subject of railroad tracks, the folly of trusting to the railroad as a means for the transportation of armies, and their equipments, stores, &c., without adequate protection, has been severely illustrated by these same cavalry raids. To intrust the lives of our soldiers and the property of the government to the melancholy chances of a burned bridge or a displaced rail is unworthy of any enlightened people. Long lines of unguarded railroad running through semi-hostile sections of country, and easy of access to all well-mounted troops, are totally unfit for the safe transit of men from one department to another. Our daring cavalry hero, Grierson, did more service to the north in destroying the southern railroads on his famous raid through Mississippi and Louisiana than those railroads had done to the south. It is to be noticed in this connexion that the horses used in that instance were of Mississippi blood stock.

All truly great armies have been abundantly provided with cavalry. Napoleon, deprived of his mounted soldiers, would have achieved but little worth recording in history, Since the night when Diomedes and Ulysses went upon a classic raid to capture the horses of Rhesus, the cavalry has been esteemed the most honorable branch of military efficiency. A contemporary writer has well remarked:

> "For ages after the siege of Troy the back of the horse was the true throne from which warrior-kings ruled the world. He carried Alexander to India, and Tamerlane to China. He enabled the Persian king to use the bent back of a Roman emperor as a step from which to vault into the saddle; but ere that, he leapt with Marcus Curtius into the gulf in the forum, and saved Rome from a fate worse than that which overtook Pompeii and Herculaneum."

The immense army of Hannibal, with which he fought the battle of Cannæ, where forty thousand Roman heroes bit the dust, was not less than one-fifth cavalry. Without this important aid, that great warrior had hardly been able to cross the Alps. By the superiority of his Numidian horses he defeated the ill-mounted Romans at every turn, destroyed their towns and cities, dashing through the land like a whirlwind of fatal power and rapidity, and leaving his enemy to gape and wonder over the ruins these gallant horsemen left to mark their passage.

The railroad is of vast assistance in the carrying of heavy stores, and large bodies of unmounted troops which must be moved with great speed, to meet a sudden emergency; and then it requires large forces of efficient cavalry to protect it. Attacks upon roads are generally made by horsemen, and neither infantry nor artillery can move rapidly enough to be capable of successfully resisting them. Every important line of railroad or telegraph that lies exposed to the action of the enemy should have a numerous force of mounted guards to patrol and protect it. Against cavalry raids nothing but cavalry will suffice while in battle it is equally valuable with the other arms of the service; and in this particular we have failed to meet the south upon terms of equality. Her cavalry has been her strength; ours has proved our weakness. After winning a glorious victory, we have been compelled, more than once, to sit quietly down in camp, to see the enemy retreat safely, even when in disorder, to his strongholds, simply for the want of some thousands of good troopers with fleet, thoroughbred steeds, and trusty sabres, to follow and harass the rear, capture detached bodies, seize lingering trains, artillery, &c., and, converting a retreat into a rout, make a second Waterloo.

There was at one time no hour when the mounted hordes of the rebels might not have penetrated our borders, and even into the heart of our country. Every raid that they have ventured upon took us by surprise, and we have not had, nor have we now, enough troops of the same kind to intercept the marauders. The way was cleared by Stuart's cavalry for Lee to enter Pennsylvania last summer; and for all that we could have done, Stuart might have ravaged all that State, and the greater part of New Jersey besides, before we could have prevented it.

Having taken a view of the necessity of a large and efficient force of cavalry in the armies of the north, it may be in place here to analyze a little the causes of southern superiority in that direction.

In the happier days of the country, when peace sat upon her throne in the heart of the nation, and abundance smiled everywhere over an undivided land, the south was the home of a noble institution—"the turf." Every planter of means plumed himself upon his stables, and no southern town of any magnitude was without its race-course. In this way the breeding and raising of blood horses was made the pleasant occupation or pastime of nearly all gentlemen of wealth, and the equine stock of the south was improved generation after generation, until thoroughbred horses were almost as plenty as those of mixed or mongrel descent.

Almost every southerner learns to ride while a mere child, and is perfectly at home in the saddle long before he arrives at manhood. Hence, when the war began to demand serious action, the young men of the rebellious States naturally formed themselves into cavalry organizations. Not unfrequently each soldier furnished his own horse, and often this was a thoroughbred of considerable fame, won in hard-fought contests over the Washington course, at Charleston, the Metairie, at New Orleans, the Savannah, Augusta, Mobile, and Natchez courses.

This universal prevalence of horsemanship was due undoubtedly to a variety of causes. The proverbial badness of southern roads is inimical to the use of vehicles, save of heavy and ponderous construction; many roads pass through enclosed fields, with numerous gates, and the streams are deficient in bridges. The mercurial character of the people, also, led to a fondness for the vivacious excitement of the race, and its popularity with the fairer sex lent an additional charm to the annual meetings where a *Peytona*, a *Monarch*, a *Fanny King*, a *Verifier*, a *Lexington*, a *Lecomte*, and hundreds of others made their appearance for the contest. Compared with the running race, trotting was a rare occurrence, and the result was precisely what might have been expected. There is nothing so much improves the breed of horses in any country as a liberal encouragement of the running race, to which England owes the rare beauty and value of her horses.

Under all these circumstances it is not strange that the south should have turned out bodies of excellent riders, mounted upon steeds of extraordinary fleetness and endurance. Exception has been taken to the expense of the cavalry, but the enemy has unquestionably found it the most valuable of all, in proportion to the money expended.

Whatever objections may be made through prejudice or a false idea of morality against organized trials of speed between thorough-bred horses, they have, beyond a doubt, been of the greatest benefit to the cavalry of every country that possesses an army. The scions of racing stock are infinitely superior to the bastard hacks of the farm or the city railway stable; and this is so well known and appreciated that the simple name of a remote ancestor of celebrity, duly authenticated, suffices to render a colt desirable before he has shown any qualities of intrinsic excellence. Queen Victoria, a lady of more than ordinary refinement of taste and Christian principle, and gifted with the practical virtue of common sense to an unusual degree, not only encourages the purification of equine blood by the retention of a magnificent breeding and racing stud—that of Hampton court—but by visiting in person the more interesting races, and donating truly regal prizes for the contest.

And this is, furthermore, the practice with many other European sovereigns. None are too lofty or too dignified to take an active part in a matter so important as the elevation and improvement of their national breed of horses. It seems strange, then, that our government should take so little interest, amounting, in fact, to almost total apathy, in so vital a subject.

Perhaps the American nature, especially in the north, has been a little too preoccupied with immediate affairs, commercial business, and the like, to fully appreciate the amusement and the benefit to be obtained from the turf.

Foreigners visiting this country often notice and comment upon our worried, hurried, anxious expression; and it has frequently been said that we are deficient in holidays. New England, where business of all kinds is particularly and universally active, has never since her States were colonies been able to support a thorough-bred horse, with the exception, perhaps, of "Balrownie," a fine horse imported in 1857 by Quincy A. Shaw, a public spirited gentleman of Boston.

The expense of establishing fine studs and running stables may have been alarming to the practical, busy nature of her people, and government patronage will be necessary to allay their fears, perhaps, concerning a loss of their commercial reputation. Malicious persons also might say that they object to racing; as Macauley says the early Puritans objected to bear-baiting, "not because it gave pain to the bear, but because it gave pleasure to the spectators."

Undoubtedly, the practice of betting is intimately associated with the turf; but so it also is with elections. Could any sane man object to the electoral privileges because unprincipled persons invariably make it an occasion for wagers?

Another reason, perhaps, why the racing of horses has been somewhat held in disfavor is the unsettled and loose state of our social condition. Many called "respectable families" have not felt sure enough of their own position to mingle with those who were considered questionable on the point of morality, and have sought to render themselves secure by an ultra degree of virtue, that, while it approached very nearly to pharisaism, left nothing for prying neighbors to inveigh against. Surely, if racing should be prohibited because gamblers bet upon the issue, railroads might be abolished on account of the bulls and bears who "operate" dishonestly in stock.

For these causes the people of the north have been far too indifferent to the improvement of their horses, and it is hardly too strong a statement to say that this fatal indifference has indirectly cost us thousands of lives upon the battle-field and millions of dollars during the progress of the present war.

Hereafter, however the issue may be decided, a strong standing army will be requisite, and a goodly proportion must be mounted. The best armies the world has seen have been largely composed of cavalry, and, instead of the proportion being only about one-tenth, as is now unfortunately the case, we shall probably need not fewer than one-fourth of the whole army mounted.

Of what vast and vital importance, then, is the raising of a good and true stock of horses, pure in blood, and possessing the qualities of speed, courage, and endurance, without which the animal is merely an encumbrance to the cavalryman.

The greatest cavalry charge of which modern history takes cognizance, and one which has been nobly celebrated in immortal verse by the poet laureate of Great Britain, Alfred Tennyson, was that of the famous "light brigade" at Balaklava. It is a note-worthy fact that the animals ridden on that occasion by the fearless heroes who followed "the last of the Cardigans" were all three-quarters bred, and each one cost three hundred pounds sterling.

And not only does the well-bred horse signalize himself by his swiftness and power of endurance, but his intelligence renders him more fit for the duties of military service than the horse of ordinary breeding.

The cavalry drill requires more practice than any other, for the very simple reason that each movement must be performed by two individual beings—man and horse. It is requisite, therefore, for the man to have more intelligence than the one who can carry a knapsack and walk straight, and for the horse to have finer instincts than the poor brute that drags a plough or a cart from morn till night. Instances of superior instinct displayed by well-bred animals of all kinds are too numerous to leave room for any doubt whatever upon the question.

All the agricultural societies of Great Britain have recently determined not to give a certificate for any stallion as a breeder of hunters—the best of cavalry horses—without satisfactory evidence of pure blood and a record of successes upon the race course.

It is not every one who knows the meaning of the term thorough-bred as applied to the horse. Originally in Arabia the horse was a member of the household. It is possible that those physiologists are right who think that domestic animals acquire intelligence in proportion to their association with man; many anecdotes of unquestionable veracity would at all events support the theory. Be this, however, as it may, the life and needs of the Arab tended in every way to make him solicitous for the improvements of his horses. Tests of speed and power were of constant occurrence. There were caravans to be attacked and swift escapes to be made. A girl with several suitors made them compete on horseback in a race with her, the one who first overtook her being the "happy man." Thus the fastest horse gave celebrity to the owner, and was the pride of his family. This pride is well illustrated by a curious story of an Arab who believed he possessed the fleetest mare in the tribe. One night she was stolen. He was in despair, but mounted his next best animal and rode in pursuit of the thief. Coming in sight of him, the owner put his steed to its best pace, and the chase became exciting. The robber cheered on the mare, his pursuer followed like the wind, and finally began to draw along side. At this juncture his pride in the cherished animal, the glory of the family, got the better of his desire to regain his property. He could not bear to see her beaten by an inferior horse; so he cried out, "Touch her in the left flank with your heel!" The thief profited by the secret; the mare redoubled her pace, and soon left her unhappy proprietor to console himself with the knowledge that, though he had lost her, she had never been defeated in a race.

It was a descendant of such stock as this, imported into England by Darley, during Queen Anne's reign, that originated the beautiful animals that now contest for the prizes of the British turf. Darley's example was followed by others. Pedigrees were carefully preserved. The English stud book became an institution. Racing was organized and regulated as a test, and the thorough-bred was perfected. It was in 1732—the year of Washington's birth—that the English thorough-bred horse was acknowledged as the best in the world. About this period, or very little later, the matter attracted interest in this country. The cavaliers, then recently settled in Maryland and Virginia, clung to the sports of home, and imported stallions sired by the most famous horses of the Old World, such as the Cullen Arabian, Darley Arabian, Flying Childers, Curwen's bay Barb, and many others of high celebrity.

The offspring of these noble animals made the southern cavalry what it was; the loss of them has reduced it to what it is. Now that they have no more thoroughbred cavalry steeds, and are compelled to use the northern horses they may capture, we are on nearly equal terms in quality, and far ahead in numbers.—(See "Wilkes's Spirit" of August, 1863, on this subject.) Naturally, as the Arabian was the original progenitor of the English horse, unthinking persons claimed him to be superior, without considering the inestimable advantages of organized training and testing. Arabian horses, however, imported to England were invariably beaten by the native animals. It was then said that the climate was unfavorable to such high-bred creatures, and that at home, in their own country, they would be found superior. To test this, Fair Nell, an Irish mare of some celebrity, though by no means a first-class racer, was procured by the English merchants of Cairo to run ten miles on the desert sand. She won the race with ease over all the Arabians entered against her. More recently the question being again renewed, Ali Pacha ran the best horse of his magnificent stud—the finest in Egypt—against a very common English racer, Companion, and was badly beaten—Companion winning the race in a canter by more than half a mile. Again, last year an Arabian which had vanquished all the noted horses at home, and was brought to England and thoroughly acclimated, in the contest for the Goodwood cup, a race of two and a half miles, with twenty-eight pounds allowance in his favor, this distinguished stranger was beaten out of sight, although the pace was so slow that the running did not fairly commence until within three-quarters of a mile from the winning post.

And it must be confessed that the American thorough-bred, though superior to the Arabian, is not equal to the English.

In 1856 several celebrated horses were taken from this country to England for the purpose of comparison, and they were allowed fourteen pounds advantage in running for the Goodwood cup. Of these, Lecomte ran but one race, and was easily beaten by the English horse Fisherman; Pryor ran for the Goodwood cup, and was beaten; Prioress, in the same race, might possibly have won under more favorable circumstances of riding, &c. She afterwards won the Cesarewitch stakes at Newmarket, and this was the only success of American horses in England the first year of their sojourn. It must be allowed, however, that Pryor and Lecomte were never in good physical condition there; both died in the process of acclimation. The result of all this has been ascertained to the satisfaction of those interested.

There can be but little doubt that the best horse of the year, in England, can give any American horse yet produced fourteen pounds allowance, and beat him in a race of two and a half miles, though the authorities of the English turf have reduced this allowance at the Goodwood races to seven pounds. Mr. Tenbroeck, who took over these horses, has since taken others, among them Umpire and Starke. The former ran with success as a two-year old, and was first favorite for the Derby, but was signally beaten, not being in the race for more than the first mile.

We see that the country in which the race is most permanently established as a popular institution, and most largely patronized by the better classes, produces the best horse. The deduction is, therefore, that public trials of speed and endurance tend to improve the stock of breeders. The race is simply a test of the animal's power—a proof of how much he can carry, and how fast he can carry it. Everything in this world requires a trial of some sort, and th more regularly organized it is, the greater the improvement. This general law is of universal applicability, and it may be safely laid down as a rule, that for the purification of blood and breed in all animals, from the human down, some competitive test of power and ability is requisite; and this is precisely the object and the result of the running race.

It is not uncommon to hear ignorant persons talk of thorough-bred trotting horses, but the animal is a rare phenomenon. There may be, doubtless, some instances of the real thorough-bred trotting well, but the trot is entirely an artificial gait. The wild horse, in his natural state, never trots, though the untaught foals of good trotters sometimes take that gait. It must be remembered also that no trotter has ever shown courage, endurance, and mettle whose pedigree could not be traced, with more or less directness, to good racing stock; and the best pedigree that the much praised Morgan and Black Hawk can boast is a somewhat remote descent from thorough-bred ancestors on one side at least, and the horses of those lineages transmit only the virtues of their racing blood in breeding. The most celebrated trotting stallions of to-day claim to be descended from the famous Messenger, among which may be mentioned Hambletonian, Abdallah, Mambrino, and others. Trustee, that trotted twenty miles within an hour, was out of a Messenger mare, by the famous sire of Fashion. With this stock, what is called "in-breeding" has produced remarkable results in the way of improving successive generations.

The many good qualities, too, of the Canadian pony are due, without doubt, to the early importation, by English officers, of valuable racers to Canada. In fact, by tracing back a little the history of horse-flesh, in every region of country where the horses are uncommonly fine, it will be found that thorough-bred stock has been there at different eras. Monmouth county, New Jersey, is famous for its fine horses, and it is well known that racing was a favorite pastime there in the olden time, and more recently every farmer who could has obtained the service of the blood horse from numerous training stables in that part of the State. Dutchess county, New York, is another celebrated place for fine stock, and was long the home of imported Messenger, traces of whose blood may be seen everywhere in that locality.

This increased use of good material is having a marked effect upon the trotting horse everywhere, and unconsciously those who talk of "pure trotters," and hold them in higher estimation than racers, are breeding them to be more and more like the latter. The form of the trotter has undergone a wonderful change within the past fifteen or twenty years. The broad chest is no longer a virtue, for the gait has become different, and the trotter, instead of putting his hind feet down directly under his fore feet, lengthens the stride by throwing them out on each side beyond the fore feet. Thus the deep, narrow, grayhound style of chest is now the thing to be sought, and the hind leg is longer from the hip to hock, giving a greater power of reach. In a word, the trotter is improving, and therefore growing to look and travel more like the racer.

It is not impossible that if thorough-bred horses were educated and trained to trot solely, and bred in the best manner for preserving hereditary qualities, a thorough-bred trotting stock could be produced. At present, however, there is no such thing, and our most celebrated trotters are merely mongrel horses, with a dash of good blood, which they may or may not transmit to their posterity.

As the English system of racing has resulted in the finest breed of horses, we may properly consider that system the best. Here we run long distances with light weights, and around a circular course, whereon the rider rests his animal at several points, by what is called "taking a pull." This occurs at the short turns of the course. The English race, on the contrary, is a short distance, with heavy weights, and upon a straight course. The weight for three-year old, in England, generally is one hundred and nineteen pounds, while here it is but eighty-six pounds. Lately it has been increased, upon some of the courses, to ninety pounds, but that is by no means weight enough to properly test the carrying powers of the horse.

The English course also, in many instances, comprises undulations which considerably vary the level of the ground, and the care required in managing the racer so as to save him for an ascent, keep him from fretting, and bring him to the home stretch in the very best condition for a final brush, makes English jockeys unequalled.* It was more the American rider than the American horse that lost the Goodwood cup for Prioress.

Another excellent racing institution peculiar to England is the "handicap." This is an attempt to equalize the ability of the various horses by weighting. The good horses are compelled to carry more than the standard weight for their age, and the poorer ones carry less, according to the judgment of the "handicapper," generally one of the first gentlemen of the land, frequently a titled one, and always as far above any suspicion or reproval as the Chevalier Bayard himself. In this race, notwithstanding all allowance which may be made for "dark horses," those whose powers are kept private, with reference to some especial handicap, both the handicapper and the public are often astonished at the result. The last horse dreamed of as a winner is just as likely to bear off the palm as the favorite. The necessity of a continuous and regular system of test by racing, instead of relying upon anything so fallible as human judgment, finds an apt illustration in this fact.

Over and above all these urgent and strenuous arguments in favor of the race may be added the pleasure it gives to every liberal and right minded spectator. The sight of a number of beautiful and thorough-bred horses, thin of skin and slight of build, but strong as if made of whalebone and steel, going at a tearing pace, flashing down the home stretch like living thunderbolts, and arriving at the goal amid the deafening plaudits of an enthusiastic throng; the winning horse wet, foam-flecked, exhausted, but proud and fearless, sharing with his rider the pleasure and the pride, intelligently anxious for his reputation, and splendid in his victory. All this is a true enjoyment, which cannot debase that part of our nature which craves rapid and tumultuous sensations. When, as in England, the bright eyes and comely toilets of ladies, high-born and lovely, illuminate the scene in elegant equipages or mounted on slender, satin-skinned thorough-breds, hardly less beautiful than those upon the course, the charm of the spectacle is vastly greater. He who has once tasted the delights of the race as it exists in England, and should exist here, will never lose his admiration of so wholesome and innocent an excitement.

It has been pretty fully shown in the foregoing remarks that thorough-bred horses are a necessity with any nation that desires its armies complete in the department of the mounted service, and, further, that these horses are only to be obtained by a liberal patronage of the institution of racing. It may now be necessary and proper to examine into the various methods of breeding horses, for the colt must give promise if the horse is to realize success. Racing is training; it developes whatever qualities, good or bad, the animal may possess, but it can hardly make thorough-bred out of mongrels.

In-and-in breeding may be resorted to for some generations to produce fine bred stallions, but great care and judgment should be exercised in the experiment. The aristocracy of Spain, "the *sangre azul*," is a sad example of long intermarriage between relatives, and nature revolts at its perpetration. The result of this in the horse, as in the human species, is to inaugurate a scrofulous tendency, with the usual train of dire evils. It is not so prompt, however, with the animal as with the man, because the life of the latter is more artificial and unwholesome in all particulars. In-and-in breeding makes the foal delicate, slender, and mettlesome, and intensifies all the prominent characteristics of the stock. This may be a highly valuable process in some cases, but if continued too long the blood must inevitably become tainted. The test of racing should be constantly and regularly employed, that the breeder may judge when he has exhausted the capabilities for improvement that this system offers. So soon as the foal exhibits a thickeni g of the jaw-bone and enlargement of the glands—an incipient scrofulous symptom—in-breeding should be stopped, for a continuance of it would surely destroy the blood of the stock.

It must be remembered, in this connexion, that the most sought and successful stallions in the history of the turf were in-bred. The most remarkable racers, perhaps, have been an out-cross from in-bred stock; but it is noticeable that these have rarely, if ever, sired valuable colts, except from mares of their dam's lineage.

From these facts, gleaned from unquestionable sources, we must decide that in-and-in breeding is an absolute necessity to the production of thorough-bred stock, and when employed with judgment and intelligence, capable of the happiest results. The same laws appear to govern all inferior animals in this particular. The pigeon is a singular example among birds. The rapidity with which it reproduces is favorable to the experiment, and breeders have taken advantage of it to obtain some very singular results.

Another striking example may be found in the Devons. It matters not what sort of cow be employed, the Devon bull invariably produces a red calf with a whiteish tuft to its tail. The Devon stock is the oldest and purest of all the bovine race, and has acquired the mysterious power of reproducing itself more literally, in detail, than any other. It is now almost a recognized fact among breeders, that, whichever animal of the two parents is the purer in race will have the most influence in making the offspring; and it is further understood by those versed in these matters, that for improvement we should breed to a thorough-bred stock, on one side at least.

Mongrels bred upon half-breeds communicate most of the vices and infirmities of their blooded ancestry and few of their virtues, and a second or third out-cross generally loses all trace of the original good blood.

The exemplification of this can be found nowhere more sharply defined than in the crossing of the Caucasian with a lower type of humanity. The first cross results in a man inferior to the pure Caucasian, but superior to the Chinese, the Indian, or the negro, from whom he may have sprung. The second cross is with another mongrel, produces a being inferior to either race. Persistent commingling with the same blood destroys all traces of the Caucasian element, and, in the case of the negro, at least leads to scrofula, impotence, and death.

There has been from time to time much discussion among turf authorities on the question as to which of the two breeding animals, the blood of both being equal, the sire or the dam, has the greater influence upon the organization of the foal. Able pens have defended both sides, and the question remains a mooted one.

Stonehenge, a noted authority on breeding, says:

"As the male and female each furnish their quota to the formation of the embryo it is reasonable to expect that each shall be represented in it, which is found to be the case in nature; but, as the food of the embryo entirely depends upon the mother, it may be expected that the health of the offspring and its constitutional powers will be more in accordance with her state than with that of the father; yet, since the sire furnishes one half of the original germ, it is not surprising that in externals and general character there is retained a *fac simile* to a certain extent of him."

"The influence of the male upon the embryo is partly dependent upon the fact that he furnishes a portion of its substance in the shape of a sperm-cell, but also in great measure upon the effect exerted upon the nervous system of the mother by him. Hence, the preponderance of one or other of the parents will in great measure depend upon the greater or less strength of nervous system in each. No general law is known by which this can be measured, nor is anything known of the laws which regulate the temperament, bodily or mental power, color or conformation of the resulting offspring."

It must be considered that outward circumstances and accidents may furnish exceptional cases to all rules, where everything is equal between the two animals; where they have the same purity of blood, the same degree of vital power, the same general temperament, &c., the dam unquestionably furnishes the internal organization, the blood, and viscera; and the sire gives the external form and appearance. The stallion, however, in most cases, has more vital power and nervous strength than the mare, and exerts his individuality more than she at the moment of depositing the germ. For this reason colts resemble their sires more frequently than their dams, where the parents "nick," as breeders say.

To "nick" is to reproduce their best qualities in the foal. This does not by any means always happen, even where both animals are of the purest blood. The celebrated English stallion West Australian—a marvellous horse, winner of the Derby and the St. Leger, of the same year—failed to nick with some of the finest mares in Great Britain. Only a few of his colts possess any of his virtues. The same was the case with Priam, very few of whose colts from our best American mares partook of all his excellence. Instances might be multiplied *ad infinitum.*

An extraordinary case of nicking was that of Van Galen, in England, with the dam of Tim Whiffler. This was his only successful nick for that year; but the colt, Tim Whiffler, won nine times at three years old, and carried off more than twenty thousand dollars and the Queen's vase at Ascot. The stallion Stockwell, on the contrary, was successful with a great number of mares, producing in the same year as many as thirty-two winning horses, which realized over one hundred and sixty thousand dollars for their proprietors.

A singular phenomenon, and one which should be much more widely known, is the lasting influence conferred upon the mare by her first stallion. The greatest care should be taken that the first horse that serves a fine mare be perfectly unexceptional in blood and breed, for all her colts thereafter are certain to resemble him in one way or another. Every one who has bred dogs knows that if the purest bitch in the world has her first litter by a mongrel cur, the purest dog of her own breed can never get a litter from her that will not contain at least one pup of mongrel character and appearance. A notable instance of this occurred in New Jersey some time since. A beautiful black and tan terrier bitch had her first litter by a mixed-blood dog with some Scotch terrier characteristics. Soon after her owner procured a thorough-bred black and tan for her, but all her subsequent litters contained pups bearing a marked resemblance to the Scotch breed.

Imagination is evidently a quality not confined to the "*genus homo.*" All animals are gifted with it, and in individuals it is sometimes exhibited very prominently. May not the imagination of the female, be she canine, equine, or whatever, be excited to the degree of producing practical results by the first male that approaches her thus, and any other subsequent similar circumstances of excitement bring back the recollection of her first love with force?

In the human race physiological phenomena of this sort are abundantly recorded. There are hundreds of instances where a widow, marrying a second time, has reproduced in her children extraordinary likenesses of her deceased husband; and of ladies who, having been thinking of their near relatives very anxiously, as in cases of dangerous illness, the chances of battle, or other troubles, have given birth to children precisely resembling the person thought of. This is exhibited most frequently in the resemblance of a child to its mother's parents.

The infant of two extremely plain and unprepossessing people who have had other children as homely as themselves, has been known to come into the world possessed of great physical beauty, due simply to a beautiful portrait placed where the mother saw it every morning on awakening. In the same way all surrounding circumstances produce their results upon "the child unborn," and the necessity for a tranquil, gentle, and undisturbed existence on the part of the mother should be held above all other considerations. There are too many horrible examples of the effect of alarm or anxiety, as shown in hideous deformities, like the "deer man," the "bear man," &c., who have been exhibited at various times by showmen, and in strange birth-marks resembling fruits or vegetables.

Thus much for the influence of imagination. The mysterious and delicate connexion between the mind, or soul and the body, is so abstruse and impalpable a subject that it baffles the researches of the acutest reason. By whatever process the offspring's physical organization may be affected, through the mental condition of the parent, it is certain that it *is* affected, and no care or pains on this account can be too great.

In the breeding of animals, then, it seems strange that so little attention should have been paid by breeders generally in this country to the condition of their producing stock. Frequently, when an ordinary mare has a colt by a blood stallion, the owner is astonished to find it full of defects, when the first offspring of the mare may have been the get of a donkey. It is known that the zebra (an animal of peculiar individuality and temper, and therefore liable to produce a very decided impression upon the imaginative instincts of the female) marks with his stripes all the foals of any mare who has her first by him. In the south mares are set apart for the breeding of mules, and are not considered fit for anything else, and a good horse has been known to get a mulish looking colt simply from the effect upon the mare of the sight of a jackass.

The only method by which the highest type of the horse can be produced is to select animals of both sexes that have proved their qualities of blood and muscle upon the race course, and whose ancestors for certainly not less than five generations have also proved victors in severe contests. The breeding must be conducted under the most auspicious circumstances of time, place, age, climate, and assimilation, or there may be many failures, notwithstanding the proven excellence of the parents; and assimilation is another subject to be gravely considered.

In the stock-raising regions of Texas, where the horse is permitted to have his own way for the greater part of the year, and to continue the habits of his untamed ancestors, so far as his instincts may direct, each stallion is allowed a certain number of mares. He is grand Turk, and this is his harem. Free to follow these instincts, he keeps his mares entirely to himself. No other stallion can approach one of them, and, when some hundreds of mares are turned out of a *corral* together, each seeks out her own stallion, and goes with him. If any in the bustle or confusion of the moment gets among the wrong party, or in a strange *mañada*, her lord and master dashes into the crowd, seeks her out, and drives her to his stamping ground; and in this untrammelled condition the stallion strenuously objects to an incestuous cross. As soon as his fillies reach the age of a year or eighteen months, he drives them from the *mañada*, and, while he remembers them, will have nothing to do with them. The result of such breeding would be fatal to the qualities of the very finest, purest blood, rendering it scrofulous, and liable to all the diseases in the veterinary surgeon's *materia medica*. No cross should ever be allowed nearer than a cousinship, and the stallion in his native state recognizes this law. In brief, he associates only with mares whose temperament and character assimilate with his own, and the breed thus perpetuated improves with the increase of each year.

Dr. Harvey has stated that as the blood of the mother circulates in the veins of the fœtus, passed in for its nutrition and development by process of absorption and assimilation, so the blood of the fœtus must in some degree commingle with that in the mother's veins, forming a sort of general circulation. Further, as the fœtal blood is in part the blood of the male parent, and possesses elements and characteristics derived from him, the mother is, so to speak, innoculated with his blood and his peculiarities, which are, to use his own language, "so engrafted in the system of the female as to be communicable by her to any offspring she may subsequently have by other males."

McGillivray, the veterinary surgeon, declares that the pure bred female, in becoming pregnant to a less pure male, is tainted *de facto*, and remains a cross ever after, incapable of producing pure offspring.

These theories with that of imagination, before stated, cover the whole ground, and fully account for the phenomena so often observed by all breeders of thorough-breds producing mongrel foals. But Dr. Harvey's idea, if sound, is full of import from another point of view. The more frequently two animals breed together the oftener the blood of the male mingles with and assimilates to that of the female. An equalization, a harmony exists between them, for the same blood animates the pulses of both, and, therefore, an improvement occurs yearly in the produce of the horses of Texas. It is not impossible that this is the reason why old married people who have had many children so often grow to resemble each other strikingly. Breeding from one mare by different stallions is sometimes attended with success, but it should never be encouraged after the first decided nick. The mare Cyprian had Joe Lovel, Songstress, Meteora, and Cypriana, all by different stallions; yet it is probable that their merits were due to the extraordinary vital and nervous power of their dam. The owner of Phryne played the wiser part in getting six celebrated racers from her by one horse, Pantaloon. Four famous colts were got from Crucifix by Touchstone; and while the thorough-bred Glencoe and Dick Andrews mares brought good foals from any good horse, (a truth powerfully shown by Pocahontas in England and Reel in the south,) they would doubtless breed better if confined to one stallion; and, under the same circumstances of treatment and health, each colt would be an improvement upon his predecessor. As a matter of course, the first foal should show that the blood of the stallion nicks with that of the mare.

The Texans have claimed that their native horse—the mustang—probably the degenerate descendant of the Spanish barb, spoiled by the errors of the Mexicans and the absence of a test like the race course, was better suited to that region than our best stock. Common horses of mixed blood, taken there during the war with Mexico, failed to become acclimated, and shortly after their arrival died of Spanish fever or some other disease. The experiment of taking thorough-breds to Texas was afterwards tried and with the happiest results. As a matter of course, they took the disease of the country, but in a mild form, and all recovered; and thereafter proved infinitely superior to any mustang for vigor, speed, and endurance, being able to travel one-third further *per diem* and with less fatigue. This in a country where riding on horseback is the only means of prosecuting a journey, and all horses are used to the saddle.

This result goes strongly to prove the superior physical superiority of the purely bred animal. His blood is free from hereditary taint, and his pulse perceptibly quicker than that of the common horse; qualities which render him less liable to contract disease, and better capable of throwing it off when contracted. His singular elasticity of temperament as well as of bodily construction enable him when once acclimated to vanquish without effort the mustang upon his native soil. An erroneous idea concerning the thorough-bred prevails, that, being delicate and slender in appearance, his legs are not so strong as those of the heavy farm horse or roadster. This is an egregious error. The English farmers, desirous of improving and converting their horses into showy hacks, have bred common animals with weedy blood stallions, discarded from the turf on account of weakness in the legs. These weeds have reproduced their infirmities in their foals—as the well-known Cobweb, for example, transmitted a tendency to navicular disease to all her colts—while their virtues have been swallowed up by the gross blood of the mare. Thus blood stock fell into disfavor for practical service in breeding road horses, but, happily, the error is being dispelled, and the more enterprising farmers are seeking to improve their stables by the use of as many scions of ancient lineage as they can procure. The legs of the thorough-bred, indeed, are a marvel of mechanical strength. Fancy a body weighing from nine hundred to eleven hundred pounds flying through the air at the rate of thirty-five miles an hour, and striking the ground at rapid strides of from twenty-two to twenty-seven feet in length! Can any one imagine that this may be done without great strength of limb? Suppose a locomotive engine, ever so strongly built, of the same weight, going at the same speed, could be made to progress by leaps of twenty or thirty feet, how long would either rail or engine last? Hardly so long as a thorough-bred racer. The best trotting horses—the highest type of the mongrel—get lame during the trotting season without one-half such trials as the racers undergo; and were it not for the dash of choice blood that flows in their veins, it would be found, after a trot, that literally and metaphorically "they had not a leg to stand upon." The reason why heavy farm horses do not get lame so often as racers and hunters is because they do nothing to make them lame. Their weight is their great virtue. All they do is to lean forward in the collar and draw by sheer dead weight. Put them to the test the racer must undergo and their legs would soon be sorry spectacles. "An ounce of blood is worth a pound of bone." Nor can they carry so heavy a weight as the racers. Fair Nell, the Irish mare that first beat the Arabians on desert sand, was accustomed to hunting with a rider of two hundred pounds weight;

and a series of experiments has demonstrated that the blood horse will stand up under a load that no mongrel animal can bear. This is probably the result of superior courage, no doubt, but also of superior strength. It is a noteworthy fact that the bones of the thorough-bred are of the finest possible texture, and actually weigh more than those of the mongrel cart-horse, though much smaller. The bones of the latter are honey-combed in structure, while those of the former are hard, closed-grained, and almost like ivory.

In England, while from twenty-two to twenty-five hundred blood horses are produced each year, the really remarkable ones are exceedingly rare. Four or five extraordinary racers may be considered the annual maximum; and the number of stallions that throw first-class colts possessing the qualities of the sire is far smaller, only one appearing in three or four years; this with all the encouragement and testing that the turf can give in a country where it is a time-honored and royally-patronized institution. What, then, would be the effect if racing were to be discontinued? None could know which sires and dams nicked, or which got the fastest foals. Animals with like infirmities would be bred together, and the infirm colts thus produced would be in-bred again until there would be no sound horses left to breed from, and a mongrel sort of mustang would take the place of the noble animals that now flash down the English course, the delight of the sovereign and the pride of the nation. How could we have known that such a famous stallion as Glencoe would have added so many splendid brood mares to the stock of America, had it not been for the race? How else could we have foreseen that Lexington would have given an Idlewild, a Lightning, or a Thunder? Who could have divined that Stockwell would have produced such colts as St. Albans and Kettledrum; or, that Melbourne, a singularly coarse, common-looking stallion, would produce foals like West Australian the best racer of fifty years—Blink Bonny, and Thormanby; or, that Touchstone—of whom all the connoisseurs cried, on seeing him stripped for the race, "Bah, he's a butcher's hack"—would turn out the greatest producer of modern days?

But while the importance of the race, as a test of purity of blood and breed, cannot be overestimated, the race itself may be abused in the case of mares destined for breeding purposes. It has been observed that many of the best racing mares on record, after retiring from the course they had honored by scores of noble contests, have failed to reproduce their brilliant qualities in their offspring. Their nervous energies and vitality had been expended in the labor of training and the excitement of the race. Breeders should make a note of this truth, in selecting brood mares, and choose those whose exploits are few but wonderful, and whose constitutions have not been impaired by age and over-exertion, rather than the veteran winners of a hundred prizes. The melancholy example of Black Maria, Trifle, Fashion, Peytona, and hosts of others, should be a warning to those who fancy that a mare can be run until she is entirely exhausted and grown old, and then put to breeding. Like all other rules this has its exceptions, but they are rare.

Another widely prevailing error among breeders is, that after having brought the stock up to a given degree of purity, it is no longer necessary to employ genuine thorough-breds. They seem to imagine that their three-quarters or seven-eighths bred animals, breeding together, will get thorough-bred foals. Would a generation of mulattoes or quadroons, intermarrying continually, produce white children? The fact is, that constant infusions of the purest blood are necessary, not only to improve all stock, human and equine, but to keep it up to its standard. The service of a thorough-bred cannot be dispensed with for any length of time, or degeneration must surely follow. If we arrive at a desirable point of excellence for saddle horses for cavalry and other uses, it will not do to rest there and breed solely from them. The "sang pur" must be immingled frequently in order to keep the race from deterioration, and so improve it as much as possible. Such is the recent wise decision of the agricultural societies of Great Britain, founded upon thorough research and careful analyzation of all the facts possible to be obtained. From these remarks it must not be understood that breeders who wish to improve their horses can do so by picking the worn-out, weedy, cast-offs of any and every racing stable. Some writers seem to fancy, when the thorough-bred stallion is recommended as a means of purifying the blood of American horses, that all thorough-breds are alike for that purpose. This is simply absurd. When speaking of the cart-horse, it is by no means meant the rack of bones that staggers in front of the ragman's cart; and when of the blood stallion, it is meant one which has not failed to stand the most vigorous test. If our stables are to be replenished by the descendants of English racers, the most successful of them should be selected. To produce the thorough-bred, all circumstances of feeding, stabling, grooming, and general care must tend to encourage the qualities that make the great racer a type of his genus. The real thorough-bred is an animal which shall stand the test of training and racing successfully, and can reproduce himself or a better. This is the horse we want, and it is simply hypercriticism to say that the present running horse is not thorough-bred because his remote ancestors may have been a mixture of the Arabian, the Barb, and the Turk. Six to eight generations of racers that can fulfil these obligations will result in as perfect a specimen of the horse as can be desired or procured. The vital importance of breeding from the finest proven thorough-bred animals must now be clearly seen, yet, after the care and trouble of procuring the true foal, genuine and unblemished, we have accomplished little if we do not know how to raise him in a manner worthy of his high pedigree and mission. It is the easiest matter in the world to spoil good colts by careless or ignorant treatment.

Take, for instance, two Durham calves from cows of equal purity, and sired by the same bull. Send one into "green fields and pasture new," stable it in cold weather, and give it all it can need for its health and comfort. Turn the other out to pick its living on a bleak and rocky barren, to shiver with cold, and to search wearily for the few blades of sickly grass that grow in granite clefts. Then at the end of the year compare them. The first will be a fat, sturdy, handsome fellow, sleek, bright, erect of head, straight of limb, courageous and intelligent; the other, a miserable, melancholy runt, without pluck or beauty, lean, small, and showing scarcely a trace of blood. Take two more calves of the same parentage, and turn the fat one's brother out upon the hills, and the lean one's brother into the rich pasturage and warm stables; feed them precisely as their relatives were fed before, and it will be found that the brothers look nothing alike, while those of different parentage look like brothers. Now, try to fatten them all alike. The two that were well treated will thrive, but the others, though they may improve, will never attain their proper size, or be anything but runts; nor will they be fit for breeding purposes, comparatively, and it is in nowise different with the horse.

A great deal of the stamina and ability of the growing foal must be taken into his system through the stomach. As beef and mutton are the most strengthening food of man, so oats hold the same prominent place with the horse. He must be fed high at an early age if he is to run fast and endure. As soon as he can eat he should be fed liberally upon a gruel made of ground oats and cow's milk; as he gets older, unground oats without milk should be given him, not in his mother's feed-box, but in a separate one for himself. In summer, while he must be permitted to run at large every night, to roll, to run, and eat fresh grass, he should be stabled during the day from 10 a. m. to 5 p. m., on account of flies and heat, and his diet of oats must not be suspended on account of his having grass. Of late years, the best trainers have become so profoundly impressed with this necessity for generous feeding, that they object to receive any horses into their training stables which have been raised in the ordinary way, with grass and barn-yard care. They assert that the mischief is already done, and that it is useless to attempt the training of an animal that has not been oat-fed almost from birth. But this high feeding will require close care. Its tendency is to make bone rapidly, and unless the system is kept clear of impurities, and the secretory glands are strengthened by compulsory exercise, this rapid formation of the bony element may clog the secretions and produce ring-bone, or some kindred complaint. The English method is to work their two-year-olds rather too severely. That age is not sufficient to bear the labor of racing. The colt may be gently exercised, say for two hours a day; one in the morning, and one in the evening. It may be said, however, that the English colt is as mature at two years old, as ours at two and a half, probably on account of the advantages of heavier oats, more succulent hay, and a less varied climate, for it must be known that climate affects all animals very considerably. No better illustration of the fact can be given than that of the English bull-dog, the most savage, vindictive, ill-tempered of all dogs when at home, but which becomes transformed by a residence in Italy to quite a reasonable creature. A few generations bred in Italy suffice to bring forth pups without a trace of the original bull-dog character, save in external formation and appearance. And in this country our organization, derived from our English ancestry, is perpetually at war with the polar frigidity of our winters, and the torrid heat of our summers. There are those who eulogize the climate, but we have sadly lost the erect frames, the red and white complexions, and the sturdy air that belong to the colonists, and are still preserved by our English cousins.

And, now, to sum up: for a long time it will be necessary to breed and raise horses, especially for the use of cavalry—horses that can go well, carrying not less than two hundred and twenty pounds—the average weight of the trooper with his equipments. This requires a horse of sixteen hands, (five feet four inches,) weighing from one thousand to twelve hundred pounds. He must be strong-backed, sound in the limbs, and with plenty of bone and sinew. His withers must be high and oblique, so as to carry the saddle naturally, and he must have the temper and courage of the thorough-bred. The courage of the trooper depends much upon that of the horse. Brood mares, to produce such stock, should be put, between the ages of five and fifteen, to thorough-bred, well-tried stallions. The colt should be brought to eat oats as soon as possible, and should have two quarts a day until weaned; after that four quarts should be his allowance, with grass and hay in their seasons. This gives good size; and, at the end of two years, he may be broken to advantage, both to saddle and harness, and the cavalry drill may commence.

To procure stallions capable of producing such offspring, it is imperatively necessary that the running race should become a regular institution, and this requires the patronage and authority of the government.

To make good cavalry horses, then, the first necessities will be a bounty given by government to racing stallions; liberal appropriation to every club of one hundred gentlemen who will contribute a certain fixed sum, the whole to be given in purses for the promotion and encouragement of the running race; and the introduction and raising of thorough-breds. There might be, too, a discriminating tax in favor of thorough-breds laid on the receipts of all stallions standing for service; and, furthermore, an annual tax upon vehicles of every description, save those used strictly for business purposes. This will tend to drive into the saddle those who now take the air only in pleasure wagons, and to foster a real interest in the production of horses for the saddle alone.

There should also be an annual agricultural exhibition in each one of the States, when a government premium should be awarded to the best thorough-bred stallion of a fixed standard—the winner not to be allowed to compete for a second premium.

The government should be ready to purchase colts of a given excellence and size, at a given price, for the cavalry service; not the price of the present day, for a vastly better animal is needed before our cavalry can be worthy of the name. The English mounted regiments have a certain sum appropriated them annually for horses. The colonels expend this sum in yearling thorough-breds, which are immediately put out to be raised expressly for the service. This is, perhaps, expensive, but so are all military operations; and one result of the generous English plan was that the six hundred of the Light Brigade charged straight through five thousand Russians, and some of them lived to return, hewing their gory way back again. The English cavalry horse of the very best type is precisely the same as the English hunter, and his improvement may be judged from the fact that, while a hundred years ago it was not uncommon to run a fox from daylight until dark, and then, unearthing him next morning, to run him all that day. In these times the run never lasts more than four hours, and in general only an hour or two. The fox has remained the same, or, if anything, has become more wily, while the horse and the hound, by training and testing, have vastly improved upon their former degree of excellence.

It may be thought that England has received a somewhat extravagant amount of credit in the course of these remarks. She deserves it, and it is better to tell the truth and follow its teachings than to garble facts in favor of a false and selfish idea of patriotism. In giving her saddle horses the first place of honor, we only do what France, Austria, Prussia, and Russia have done in purchasing them for their cavalry, and what American turfmen have done in acknowledging decisive defeat of some of our best horses when fairly tried against those of England.

The portraits which accompany this paper are those of *Slasher* and *Ten Broeck's Eclipse*. The former an American bred horse by Childe Harold, out of Sarah Washington.

PEDIGREE OF SLASHER.

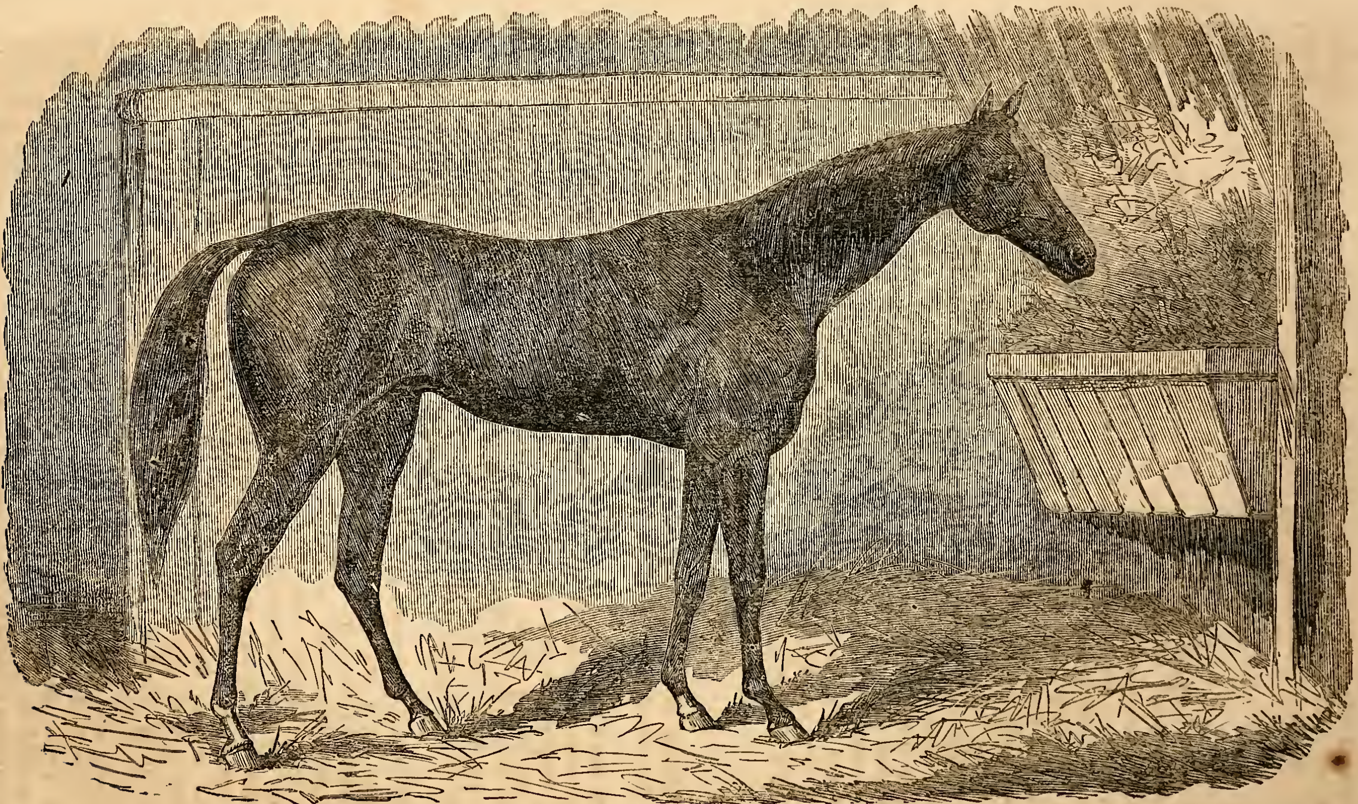
Slasher is a bay, 16¼ hands, foaled 1854, by Childe Harold, by Imported Sovereign by Emilius, out of Sarah Washington, the celebrated dam of Inspector, Sue Washington, Fanny Washington, Bonita, &c., &c. Slasher's numerous races, at every distance, but especially his four-mile victories at Ashland, Petersburg, and New York, are too recent to require more mention.

The dam of Slasher, Sarah Washington, has been very remarkable for the production of very superior colts. She brought nothing but celebrated racers, with one exception, when the foal was injured by a fall while very young.

Arguing from the facts and principles laid down in the foregoing article, we may conclude with all safety that Slasher, with such a pedigree, must possess in an eminent degree the power of nicking and reproducing his own best qualities in his offspring. So far his colts give every evidence of verifying this conclusion, although none of them have as yet made a debut upon the turf. In appearance Slasher, as may be seen, is a handsome horse; color bright bay, black mane, tail, and legs, and stands sixteen hands high. As a racer he was a winner at all distances against the best horses of the day. He is a good trotter, and might to the superficial observer pass for a coach-horse of the highest type.

PEDIGREE OF ECLIPSE.

Eclipse, imported to this country by Mr. Ten Broeck, is a dark bay, 16¼ hands, foaled 1856, by Orlando, out of Gaze by Bay Middleton. He was imported from England after winning the Clearwell stakes, the stakes at



ECLIPSE.

Imported Stallion, owned by Francis Morris, Esq., New York.

New Market Craven, the biennial stakes at Ascot, and other races; beating Fitz Roland, the winner of the 2,000 guineas stakes, and Sunbeam, the winner of the Doncaster St. Leger, and running a dead heat in the New Market stakes with Beadsman, the winner of the Derby. By his performances and his pedigree, Eclipse was considered the best colt of his age in England. His sire, Orlando, was one of the fastest horses of the century; and his grandsire, Touchstone, has to this day produced the greatest number of winners. Eclipse weighs 1,150, and his colts already in training show the speed, size, and bone of their sire.

Like Slasher, Eclipse has no colts yet upon the race course, but they are as highly prized by their owners as any in the country, and give abundant promise for the future, having exhibited as two-year-olds on their first training a remarkable degree of speed and mettle.

Eclipse stands sixteen hands in height; is of a rich chestnut color, and in form and appearance is the highest type of the thorough-bred English racer. His best performance in England was running a dead heat for the "two thousand guineas stakes" with *Beadsman*, the winner of the Derby the week following.

Mr. A. J. Miner, who brought so many of Mr. Ten Broeck's horses, English and American, successfully to the post, considered Eclipse as probably the fastest horse he ever saw. For many of the facts and suggestions in this article we are indebted to "Wilkes's Spirit of the Times."

THE CONESTOGA HORSE.

BY HON. JOHN STROHM, NEW PROVIDENCE, PENNSYLVANIA.

The wide celebrity acquired by this distinguished animal has induced a belief that he springs from some peculiar species or breed of that genus of quadrupeds whose services contribute so largely to the comfort and prosperity of man, especially in an agricultural community, and has inspired a desire to know something about the origin, comparative merits, and system of breeding, of a class of horses whose fame is commensurate with a large portion of the United States.

Fully impressed with the belief that the superior excellence attributed to the Conestoga horse is not derived from any strain or breed that can now be traced to its origin, the following sketch has been penned with the view of exploding that idea, and at the same time to rescue the history of that celebrated animal from that oblivion to which modern inventions and recent innovations are rapidly consigning it.

The name of "Conestoga" is derived from a river (to which the aboriginal inhabitants had given that name) that rises in the northeast part of the county of Lancaster, one of the southeastern counties of the State of Pennsylvania, and flows through the central part of said county, in a southwesterly direction, disemboguing into the Susquehanna at a place now called "Safe Harbor," where extensive iron works have been established. This river rises in and flows through a region of country of unsurpassed fertility, where cereal grains and nutritious grasses are grown to an extent unrivalled in any part of the United States.

The settlement of this valley commenced in the early part of the last century. The first European settlers emigrated mainly from Switzerland and the adjoining parts of Germany, interspersed with French Huguenots, who sought in this new country a refuge from the persecution which oppressed them in their native land. They were principally agriculturists, and, from necessity as well as choice, devoted their attention to the same vocation in their new home.

Their first care was to clear the ground of the heavy growth of timber that extended over the whole region; for here were no prairies covered with rich grasses, furnishing abundant nourishment for stock without labor and without price, and requiring but little cultivation to produce the grain that composes the principal sustenance of man, and the domestic animals subservient to his comfort, convenience, and pleasure. The laborious task of clearing away the forest was mainly effected by the use of the axe and the action of fire. The huge logs were collected together in piles, the interstices filled with the branches, when the application of a torch soon reduced the whole mass to ashes, which served to ameliorate and fertilize the soil. The next object was to break up the ground, and prepare it for the reception of the seed, from which the abundant harvest was anticipated.

In the accomplishment of this, the horse was found a useful and convenient, if not indispensable, assistant, for without the aid of this useful animal the cultivation of the soil must have been very limited. The horses used by those early settlers were no doubt the progenitors of the far-famed "Conestoga horse," which in after times became so extensively known and spoken of; but of what particular stock or strain they were, or whence they came, history and tradition are equally silent, or afford no reliable information.

As Chester county and the vicinity of Philadelphia were partially settled and considerably improved before any settlement was effected in the Conestoga valley, it is quite probable that the first immigrants to this valley derived their first stock of horses from their nearest neighbors inhabiting the above-named localities; and it requires no great stretch of imagination to suppose that the first settlers of Pennsylvania who came here with William Penn, or some of their immediate successors, brought some of those useful animals with them from England, from which the whole stock of horses in the country at that time were derived. But it was not only in the cultivation of the soil that the horse was so essential to the immigrants to this (then new) country. There being then no flouring mills in the county of Lancaster, the inhabitants were compelled to carry their grain to the Brandywine mills, near Wilmington, in the State of Delaware, some forty miles distant, to be manufactured into flour for family use.

This was a laborious task, that could hardly have been executed without the aid of the useful animal that forms the subject of this essay. These important services were fully appreciated by those honest and industrious settlers, and the horse, who was a companion of their toil, and so essentially necessary to their success and prosperity, became to them an object of great attention and (I had almost said) affection. Just, humane, and generous, this rural people treated this trusty and faithful domestic with a degree of consideration seldom bestowed upon any of the brute creation. Their superior intelligence restrained them from that ardent affection, approaching to adoration, which the wild Arab of the desert is said to entertain for his courser; and, though the horse was not an inmate of the same apartment that sheltered his wife and children, as we are told is sometimes the case with the Bedouin Arab, he was provided with comfortable quarters, at no great distance from his master, and partook generously of the cereal grain and nutritious grasses which his own strength and labor contributed so materially to produce.

Being thus well fed, protected from the cold and inclemency of the weather when not actually in service, and never overworked or abused, this horse, under

CONESTOGA.

Owned by John Eshelman, of Martic, Pa.

this kind treatment, attained to the full development of his natural powers, and arrived at a degree of beauty and perfection seldom found in any other country. and much surpassing the original stock. The deep interest with which the farmers of this region regarded this noble animal, naturally stimulated a desire to improve the stock and to bring him to a still greater degree of perfection This was not attempted by any scientific system of breeding; for this frugal people, always having an eye to economy and utility, kept neither males nor females for the exclusive purpose of breeding. Sometimes a stud horse was absolved from labor during the two last months of spring and the first of the summer season; but at the expiration of that term he was put to the harness again and compelled to do his share of the labor which the interest of his proprietor required. So with the mare; she was generally worked until within a few weeks of foaling; and instances are not unfrequent where they have been kept in the harness until the time of parturition. This, however, was only done through ignorance or misapprehension of the time when the foal is expected. In about a week after the mare has foaled, she is again put to the harness and performs her ordinary share of labor on the farm.

The colt is permitted to run with its dam until it is about three months old; it is then weaned and turned to pasture, generally receiving a little oats once or twice a day for a month or longer. Judicious farmers advise the feeding of a small quantity of oats daily during the first winter; but colts frequently, if not generally, have to be content with a warm stall and plenty of good hay. The second winter they require no grain, and, unless regularly and very sparingly fed, are considered better without it.

At about two and a half years old they are usually "bridle broken," and sometimes lightly worked for a while in the autumn; but during the ensuing winter they are commonly suffered to run idle, being seldom regularly worked until fully three years old.

Under this system of breeding, by selecting their best stock for the purpose, the farmers of the Conestoga valley were very successful in improving their stock. As the country was brought under cultivation, and the dense forest was succeeded by fertile fields of waving grain and rich pastures of succulent grasses, roads were opened and facilities afforded for transporting the surplus productions of the farm to the sea-board. Wagons were now introduced, (for railroads and canals were not then in vogue,) and the strength and fidelity of the horse were relied upon to drag those heavy-laden wagons to their destined places.

In the performance of those services it will readily be perceived that strength and activity were the most essential requisites. To these points, then, the attention of the sagacious farmer was constantly directed in the improvement of this indispensable quadruped—their aim being to produce a strong, heavy, well set, and tolerably active animal, with great powers of endurance.

The immigration to and settling of the western States created a demand for the transportation of large quantities of dry goods and groceries to supply the wants of those engaged in opening up and settling those new countries; and many of the farmers in the Conestoga valley occasionally employed their teams in hauling "store goods" from Philadelphia to Pittsburg, the latter place being the terminus beyond which eastern teams seldom went.

During the war of 1812 these noble teams rendered essential service to the country in the transportation of arms, ammunition, and supplies to the army on the frontier. Long lines of those teams were frequently seen wending their weary way to the theatre of action, and contributing greatly to the comfort of the army and the defence of the country. Their usual route of travel was from Philadelphia through Lancaster, crossing the Susquehanna at Columbia or Marietta, and thence over the mountains to Pittsburg, and sometimes northward to Lake Erie. This was before the construction of turnpikes and canals, and the capacious wagons which the Conestoga farmers then had in use, and the heavy teams of large, fat, sleek horses attached thereto, were the best means of transportation which the times and circumstances of the country then afforded. These wagons and teams attracted attention and commanded admiration wherever they appeared; and hence the origin, as I conceive, of the horse and wagon to which the appellation of "Conestoga" has been attached. The farmers of those days seemed fully to appreciate the importance of these teams, and evinced considerable taste and no little pride in their style of fitting them out. The harness was constructed of the best materials, with an eye to show as well as utility. In the harness and trimmings of these teams they frequently indulged in expenses that approached to extravagance. In addition to what was indispensably necessary, articles that by some were deemed mere decorations were sometimes appended, and served to increase the admiration which the noble animals to which they were attached so universally attracted. It was, indeed, an animating sight to see five or six highly fed horses, half covered with heavy bear-skins, or decorated with gaudily fringed housings, surmounted with a set of finely toned bells, their bridles adorned with loops of red trimming, and moving over the ground with a brisk elastic step, snorting disdainfully at surrounding objects, as if half conscious of their superior appearance, and participating in the pride that swelled the bosom of their master and driver.

The Conestoga horse, then, though his origin cannot be traced to any distinct species or breed, though his pedigree is not recorded in any stud-book, or his exploits blazoned forth on the pages of a turf-register, is still not a myth—not the creature of a fervid imagination or a disordered fancy—but a veritable, strong, active animal, pre-eminently useful in his day and generation, brought to perfection by judicious breeding, kind treatment, and careful management; and the term Conestoga is used as denoting superiority in the class of draught horses.

Subsequent to the period above referred to, as the improvements in the country advanced, and the population became dense and prosperous, a spirit of enterprise was fostered and excited that culminated at that time in the construction of a continuous line of turnpike road from the city of Philadelphia, on the eastern margin of the State of Pennsylvania, to the city of Pittsburg, near the western border of the same State. This great improvement, constructed to facilitate the constant and rapidly increasing trade to the western States, introduced innovations that imposed new and additional duties on that useful quadruped which forms the subject of this essay. A line of stage-coaches was established, running between the above-named cities, which brought into requisition a class of horses widely different from those above described. A lighter animal, combining strength with more agility, was required for the transportation of passengers and forwarding the mail, which, in consequence of the vast increase of business, had become an object of public solicitude. These innovations directed the attention of the Conestoga farmers, as well as of all others engaged in the breeding of horses, to the peculiar qualities of the English race horse, whose slender form and tapering limbs seemed well calculated for light and active employment. Stallions were imported from England, and by a crossing of those with the native breed of the country, or rather with the stock then existing in the country, an animal better suited to the exigency of the times was produced; while at the same time the heavy draught horses to transport the weightier and more cumbersome articles of commerce were constantly in demand. At a later period in the history of our country, when the construction of railroads and canals subserved the purposes of transportation both of passengers and freight, the services of the class of animals hereinbefore described were to a great extent dispensed with; long journeys with heavy teams were no longer necessary, and less pains were taken to propagate a class of horses for which there was no pressing demand.

As the new States of the west became settled and cultivated, the western farmers drove large numbers of horses and mules to the eastern part of Pennsylvania, a considerable portion of which were purchased by the farmers of Lancaster county; the former, as being better suited to the business of the times, while the latter were well calculated for heavy draught and endurance of labor, at less expense of feed and provender than the horses formerly used, being less liable to disease, and capable of sustaining labor at a much greater age, they have in a great measure superseded horses; and, at the present time, a good western horse finds a readier market even on the banks of the Conestoga than one that has been raised in the immediate vicinity.

The construction of railroads, locomotives, steam engines, and telegraph communications has infused a spirit of activity and energy into all business circles. Numerous light vehicles are now daily used on our common roads in the ordinary transaction of business, as well as for the purpose of travelling and the interchange of friendly visits betwixt neighbors and relations; and "Young America" can no longer endure the slow, steady, but sure and regular gait of the "Conestoga horse." A "two-forty" nag is more highly valued and seems more in keeping with the rapidity with which business of all kinds is driven at the present day. Notwithstanding, there are still a great many fine teams in the Conestoga valley, and in despite of youthful opinions and modern innovations, many of the old-fashioned farmers cling to the use of the faithful horse that has so long been the boast and the pride of Lancaster county; and on occasions of public demonstration, such as cattle shows, fairs, political conventions, &c., these teams may be seen parading the streets of Lancaster city under the merry jingle of their well-chimed bells, and champing their bits with all the pride and fervor of days of yore.

From the preceding considerations, I come to the conclusion that the Conestoga horse is not a distinct species or strain of that noble quadruped, but belongs to a class that has attained a great degree of efficiency for a particular purpose; and that the appellation by which this class is so widely known denotes superior excellence in the class of draught horses, although the individuals composing it may have sprung from a crossing or mixture of various breeds or families into which the horse family is at present divided.

There is, however, one distinguishing characteristic in the history of this animal that has been but slightly adverted to, which deserves, perhaps, a more extended notice; and that is the high condition in which the animal is usually kept in the region of country from which he derives his name and his fame.

The farmers of the Conestoga valley, (which includes so large a portion of the county of Lancaster as to be almost synonymous with it,) as a general rule, are in the habit of feeding more grain to their horses and keeping them in higher condition than those of any other section of country known to the writer of this article. Indeed, the keeping of very fat horses has become a passion with them. This passion, stimulated by pride, as is frequently the case, has a tendency to deteriorate rather than improve the animal; for being encumbered with an unnatural load of flesh and fat, the horse becomes sluggish, unwieldy, and incapable of undergoing or enduring the same amount of labor that he might otherwise do. This morbid condition of the system renders the animal more liable to disease, and in various ways detracts from his merits and impairs his usefulness.

But in this as in other things "passion rules the hour," and the individual who neglects or refuses to keep his horses plump, sleek, and fat, is deemed careless and thriftless, or exceedingly penurious, loses cast with his compeers. and becomes an object of ridicule and contempt. I do not mean to intimate that every fat horse is a Conestoga horse; but I never knew that flattering term to be applied to a lean, gaunt, half-starved-looking animal, whatever his merits, good points, or other qualifications may have been; and hence we frequently hear such expressions as "broad as a Conestoga horse," "fat as a Conestoga horse," "has a neck (or breast) like a Conestoga stallion," used either in compliment, irony, or derision, according to the humor or design of the speaker.

I cannot close without expressing regret that the "Conestoga horse," whose name for so many years has been suggestive of strength, usefulness, and beauty, is likely in a few years more—from disease and neglect in breeding—to become quite extinct as a breed of American horses.

The horse from which the illustration for this article is taken is owned by Calvin Eshelman, of Martic township, Lancaster county, Pennsylvania, and will be three years old next July, is 16 hands high, and weighs 1,350 pounds. His color is black, and he is a very good specimen of the Conestoga horse.

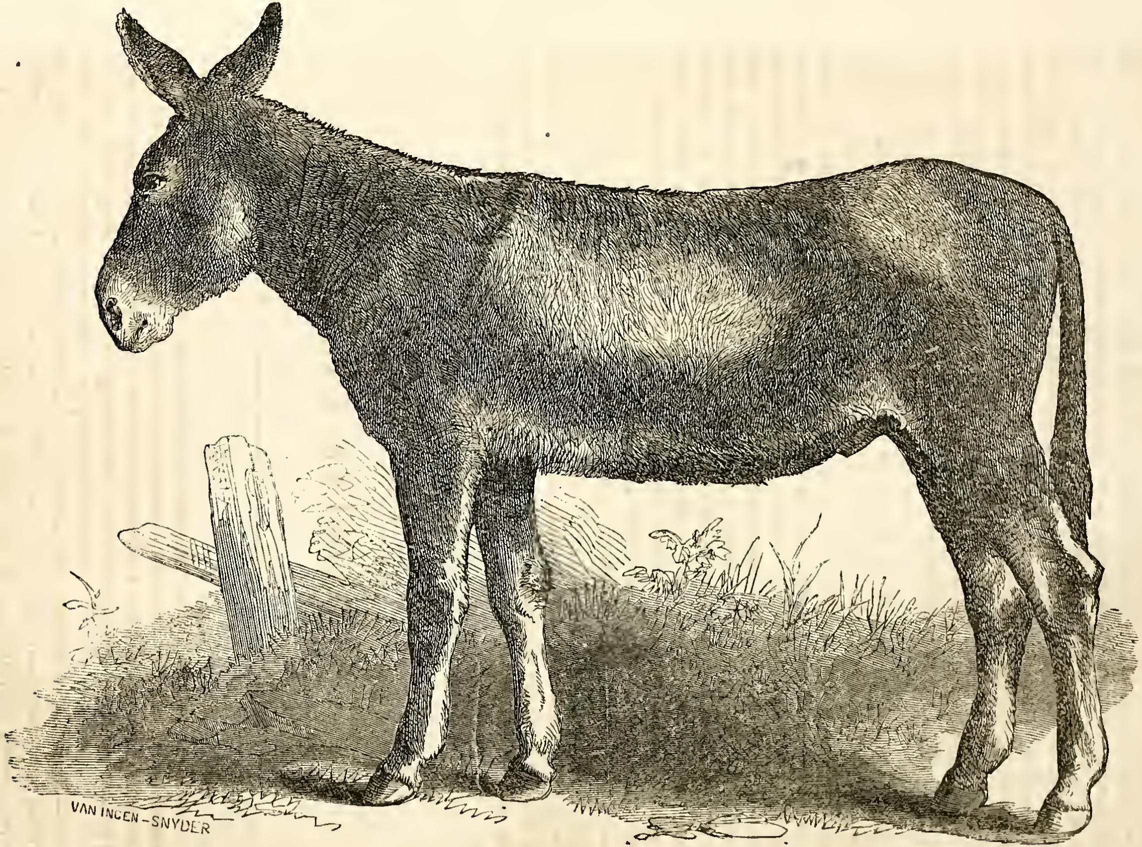
MULE RAISING.

BY J. T. WARDER, SPRINGFIELD, OHIO.

A PAPER upon the production of so useful a domestic animal as the mule would not be considered complete without some allusion being made, at the outset, to the origin and parentage of this hybrid. Though everybody is supposed to be acquainted with the facts of mule breeding, we yet find a great many persons who do not know the precise meaning of the terms employed. A mule, in scientific language, means the progeny from a cross between two distinct species, either of animals or of plants, which species, however, must be very nearly related, or they will not intermingle. This progeny is generally infertile or barren, though there are some exceptions to this observation in the first generation of hybrids. In the case of the horse-mule there appear to be but few instances recorded of fruitful intercourse, and none beyond the first generation, though in the case of plants, where, perhaps, the species were less distinctly marked, few seeds will germinate, and few are perfected after two or three reproductions from the first cross. Indeed, this production of mule hybrids, next to the non-production of any progeny, as the result of attempts at crossing distinct animals and plants, has been assumed by naturalists to be conclusive evidence of the existence of distinct species.

In the practical language of the farm and of the market the word *mule* has come to mean the progeny of the male ass, or jack, upon the female horse, or mare, while the word hinny is applied to the product of the reverse cross of the stallion upon the jenny, or female ass. In these two different hybrids, containing a similar admixture of blood, we find a most remarkable difference of character, which cannot be explained philosophically, but which is often cited as showing the relative impress of dam and sire upon their progeny. In the mule we find the general characteristics, such as the head, ears, voice, tail, feet, and temper, are asinine, and the males are two or three times as numerous as the females, while in size the progeny more nearly resembles the dam; but in the hinny, or progeny of the stallion on the jenny, the qualities of the horse predominate, with diminished size, this latter quality appearing to depend upon the female.

There is a common impression that the mare which has once been covered by a jack will never again produce a good horse colt, and that she should be



JACK.

Three years old, fifteen hands and three inches high, owned by J. J. Warder, of Springfield, Ohio.

kept for mule breeding exclusively. This would make it appear that the male exerts an influence upon the female that is not confined to her immediate progeny, but is transmitted through her to her future offspring. This principle is admitted as established by some physiologists, and the following incident is often cited in proof of the position: A mare that had been covered by a quagga, or zebra, and produced a striped mule from that cross, afterward had colts that were begotten by three different stallions; each of these horse foals was striped, and resembled the quagga in other respects. The same is said to be the result after breeding a mare to the jackass. The authority for the above is not given, but it is generally admitted to be correct. Mr. Lyell tells us that it may be laid down as a general rule, admitting of very few exceptions among quadrupeds, that the hybrid progeny is sterile; and there seems to be no well-authenticated examples of the continuance of the mule race beyond one generation. The principal number of observations and experiments relate to the mixed offspring of the horse and ass, and in this case it is well established that the he mule can generate, and that the she mule can produce. Such cases occur in Spain and Italy, and much more frequently in the West Indies and in New Holland; but the mules have never bred in cold climates, seldom in warm regions, and still more rarely in temperate countries.

We learn from Wilson's Rural Encyclopedia that no impediment to propagation has been observed by anatomists or physiologists; and the incapacity of these creatures, in all ordinary circumstances, to become parents, must arise from some subtle property of the vital power, or some anomalous working of the organic functions, or some derangement in the peculiar or proper forces of a species consequent upon the monstrousness of their origin. Every mule is a compound of two species, and seems to be to a certain extent a malformation of each, and a type of neither; and while unable to reproduce the specific form of his dam or of his sire, he is wanting in a sufficient specific character of his own to be the proper subject of reproduction. Nor do mules exhibit a true blending of the specific properties of their parents; but as regards the most important properties, such as size, form, constitution, temper, and habits, they generally possess a closer resemblance to their dam than to their sire. Buffon says, in the case both of mules and hinnies, "that they retain more of the dam than of the sire, not only in magnitude, but in the figure of the body; whereas in the form of the head, limbs, and tail they bear a greater resemblance to the sire." The same naturalist infers, from various experiments respecting cross-breeds between the he goat and ewe, the dog and the wolf, the Canary bird and the goldfinch, that the male transmits his sex to the greatest number, and that the preponderance of males over females exceeds that which prevails where the parents are of the same species. Any two species of the equine genus will hybridize with each other, but some do so with facility and willingness, and others with difficulty and repugnance. Mules have been generated between the horse and the quagga. They are readily produced between the horse and the ass, as is well known; but they are very reluctantly and sparingly produced between the ass and the quagga. In an experiment related by Pennant, a he ass and a she zebra were for some time unsuccessfully kept together with a view of their hybridizing; but after the ass was taken aside and painted in such a manner as to resemble a zebra, and conducted back to his companion, they united and produced a mule; another ass and zebra mule was produced at Turin, but it died as soon as it was born; and another, a well-formed female mule, was produced in a menagerie at Paris, from a Spanish ass of the largest size, and a female zebra, and became larger than its dam, acquiring a form somewhat similar to that of its sire, and was remarkable for docility. In another experiment a female zebra was covered by a stallion and became pregnant, but died in the eighth month of her gestation, and when her body was opened the fœtus was found to be a male without hair, and marked on the head with black and white stripes. The same authority, after referring to the similarity of the name in different languages of the true mule, produced by the jack crossed upon the mare, tells us that "the mule has considerably more resemblance to the horse than to the ass, and often, in the south of Europe, is a very fine animal of from fifteen to seventeen hands high. Its head has generally a clumsy form and a heavy appearance, and is the most exceptional part of the whole system."

These animals are considered by naturalists to be distinct, but nearly allied, species. According to the latest authorities they are members of two genera, though formerly the horse and the ass were both included under one. The scientific name of the horse is *Equus caballus;* of the donkey, *Asinus vulgaris;* and the zebra, or quagga, is called *Asinus zebra* by Baird. In every country the mule is sure-footed and hardy. In Spain it has the finest form and appearance; in Savoy it has a remarkably large size; in Egypt it is about equal in value to a medium horse; and in the mountain regions of large portions of both Europe and South America it is far more serviceable than the horse could be, and completely supersedes it.

The mule is everywhere hardier than the horse, subject to fewer diseases, more patient, better adapted to travelling on rugged and trackless surfaces, less fastidious as to its food, and much less expensive in feeding, more muscular in proportion to its weight, and usually living and working to about double the age. A troop of mules, freighted with their burdens and travelling among the passes of the Andes, is said to be a very picturesque sight. If the camels are styled "ships of the desert" when traversing those trackless plains, the pack-mules are equally important in the narrow defiles, and on the rocky ledges of the elevated mountain regions of the world. Darwin, speaking of the mules in South America, says, "Each animal carries on a level road a cargo weighing four hundred and sixteen pounds, but in a mountainous country one hundred pounds less; yet with what delicate slim limbs, without any proportionate bulk of muscle, these animals support so great a burden! The mule always appears to me a most surprising creature. That a hybrid should possess more intelligence, memory, obstinacy, social affection, and power of muscular endurance than either of its parents, seems to indicate that art has outmastered nature." The same authority informs us that "an old steady mare, with a little bell around her neck, acts as a *madrina* or god-mother to the troop upon their journeys, and wheresoever she goes, the mules, like good children, follow her. If several large troops are turned into one field to graze for the night, in the morning the muleteer has only to lead his madrina a little apart and tinkle her bell, and although there may be 200 or 300 mules together, each immediately knows its own bell, and separates itself from the rest to join its own troop."

"The affection of these creatures for their madrina saves infinite trouble. It is nearly impossible to lose an old mule, for, if detached for several hours by force, she will track out her companions, or rather the madrina. It is now a well-established fact that these creatures will follow any animal that wears the bell, and drovers take advantage of this trait in their character in moving them from place to place, as is well known to every one who has had anything to do with their use." Though so wonderfully adapted as pack beasts for the transportation of merchandise over difficult roads, in precipitous mountain passes that are impracticable for horses, these valuable animals are also admirably suited to other uses to which they have been applied. In southern countries particularly they are used for light transportation almost exclusively, and even the grandees use them for their carriages as well as under the saddle. In our own country the prejudice that once existed against them is rapidly yielding, and we find them used in the street cars in some of our cities, and occasionally observe them attached to elegant private carriages. In many parts of the country they are used for heavy draught; for this purpose they have long been employed in some of the iron regions, which are often hilly, and even mountainous, and traversed with very bad roads—rough, rocky, and muddy—where these animals are found to be better adapted to the circumstances than horses. In some of the mountainous portions of Pennsylvania they are used in the log-wagons, and it is truly marvellous to see them tugging at their loads, drawing the wains around huge rocks, logs, and stumps, and through rapid torrents, and among thickets of tangled underbrush that would appal a team of horses, and where these latter animals would be entirely worthless. It is true the teams employed n such situations are of superior quality, and are much larger and heavier than common mules; but their powers of endurance and their determined pluck and perseverance in overcoming difficulties make them invaluable in this kind of service. Then, again, their great intelligence adds to their value in the wild roads they have to traverse, and enables their driver to manage them without a line, but simply by the word of command, to which they rapidly accustom themselves, especially when rendered emphatic by the sharp crack of the resounding whip. In the army service mules have been very extensively employed, and increasingly so within a few years. The teams consist of four and six animals, which are found to draw as much as horses, to be more easily maintained, and to endure more hardships. It is a common saying that "a mule never dies," but this has not been verified in the service. Upon the farm they are very much liked by those who employ them, and they are peculiarly adapted to much of the labor to be performed. In deep ploughing, in heavy soils, most mules might be considered too light for this kind of labor, which is supposed to require more weight of carcass to be thrown against the collar in the steady and continuous draught requisite to carry the large turning plough through such a soil; but with a lighter furrow, on loose, sandy, and gravelly soils, mules are found to make an excellent team, their quick step and their peculiar configuration making them track all their feet in nearly the same line, which with the small size of their hoofs adapt them most happily for the cultivation of what are termed hoed crops. In this work the intelligence of the mule keeps him from treading upon the young plants, and his close walking enables us to run a suitable cultivator between rows that are very close together in such crops as carrots, turnips, and other vegetables that constitute the majority of our hoed crops. So, also, in the garden, the mule becomes a most valuable assistant; and, indeed, there are a thousand places which he can fill better, or at least as well, as the more noble animal which is usually assigned to such services. Mules have long been the favorite draught animals of the southern plantations; and, with many persons, the mule and the negro are intimately connected by association, under the impression that the obstinacy and hardiness and endurance of the one, were naturally adapted and related to the low degree of intelligence and brutality of the other. Hence, also, a most mistaken estimate of the intelligence and value of the mule. For while we may with great propriety claim that the mule has wonderful powers of endurance that enable him to bear unnumbered cruelties which are heaped upon him, and that, therefore, he is better adapted to suffer from contact with an ignorant race, degraded by slavery and its attendant depressing and demoralizing influences, still, we must be allowed to assert on his behalf that he is a most intelligent, affectionate, and excellent creature, and that it is his powers of endurance, as well as his adaptation to a warm climate, that have caused him to be so generally adopted in the south, where long experience has shown his superiority to the horse for the fatigues and neglects to which he is liable to be subjected at the hands of the careless and brutalized slave.

The ass is very rarely used in this country for any purpose except for cross-breeding with the mare in the production of mules. In other parts of the world, however, these animals are numerous, and are considered useful, being well adapted to light work, and suited, by their cheapness, in the first outlay, and in their subsistence, to the wants of the poor, and also because, from their organization, they are especially adapted to sterile, stony, and rocky soils and mountainous regions, and even to torrid climates. The ass is historic, and appears to have been domesticated at a very early period of the world's history, and he is found at the present day in a state of nature or wild in the same regions, where, we read in the Bible of the wild asses snuffing up the wind. So also in the very earliest history of the human race we read of the hybrid animal, the mule, having been a familiar object; and, indeed, in the book of Genesis we find mention of the mule before the horse has been named. Mules are admirably adapted to torrid climates, and they will subsist under very unfavorable circumstances of soil, climate, and exposure to hardships where the horse could not be sustained. In England, where the donkeys are the property of the poor, and are considered of little value, and where the poorer mares are used for crossing, the resulting mule is an inferior animal, and is employed in very subordinate situations, though admirably adapted for the subterranean occupation of dragging coal cars in the mines where a larger beast could not get along. In southern latitudes, however, where the mule rises into importance from its being peculiarly adapted to the attendant circumstances of soil and climate, and where the jacks are more noble, and are bred with more care, the donkey is a much larger and finer beast, and the resulting cross, when proper mares are employed, is a superior animal. Some of the finest jacks in this country for a long time were of the Maltese breed, the first of which was sent by La Fayette to Washington in the year 1787. He was the first "Knight of Malta" in this country, where now so many may be found, and his progeny was highly valued. After the death of Washington, eight of his mules were sold at $200 apiece, and these were probably the get of this so-called "Knight of Malta."

This item from history not only shows that mules were highly and justly appreciated at that early period, but also that the immortal Father of his Country, when retiring from the arena of public life, attended scrupulously to the details of the farm, and brought his great sagacity to bear upon the proper breeding, rearing, and breaking of a mule for his plough and wagon, as he had ever done in directing the movement of armies raised to defend our borders, or in guiding the ship of state through the troublesome breakers of the political storms that attended and followed our first great revolution. Washington's "Knight of Malta" is described as having moderate size, great activity, and clean limbs, possessing the fire and ferocity of a tiger, and as being of a dark brown color, with white belly and muzzle. Professor Low, in his excellent work on Practical Agriculture, pays a just tribute to the ass, which he says "has been the servant of man from the earliest records of the human race. He has come to us from the south and east, and it is there that he is seen in his perfect state. Were we to judge of the value and importance of this creature from the feeble services he is able to render us in the oppressed and degraded position he occupies in this country, we should form a very false estimate of his importance. He is the inhabitant of the desert, and an invaluable servant in the regions in which nature has fitted him to exist. But yet, more than this, he is endowed with the power of propagating a race of creatures of the highest importance to the inhabitants of many countries. The mule, as an animal of burden in a rocky and precipitous country, far exceeds the horse or any other animal; and some countries would remain separated from one another by impassable barriers, were it not for the matchless sagacity, patience, and surefootedness of this creature."

It is in the south of Europe, and in an especial manner the mountainous parts of it, that the mule is regarded as important in rural economy. Yet he is capable of being cultivated in the colder countries. He possesses the hardy properties which fit him for innumerable kinds of lighter labor; he is long-lived and remarkably exempt from diseases, especially of the limbs; and he can be maintained on far inferior kind of food to that required by the horse. The difficulty which presents itself in rearing him to the same perfection in the colder regions as in the warmer is, that the male parent cannot be brought to perfection in the former. This is a difficulty, however, which does not apply to those extensive regions of our own favored land, which have been largely given to the production of the mule. In the famous blue-grass region, which spreads over a large portion of the great basin styled the valley of the Mississippi, the well-selected jacks and jennies have been almost naturalized, and, under the influence of abundant food and a suitable climate, with judicious care and skill in their breeding, they have really improved upon our hands since their introduction among us; and the American mules, many of which may claim high blood on the side of their dams, will compare most favorably with those of any other portion of the world. In the mule we have the size and activity of the horse, combined with the form and ha. dihood of the ass, while he surpasses both his parents in sure-footedness and in longevity, and has more endurance and greater power of recuperation from fatigue and exhaustion when excessively worked. Well-bred mules are as spirited, and equally active, or even quicker than horses, if perfectly broken. They will walk fast, and in the draught they pull even more steadily. Their intelligence is so great that they may be trained very readily either to the line or to the word, and many splendid, large teams are driven, even over rough ground where there is scarcely any road, perfectly guided by the voice of the teamster, aided only by the loud crack of his whip, which they understand as a sound of encouragement rather than as an intimation of impending torture.

Since the commencement of the rebellion the routine of the mule trade has been diverted from the usual course of former years, and the immense extent of the government transportation has directed attention to this branch of industry. Hence the value of this animal has become of such increased propor tions, that the raising and feeding of mules has attracted much attention.

In the procreation of these creatures the selection of the jack is of the first importance. Great improvement has been made in the mule since the introduction of the Spanish jack into this country, which has resulted in giving us animals that come to maturity earlier than the old Maltese stock, besides having more size and better action. In the production of mules for government use the jack should be from fourteen to fifteen hands high, with a good length of body, depth of chest, and with a round barrel, as indications of a good constitution. He should have heavy, flat-boned limbs, a long, thin face, with fine, thin under jaw-bones. His ears should be carried upright, and they must not be too thick. The animal should have a sprightly temper and appearance, as these qualities will almost always be transmitted to his progeny.

The jack must be fed with a view to the maintenance of the greatest physical vigor, so as to produce an even lot of colts, and to this end he should rarely be allowed to serve more than fifty mares during the season of three months. He should be provided with such food as will give him strength without inducing feverishness. Natural exercise, with the freedom of a grass lot, should always be allowed, when practicable. Animals designed for crossing with mares should be kept from any intercourse with their own kind, as they often become entirely useless for cross-breeding when allowed contact with their own species.

For the production of mules, mares should be selected that have large, roomy bodies on short, strong limbs. They should have good, sprightly tempers, and, when attainable, the more they have of cross with the thorough-bred horse, the better, if the above requisite of form and strength shall have been preserved.

In the west the jack is generally owned by the mule-feeder, who places him upon a stand sometimes having two or more stations, and moves him from one to the other at stated periods. He engages the use of the mares in each neighborhood at a given price for the product. In such cases contracts are made with the owners of the mares to deliver the colts in sound condition at a given place and date, where the feeder collects his crop, as it is often termed.

A horse should always be used as a teaser to try if the mare be in season, because mares will often allow the jack to serve them after having been teased by a horse, when their natural timidity would have caused them to refuse any approaches by the jack without such preparation. Moreover, it saves the jack from an undue excitement in trying to overcome the antipathy which some mares have to the very sight of him. Mares should be bred to the jack early in the spring, so that the colts may have sufficient age before winter sets in. Besides, if they are all weaned at the same time, they will have the advantage of beginning their feeding alike, and they will remain more uniform during the winter.

TREATMENT.

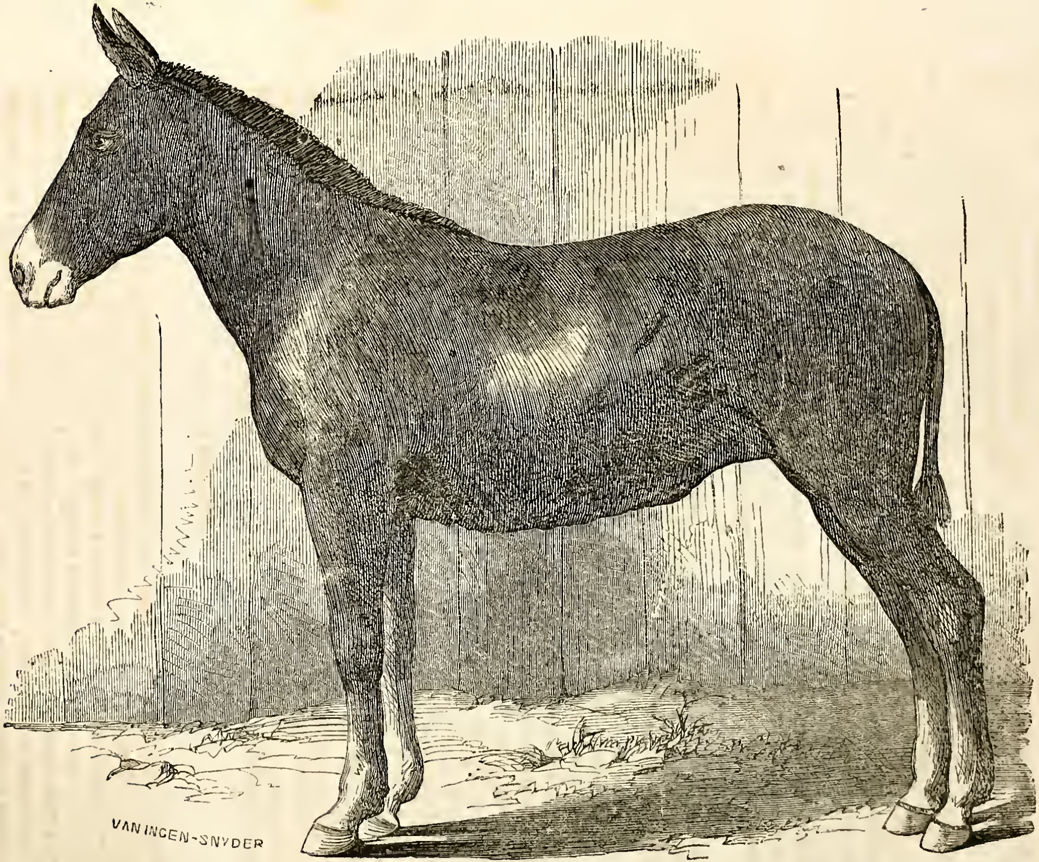
Mules are timid animals, possessing also a great amount of curiosity in their composition. Affection strongly characterizes all their actions; but they possess a peculiarity unusual in most domestic animals, that of resenting any injury. From this circumstance they have received the credit of viciousness and stubbornness, which, by a proper study of their characters, and by proper treatment from the beginning, can, in most cases, be overcome. It is much easier to train up a mule in the way in which it is to go, and to fit it for the purposes for which it is intended, than to overcome any bad propensity arising from years of mismanagement. Therefore, upon the collection of the colts at weaning time, they should be placed in an enclosure from which there is no possibility of their escaping until they shall have forgotten their dams. By this means the first step is taken to prevent the formation of one of their mulish propensities—that of being "breachy." At all times one should move among the colts quietly, and without evincing any outward manifestations of fear, and in this way will soon gain their confidence, and, after a very few days, the feeder will be in perfect safety from injury.

If during the first summer any of the colts should have been taught unruly tricks, care must be taken to avoid receiving harm from them; and before many months, if they be kept away from the bad associations, the tricks will be forgotten.

Feeders succeed best when the colts are collected about the same time, early enough for them to become accustomed to the change of food before the setting in of cold weather, and late enough to avoid the great annoyance and injury which young stock suffer from the flies.

The period usually considered best for gathering the crop is from the 20th to the end of September. When the colts are collected and brought together in this way, they form mutual attachments which last until they are separated. They should be furnished with good pasture, and should be fed with grain once a day, which usually consists of oats, mill feed, or green corn. If obliged to confine them when first collected, green corn, cut up with the stalks, should be given frequently in small quantities at each time, so as to entice them to eat, and to encourage their appetites. This may be alternated with dry oats or mill feed. A constant supply of pure water is very desirable; for, though the mule is capable of enduring greater irregularities in feeding and vicissitudes of the weather than the horse, still success in feeding depends upon having food and water convenient and accessible to the stock. When these arrangements are properly provided, the mule is a very light feeder; but he wants a *little* often, and should be furnished a variety of food, so that he may partake of it according to his fancy.

Many prefer a wood-lot for wintering their mules, if the ground be firm and



MULE.

Two years old, fifteen hands and a-half inch high, owned by J. J. Warder, Springfield, Ohio.

dry, and not liable to become too muddy. They assert that the mules are less likely to suffer from colds and coughs, which run into distemper, than when confined to stables or sheds.

At all times their food should be given in such proportions and of such nature as to insure a free passage from the bowels; for constipation brings on fever, as well as colds and distempers, which is a very prevalent disorder among colts during the first winter; hence the importance of taking care to work it off with loosening food. Corn is the great food for all kinds of stock in the west; but young colts require a portion of their food to be of a more digestible character, producing more growth of muscle and less fat; therefore, after the grain has become hard and the stalks have dried, the colts should be provided with wheat bran, mixed with corn meal, or the richer kind of offal from wheat generally sold by the millers as "middlings;" and for the "roughness," as we term it, give them all the clean wheat straw or corn fodder they will eat, with an occasional change to *clover hay*. Colts will consume an average of about six or seven pounds of the middle feed each day through the first winter. If there be a tendency to constipation, unthreshed Hungarian grass, cut when the seed was nearly ripe, is the best food to relieve the difficulty. A portion of this hay placed where the colts can have easy access to it, insures a good state of the system, and many feeders find it to be invaluable.

Salt mixed with ashes in equal proportions, should be placed under shelter, where it can be at all times accessible to the colts, for nature will direct them as to the quantity and periods when it should be consumed, and if given in this way, it will never be taken in excess.

If colts be stabled, care must be taken to provide clean dry bedding, and if their feet become diseased, as is frequently the case, where they are exposed to wet, a strong solution of sulphate of copper in vinegar, applied after a thorough washing with soapsuds, will almost always effect a speedy cure. This disease *must not* be neglected, for it it be allowed to continue, the general health of the animal will suffer, and its hoof becoming deformed, the value of the mule will be very greatly depreciated.

Castration is done by many breeders during the first summer, while the colt is still with the mare, but it is more commonly postponed until the animals are approaching one year old and before they are turned out to pasture. The operation is performed in the same manner as with horses; some using clamps, others *searing* with a hot iron. Castration should be done before the flies are troublesome, and the colts should not be allowed to roll in the dust for fear of obstructing the free discharge of the suppuration.

During the summer, the care of the stock consists in regular salting, and the occasional trimming a hoof that may have assumed an unnatural proportion of length or shape, which by a little care may be rendered straight and perfect. A month of feeding on grass alone through May, purifies the system from the humors that may have arisen from colds and distempers, and have been continued in the blood in consequence of high feeding with grain. After this change of diet has produced its effects, a regular feeding of grain with the grass. has the advantage of a tendency toward early maturity; for in mule raising it is a maxim, that what is gained in time is saved in the amount of food consumed. Besides, this grain fed during the fly season insures a constant and regular growth, which is so desirable that it should always be obtained if possible.

By the 1st of September, yearling colts are very apt to be restless, and if the enclosures are not very good, they will become breachy; it is therefore best at that period to put them up for their regular fall and winter feeding. The stock should be placed in a small lot or open shed and fed with whole corn in deep wide troughs, which should be four feet across and eighteen or twenty inches deep, and raised from the ground so that the sides shall be three

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feet high. The stalks may be thrown into these troughs as they come from the field; or the fodder may be cut up, and may be continued as long as the stalks are soft. After this, if stabled, they should be fed with corn from the shock, with the addition of mill feed each day. Beside this, Hungarian grass and wheat straw should at all times be kept within their reach for the sake of providing a variety of food, for the greatest success depends upon keeping up a good appetite by constant regular feeding.

During the second summer, if soiling be practicable, a large amount of food may be saved by adopting this plan, for at this age, mules are very restless and uneasy, and are constantly roving about, and thus destroy more food than they consume.

By giving them a regular feed in a good lot which is sufficiently large for exercise, they will make a better growth and are less liable to the injuries to which they are incident when running in the pastures. Grain or mill feed should be provided, at least through that part of the summer when flies are troublesome, if not, indeed, throughout the season; otherwise, they will not consume enough food to keep them in good condition.

The second winter the same treatment is required as in the first, but as they are older, corn alone will answer for their food, because it is desirable to push them forward for an early market when they have become two years old.

During this period it is necessary to watch their feet carefully, because while we are pushing the animal to an early maturity the lower part of the hoof is often disfigured, because its growth is in excess of the wear, and will require to be pared off.

BREAKING.

In breaking colts for farm use, it is best to begin when they are coming two years old, and by using them at light work during the third year they will have a quicker step than if they were allowed to attain their full maturity and then set at once to heavy work.

The first lesson for the mule-trainer, before attempting the management of these animals, is to learn to govern himself; and the sooner the barbarous custom of choking a mule almost to suffocation is abolished, the better. By this treatment the animal suffers a shock, both mental and physical, that in many cases injures the constitution of the animal without conducing to its proper training.

The mule should be led or driven into a confined stall or stocks, from which he cannot by any possibility escape; in a very short time he will cease struggling; gentle handling with quiet soothing words will soon give him confidence when the gears or harness may be put upon him. The company of his mate, if he have one, or the presence of another animal, with which he is to be worked, aids in alleviating his fears. Avoid the possibility of his breaking away when released, for success depends upon the result of this first effort and the impression made upon him. After being hitched to the wagon the trainer should endeavor to repress too great eagerness in the animal, lest, by being overtasked, he become discouraged. By kind treatment mules may be rendered the most docile and affectionate creatures among our domestic animals, and will often show more intelligence than the horse.

STATISTICS.

Whether it arise from a greatly increased demand for these beasts in our country, which is now swollen by the enlarged wants of the army and its immense transportation, or whether it has come from a higher appreciation of the mule, it is certain that the number produced at the present time is vastly greater than at any former period of our history. Some shrewd agriculturists may have made the discovery that it costs less to breed and raise a mule to a suitable size than a horse; that less time is required to prepare a lot of mules than a lot of colts for the market; that young mules may be sold readily at any period and in any amount; and more than this, that they uniformly command a higher price than a drove of horse colts of similar relative quality and value. Moreover, it may have become apparent that mules are subject to fewer diseases, that they are less liable to serious accidents, and that they are altogether more certain of producing satisfactory results from their production than horses. All of which may be set down as well-established axioms. The fact remains, (whether explained or not, is immaterial,) that the mules of the United States have greatly increased in numbers during the decade between the census returns, as will appear by a comparison of the tables furnished by the Census Bureau; and we have every reason to believe that at present the supply is keeping up with the demand, notwithstanding the terrible exhaustion, both of men and mules, consequent upon the fearful war that has consigned so many of both to early graves. The census tables show that the number of mules produced has increased in a greater ratio than those of any other kind of farm stock, and that from 1850 to 1860 the total number of these animals had more than doubled.

The comparative figures below are extracted from the preliminary report of the eighth census. They show at a glance the great increase of mules during the ten years from 1850 to 1860 in some of the States where they are most extensively employed in agricultural labors. Asses are included, but their numbers are comparatively so small as not materially to affect the result.

Table showing the number of mules and asses in the United States.

	1850.	1860.
Alabama	59,895	108,701
Arkansas	11,559	44,158
California	1,666	13,744
Delaware	791	2,294
Florida	5,002	10,909
Georgia	57,379	101,069
Kentucky	65,609	117,639
Louisiana	44,849	92,259
Maryland	5,644	9,829
Mississippi	54,547	112,488
Missouri	41,667	80,941
North Carolina	25,259	51,388
South Carolina	37,483	66,456
Tennessee	75,303	119,221
Texas	12,463	63,000
Virginia	21,483	41,014
The grand total in the whole United States at the same period	559,331	1,129,553

Increase of mules in ten years, 570,222.

In drawing the consideration of this subject to a conclusion, it is to be regretted that it has been found impossible to collect reliable data upon some points of great interest to the farmers and economists of the country in regard to these animals. The absolute cost of breeding and rearing a mule to a saleable age could not be ascertained, nor could the comparative expense of rearing a horse colt be learned with any better success.

The following is the number of horses and mules on hand in the army June 30, 1862, together with those purchased, captured from the enemy, and also those that have died, been lost and sold, from that date up to May 31, 1864, as furnished from the office of the Quartermaster General:

	PURCHASED.		CAPTURED.		SOLD, DIED, & LOST.	
	Horses.	Mules.	Horses.	Mules.	Horses.	Mules.
Stock on hand June 30, 1862..	24,025	23,814	....	....	....	....
Purchased, captured from the enemy, died, lost and sold, from June 30, 1862, to June 30, 1863..................	173,832	86,254	7,783	6,915	57,676	17,170
Purchased, captured from the enemy, died, lost and sold, from June 30, 1863, to May 31, 1864..................	173,182	78,298	17,514	8,091	103,408	54,714
Total................	371,039	188,366	25,297	15,006	161,084	71,884

Imperfect, however, as is this paper, it is respectfully submitted with a hope that it contains some hints and details of practice that will be of some use to the American agriculturists.

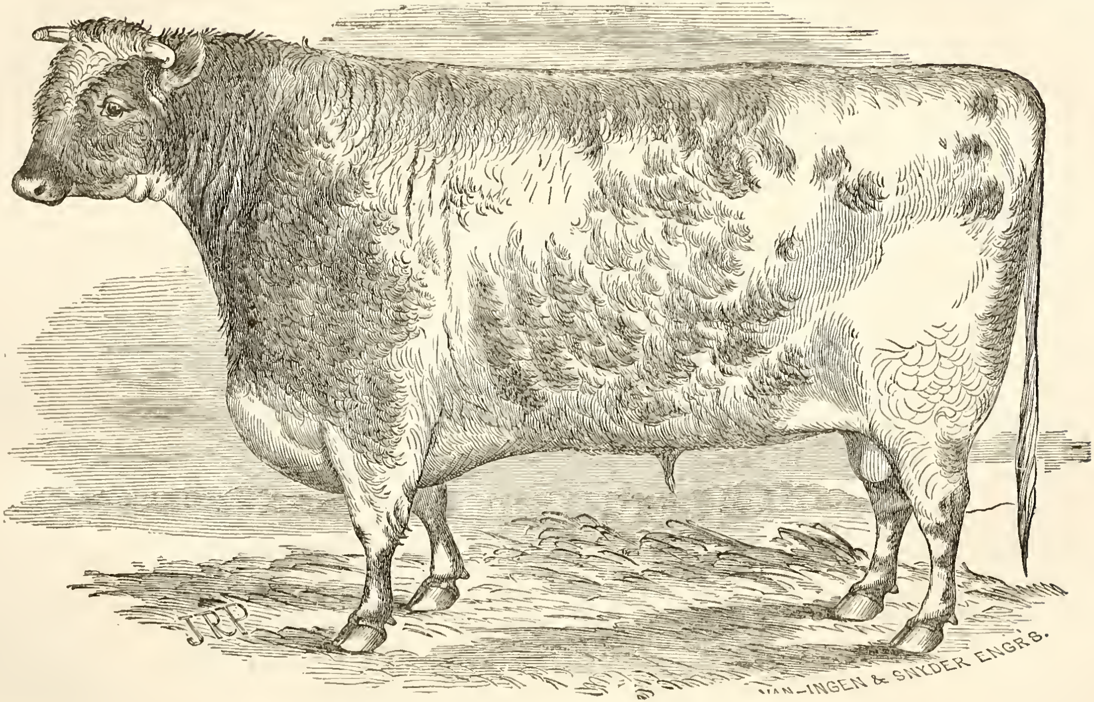
SHORT HORN CATTLE.

This breed has attained a distinction and won a substantial appreciation which no other race has so fully and widely enjoyed among the enlightened graziers of the world. From Great Britain its dissemination has extended to the continent, to Australia, to South Africa, South America, Mexico, and the West Indies, while it has secured almost a monopoly of the importations of this country and of Canada. For the grass pastures of the Ohio valley, and the abundant, natural, and cultivated grasses of the broader prairies of the Mississippi region, it is admirably fitted, and held in high esteem as the most economical machine for the speediest conversion of corn and grass into meat and money.

THEIR ORIGIN.

The original short horns occupied the east of England, Yorkshire, and the valley of the Tees at the date of the earliest records of British stock-growing. They were various in size, color, and other peculiarities; the dark-skinned herds of the fens resembling the black cattle of the Holland marshes, and the finer forms of Yorkshire and Durham assuming the style and quality of the noted cattle of Holstein and Jutland; and yet it may not certainly be known whether the ancient immigrants from those localities brought this stock to England, or whether this similarity is the result of climate and keeping. It was, at least, a race very distinct from that of Ireland and the west of England, with long horns, thick skins, and a heavy coat of hair, well suited for their protection in a climate subject to continuous seasons of rain. It is well

PLATE XXVII.



SIXTH DUKE OF THORNDALE.

Short-horn Bull, bred and owned by Samuel Thorne, of Thorndale, N. Y. Two years old.

known in later times that Dutch and Danish importations modified these cattle of the east of England, and suggested the more recent and greater improvements of Charles and Robert Colling, commencing about the era of our revolution, and continued successfully since by Messrs. Bates, Booth, Townley, and others in England, and Thorne, Alexander, and other breeders in this country.

While Bakewell was pursuing his experiments with the long horns of the west, then regarded as superior to other breeds, and perfecting his Dishley cattle, reducing their size, giving a full cylindrical body, softening the skin and reducing the bone, very much in the manner of his improvement of the Dishley or Leicester breed of sheep, it occurred to the Collings that the short horns were more susceptible of improvement. The result has proved their superiority. The Dishleys are now only bred for the production of bulls to cross upon common stock for early maturity. The story of the bull Hubback, the founder of the modern short horn, has often been told. He was purchased in 1783 by Charles Colling of his brother and a Mr. Waistell for eight guineas, and is said to have been from a cow grazed by a poor man on the highway. It has long been a matter of controversy whether he was a pure-bred Teeswater, the short horn of that day. He was somewhat below the usual size of the Teeswaters, yellow, red, and white in color, of a fine, compact form, admirable touch, and so easily fattened that he early became useless as a bull. The cow, also purchased by Colling, acquired fat very rapidly, and never again bred. Either from mere curiosity or from a suspicion that he was impairing the constitution of his animals by continuous breeding in too small a circle, Colling attempted the experiment of infusing some of the Galloway blood, which was confined, it is understood, to a single cross upon certain individuals of his herd. At the sale of Charles Colling, in 1810, forty-seven animals produced 8,911 guineas. Robert Colling, not so renowned, but esteemed by many quite as judicious a breeder, sold sixty-one (but six of them bulls) for 7,484 guineas. High prices have been maintained by later breeders. Mr. Bates, in 1850, sold one family of Duchess stock, including calves, at an average of $581. Lord Ducie's herd, in 1853, realized an average of $760 for sixty-two animals. Individuals of superior excellence, from the day when Colling's "Comet" sold for 1,000 guineas, have commanded fabulous prices. Similar prices have been obtained in this country.

There were at least five hundred herds of pure-bred short horns in Great Britain ten years ago, and from six to seven thousand head are registered in the herd-book every alternate year at that period, and these numbers are yearly increasing in accelerating ratio.

CHARACTERISTICS.

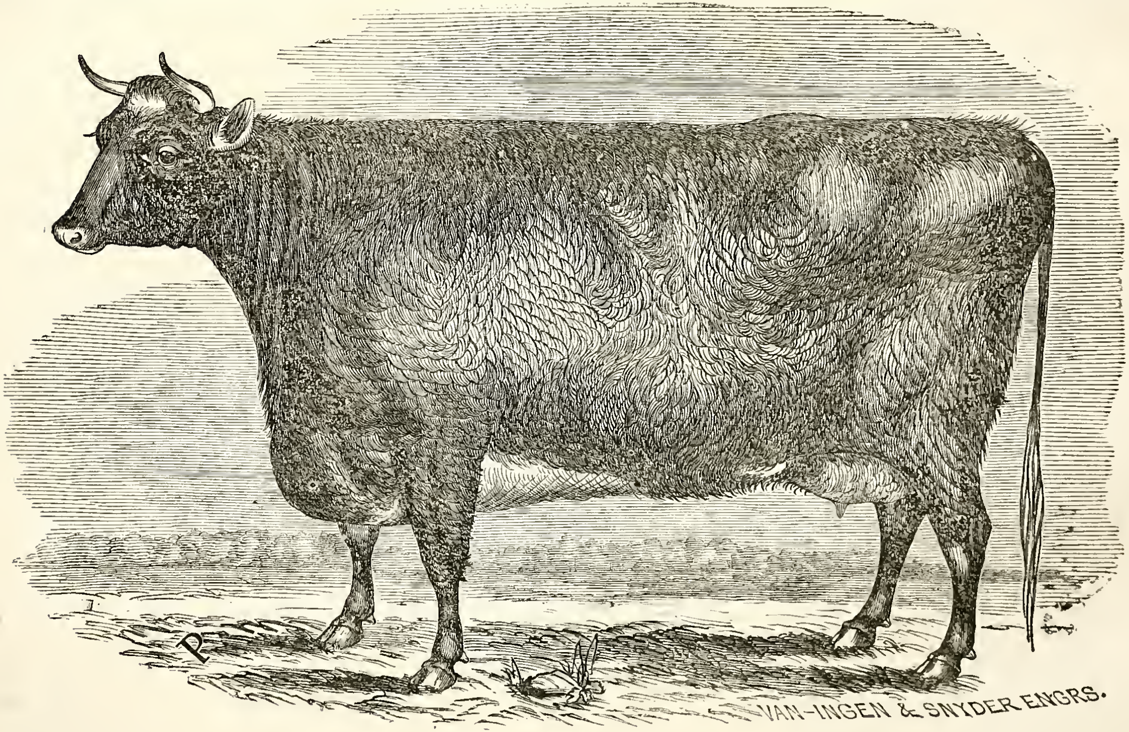
Derived from a large breed, the improved short horn is heavy, less in height than the originals of the Tees, rounder and deeper in the trunk, the limbs shorter, chest and back broader, appearing less in bulk, while really greater in weight. The skin is light-colored, hair reddish brown or white or mixed, the muzzle flesh-colored, the horns shorter and lighter-colored than in the former breed, the skin soft to the touch, the form square, the shoulder upright, and the hind-quarter large. The color cannot be characterized by a single term, varying greatly from a pure white to a rich red, a mixture being the fashion, known as roan or strawberry. The skin should be velvety and not too thin, while the hair should be plentiful and of a mossy softness. The head of the female is finer and more tapering than that of the male, the neck thinner and lighter, and her shoulder inclining to narrow towards the chine. The short horn looks smaller than he is. He excels all other stock in facility of fattening, making good and heavy beef in thirty months, and even in two years. Henry Strafford, an excellent judge, thus sums up his points:

"The head of the male animal is short, but at the same time fine; very broad across the eyes, but gradually tapering to the nose, the nostril of which is full and prominent; the nose itself of a rich flesh-color, neither too light nor dark; eyes bright and placid, with ears somewhat large and thin. The head, crowned with a curved and somewhat flat horn, is well set on to a lengthy, broad, muscular neck; the chest wide, deep, and projecting; shoulders fine, oblique, and well formed into the chine; fore legs short, with the upper arm large and powerful; barrel round, deep, and well ribbed up towards the loins and hips, which should be wide and level; back straight from the withers to the setting on of the tail, but still short—that is, from hip to chine—the opinion of many good judges being that a beast should have a short back with a long frame."

The idea is somewhat prevalent that short horn cows are not good milkers. It has been obtained, without doubt, from the fact of the well known efforts made to perfect their fattening qualities, in accordance with Bakewell's saying that "all was useless that was not beef;" and it is true of many families of short horns. Others are superior milkers. The original Holstein blood of the Durham and Holderness districts was famous for its milking quality, and it is difficult to breed it out with all the culture which modern improved short horns have received. The modern Holderness stock at this day chiefly supplies the London dairies, and many of their best milkers have strong strains of the improved blood. The Duchess stock, of great celebrity and purity, bred by Mr. Bates, was distinguished for its excellence in this respect. Some short horns in this country have yielded ample supplies of milk of excellent quality. J. H. Powel, of Pennsylvania, once claimed to have obtained from an imported short horn 28 quarts of milk, which yielded at the rate of 20½ pounds of butter per week. It will be found true that the short horn, for the production either of meat or milk, is eminently fitted, and may be made pre-eminently so with a careful selection in either direction.

THE THORNDALE STOCK.

The strange and noteworthy fact that an American breeder has shipped to admiring purchasers in England the descendants of former importations is a sufficient apology for allusion here to a single herd of American short horns—that of Samuel Thorne, of Thorndale, New York. Notwithstanding the professional pride of the English breeder, and a tenacious adhesion to his favorable opinion of English superiority in cattle growing, these animals have given the greatest satisfaction and received the highest commendation from the best judges of that country. The singularity of the circumstance is lessened in view of the fact that Mr. Thorne has culled from the best herds in England, and bought those of Messrs. Morris and Becar, of New York, to add to his own, and with these combined herds has surmounted all obstacles, in feeding and climate, through the exercise of untiring care and judicious effort. The ups and downs of the business of breeding here, the quickly alternating fluctuations in price, have given fine opportunities for shrewd Englishmen to come over and pick off some of the best of our stock, to the great detriment of our future in stock improvement. It will be many years yet before our native cattle throughout the country shall be generally modified and moulded into an improved stock, through the influence of pure blood of the best foreign breeds; and the time has not yet arrived when a drop of it can be spared. And it is to be hoped that some American Bakewell or Colling may arise, and do for our "native" cattle—certainly they have been bred long enough here to have acquired American characteristics—what they did for the long horns and short horns of England; but such a work cannot be expected till we have made a further and more universal advance in the direction of improvement in our horned cattle. Colonel Jaques, of Ten Hills farm, near Boston, Massachusetts, conducted, for several years, experiments of this nature with great success, and it is much to be regretted that they were not continued after his death. The following is a notice of the shipment made by Mr. Thorne in May, 1861, from the London Agricultural Gazette:



THIRD DUCHESS OF THORNDALE.

Short=horn Cow, bred and owned by Samuel Thorne, of Thorndale, N. Y. Six years old.

"The second Duke of Thorndale has been sold to Messrs. Howard & Robinson for 400 guineas; the third Duke of Thorndale has been sold to Mr. MacIntosh for 300 guineas; the fourth Duke of Thorndale has been sold to Mr. Hales for 400 guineas; the Thane of Oxford has been sold to Colonel Pennant for 250 guineas; Imperial Oxford has been sold to Mr. Lawford for 200 guineas; 4th, Lady of Oxford has been sold to Mr. MacIntosh for 250 guineas. These have thus averaged 300 guineas. Besides these, a young bull, Hero of Thornedale, has been sold to Mr. Welch for 200 guineas. These seven animals have thus fetched 2,000 guineas; and Mr. Thorne has received the same he gave to English breeders some years ago for their sires, the two Grand Dukes."

In the report of the meeting of the Essex society, the third Duke of Thorndale and fourth of Lady of Oxford, which were exhibited, but not in competition, were alluded to as constituting a feature of no little attraction, with the closing assertion that this "American bull is a superb animal, thick, deep, fleshy, and symmetrical, and of first-rate quality."

The following are the pedigrees of the animals illustrating this article:

SIXTH DUKE OF THORNDALE.

Roan; calved February 3, 1862; bred by, and property of, Samuel Thorne, Thorndale, Washington Hollow, Dutchess county, New York; got by 3d Duke of Thorndale; dam 4th Duchess of Thorndale, by 2d Grand Duke, (12,961;) g. dam Duchess —, by Duke of Gloster, (11,382;) gr. g. dam Duchess 66th, by 4th Duke of York, (10,167;) gr. gr. g. dam Duchess 55th, by 4th Duke of Northumberland, (3,649;) gr. gr. g. dam Duchess 38th, by Norfolk, (2,377;) gr. gr. gr. g. dam Duchess 33d, by Belvidere, (1,706;) gr. gr. gr. gr. g. dam Duchess 19th, by 2d Hubback, (1,423;) gr. gr. gr. gr. gr. g. dam Duchess 12th, by the Earl, (646,) gr. gr. gr. gr. gr. gr. g. dam Duchess 4th, by Kelton 2d, (710;) gr. gr. gr. gr. gr. gr. gr. g. dam Duchess 1st, by Comet, (155;) ——, by Favorite, (252;) ——, by Daisy Bull, (186;) ——, by Favorite, (252;) ——, by Hubback, (319;) ——, by J. Brown's Bull, (97.)

THIRD DUCHESS OF THORNDALE.

Red; calved March 14, 1858; bred by, and property of, Samuel Thorne, Thorndale, Washington Hollow, Dutchess county, New York; got by Duke of Gloster, (11,382;) dam Duchess 66th, by 4th Duke of York, (10,167;) g. dam Duchess 55th, by 4th Duke of Northumberland, (3,649;) gr. g. dam Duchess 38th, by Norfolk, (2,377;) gr. gr. g. dam Duchess 33d, by Belvidere, (1,706;) gr. gr. gr. g. dam Duchess 19th, by 2d Hubback, (1,423;) gr. gr. gr. gr. g. dam Duchess 12th, by the Earl, (646;) gr. gr. gr. gr. gr. g. dam Duchess 4th, by Kelton 2d, (710;) gr. gr. gr. gr. gr. gr. g. dam Duchess 1st, by Comet, (155;) gr. gr. gr. gr. gr. gr. gr. g. dam ——, by Favorite, (252;) ——, by Daisy Bull, (186;) ——, by Favorite, (252;) ——, by Hubback, (319;) ——, by J. Brown's Red Bull, (97.)

CHARACTERISTICS OF AYRSHIRE CATTLE.

BY SANFORD HOWARD, OF LANSING, MICH., SECRETARY STATE BOARD OF AGRICULTURE.

THE leading cattle-breeders of Britain have of late years, for the most part, aimed to establish in their stock some particular property in a high degree, beef or milk, according to circumstances, being the leading object. Hence it has occurred that British cattle have latterly been classed under the heads of "beef breeds" and "milk breeds." Prominent among the latter is the Ayrshire breed, which originated in the county of Ayr, Scotland, and within the last fifty years has been disseminated over every part of that country where dairying is much practiced.

The breed has also been established in the north of Ireland, forming in several counties the leading stock. A great number of the cows are annually taken into various districts of England, while in several countries of continental Europe the breed has been introduced, and is propagated with care.

It has also been introduced into the United States and the British provinces of North America, and, at the present time, is probably more extensively kept as a dairy breed than any other in the world.

Importations of Ayrshire cattle into this country were made upwards of twenty years ago, but the animals were neither numerous nor generally in the hands of persons who took much pains to increase them. It was not, therefore, until a comparatively late day that the Ayrshires were much known here, or that specimens were sufficiently numerous to indicate the permanent establishment of the breed in this country.

A few remarks in regard to the origin of this valuable breed of cattle, in connexion with their comparative value for dairy purposes, may not be out of place.

It is evident that the modern Ayrshire breed presents a wide contrast to that which occupied the western portion of Scotland many years ago.

Aiton, in his "Dairy Husbandry," speaks of the cattle which occupied Ayrshire fifty years before the time, when he wrote (1806) as follows: "The cows kept in the districts of Kyle and Cunningham (districts of Ayrshire) were of a diminutive size, ill-fed, ill-shaped, and yielded but a scanty return in milk; they were mostly of a black color, with stripes of white along the chine or ridge of their backs, about their flanks, and on their faces; their horns were high and crooked; their pile (hair) was coarse and open, and few of them yielded more than three or four Scotch pints (six to eight wine quarts) of milk a day.

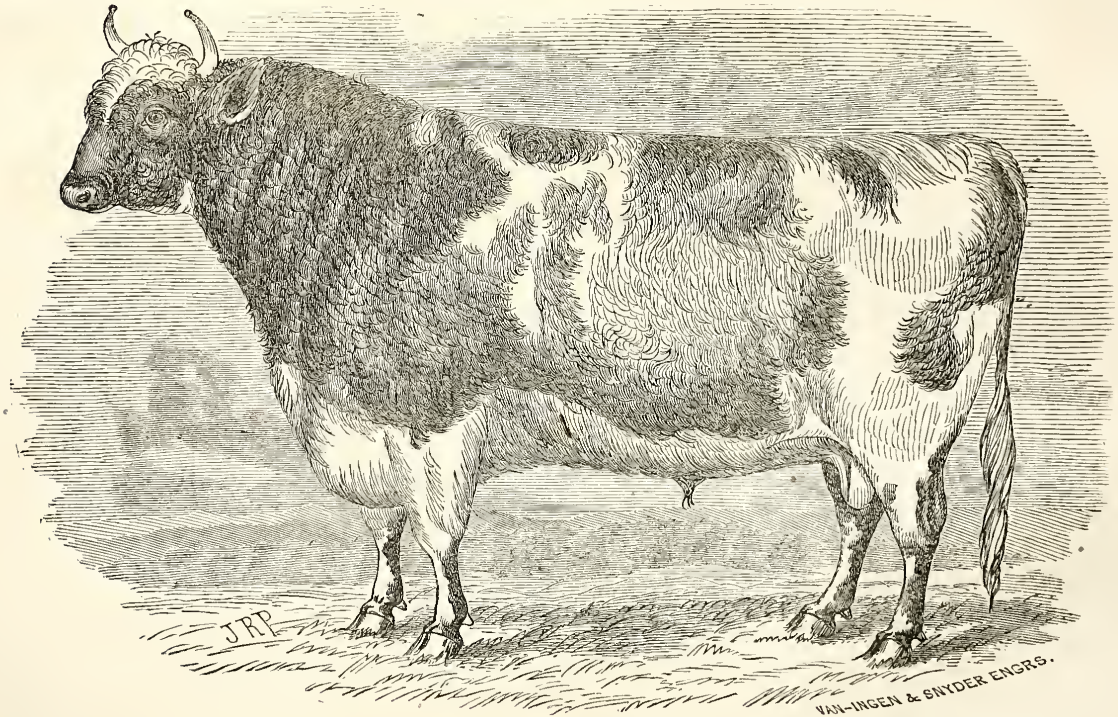
A comparison of these points with those presented by the present breed of Ayrshire cattle renders probable the conclusion of Youatt, that the present stock could not have arisen entirely from the old. It follows, therefore, that the modern breed, like various other valuable breeds of domestic animals, originated in crossing. The question as to the breeds from which it was derived will be briefly considered.

Various accounts represent that the Earl of Marchmont, some time between 1724 and 1740, introduced to his estates in Berwickshire some cattle, conjectured (their history was not positively known) to be of the Holderness or Teeswater breed, and that not long afterwards some of the stock was carried to estates belonging to the same nobleman in that part of Ayrshire called Kyle.

But it is not improbable that the chief nucleus of the improved breed was the "Dunlop stock," so-called, which appears to have been possessed by a distinguished family by the name of Dunlop, in the Cunningham district of Ayrshire, as early as 1780. This stock was derived, at least in part, from animals imported from Holland.

The Dunlop cows soon became noted. Rawlin, (as quoted by Youatt,) who wrote in 1794, speaking of the cattle of Ayrshire, says: "They have another breed, called the Dunlop, which are allowed to be the best race for yielding milk in Great Britain or Ireland, not only for large quantities, but also for richness and quality." This, though perhaps extravagant praise, shows that the stock possessed remarkable properties at that early day. It was, indeed, held in great esteem still earlier. In Youatt's "Treatise" it is mentioned, when speaking of the cattle of Dumfriesshire, that the poet Burns, when he occupied a farm near the city of Dumfries, not content with the Galloway breed, introduced some of the west country cows, which he thought would produce more milk. In the poet's published correspondence allusion is made, in a letter dated November 13, 1788, to a heifer which had been presented to him by the proprietor of Dunlop house as "the finest quey in Ayrshire." Mrs. Dunlop, it will be recollected, was a special friend and correspondent of the poet.

As a further explanation of the preference given by Burns for the "west country cows," it may be mentioned that the writer, when visiting Scotland for the purchase of Ayrshire cattle in the year 1858, had several interviews with the poet's sister, the late Mrs. Begg, of Ayr, in one of which she stated that her brother, during his occupancy of the farm of Ellisland, near Dumfries, "kept



HAROLD.

Ayrshire Bull, imported and owned by H. H. Peters, of Southboro', Mass. Four years-old.

a dairy and made considerable of cheese." His efforts to procure the Ayrshire cows show that they had, even at that time, a high reputation for this object. Colonel Le Couteur, in a paper on the Jersey or Alderney cow, published in the Journal of the Royal Agricultural Society of England, refers to a statement by Quayle that the Ayrshire was a cross of the Short-horn and Alderney, and adds, himself, that "there is considerable affinity between the two breeds," meaning the Ayrshire and Alderney.

Rawlin also says, in reference to the Ayrshire breed: "It is said to be a mixture by bulls brought from the Island of Alderney with their own, or the old race of cows."

Martin says: "At some period or other there has evidently been a cross with the Durham or Holderness, and perhaps, also, with the Alderney breed."

Professor Low, in his "Illustrations of British Quadrupeds," says: "From all the evidence of which, in the absence of authentic documents, the case admits, the dairy breed of Ayrshire cows owes the characteristics which distinguish it from the older race, to a mixture of the blood of the races of the continent, and of the dairy breed of Alderney."

In addition to the foregoing evidence respecting the origin of the Ayrshire cattle, it should be stated that the present leading type of the breed was formed in part by an infusion of the blood of the Kyloe or West Highland breed. This appeared in the first instance, probably, in what has been called the Swinley variety.

The facts, as authentically obtained by myself in Scotland, on this point are substantially as follows: Theophilus Parton, of Swinley farm, near Dalry, Ayrshire, about forty-five years ago, took great pains to establish a herd of what were deemed the best Ayrshire cattle, into which he infused a strain of the West Highland blood, the particular degree of which is not publicly or generally known. The Swinley stock differs from the older Ayrshire in having a shorter head, with more breadth across the eyes, more upright and spreading horns, more hair, and that of a more mossy character, and generally better constitutions. They are also somewhat smaller boned than old stock, though from their superior symmetry and greater tendency to fatten they are fully equal to the former in weight of carcass when slaughtered.

The following points given by the Ayrshire Agricultural Association in 1853, "as indicating superior quality," will give an idea of the standard of Ayrshire cattle as recognized by the leading breeders: Head short; forehead wide; nose fine, between the muzzle and the eyes; muzzle moderately large; eyes full and lively; horns widely set on, inclining upwards, and curving slightly inwards; neck long and straight from the head to the top of the shoulders, free from loose skin in the underside, fine at its junction with the head, and the muscles symmetrically enlarging towards the shoulders; shoulders thin at the top; brisket light; the whole fore-quarter thin in front, and gradually increasing in depth and width backwards; back short and straight; spine well defined, especially at the shoulders; short ribs arched; the body deep at the flanks; and the milk veins well developed; pelvis long, broad, and straight; hook (or hip) bones wide apart, and not much overlaid with fat; thighs deep and broad; tail long and slender, and set on a level with the back; milk vessel (udder) capacious, and extending well forward; hinder-part broad, and firmly attached to the body; the sole or under surface nearly level; the teats from two to two and a half inches in length, equal in thickness, and hanging perpendicularly; their distance apart at the sides should be equal to about one-third the length of the vessel, and across to about one-half of the breadth; legs short, the bones fine, and the joints firm; skin soft and elastic, and covered with soft, close, and woolly hair; the colors preferred are brown, or brown and white, the colors being distinctly defined; weight of the animal when fattened about forty imperial stones, (that is 560 pounds,) sinking the offal.

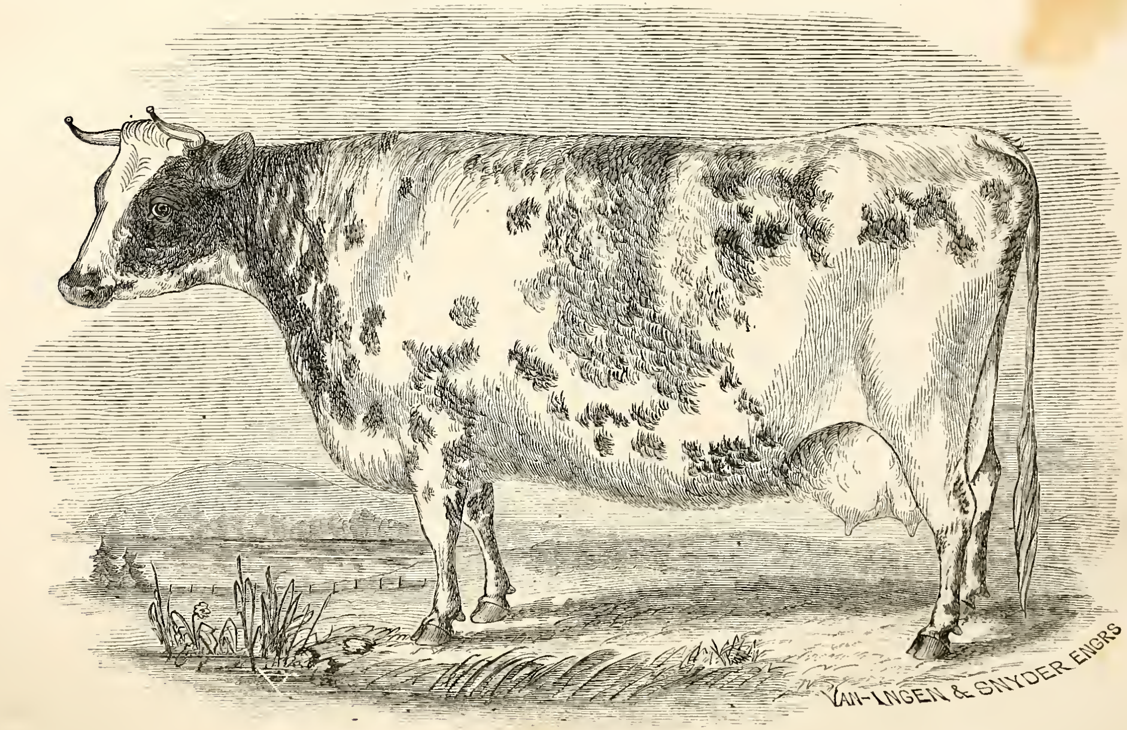
As to the annual returns of Ayrshire cows in dairy produce, Professor Low says: "Healthy cows in good pastures give 800 to 900 gallons of milk in a year." Aiton says "600 gallons a year may be deemed about an average of this breed." And the author of "British Husbandry" says, in reference to this yield: "If equalled, we believe it will not be found excelled by any other breed in the kingdom." Martin says: "The milk of a good Ayrshire cow will afford 250 pounds of butter, or 500 pounds of cheese annually." Milburn's estimate is, that cows of this breed will give from 600 to 800 gallons of milk in the course of the year, and as much as 260 pounds of butter. Haxton cites many statistics, from which it appears that in one dairy of thirty cows the average annual yield of milk was 632 gallons; that 9¼ quarts afforded a pound of butter, amounting to an aggregate of 274 pounds in a year. He adds: "From these data, it appears that the milk of the Ayrshire breed of cows is not only abundant in quantity, but also rich in those substances which constitute excellence of quality, and when with these qualities is considered the small amount of food consumed, the result is so favorable to this breed that few thoroughly acquainted with the subject will refuse to rank the Ayrshire cow among the most valuable for dairy purposes in the United Kingdom."

In the competition at Ayr in 1861, for a prize offered by the Duke of Athol, the average weight of milk per day, for two days, from six cows, was about 50 pounds, the cows being milked twice a day. The cow which took the first prize gave an average of 57 pounds per day. On this occasion, the Duke of Athol stated that the cow (then in his posession) which received the first prize of the previous year had given an average of upwards of twelve quarts of milk per day for a year, actual measurement having shown a product of 1,110½ gallons in something less than twelve months. Comparatively few accurate trials have been made with specimens of the breed in this country. One of four imported Ayrshire cows, owned several years since by the late J. P. Cushing, of Watertown, now Belmont, Massachusetts, gave in one year 3,864 quarts of milk, beer measure. One of the cows, imported by the Massachusetts Society for Promoting Agriculture, in 1837, while kept by the late E. Phinney, esq., of Lexington, Massachusetts, was said to have afforded sixteen pounds of butter per week, for several weeks in succession. The imported cow, Jean Armour, owned by H. H. Peters, of Southboro', Massachusetts, in 1862, gave an average of 49 pounds of milk a day for 114 days, commencing June 1st; and for the month of July her average was 51 pounds 13 ounces per day. Her milk for three days in July yielded six pounds of butter. Her live weight at the close of the trial was 967 pounds.

It will be understood, from what has already been said, that the dairy is the leading object with the breeders of Ayrshire cattle. At the same time the important fact has not been overlooked, that to breed and perpetuate a profitable dairy stock regard must be had to hardiness and strength of constitution, and also to such fattening tendencies as will insure a profitable return from calves, fattened for veal, from steers, reared for beef, and from cows, which, having served their turn in the dairy, are at last dried of their milk and prepared for the shambles.

The importance of these properties is not sufficiently regarded by keepers of dairy stock in this country. Even if milk were the sole object, it would be impossible to preserve a breed possessing superior qualities in this respect, without giving attention to those points of form which denote strength of constitution. It has been well observed by Magne that "in the breeding of dairy stock we should make choice only of animals possessing the *two-fold character* of general vigor and activity of the mammary system."

These principles have been followed to a considerable extent by the leading breeders of Ayrshires in Scotland. Hence they claim a high rank for the breed in reference to general usefulness. Aiton, in speaking of what the



MISS MILLER.

Ayrshire Cow, imported and owned by H. H. Peters, of Southboro', Mass. Eight years old.

Ayrshire cow will do, says "she yields much milk, and that of an oily or butyraceous, or caseous nature, and after she has yielded very large quantities of milk for several years she shall be as valuable for beef, as any other breed of cows known; her fat shall be much more mixed through the flesh, and she shall fatten faster than any other."

Whatever may be said in regard to the extent of these claims, it will be admitted that they indicate the confidence which was long ago placed in the breed in regard to the properties mentioned.

Youatt, who wrote twenty-five years after Aiton, says: "The breed has been much improved since Mr. Aiton described it." It is upwards of thirty years since Mr. Youatt made this remark, and in this time the breed has been still further improved in reference to general usefulness.

It is the unanimous testimony of the most experienced breeders in Scotland, that while nothing has been lost on the score of dairy properties, considerable has been gained in hardiness and thrift, and in the faculty of giving a greater return both in milk and flesh, for the food consumed.

The common course in Scotland with calves of the Ayrshire breed that are not wanted for keeping up the dairy stock, is to fatten them for veal, or turn them for beef at an early age. The larger portion perhaps of the males are killed for veal. In some districts the fattening of calves is an object of considerable importance, and the superiority of Ayrshire cows for producing the best quality of veal is acknowledged. Thus Haxton observes, "for all medium soils and climates throughout the United Kingdom, there is no breed equal to the Ayrshire for profit whether the produce is converted into cheese, butter, or veal. Scotch farmers, who are in the practice of fattening stock of various breeds, state that Ayrshire steers at the age of three to three and a half years fatten to as much profit as any, reaching the weight of 700 to 800 pounds, the four quarters, and affording beef excelled in quality only by the West Highlanders and Galloways. The cow Ada, imported and owned by H. H. Peters, of Southboro,' Massachusetts, was slaughtered about the first of April, 1863. Her dressed weight was as follows: beef, 882 pounds; tallow. 111 pounds; hide, 70 pounds; making a total of 1,009 pounds. The quality of the beef was pronounced by all who tried it superior to any they had before tasted, being high-flavored, fine-grained, and well *marbled*. This cow was seven years old.

Few trials have yet been made with the Ayrshires in reference to fattening in this country, as most of the males have been kept for bulls, and the females have seldom been turned for beef till too far advanced in years to breed. As they become more numerous, however, the males will be more frequently castrated, and their value for beef, and also for labor, will be ascertained. Some breeders of the stock are now rearing steers, with the intention of working them in the yoke. There is no reason why Ayrshire oxen should not be equal to any of their size for labor. They are about the size of Devons, have clean strong legs, well placed muscles, and are generally very quick walkers.

Among the earlier importations of Ayrshires into this country were those of the "Massachusetts Society for Promoting Agriculture," about 1835 or 1836. A bull imported at this time was kept for one season or more in the neighborhood of Pittsfield, Massachusetts. Mr. C. N. Bement, who then had a farm in the vicinity of Albany, New York, and was breeding Short-horns, sent some cows of the latter breed to the Ayrshire bull alluded to, and reared several cows of this cross, with which he was so well pleased that he afterwards imported or obtained some full-blood Ayrshires, which he kept and bred from for several years, finally disposing of the stock to E. P. Prentice, of Albany, New York.

In 1844 the "Massachusetts Society for Promoting Agriculture" made another and larger importation of Ayrshires, and in 1858 they imported ten heifers and four bulls. These were subsequently sold by auction, with their progeny, and served to disseminate the blood very generally through Massachusetts. The late J. P. Cushing, of Watertown, Massachusetts, imported several Ayrshire cows and a bull about 1838. Near this time the late Captain Randall, of New Bedford, Massachusetts, commenced his importations, of which he made several, previous to 1844. Hon. Daniel Webster, also, imported some Ayrshires about 1840.

Mr. Ward, of Lenox, Massachusetts, imported several animals of this breed about 1840 to 1842, some of which were very fine specimens of the so-called Swinley family. These subsequently passed into the hands of Mr. Prentice, of Albany, New York, as did also a portion of the herd of Captain Randall; the best portion of Mr. Prentice's herd was purchased a few years since by William Birnie, of Springfield, Massachusetts. The late R. L. Colt, of New Jersey, Mr. Watson, of New York city, and others of that city and neighborhood, made various importations from 1844 to 1855, and, perhaps, later. The first importation of the fine stock known as that of Hungerford, Brodie & Co., Brodie & Campbell, &c., of Jefferson county, New York, was made in 1853.

H. H. Peters, of Southboro,' Massachusetts, made his first importation of Ayrshires, consisting of four heifers, in 1858; a further importation of twenty-one females and two males was made in 1859. This herd now numbers ninety animals, and is the largest of this breed in the country. Mr. Peters has bred with great care and judgment, of which his splendid herd is a full testimonial. He intends to pursue the course of English breeders, and have an annual sale of such stock as he can spare.

The prominent position which the Ayrshires are taking, particularly as a dairy stock, is indicated by the fact that a herd-book of Ayrshires was issued in 1863, under the auspices of the "Association of Breeders of Thorough-bred Neat Stock," (Henry A. Dyer, of Brooklyn, Connecticut, Secretary,) in which are recorded the pedigrees of seventy-nine males and two hundred and seventeen females, nearly all owned in New England. It is much desired that breeders from other sections of the country should send their stock for record.

HOGS AND PORK PACKING IN THE WEST.

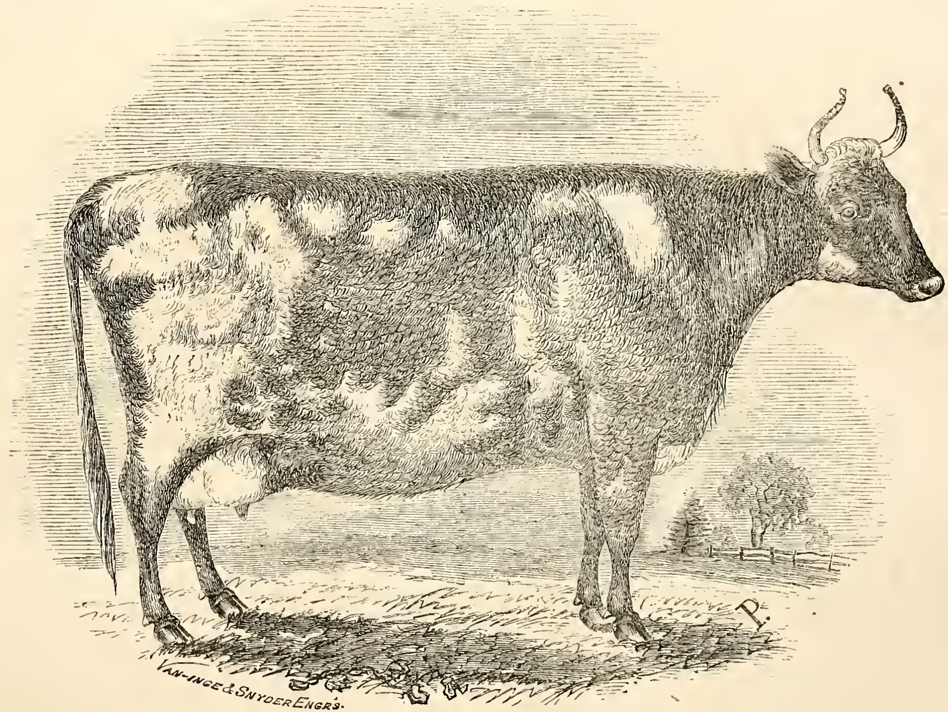
BY H. D. EMERY, CHICAGO, ILLINOIS

THE POINTS OF A GOOD HOG.

An English writer gives the following as the points of a good hog:

"Sufficient depth of carcass, and such an elongation of the body as will insure a sufficient lateral expansion. Let the loin and chest be broad. The breadth of the latter denotes good room for play of the lungs, and a consequent free and healthy circulation, essential to the thriving or fattening of any animal. The bone should be small and the joints fine. Nothing is more indicative of high breeding than this; and the legs should be no longer than, when fully fat, would just prevent the animal's body from trailing on the ground. The leg is the least profitable portion of the hog, and we require no more of it than is absolutely necessary for the rest.

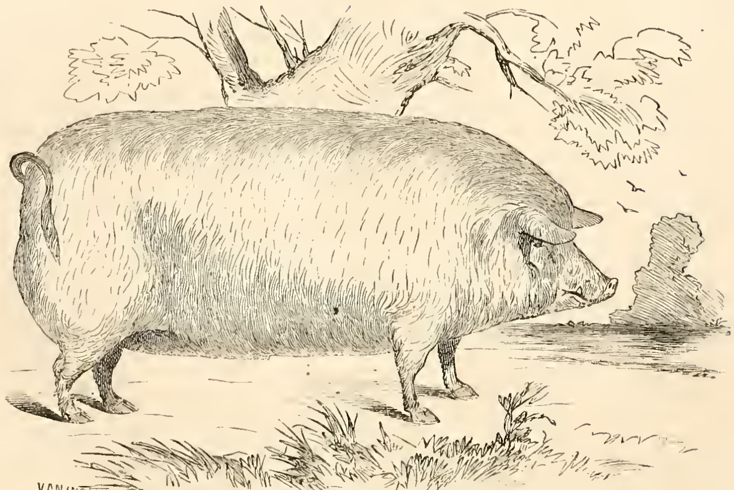
"See that the feet be firm and sound, that the toes lie well together, and press straightly upon the ground, as also that the claws are even, upright, and healthy. Many say that the form of the head is of little or no consequence, and that a good hog may have an ugly head; but I regard the head of all animals as one of the very principal points in which pure or impure breeding will be most obviously indicated. A high-bred animal will invariably be found



MISS DREW, 2d.

Ayrshire Cow, bred and owned by H. H. Peters, of Southboro', Mass. Four years old.

Plate XXXII.



KEYSTONE.

Chester County Boar, owned by H. G. White, of Framingham, Mass.

to arrive more speedily at maturity, to turn out more profitably, than one of questionable or impure stock; and such being the case, I consider that the head of the hog is by no means a point to be overlooked by the purchaser. The description of head most likely to promise, or rather to be a concomitant of high breeding, is one not carrying heavy bone, not too flat on the forehead, or possessing too long a snout. The snout should be short, and the forehead rather convex, curving upward; and the ear should be, while pendulous, inclining somewhat forward, and at the same time light and thin. Nor should the buyer pass even the carriage of a pig. If this be dull heavy, and dejected, reject him on suspicion of ill health, if not of some concealed disord actually existing or just about to break forth; and there cannot be a more unfortunate symptom than a hang-down, slouching head. Of course, a fat hog for slaughter, or a sow heavy with young, has not much sprightliness of deportment."

BREEDS OF HOGS.

There is not uniformity enough in the variety or breeds of hogs grown in the west to describe them under one general head, or to give any one the preference over others for all locations.

The general quality, however, of the present day is far superior to that of twenty or thirty years ago, when it was the exception to find hogs in market weighing over one hundred and fifty to two hundred pounds, and these were principally of the racer breeds, such as must make their mile in about three minutes. These are now known as the "Land Pikes," "Prairie Rooters," "Elm Peelers," &c., &c.

The enterprising "Suckers," "Hoosiers," &c., have, however, found that a much greater profit can be realized in raising a better class of hogs, such as shall mature in the shortest time, and make the heaviest hogs at about eighteen months' age.

As in other sections of the country, the various breeds have had their *run*, such as the Suffolk, Berkshire, Yorkshire, Irish Grazier, Poland, Essex, and Chinese, and more recently the Chester Whites. There are some other hogs that have a more local fame in the west, the most prominent of which is the McGee or Magee breed, originated and disseminated by a gentleman of that name in Ohio.

It is unnecessary to go into a general description and history of these various breeds, as they are too generally known to make it important.

In the northern part of the State the Suffolk and its crosses predominate. There have been large numbers of the Suffolk imported into the west for several years, principally from the Stickney stock, in Massachusetts, Mr. Stickney having been a large importer and breeder.

The Hon. John Wentworth, of Chicago, has also given much attention to the breeding and dissemination of this class of hogs, and has annually a large sale of them.

The west is also largely indebted to Hon. L. G. Morris, of New York, for improvements in the Suffolk hogs. From published foreign testimony the Suffolk stands very high in England.

In the central part of this State it is much more common to meet with the Berkshire breed, either pure or crossed. In 1857 the Illinois Importing Association brought from England several head of Berkshires and others, which were sold at high figures. The Berkshires have proved very prolific, and become very popular. One of the original pigs then brought over ("Siddington") is still alive and doing good service.

The following is a list of the swine brought over and the disposition made of them:

BERKSHIRES—BOARS.

Name.	Age.	Purchaser.	Price.
Edward	1 year	W. D. Sanger	$200
Siddington	6 months	J. C. Crowder	40
Pipton	6 months	W. D. Sanger	35
Gipsey Boy 18th,	7 months	Jesse Cloyd	200
" " 19th,	7 months	E. B. Hitt	150

SOWS.

No. 1	11 months	J. C. Crowder	200
No. 2	10 months	Jos. Stockdale	250
No. 3	1 year	C. Bohnman	380
No. 4	11 months	J. H. Thomas	195

IRISH, CUMBERLAND, AND YORKSHIRE—BOARS.

Boylo	11 months	F. Stevenson	18
John	8 months	S. N. King	10
Pert	8 months	E. N. Tanter	125

SOWS.

No. 1	11 months	J. Stockdale	300
No. 2	11 months	E. B. Hitt	200
No. 3	12 months	J. G. Taylor	205
No. 4	12 months	L. P. Sanger	215
No. 5	12 months	James Hill	40
No. 6	8 months	E. B. Hitt	110

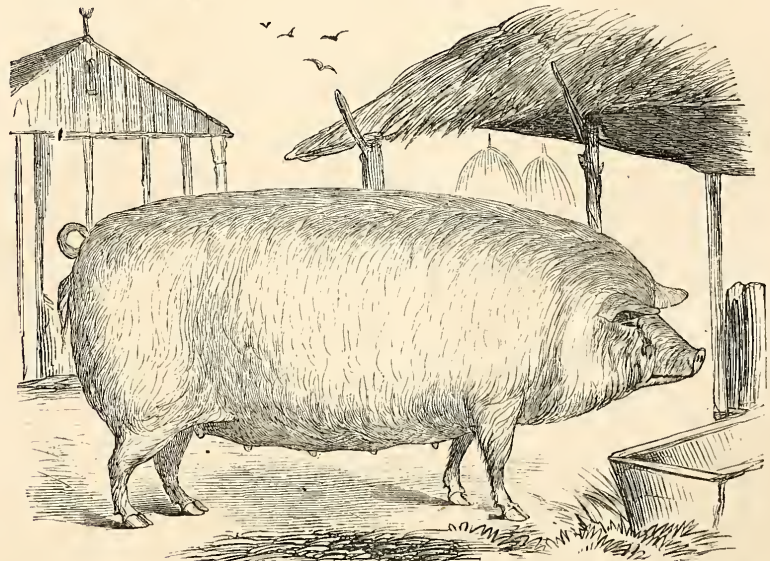
About the year 1840, A. B. Allen, of New York, gave considerable attention to importing improved stock of various kinds; among others he paid especial attention to Berkshire hogs. One boar which he imported, "Windsor Castle," was sold into Ohio for $1,000. From that stock, brought to the central part of this State in 1842 by John Marhard, of Sangamon county, we are indebted to the earliest introduction of the improved breed. There were some of the old style of coarse lop-eared Berkshires there, then owned by J. C. Crowder. These he crossed with the stock of Mr. Marhard. But little more was done in that section in changing the breed, except careful and judicious breeding, until the importation by the association mentioned above, when both these gentlemen, as well as others, improved the opportunity to obtain the stock for crossing with what they already had.

CHESTER WHITES.

The "Chester White" hogs, originating in Chester county, Pennsylvania, have been very generally introduced all over the west, and are very popular, although there have no doubt been many frauds in sending out stock from the east for "pure Chesters" which were not such Paschall Morris, of Philadelphia, one of the most popular and reliable breeders in eastern Pennsylvania, writes us that within three years past he has sent to Illinois, and States north and west of it, about one hundred and seventy-five head, some of which have gone to Kansas and Missouri, and even by the overland route into the territories, where they have been wagoned one hundred or more miles. He has also sent to Mississippi, Liberia, Cuba, &c. Several other men in that region have sent as many or more of that breed into the west. This shows something of the general distribution of that breed. It is claimed by many not to be a distinct breed. It is, however, probably as much so as many of the others. It has at least been known as such in the east for more than a quarter of a century. These pigs have been sold at from twenty to thirty dollars a pair at weaning age.

A gentleman of large experience in the northern part of the State (Whitesides county) says:

"I prefer the Chester Whites and Irish Graziers mixed, using the Chester boar, because they are better adapted to our northern climate than most other breeds. They are more prolific in breeding; their pigs are stronger when dropped. The sows are more motherly while the pigs are very young; they seem to give a greater flow of milk for their young; the pigs are less liable to the scurvy than the finer grades. At eighteen months old they will produce a greater amount of pork to the same amount of feed than any other breeds that I have tried, when they can have a good clover pasture to graze in. They are more inclined to have a good and regular appetite for food than most other hogs that I have tried. On the whole, they prove to me a choice over all other breeds. I have been able to keep up a good stock of hogs of this cross, while finer breeds failed me in both number and weight of pork."



PENNSYLVANIA.

Chester County Sow, owned by H. G. White, of Framingham, Mass.

Another gentleman in Iowa says: The Chester Whites are his favorites, as they are pure white in color, have good coats of hair to stand our northern climate; and they will fatten at any age, are very quiet, not inclined to roam, and will fatten well in good clover pasture. They are great eaters, but grow rapidly. Half breeds of this class of hogs weigh well; three killed at the age of thirteen months weighed respectively, net, 425, 415, and 348 pounds.

BERKSHIRES.

One of our best hog-raisers in Sangamon county, in giving his preferences for the Berkshire hog, says:

"Their flesh is better than the flesh of any other breed of hogs I have ever eaten; it is finer grained, tender and juicy, and when regularly fed is fit for market, or to kill and eat, at any time from four to eighteen months of age. The brood-sows are good nurses, and produce generally from eight to ten pigs at a litter. They are very hardy, and less liable to disease than any other breed of hogs; and I have no doubt, from my experience in feeding and fattening, they will make more pounds of pork on a given quantity of food than any other breed of hogs. The late J. C. Crowder said that he had no doubt that any sow, even the veriest scrub, bred to a Berkshire boar, would produce pigs worth two dollars a head more than any other stock. My own opinion is, they are worth at least one dollar a head more."

This is the testimony of but one or two; but they might be multiplied, giving this breed the preference; but we think, as before remarked, it is more confined to the central district of the State. The color (being black) is, with many, an objection—we imagine mostly of fancy.

SUFFOLKS.

There might be pages of testimony given in favor of Suffolks. Certain it is that when well kept and carefully cared for they produce pork which brings the best of prices in this market, and many choice lots are selected each year for the eastern markets, where they bring the highest price. We think it no exaggeration to say that we believe three-fourths of the hogs of northern Illinois have strains of Suffolk blood, and to their introduction may be attributed much of the improvement observable in years past. It is not uncommon to meet with lots averaging 400 pounds in weight, at eighteen months old; and when well cared for, and not kept too fat while young, very readily reach 300 pounds.

The pork of the Suffolk will almost always make "prime mess."

A gentleman in Will county, who raises and feeds a large number of hogs for the New York market, prefers the Berkshire crossed with the Irish Grazier, which latter in their native state are of about a rail's length, and require three or four years to come to maturity. By this cross he obtains a very uniform hog, which, at eighteen months' old, will average four hundred pounds, gross. His practice is not to wean spring pigs until September, and while at pasture feeds a small amount of corn daily during the whole season.

HOG RAISING.

But few of our largest *feeders* raise their own stock, preferring to pick them up as they can buy them, at weights ranging from one hundred to one hundred and fifty pounds, when they can do it at low rates, often buying in the Chicago market, and taking back into the country to feed.

The practice of the most successful breeders is to arrange to have the pigs dropped in March or early in April. It is a usual custom with many to arrange the pens for breeding of convenient size for two sows, placing them together, with but little bedding, keeping all clean and well ventilated; giving the sows generous and regular feed, especially after the pigs have been dropped; keeping them together until about three to four months old, when the pigs are weaned, they having already learned to eat well aside from their mothers. The practice of some is not to wean at so early an age.

To prevent loss of pigs by overlaying, the best arrangement known is to provide the *two* sides of the pen, where the bed is arranged with a board or joist running along the sides about eight inches from the floor, and ten or twelve inches from the side of the pen. This gives a chance for the pigs to slide under it out of the way of being crushed. There is annually a large loss of pigs from overlaying, which might nearly all be avoided, if attention were given to this small matter. It is the custom in the summer to give hogs a range of pasture, some giving them the chance with other stock only, while the appreciating ones prepare a good clover pasture for their benefit, on which they do well without grain, though some feed sparingly of corn during the season of good pasturage, increasing the feed of corn until pasture fails, when they are forced ahead with all speed for the market, if the stock is to be marketed that fall. Old corn is found much more desirable and economical to feed to fattening hogs. Hogs while at pasture should be frequently *moderately* salted, say once a week, and have access to good water, but not to wallow in. In feeding corn, the feed should be only all they will eat up clean.

COOKED FEED.

There is no difference in the opinions of men who have thoroughly tried cooked corn feed for hogs while fattening. The *feed* goes further, and the hog will gain more rapidly on such feed, some careful feeders placing the saving at least 30 per cent. over corn fed in the ear. The advantage would not be so apparent, probably, were the hogs to have the range of a pasture, as the change of feed and exercise would secure a better digestion of dry corn. The recent inventions for cooking large quantities of feed at a small expense by the use of a portable steam boiler made for the purpose, which is very safe, has done much to encourage this method of feeding. The food to be cooked is placed in any convenient receptacle, such as a hogshead or tank made for the purpose, the steam to be conveyed to them through a flexible pipe, which is readily turned from one to another, as desired.

The same apparatus is very convenient at killing time for heating water and trying out lard.

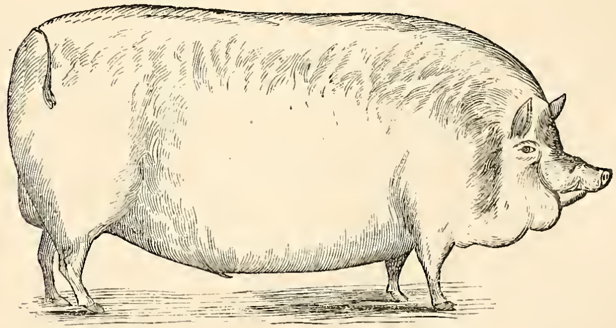
FIELD FEEDING.

In the large cattle feeding districts, where corn is usually to be found cheap, the practice is to have two *feeding lots* near the corn-fields, the corn is cut up and drawn to one of these yards, where the cattle feed for one day. The hogs (one to three, as the size and age may warrant for each head of neat stock) are then turned in to pick up and eat the corn scattered by the cattle, while the cattle are turned into the other feeding lot and fed with fresh corn from the field. Thus they are alternated until the cattle are turned off to the markets, which is generally some weeks previous to the hog market. The hogs are then put on *old* corn and pushed as fast as possible until ready for market. The practice with some is to let cattle and hogs run together; there is, however, much more danger of being trodden upon or injured by the cattle. The usual age for marketing hogs is from sixteen to twenty months.

DISTILLERY FEEDING.

This has been a favorite method of feeding hogs. They are usually picked up early in the spring at weights ranging from 100 to 150 pounds, and placed in pens, when the slop is conveyed to them in troughs while hot. It is not uncommon to confine them without ever removing them from the pens until taken to the slaughter-house. At other places where distilleries are situated contiguous to ranges, they are allowed the range of a pasture, where they obtain a change of feed.

PLATE XXXIV.



LORD WENLOCK.

Suffolk Boar, imported by Col. Lewis G. Morris, of Fordham, N. Y.

Since the prevalence of the hog cholera, which has at times raged so violently over many parts of the west, the distillers have found it very precarious business to feed them, as often half to three-fourths of a lot of hogs are swept off in a single season. At other times a very small per centum is lost from any cause. This method of feeding is then found very profitable. Hogs are usually kept at the distillery until October, when they are sent to market to give place to cattle, which are found much more profitable and safe to feed through the winter season. In this time hogs put in at 125 to 150 pounds will usually average from 275 to 300 pounds, some, of course, attaining very heavy weights.

The quality of pork made on still slops is not such as is suitable for packing, unless for immediate use, as it is very soft and juicy, neither does it bring as good a price as other pork for packing. The lard obtained is neither of as good and desirable quality as that from corn-fed hogs. The meat is said not to take salt well, it being so soft that the salt forms a kind of crust on the outside of the meat, leaving the inside fresh, which would soon cause it to taint and become rusty.

Considerable of this quality of pork finds its way to market during the warm weather, and is sold fresh from the butcher's stalls, it being in a good condition for market through the summer.

The hams of still-fed hogs, when carefully treated and cured, are considered superior for their rich and juicy character.

Still slops are the residue, after distillation, of corn, oats, rye, and barley, about seven-eighths of which is corn, the whole being mixed with water in the proportion of forty gallons to one bushel of grain.

PRICE OF CORN AND PORK.

From careful calculations made with Berkshire hogs, they have been found to gain two pounds per day for two months, (the usual time of feeding,) during which time they have consumed ten bushels of corn each. If the pork sells at at 5 cents per pound, this would give (say 60 days) 120 pounds gain, $6, which would be 60 cents per bushel for corn—certainly a good disposition to make of "ten-cent corn." From these data some idea can be formed when it would cease to be profitable to feed corn.

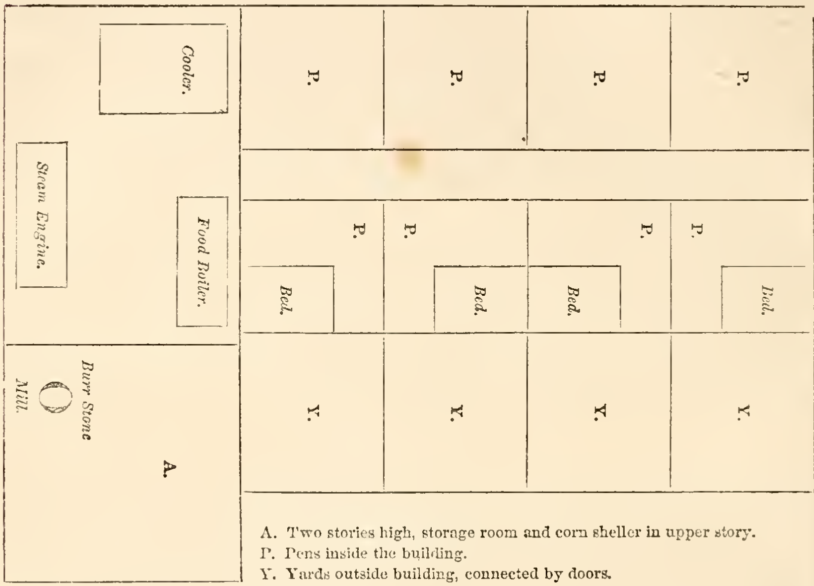
INDIVIDUAL PRACTICE.

We give annexed the practice and statistics of a gentleman in Ogle county who has had considerable practice in feeding hogs and been very successful. We give it in his own words:

"I raise the Chester Whites; they are very good. I can make hogs at eighteen months old average 350 pounds, live weight, without any difficulty. From what experience I have had with ground and cooked feed, I am satisfied it is preferable to whole corn by at least from three to four pounds of pork per bushel of corn. I do not, however, confine my hogs to cooked food entirely, as after they have eaten all they will of the cooked feed they will eat whole corn greedily. I have frequently fed them corn first, and after they had eaten what they would of it would eat heartily of the cooked food. Hogs do better to moderately salt their cooked food; they also eat it much more readily, and keep in better health. Since August last I have fattened 150 head, and have not had a sick hog to trouble me. In the summer I give my hogs the range of a fine grove near which I live. I would prefer to let pigs run with the mother until she weaned them herself, unless there was some special reason for doing otherwise. With good thrifty hogs, I am satisfied I can make fourteen pounds of pork from one bushel of corn, and, under favorable circumstances, more than that. I fattened a pen of hogs last spring, twelve in number, (not quite one year old when turned off,) that gained in weight over one hundred pounds each in seven weeks, the twelve weighing 3,610 pounds."

The annexed outline engraving gives the plan of pen and feed-house of the gentleman referred to. It forms an L, 65 by 91½ feet. The feeding-room, 36 by 70, divided into eight pens, with an alley through the middle lengthwise four and one-half feet wide; outside yards are arranged 16 feet wide, the same length of the pens inside, the passages to which are provided with doors to shut up in severe weather:

PLAN OF HOG HOUSE AND YARDS.



One part of the L is built two stories high, with corn-sheller arranged for shelling, from which it is conducted to the mill below. The other part of the building contains the engine for driving the sheller and mill and furnishing the steam with which to cook the feed. The building is built of stone in a very substantial manner.

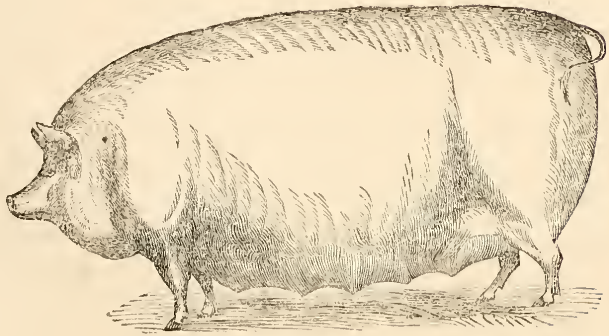
MARKETING HOGS.

The largest number of hogs are marketed on foot, and are generally transported from the nearest railroad station to the great packing centres of the country. A common way with railroad men is to prepare cars with double decks, one above the other, and thus providing for 50 to 75 hogs. This seems a more humane way than to crowd so many as would be necessary in one tier to load a car. In the height of the hog season in Chicago, in the neighborhood of the yards, it would sometimes seem as though we had almost got into a "hog heaven," for, turn which way you will, in the cars, in the yards, in the streets, all is hog, hog; and their cowardly pointed heads always turned earthward, running, grunting, squealing, and all showing a disposition to travel any way but the direction wanted.

During one single day the past season the astonishing number of 122,825 hogs were received in Chicago, and some enterprising statistician has figured them up in this wise:

"Allowing each hog to measure six feet, and all strung in one continuous line, they would form a hog-telegraph 140 miles long; and if each hog were made up into sausages and all

Plate XXXV.



SCAR.

Suffolk Sow, imported by Col. Lewis G. Morris, of Fordham, N. Y.

joined together they would make 5,800 miles of "bolognas"—enough to girt the continent from San Francisco to New York, and give beside a small piece to grace the head of every beer barrel on the route."

But few hogs are now driven any considerable distance on foot for a market. Much the larger portion of the hogs received alive in Chicago are slaughtered here, while many of the better lots finds an eastern market, being shipped in cars, as before described, over the three great routes—the Michigan Central, Michigan Southern, and the Pittsburg, Fort Wayne, and Chicago railroads The statistics of receipts and shipments will be found in another part of this article.

As will also be seen by the annexed statistics, a large number of dressed hogs are brought to market, killed and dressed by the farmers themselves, and either consigned to commission men for a market, or sold from teams as brought in.

HOG TAMING.

The hog in his natural state is a long, lean, cadaverous-looking animal, apparently as wild as when the herd "ran violently down a steep place into the sea." Their noses are in the ground wherever they can be, and if perchance they find their way into the lawn or pasture it is soon full of unsightly spots where the turf is overturned. That they obtain anything from the earth of any value to them as food, compared to the injury they do, is not generally believed, while it is known that they really consume considerable earth or clay, which by many is deemed decidedly injurious to a growing hog.

Various devices have been resorted to for many years to prevent their rooting by ringing them, some with a simple wire ring put through the centre cartilage of the nose; some by cutting off the gristle or rim from the upper end of the nose with a knife or chisel; others by simply cutting the gristle or rim loose in the centre, leaving it hanging at the two ends. This latter, when well done, seems to be the best of all ways, as in the winter it is not like a metallic ring, accumulating frost and mud on the end of the nose to annoy and make the nose sore, neither is it ever in the way of eating. Hogs thus treated are far more peaceably inclined, seem in a great measure to loose their uneasy wandering disposition, and never afterwards show any disposition to root, especially if the operation is performed when the pig will weigh 30 to 40 pounds. They rest more and take on fat better, and hence the term "hog taming." A simple instrument has been invented, somewhat resembling a pair of shears in form, with a wooden block on one blade and a semi-circular blade on the other. The shears are opened with the wooden block against the end of the snout, the blade brought down, and the work is done. The instrument is known as "Hurd's hog-tamer." But any device which will prevent the hog from rooting is very desirable, and nearly all good feeders practise the "taming" in some manner.

DISEASES.

Nearly all the diseases to which hogs are liable are classed under one head by the masses, and called "cholera;" and the description of the disease and symptoms of the animals are almost as varied as the writers—due, in a great measure, to the want of sufficient knowledge of the anatomy of the hog, and the terms used, to give an intelligible idea of the disease. The most reliable description of the hog cholera that has come under our observation was furnished, in 1858, to the "Medico Chirurgical Review," by Dr. George Sutton, of Aurora, Indiana, and is as follows:

"The hog at first appears weak, his head droops, and sometimes, in a few hours after these symptoms, diarrhœa commences; there is frequently vomiting. In some ca..., the discharges were serous and clay-colored, sometimes dark, also bloody and mucous, resembling those of dysentery. The urine at first was generally small in quantity and high-colored, but, as the animal recovered, it became abundant and clear. This was one of the symptoms by which the men who were attending the hogs at the distillery ascertained that they were recovering. In a large number of cases the respiratory organs appeared to be principally affected, and there was coughing, wheezing, and difficult respiration. In some instances the animal lost the power of squealing, and the larynx was diseased. There was frequently swelling of the tongue and bleeding from the nose. In those cases, where the respiratory organs were the principal seat of the disease, there was generally no diarrhœa or dysentery. In many instances the ear, or the side of the head, were very much inflamed, the ear swollen to twice its usual thickness. This inflammation would spread along the skin, sometimes over the eye, producing complete blindness. Sometimes one or more legs were inflamed and swollen, and the inflammation also extended along the body. The skin where it was inflamed was red and swollen. Some had large sores on their flanks or sides from three to six inches in diameter. In one instance the foot became ulcerated and sloughed off, and the animal recovered. Some appeared delirious, as if there was inflammation of the brain. Sudden changes of the weather, particularly from warm to cold, appeared to increase the fatality of the disease."

The disease has of late been very wide-spread, and in many localities has been extremely destructive, so much so at times as to almost devastate some large districts of hogs, the farmers turning their attention to other pursuits.

The treatment of the disease has been varied, and of course with varying results, without there being any settled course of practice pursued alike by any considerable number of people.

As a preventive, Dr. G. W. Wallace, in the "Prairie Farmer," of July, 1859, advised giving from five to twenty grains of calomel to a hog, two or three times a week, during the prevalence of the disease. He had thus been exempt from the cholera, while his neighbors lost a great number. His neighbors used it, and the cholera disappeared.

A writer in the Country Gentleman has found a strong drench of alum-water effective, dissolving all the water would bear, and giving to them about one pint each of the solution, and also giving to the lot (about one hundred head) one pound of powdered alum in swill, fed each day for two weeks. Out of a lot of twenty-two affected head thus drenched, he lost five; of the remainder, fifteen permanently recovered.

Dr. E. M. Snow, in the Agricultural Report for 1861, gives some valuable suggestions relating to the treatment of this animal.

Prof. J. B. Turner, of Jacksonville, communicated the following cure, which has proved effectual with him:

"Take one peck of ashes, four pounds of salt, one pound of black antimony, seven pounds of copperas, one pound of sulphur, a quarter or one-eighth pound of saltpetre, pound the ingredients fine and mix them well, and keep them constantly in a trough by itself, and each hog will eat what he needs of the medicine from day to day. If predisposed to cholera they will eat it much more freely than if wholly well; and at such times the expense will be considerable. If through any cause a hog get down, pour down him, or induce him to drink in slops, one gill of coal-oil per day."

The wide-spread prevalence of the disease has attracted much attention from the learned men of the land, without coming to any definite course of treatment to be pursued.

The best preventive is, most likely, to keep hogs from the filth they are so often allowed to indulge in, giving them regular and wholesome food, and good pasture in season, and moderate salting.

There have, at various times, appeared individuals who claimed to have discovered a specific cure for it, and holding it a secret while they petitioned State legislatures and Congress for aid or compensation by large appropriations.

The latest of these men is one in our own State, Mr. G. W. Kinney, of Albion, Illinois, who has repeatedly presented the matter to our State Agricultural Society's executive board and our State legislature, in order to get an appropriation, which he would deem compensation, when he would make his discovery public.

The State board last winter chose a committee to use his remedies, and report upon the same. We have no knowledge of their ever having made a report as yet. We have, however, learned from them something of the results. Captain James N. Brown, of Sangamon county, who was one of the committee, administered the medicine as prepared by Mr. Kinney to a lot of hogs, which were dying very rapidly. They at once began to improve rapidly, and soon lost all traces of the disease, which did not appear again for several months, and then slightly. The medicines again administered had the same effect.

At the last State fair, held at Decatur, we saw and conversed with several intelligent farmers who had purchased the privilege of using from Mr. Kinney. and had tried it with like results, and highly recommended the remedies.

Mr. Kinney's theory of the disease, as given by him before the executive board, is that the seat of the disease is at first in the lungs of the animal, the lungs of every diseased animal containing a knot of small worms. In the first stages of the disease he gives a medicine to be inhaled as the hog takes to food. In the third and last stage, other medicine is required to regulate the action of the bowels. Mr. Kinney stated that to the "undetective eye" it was difficult to discover the disease in what he calls the first two stages. The symptoms he describes as follows:

"The first thing to be noticed in the diseased hog is weakness in the eyes, the water flowing from them, together with the forming of dark spots under the eyes. In the second stage there is discoverable a slight shrinkage of the shoulder, something like that of the shoulder of a horse in case of sweeney, connected with slight coughing. In the third stage there is great thirst, a drawing up of the hindquarters, a sign of great weakness, and a refusal of food."

The third stage, Mr. Kinney asserts, is nearly identical with the first symptoms, as described by Dr. Snow, of Providence, Rhode Island, and is extremely difficult to overcome.

HISTORY OF PORK PACKING IN CHICAGO.

The history of Chicago as a centre of trade, in very many branches of industry, shows a progress without parallel in the annals of trade. Chicago now stands first among American cities in the amount of grain, lumber, and provision trade transacted here. Its natural location as the receiving and distributing point for both eastward and westward bound merchandise, together with the energy and enterprise which have been shown by its business men, have mutually contributed to this rapid development.

The earliest packing or slaughtering done here was as early as 1827, when Archibald Clybourn erected the first slaughter-house, for the especial purpose of supplying the garrison then at Fort Dearborn. But little was, however. done beyond the immediate consumption until in 1833, when the tide of emigration set westward quite strongly, creating a larger demand, and in such shape that it could be transported. During the fall of 1835 Mr. Clybourn packed about 3,000 hogs, besides considerable beef, for which a ready market was at hand. To obtain this stock it had to be picked up at long distances from Chicago, and was driven on foot to the city. About this time other enterprising men commenced to pack both pork and beef, the surplus of which found a market at the east.

Each succeeding year added more firms to this branch of business. The slaughter-houses were principally located upon the south branch of the Chicago river, it affording a sewer into which the offal and filth were freely poured, which, with the great increase of later years, has proved such a nuisance, and caused an edict to go out from the city fathers that it should be used as such no longer. Many of these houses are so located that vessels can be laid along side of the docks, and shipments made without any extra handling of the stock when ready for market; they also have tracks connecting with all the principal railroads, so that hogs can be delivered at their doors. There are fifty-eight different establishments in Chicago doing a general packing business the present season. The following table will show the hogs packed in the city for the several seasons:

1853–'54	52,849
1854–'55	72,694
1855–'56	80,380
1856–'57	74,600
1857–'58	99,262
1858–'59	185,000
1859–'60	167,968
1860–'61	231,335
1861–'62	511,118
1862–'63	970,264
1863–'64	904,159

The average yield of lard and weight of hogs packed during 1863–'4 is as follows:

Yield of lard	34 pounds.
Average weight	192 pounds.

The following table shows the number of hogs received and forwarded for the respective years, including live and dressed:

Year.	Received.	Forwarded.
1858	540,486	192,013
1859	271,204	110,246
1860	392,864	227,164
1861	675,902	289,094
1862	1,348,890	491,135
1863, estimated	1,900,519	810,959

The receipts of hogs at Cincinnati, the next largest point to Chicago, for a series of years, are as follows:

1853	275,665
1854	328,885
1855	313,702
1856	328,855
1857	302,698
1858	346,878
1859	404,126
1860	300,077
1861	315,841
1862	479,698
1863, estimated	400,000

PORK PACKING AT DUBUQUE, IOWA

Hogs packed in 1862–'3	12,585
Hogs packed in 1863–'4	13,200
Average weight of hogs, 1862–'3, pounds	229
Average weight of hogs, 1863–'4, pounds	208
Hogs bought and shipped from Dubuque without packing, in 1863–'4.	25,300

PORK PACKING AT TERRE HAUTE, INDIANA.

Number of hogs packed	49,674
Average weight	$176\frac{60}{100}$ pounds.
Yield of lard per hog	$22\frac{69}{100}$ pounds.

The number packed in Louisville and around the Falls is estimated for the season at 103,996, being a falling off from the previous year of some 11,000 head.

At St. Louis the estimated number received and packed is 200,000, which is an increase of over 20,000 head from the previous year.

The receipts at most other western packing points have fallen somewhat in numbers.

The whole decrease in number in the west has probably amounted to 20 per cent., and in weight at least 12 to 15 per cent. The decrease in lard will be very large, as the hogs were turned off unusually early, in light condition, as the corn crop was so badly injured by early frost in August, and the high prices obtainable for it would not warrant putting it into pork.

The following are the prices that have been paid in Chicago the first and third week of each month for live and dressed hogs during 1863:

1863.	Live hogs.	Dressed hogs.
January 3	\$2 80 *a* \$3 90	\$3 85 *a* \$4 40
January 17	3 25 *a* 4 00	3 75 *a* 4 75
February 7	3 55 *a* 4 40	4 15 *a* 5 00
February 21	3 60 *a* 4 55	4 00 *a* 5 15
March 7	3 65 *a* 4 85	4 40 *a* 5 75
March 21	3 75 *a* 5 12½	
April 4	2 00 *a* 4 75	
April 18	3 50 *a* 4 95	
May 2	3 75 *a* 4 25	
May 16	3 00 *a* 4 12½	
June 6	3 75 *a* 4 25	
June 20	3 80 *a* 4 50	
July 4	4 00 *a* 4 55	
July 18	4 00 *a* 4 50	
August 1	3 75 *a* 4 25	
August 15	3 00 *a* 4 00	
September 5	3 60 *a* 4 65	
September 19	3 80 *a* 4 90	
October 3	3 50 *a* 5 00	
October 17	3 50 *a* 4 90	

The following table gives the current prices of provisions at Chicago during the season of 1863–'64 :

Date.	Live hogs, gross.	Dressed hogs, net.	Mess pork.	Prime mess pork.
November 7, 1863	$3 25 *a* $4 80	$4 50 *a* $5 25	$15 25 *a* $15 50	$13 00 *a* $13 50
November 14, 1863	4 25 *a* 5 20	5 00 *a* 6 00	16 00 *a* 16 50	13 50 *a* 14 00
November 21, 1863	4 25 *a* 5 50	5 50 *a* 6 50	17 25 *a* 17 75	14 50 *a* 14 75
November 28, 1863	4 25 *a* 5 25	5 50 *a* 6 00	17 00 *a* 17 25	13 75 *a* 14 00
December 5, 1863	4 85 *a* 6 25	5 50 *a* 6 50	17 25 *a* 17 50	13 75 *a* 14 00
December 12, 1863	4 50 *a* 6 00	5 50 *a* 6 00	17 00 *a* 17 25	13 75 *a* 14 00
December 19, 1863	4 75 *a* 6 25	5 80 *a* 6 80	17 25 *a* 18 00	14 00 *a* 15 00
December 26, 1863	5 35 *a* 6 35	6 00 *a* 6 75	18 00 *a* 18 50	14 50 *a* 15 00
January 2, 1864	5 25 *a* 6 25	6 10 *a* 7 25	17 50 *a* 18 50	14 50 *a* 15 00
January 9, 1864	5 50 *a* 7 00	6 60 *a* 7 60	18 00 *a* 18 50	15 00 *a* 15 25
January 16, 1864	6 00 *a* 7 00	6 75 *a* 7 75	19 25 *a* 19 75	16 00 *a* 17 00
January 23, 1864	5 50 *a* 6 50	6 35 *a* 7 35	19 00 *a* 19 50	16 00 *a* 16 50
January 30, 1864	6 00 *a* 6 90	6 85 *a* 7 85	18 00 *a* 19 00	16 00 *a* 16 50
February 6, 1864	6 00 *a* 7 00	7 00 *a* 8 00	19 00 *a* 19 50	17 00 *a* 17 25
February 13, 1864	6 75 *a* 7 75	8 00 *a* 8 50	19 00 *a* 20 00	17 00 *a* 17 50
February 20, 1864	6 75 *a* 7 75	8 00 *a* 8 50	19 50 *a* 20 00	17 50 *a* 17 75
February 27, 1864	7 00 *a* 7 75	7 75 *a* 8 00	19 50 *a* 20 50	17 50 *a* 18 00
March 5, 1864	7 00 *a* 8 00	7 60 *a* 8 00	20 00 *a* 20 50	18 00 *a* 19 00
March 12, 1864	7 00 *a* 8 00	7 35 *a* 7 75	20 00 *a* 20 50	18 00 *a* 19 00

Date.	Prime lard.	No. 1 lard.	White grease.	Yellow grease.	Bulk meats.			Sugar pickled hams.	English meats.					
					Hams.	Sides.	Shoulders.		Short boneless.	Short middles.	Long boneless.	Long middles.	Cumberlands.	Long cut hams.
November 7, 1863	10⅝	10½	9½	9	......	......	......	......	......	......	....	....	....	7¾
November 14, 1863	11⅛	10½	9½	9	8	7	5	......	7	8¼	8¾	8	7¼	8½
November 21, 1863	12	11¼	9¾	9¼	8½	7½	5½	......	9½	8¾	....	....	7¾	9
November 28, 1863	11⅛	11	9½	9	8¼	7¾	5⅛	......	9¼	8½	....	....	7⅛	....
December 5, 1863	11¾	11¼	9⅝	9¼	8½	8	5¾	8¾	9¼	8½	....	....	7½	9¼
December 12, 1863	11⅝	10¾	9½	9	8½	7½	5½	8⅞	9	8¼	8⅛	8	7¼	9
December 19, 1863	11¾	11½	9¾	9¼	8½	7¾	5½	9	9½	8¼	....	....	7⅛	9½
December 26, 1863	12	11½	9¾	9½	9	8¼	6	9¼	9¾	8⅝	9	8½	7½	9¾
January 2, 1864	12	11⅛	10	9⅛	9	8	6	9⅛	10¼	9	....	....	8	10
January 9, 1864	12¼	12	10⅛	9¾	9¼	8¼	6¾	10	10¼	9	....	....	8¼	10⅛
January 16, 1864	12½	12	10⅛	10	9¾	8¾	6¾	10⅞	10⅛	9½	10	9	8⅛	10⅞
January 23, 1864	12	11¼	10¼	9½	9½	9	6¾	10¼	10½	9½	....	....	8½	11
January 30, 1864	12	11½	10½	9½	10	9	7	10¾	10¾	10	....	....	9	11¼
February 6, 1864	12	11½	10¾	9½	10	9	7	10¾	10¾	10	....	...	9½	11⅛
February 13, 1864	12¼	11¾	10½	9¾	10¼	9¼	7¼	11	11	10½	....	....	9½	12
February 20, 1864	12½	12	10¾	9¾	10½	9½	7¾	11⅛	11	10½	....	....	10	12¼
February 27, 1864	12¼	11¾	10⅛	9¾	10⅝	9¼	7¾	11¼	10¾	10	....	....	9⅝	12¼
March 5, 1864	12½	11⅝	10¾	9¾	10⅝	9¼	7¾	12	10½	9¾	....	....	9⅝	12¼
March 12, 1864	12¼	11¾	10¾	9¾	10⅝	9¼	7¾	12	10½	9¾	....	....	9⅝	12⅜

The price for dressed hogs divides on those weighing 200 pounds, the lowest price being for light ones, the others for heavy. The price of live hogs is governed both by quality and supply and demand.

The prices that have been paid for pork have, of course, varied with the years, like all other articles of commerce. The earliest purchases made for packing in 1832 to 1834 varied from $2 to $3 per hundred net. To show the weight of hogs in early days, contracts were sometimes made between packers and drovers for a lot of hogs, for which a given price was to be paid, the hogs to average 150 pounds; for all that they averaged over that 1 cent per pound was to be added, and all that they fell short 1 cent per pound was to be deducted. This was an incentive to produce heavy hogs, the contracts being made early in the season.

A MODEL PACKING-HOUSE.

We give but one description, which will answer for a model one. Others vary according to the business to be done, but the general features are the same; the classification of the meats are the same in all. In the one described but one grade of lard is made, in some there are two or three grades; the parts of the hog producing lard being sorted out, making prime leaf lard, No. 1, &c., &c.

The superior advantages presented by Chicago as a packing point have centered large amounts of capital here in the business, and the packing-houses now are among the wonders of this thriving city, from their completeness of arrangement and the wonderful facility with which the business is conducted. We cannot give a better idea of it than to describe one of the largest and most complete establishments, which has been erected during the year 1863 by Messrs. Jones & Culbertson, and at this writing is in full operation.

The main building occupies a ground-room of 180 by 156 feet, with a lard-house 35 by 156 feet joining, being separated by a heavy brick wall and iron doors to prevent the steam and vapor from entering the main house. The building is three stories high, with nearly a flat roof, which is very heavy and double, perfectly tight, and divided off into yards or pens for receiving the hogs, capable of holding four thousand head at once. The whole building is constructed in the most thorough and substantial manner imaginable. The lower floor is used for curing the meat and storing the material, the second floor for packing and shipping, the third for cooling and cutting up the hogs.

The advantages of having all animals for packing in a natural and healthy state when killed seem not to be generally understood, or at least but few packers give the necessary attention to the condition of the animals when killed to insure the best keeping condition to the meat. If an animal is killed immediately after hard exercise and excitement, as in driving to the slaughter pens, the flesh is in a high state of fever, the marrow is in a semi-fluid condition, and produces what is known as foul joints, and becomes in a short time tainted and eventually spoiled. By the arrangement in the house under description the hogs are driven up an incline to the top of the building, where they have perfectly fresh air and good ventilation. They are allowed to remain there two nights and a day before being killed, and they are then in the best possible sanitary condition they can be.

METHOD OF KILLING.

When all is ready the hogs are driven, some twenty at once, into a small pen with a fine grated floor. A man then enters, and, with a long handled hammer, deals each hog a heavy blow on the forehead between the eyes, which instantly drops him on the floor. After he has lain a few moments, another man enters the pen with a sharp knife and sticks each hog, the blood flowing through the floor, and being conducted by spouts to large tanks outside the building. While this is being done another lot is let into an adjoining pen and served in the same manner. The first lot, by this time, having bled sufficiently, is slid down an inclined plane directly into the scalding tub or vat, made of wood, some six feet wide, twenty feet long, and three feet deep, the water in which is heated by steam-pipes, and kept at a regular temperature; here they are floated along and turned by men at the sides until they reach the further end, where they are taken out of the tub by a simple contrivance, operated by a single man, and deposited upon the end of a long inclined table. Two men stand ready and take from the back in an instant all the bristles that are suitable for the brush-maker and cobbler, depositing them in boxes or barrels for removal. Other pairs of men, standing on opposite sides of the table, divest another part of the hog of its coat and so on through some eight or ten pairs of men, who each have a different part to perform in cleaning the hog, until it reaches the last pair, who put in the gambrel stick and swing it on a hook on an overhead rail-way, there it receives a shower bath of clean cold water, washing it clean from any particles of dirt that may remain, giving it, at the same time, a parting scrape with knives. It then passes along to a man who opens it and removes the large intestines. It then passes to the second man, who takes out the small intestines, heart, lights, &c.; the hog then receives a thorough drench of clean water, and passes to another man who splits the backbone down. They are then taken from the hooks and borne away by overhead road-ways, and hung up to cool, one man being enough to handle the largest hogs with ease. At this point a man loosens up the leaf lard ready to be removed when cooled, which, together with the splitting of the backbone before mentioned, helps very much to thoroughly cool the meat. The hogs are allowed to hang in this cooling-room, before being cut up, two days, when all animal heat is gone.

After the small intestines, &c., are removed from the hog, they are taken by men and boys, and all the fat separated from them and placed in large vats of water to wash it clean, going through two waters, when it is ready to go into the lard tank, which will be described hereafter.

THE CUTTING-UP PROCESS.

Having now got the hog ready for cutting up, he is taken from the cooling-room and carried to the room for this purpose, each hog being weighed as he is brought up, and his weight entered in a book kept for the purpose. Having been rolled on to the block, one blow from an immense cleaver severs the head from the body; another blow severs the saddle, that is, the hind parts, containing the hams; another lays it open at the back; another one for each leg; the leaf lard having already been loosened is now taken hold of with the hands, and instantly stripped out of the carcass. The remainder of the hog is then cut up according to the kind of meat it is most suitable for, the whole cutting-up process occupying but a few seconds of time, two smart men having cut over two thousand in less than eight hours. The usual day's work, however, at this establishment is from 1,100 to 1,200 head.

THE LARD HOUSE.

The size of this building we have given above. In the second story are arranged seven iron tanks, made of heavy boiler iron, twelve feet high, and six feet in diameter, capable of sustaining a high pressure. These extend up through the floor above into the third story, where each one is provided with a large man-hole into which the leaf lard, head, gut lard, and pork trimmings are emptied, until the tank is full, when it is closed and the whole mass subjected to a jet of steam from the boilers, of a pressure of fifteen pounds per inch; each tank is supplied with a safety valve, so that on reaching the maximum pressure allowed, it passes off, causing a continuous flow of steam through the whole mass. By this process every particle of lard is set free from the mass.

One of the tanks is reserved for making *white grease*, into which the intestines, paunches, and all refuse from the slaughter-house are placed, and subjected to the same steam process.

Another tank is used for trying out dead hogs that are killed by accident, suffocation, &c., into which they are dumped whole, with the "pizzles" from the slaughter-house. The product of this is called *yellow grease*.

After the mass in the lard tanks has had steam on the necessary length of time, a faucet is opened midway of the tank, or about where the lard and water would meet, and the lard drawn off into an immense open iron tank, called a clarifier, with a concave bottom, provided with a steam-jacket on the bottom; here it is heated up to three hundred degrees Fahrenheit, sending all foul matters in a thick scum at the top, when it is skimmed off, all heavy matters of dirt, &c., settling on the bottom, this process thoroughly clarifying the lard. A faucet is then opened at the bottom, and the sediment allowed to run out until clear lard appears, when it is shut off, and the balance drawn into the coolers, thence into barrels, where it is weighed and branded pure lard, and the product is the purest article we have ever seen manufactured by any process, it being perfectly free from any unpleasant odor, and as pleasant to taste as new unsalted butter.

After the lard has been drawn from the tanks a large main hole is opened at the bottom, and the whole mass is drawn out in large wooden tanks set even with the floor. Here the mass is again subjected to a boiling heat, by steam-pipes laid around the inside; any remaining grease is thus set free, and rises to the top and is skimmed off. A plug is drawn, the water disappears into the sewer, and is soon mingled with the Chicago river. A gate is opened at the side, and the mass is turned out doors, ready to be carried off. Here you will find every bone that entered the tank whole and sound a bleached mass, so soft that even the teeth of the hog may be easily mashed between the fingers.

The bristles and hair are readily purchased by those who prepare hair for mattresses, "finding" dealers, &c. Thus everything that can be used is extracted, and but little of the original hog remains to be carried off as offal.

THE CURING ROOM.

This we have said occupies the lower floor. The first process is to dress all the meats, except the shoulders, with a solution of saltpetre, which is applied with a swab to the green meat, and while wet with it is covered and rubbed with salt, and then packed in tiers to cure. In three weeks it is all handled over and treated to a second dressing of salt, and again in seven days more, when it is pronounced cured. After lying a few days, the English meats (especially the Cumberlands) are taken and carefully scraped and smoothed off preparatory to packing. These meats are usually packed in square boxes containing 500 pounds.

The barrel meat is packed in the second story. Enough pieces of the various kinds are weighed out for a barrel, (200 pounds.) It is then packed in the barrels, a layer of meat, then salt, until filled, the whole headed up and branded. Each barrel is then filled with as much brine as the barrel will take, and allowed to stand with a small bung open a short time. More brine is added if need be, and the bung closed.

DESCRIPTION OF MEATS.

Mess pork is made of the sides of the thickest and fattest hogs, cut in strips six to seven inches wide, running from back to belly.

Mess O. pork (mess ordinary) is cut from the sides of a lighter class of hogs, ranging from 170 to 200 pounds, cut up in the same manner.

Prime mess is cut from a still lighter class, ranging from 100 to 150 pounds weight, the shoulder being included. While on the block this class, after being divested of the head, saddle, and lard, is cut lengthwise about midway of the ribs, and then cut up cross-ways into 4 pound pieces, so that it takes just 50 of them to make a barrel. It is wonderful with what precision this work is done, the practice of the cleaver making it almost certain that each piece will weigh 4 pounds, or fifty pieces, 200 pounds.

The hams and shoulders are taken by the trimmers—the hams nicely rounded off and shaped; the shoulders the same—when they are dropped through a spout to the lower floor, as is all the other meat cut for curing. The heads, trimmings, leaf lard, gut lard, &c., are all gathered and taken to the lard-house.

ENGLISH MEATS.

Since the large demand for export has sprung up, packers have cut and cured their meats to suit the fancy of the purchasers, (the English style prevailing,) the following being the names and style of cutting and preparing:

Short-ribbed middles.—This is the side of the medium weight hog, (shoulder and ham off,) the back bone removed, and the ribs cracked through the middle.

Short clear is the same part cut from the best hogs, with back bone and all ribs taken out.

Long clear is the side, including the shoulder, with all bones removed.

Long rib is the same as above, with the shoulder and back bone out; ribs left in.

Cumberlands is the shoulder and side together, with back bone out: the shank cut short.

Stretfords.—Sides and shoulders together; the shoulder and bone taken out; shank left in; back bone and upper half of rib removed.

Long English hams is the whole hip, bone being left in, and the ham left the full size.

The feet generally go to the glue makers. Quantities, however, are prepared for eating by thoroughly cleaning and freeing from the toe nails; then thoroughly cooking and pickling in vinegar. In this way large numbers are disposed of, and are often served up at the hotels of the country, and are always found at eating saloons. Sutlers in the army also find a large sale for them among the soldiers, who consider them a great delicacy.

The tongues are packed in barrels, the same as mess pork, and always in demand, large quantities finding a foreign market. For home consumption they are prepared and pickled the same as the feet.

In the works described but one quality of lard is made. In other establishments various grades are established, the best being made from the leaf and trimmings; the second quality from heads and other parts of the hog yielding fat.

Lard oil is made by placing the lard in heavy duck bagging, and subjecting it to heavy pressure, the residuum being stearine, which is extensively manufactured into candles, they being considered very excellent.

CURING AND SMOKING HAMS.

The quality of smoked meat depends very much upon the curing of it previous to smoking.

The process of curing varies with different houses, some applying the saltpetre and salt, and packing in bulk to cure; while others prepare a pickle (sweet pickle generally) by the use of three ounces of saltpetre, and one to two quarts of molasses for a tierce, the brine being made to show thirty degrees of saltness by the meter.

After the meat has lain sufficient time in the pickle, it is taken out and packed in bulk for curing, or, which is better, hung up where it will not freeze, remaining at least four weeks before thoroughly cured through.

The smoke-house should be built so that no meat shall ever come nearer than ten to twelve feet of the fire, and well ventilated at the top, to keep up a good circulation to prevent the house becoming too hot. The fires are made in a hole or pit in the ground, and the material used (green hickory logs) placed in it and fired somewhat like a coal pit, the wood being kept covered pretty much with ashes. Care is taken that the temperature does not rise above 65° or 70°. Corn cobs would be more desirable to use for smoking if they could be obtained, as they impart a better flavor to the meat.

The best weather to smoke meat is when it is clear and pleasant, and the barometer rising. If the temperature out doors is about 50°, it is deemed favorable. With such weather meat will make as much progress in a single day as in several when the weather is damp and foggy. With good weather, and firing day and night, one week's time is deemed sufficient to smoke hams well.

If the meat is designed for shipment to foreign ports, it is seldom ever smoked, but shipped packed in tierces, with salt, like other barrel meat, and the cask filled with the sweet pickle made as above described.

THE OFFAL.

Since the Chicago river has ceased to be the sewer for all the offal from the slaughter and packing-houses, the owners have been obliged to cart it off to the commons and open fields beyond the city limits at a very heavy expense to them.

An enterprising firm has, however, contracted with all the principal firms the present season to carry it all away by the owners paying half the expenses. Instead, however, of carrying it off and throwing away, they have commenced preparing it for fertilizers. They have provided centrifugal machines, into which they place the refuse from the lard and grease tanks, and throw out all the water, leaving only the solid parts, and that in a pulpy or pulverized condition. In this way they will prepare about three thousand tons the present season, all of which will be shipped east for the manufacture of commercial manures.

Another concern is gathering all the bones it can pick up, from which are manufactured large quantities of animal charcoal, and such as are not suitable for that purpose are ground up and sent east, they having shipped the past season over three hundred tons of ground bones alone. Thus the west is not only feeding the people of the east, but feeding their lands.

This should not be. Not one pound of this vast quantity of fertilizer should ever be allowed to leave the great prairies, for the time will surely come when it will be needed.

THE GOAT.

BY ISRAEL S. DIEHL, LATE UNITED STATES CONSUL AT BATAVIA.

THE breeding and raising of goats has of late attracted considerable notice, especially among the foreign and laboring classes of our country, as developing one of the most valuable domestic animals, particularly for its milking qualities, at comparatively little cost; and producing good, cheap food when useless for milk; while with others the experiment is attracting still more attention, arising from some new and valuable wool or fleece bearing varieties which have been introduced and successfully acclimated and reared during the last fifteen years. These are new varieties and uses of the goat in this country, though long and well known in Asia, even from the days of Moses, if not from the days of Adam; for by some naturalists the goat is considered one of the first domestic animals of creation, and is mentioned by Moses and the early Babylonian and Assyrian writers for its fine wool, from which the curtains of the tabernacle and fine cloths and garments were early manufactured. Although a great variety now exists throughout the world, nearly all reliable naturalists maintain that they derive their parentage from the "*Capra Ægagrus*" or wild goat, that still exists in portions of Asia and the Alps of Europe. Linnæus, in his "*Systema Natura,*" gives the common goat, "*Capra hircus,*" an oriental origin, but seems to consider it a distinct species.

Cuvier, in both his editions, considers the "Paseng" *(C. Ægagrus)* to be the parent stock of all the varieties of the common domestic goat, and as still inhabiting the mountains of Persia. Fisher also speaks of the "*Capra Ægagrus*" as being the parent of our domestic goat; and as they have been domesticated for the uses of man for their flesh, fine skin, or wool, or milk, a number of varieties have been originated or created equally varied in different countries, as those of the horse, the sheep, or the cow. These varieties have become distinct and permanent in different localities according to their use, the varied locality or climate, and the attention given to them, and have thus been, and may continue to be, preserved for ages without change or deterioration, if desired, or may be increased in value and multiplied in numbers almost *ad infinitum,* as is now abundantly proven by the history of the past and the successful experiments of most stock-breeders and naturalists.

In the east, throughout Asia especially, the goat has constituted from time immemorial an important part of the flock, and been a source of wealth of the people; and thousands upon thousands of goats may be seen in travelling through India, Persia, Turkey, and other portions of Asia, and some parts of Africa and Europe, more frequently being herded with the sheep of these countries, in order to protect the latter from destruction by dogs, wolves, and jackals, as the goat is decidedly belligerent, not readily frightened or running away, but generally standing its ground, and on the defensive when assailed, often offering battle, and pursuing the canine marauder beyond the borders of the flock.

The Scinde goat, the Maltese, the Assyrian, the Syrian, the Swiss, and other varieties, especially in Europe, have become most valuable milkers, and for convenience and economy to the poor, or where feed is high and pasturage scarce, it has, in many places and instances, supplanted the cow, as it is kept about the house almost anywhere. Especially about towns, villages, and cities,

CASHMERE GOAT.

where there are so many vacant lots and commons where they can browse on the coarsest of food and herbage, or that which is left or refused by the horse, cow, or sheep, is this the case.

The goat, in fact, is an indiscriminate feeder, cropping even poisonous plants with entire impunity and relish, as there are comparatively few plants or weeds that are either injurious or poisonous to it, and no herbage, leaves, or grasses seem to affect the quality of its milk, only rather to give it flavor; and in travelling through Asia, Africa, and parts of Europe, it was quite common to have the goat brought to the door, tent, or camp, and milked for our use in our presence, whenever milk was required, giving us the assurance that the milk was genuine as that of goats. It is much used both by travellers and families, and especially by the inhabitants of the tropical, low, marshy, bilious, and fever countries as a preventive and cure for those and other diseases incident to such countries. The medicinal qualities of goat's milk have long been known and acknowledged, especially in the Old World, and in some portions of this country, it being not only very wholesome, but less likely to curdle on the stomach; and by those who have tested the different kinds of milk it is much esteemed and preferred for tea and coffee, and is largely used for children's use, the making of whey, and the various medicinal drinks for invalids, especially at the various hospitals, watering places, and institutions of Europe, and a few of our own where it has been duly appreciated. It is also said to be highly beneficial to consumptives, dyspeptics, and other like invalids. Still an undue and unnatural prejudice has and does exist in the minds of many people of this country against both the animal and the use of its milk, but without any good reasons.

Valuable varieties of the Asiatic goats have been largely introduced into Europe, where they are quite extensively raised and used for the producing of wool, from which the finest fabrics, shawls, worsteds, de laines, silk velvets, and other fine articles are made, while from the milk, butter, cheese, and whey are made to a considerable extent. They are not unfrequently harnessed to small wagons or carts for marketing or pleasure purposes, or made to pack small loads as beasts of burden. Their use and importance have thus become valuable and indispensable over large portions of Europe and Asia; but notwithstanding varieties of these goats have been imported into the United States by emigrants and people of this country for their own use, the animals have been subsequently neglected, mainly on account of the cheapness of cows and the easy facilities of pasturing them upon the extensive public domains, cheap pasture lands, or commons. But as the land has become occupied and more valuable, the expense of purchasing and keeping cows has increased, and the value of butter, milk, and cheese is enhanced by the enlarged demand, the attention of thousands of our people, especially of the poor and laboring classes, has been turned to the breeding and keeping of goats; their milking qualities have been greatly improved, and their value so increased that we have recently seen common milking goats bought and sold at the price of an ordinary cow a few years ago, namely, from $10 to $25, and any ordinary milking goat is valued at $8 to $10. Most of the milkers give from two to three quarts per day, especially if well fed, tethered, and milked three times daily.

General J. S. Goe, at Brownsville, Pennsylvania, reports an Assyrian goat in his possession milking a gallon per day after the weaning of its kid. A similar goat, now in the writer's possession, is reported to have yielded twenty dollars' worth of milk during the season, after selling two kids at three dollars each. The milk was mainly sold to physicians for patients at ten and twelve cents per quart. A number of the famed Maltese milkers which we examined we were assured yielded nearly the same results, and we have obtained ten cents per quart for some from our Maltese and Cashmere grades for medicinal purposes. Thus around the suburbs of our large cities, in many of the smaller towns, in our coal and mineral regions, and along many of our public works, great quantities of the common goat can be seen in use, while their value is being materially enhanced by more attention to good breeding and valuable crosses. Among the most valuable milkers we have the Maltese, the Swiss, the Assyrian, the Syrian, the Scinde, the Spanish, and the Welsh goats.

Under many circumstances the goat is found more valuable than either sheep or swine, as goats will live and thrive where they would starve; yielding milk, wool, kids, mutton, and skins. A good goat will yield milk nearly all the year, or within a few weeks of parturition, if fed and cared for. The kids should be allowed to suck two weeks and then sold, especially the buck kids. The goat should then yield a quart of milk at each milking or meal, three times a day, say at 7 a. m., at noon, and at 7 or 8 p. m. About three months subsequent to parturition the supply of milk falls off to about two quarts daily, and continues so until within about three months of the next kidding, when it falls off to about one quart per day. The goat should be milked three times daily, in consequence of the want of capacity of her udder, for when the udder becomes charged with milk, the goat lies down, ceases feeding, and no further secretion of milk takes place; but relieve her by milking, and she again proceeds to feeding, and secretes a fresh supply of milk far more nutritious and nourishing, and easier of digestion, than that of the cow. It is not generally known that a goat tethered to a certain spot will yield more milk than when permitted to roam at large without restraint, but such is nevertheless the fact. The tether should be attached to a long pin driven into the ground, furnished with a swivel, in order that entanglement may be avoided, and shifted when a fresh supply of herbage may be obtained.

As goats are often disposed to be mischievous, and trespass upon forbidden property, either by climbing or creeping, a yoke may be made, consisting of three pieces of wood put over the goat's neck, and fastened there in a triangular form, which is found useful to prevent their getting through hedges or fences, while a side line, attaching the fore foot to the hind one of the same side, prevents them climbing or leaping. With these two simple contrivances a goat may be allowed to go anywhere without being able to enter a garden or field.

The goat is a cosmopolitan; he is found rambling amid the snows of Norway and Siberia, and basking in the sun of Africa or under the equator at Singapore, Java, Central or South America. Even the more delicate and fine wool-bearing varieties are found in the mountainous region and cold climate of the Himalayas, Thibet, and Russia, to the 60th degree of north latitude, feeding upon the scanty vegetation of that sterile soil, or luxuriating in the fertile vales of Cashmere, Persia, or Natolia. It is easily sustained and perhaps more readily so than any other animal.

As the sheep follows the ox, feeding upon the gleanings, so the goat prospers upon the scanty remains of vegetation left by the sheep, or on worn-out, neglected lands or fields, and in some places, as in Norway, feeding like the reindeer, upon simple moss.

The goat is less liable to disease than the sheep. It naturally attaches itself to man, and appears to be grateful for the very few favors it receives at his hands. The female commences breeding when from ten to eighteen months old, and continues to breed till she is twelve, producing in temperate climates one, two, or three kids at a birth, and in warmer ones from two to five. Her time of gestation is about five months. She may be milked fifteen days after parturition, when the milk is sweet, nourishing, and medicinal, having an agreeable aromatic flavor, no doubt imparted by the herbs and wild food upon which the goat feeds and delights to pasture; and this quality renders it peculiarly appropriate for the manufacture of cheese and butter, delicious specimens of which we ate in Asia and Europe.

The suet of the goat makes candles superior in whiteness and firmness to those of the ox or sheep, while the skins of the goat are useful in the manufacture of morocco leather, parchment, and vellum; it being susceptible to a deeper, more perfect, and permanent dye than the skin of any other animal. In Turkey, Persia, and Africa, morocco leather is made from its skin in vast quantities, and is highly prized all over the world, while the skin of the kid is made into gloves of the finest quality, and always commands the highest prices. In Persia we observed it constituting the chief and most valuable article in the manufacture of the peculiar woolly kid and lamb-skin hats, so highly prized by the natives. Eighty thousand raw goat skins are annually exported from Norway for leather. Russia uses it largely. The horns are used for handles to tools of all kinds, while from the fleece are made various articles of clothing from the most luxuriant and costly shawl to the more humble and useful camlet and heavy durable clothing of the peasant. The goat is not only hardy and prolific, but long-lived, some attaining to the age of twenty-five years. Its flesh, as already asserted, is used for food, while that of the kid, especially with the crosses from the Angora and Cashmere, has been pronounced as being more delicious and delicate than that of the lamb or any fine venison.

There is, perhaps, more difference among goats than among any other class of animals, their milk varying both in quality and quantity, the latter from one pint to four quarts daily; and the following directions are laid down for selecting a good milker: Let the goat be of good size, the hair hard and stiff, the neck short, resembling that of the sheep, the head small and narrow about the muzzle, the eyes large and full; those destitute of horns are generally the best milkers; the color dark, or as nearly approaching to black as possible, avoiding light, yellow, or pied; legs straight and the joints even and firm. A goat is best at from three to six years old; but is useful till twelve years and older.

At the Cape of Good Hope large flocks of goats are kept, and they manifest extreme sagacity, needing no goatherd to watch them or lead them; and they are altogether wiser than the sheep. In the morning they sally out upon their foraging expedition, and in the evening they voluntarily return; and this applies to similar flocks we saw in Asia and Europe.

The goat is also said to be an excellent barometer, and able to foretell stormy weather, and always contrives to place himself under shelter before the advance of the storm if possible; they will run miles to evade or get out of a storm or avoid an undesirable rain.

There are at least forty distinct acknowledged varieties of the goat, the most valuable of which are the Angora, the Cashmere, the Thibetian, the Rhingis, the Kirman, and an equally fine species along the Caspian, Ural, and Black seas, and the black goat of Nepaul, all of which produce the finest wool fleece or hair in the world, and will readily cross with the common goat, producing a new and valuable acclimated variety in this country. The Scinde and the Syrian goats are noticeable for their extremely long ears, often twenty-two inches in length, and touching and dragging on the ground. The Assyrian, Spanish, and a few other goats are mostly destitute of horns, while the goat of India and Thibet is celebrated for its large and exquisitely twisted horns, much resembling the Wallachian sheep.

The *Capra Americana*, or Rocky Mountain goat, is a beautiful large white goat inhabiting the Rocky mountains, the headwaters of the Missouri and McKenzie rivers, the Pacific coast range of mountains, especially around the base and sides of Mounts Rainier, Hood, Baker, and the vast buttes all along the coast as high north as Mount St. Elias.

A beautiful stuffed specimen of this goat is now in the Smithsonian Institution, and is well described by Professor S. F. Baird in the Agricultural Report of 1851, and hence requires no notice here beyond the remark that it appears to be a fine wool-bearing animal with a double coat or fleece, and is closely allied to the Cashmere or Thibetian goat, and would no doubt prove as valuable if captured and domesticated. Efforts are now being made to obtain live specimens to domesticate and breed with the Cashmere, Angora, and common goat, when we shall no doubt obtain more valuable information of their habits, fleece, and value.

With so much on the goat, its qualities, characteristics, and a few of its varieties, and commending its consideration and culture to such as are circumstanced to render its keeping convenient and profitable, we next proceed to notice the still more valuable and wool-bearing varieties known as the Cashmere and Angora goats.

THE WOOL-BEARING GOAT.

As in several of its varieties the common goat *(Capra hircus)* has become a valuable domestic milk-producing animal, so has it also in several of its varieties become a most valuable wool or fleece bearing one, even from remote antiquity. Of this we have the earliest and most satisfactory evidence from the records of the ancient Babylonians and Assyrians, whose kings and priests were clad in the fine fabrics made of this wool. The magnificent robe in which the Nimroud monarch is represented as arrayed when receiving the sacred cup from the priests was of this fine fabric, for on no other material less delicate could those elaborate symbolical figures and mythological scenes have been portrayed with such minute correctness and beauty. Moses, in the Pentateuch, speaks of the fine wool of the goats, or "goat's hair;" and no doubt this was the article from which the curtains of the tabernacle were made, with priestly robes and other fine articles of the Temple, as well as constituting the finer garments of the patriarchs and rulers of that day, as of the shahs, sheiks, pachas, and wealthier inhabitants of the present day. In the eastern world their extensive flocks are largely composed of these wool-bearing goats, constituting a source of wealth from time immemorial, and producing articles of manufacture and furnishing employment to the inhabitants. This fine-haired or woolled breed of goats we find exists under many varieties and in different latitudes and countries throughout Asia and parts of Europe, from Kirman, Persia, on the 30th degree of north latitude, to Tartary and Siberia, on the 60th degree, and from Mongolia, China, on the east, to Tartary, Cashmere, the Caspian sea, Asia Minor, and the Mediterranean, on the west. At Kirman and Teheran, Persia, most splendid shawls, fabrics, carpets, &c., are made, vieing in beauty, fineness, and value with those of Cashmere itself; while from Nepaul to Caboul, Teheran, Angora, and Constantinople, similar animals are found and similar articles of manufacture are made.

Various attempts, with varying success, have of late years been made to introduce these valuable wool-bearing animals into Europe, especially France, England, and Sweden, and lately into our own country; and by reference to the journals of the Society of Acclimation, *("Société Imperial d' Acclimation,")* we find extended and valuable accounts, but too lengthy for quotation or insertion here. Suffice it to say, the French government has considered these animals, their introduction and rearing, of sufficient importance to spend thousands of dollars upon the experiment; and we saw some fine specimens of these, both Cashmere, Angora, and other goats, in the *"Jardin des Plants,"* the zoological gardens of Paris, and at other localities in France, and are assured that they have finally succeeded in crossing the Cashmere and other goats and procuring a valuable wool-bearing animal, from which they get a long, fine, silky fleece and valuable wool, which they now manufacture into the finest and most costly shawls, velvets, worsteds, de laines, challis, threads, &c., heretofore known. The shawls are said to equal the celebrated ones from Cashmere; and it is in the French works we find the most valuable reports, plates, and experiences on this subject.

In Fitzinger's Natural History, (German,) figs. 212—215, there are four good views of the *Hircus capra pillosa*, the rough-haired domestic goat, the Cashmere, and the Thibetian, in which the Cashmere is represented with a black neck and a white face, almost straight, round, pointed horns, long coarse white hair, tail six inches long; while the Thibetian goat is represented with a long smooth neck, a sheep-like head, hornless, short hair, with an immense udder, indicative of a good milker rather than a fine fleece-bearing animal. These, with other descriptions, correspond well with what we saw of Cashmeres both in Asia and Europe, and differing widely from, or resembling in but few respects, what are called Cashmeres in this country; and by simple reference to the plates, the description, and a view of the animals, the difference is quite apparent. Thus we have valuable descriptions of these goats in the New American Cyclopedia; in the Penny Cyclopedia; Rees's Cyclopedia, vol. 5, plates, a fine plate of Cashmere and Angora; Wood's Natural History; the Farmer's Library, vol. 2, page 261; Naturalist's Library, page 108, plate 9; in the Naturalist's Miscellany, vol. 8, two plates of Cashmere; in Professor Low's Domesticated Animals of the British Islands, page 1; in Goodrich's Animated Nature and in the Agricultural Report of 1855, two plates of the so-called Cashmere, but plainly and evidently Angoras; while similar views are found in other English, French, and German works consulted; but these suffice for reference, while our personal observations, the examinations of flocks, animals, and testimony before us, both in Asia and Europe, and at home, furnish us further facts.

THE CASHMERE AND THIBETIAN GOAT.

This variety of the wool-bearing or "shawl goat," as it is often called, and of which we herewith present a good illustration, is spread over Thibet, Northern India, and the regions to the east of the Caspian sea. It is somewhat smaller than the common and Angora goat; it has straight, round, pointed horns, pendant ears, is covered with straight and falling, long, fine, flat, silky hair, with an undercoat in winter of a delicate greenish wool, of but two to three ounces to each, which latter alone constitutes the fabric from which the celebrated shawls are made. Ten goats only furnish wool enough for a shawl one yard and a half square; but even this is often found differing both in color and the quality of the wool, or rather the fine hair of which the fleece is composed. The principal points in the most approved breeds are large ears, the limbs slender and cleanly formed, the *horns not spirally twisted*, and, above all, the fleece being long, straight, fleecy, and white.

Besides, the true Cashmere and Thibetian breed from which originally the celebrated Cashmere shawls were made, there are several others which have been employed for the same purpose in different parts of Thibet, India, and Tartary. The Tartar half-breed has been found to survive well in a colder climate, and has been introduced into France with considerable success, as also those from the Ghengis and Caspian.

The shawls still most in request, however, are brought from the Kuyam of Cashmere, where 16,000 looms are constantly at work, employing three men to each, manufacturing and disposing of thirty thousand shawls annually.

Hodgson, in speaking of this goat, alludes to it as "a variety of the common domestic goat, known as shawl goat, of Thibet and Cashmere, and they are called, including its relative, the goat of Angora." "From earliest time the hair or fine underdown of this goat has been used in the manufacture of tissues or textile fabrics, especially in Eastern Europe and Western Asia."

The long-eared Syrian goat, to judge from the specimens we have seen, is only a variety of the Thibetian and Angora breeds, having long hair, with a fine undercoat like the former, but neither so abundant nor so fine as the Angora. In ancient times, when the goat divided the palm of usefulness with the sheep, the Syrian goat was no doubt superior to what we now find it in Palestine or Syria, so far as its hairy produce is concerned.

The following description is given from Sharp's London Magazine:

"The Cashmere goat is a nobler species of the common goat, descended from the goat of Thibet, which pastures on the Himalaya. The climate is subject to sudden changes. There is little rain, but much snow, as the cold in winter is below the freezing point. Thibet is situated at the northern descent of the Himalayas, and Cashmere of the southern; hence the latter is a little warmer than Thibet. Here the goat is a domestic animal. It is not allowed a very luxuriant pasture. The soil is sterile, and vegetation scanty.

"The favorite food of these animals is buds, aromatic plants, rue, and heath. The people of Thibet always give them salt at least once a week, which has always proved a useful accompaniment to their customary food.

"The head of the Asiatic goat is large, the horns situated backwards and somewhat curved, the legs slender. Proper food and careful tending increases the fineness of the wool.

"The goats of Thibet which pasture in the highest lands have a bright ochre color. In lower grounds the color becomes of a yellowish white, and still lower or further down, entirely white.

"The highest mountains here inhabitable by man contain, also, a certain kind of goat with black wool, which in India obtains the highest price.

"The goats of Cashmere and Thibet have the fine curled wool close to the skin, just as the under hair of the common goat lies below the coarse upper hair.

"The wool is shorn or pulled shortly before the warm season, the time when the animal naturally seeks thorns and hedges to free itself from the burden of its warm covering. All the hard and long hairs are carefully picked out. The wool, thus prepared, is first washed in a warm solution of potash, and afterwards in cold water, in which process felting must be carefully avoided. It is then bleached upon the grass and carded for spinning, and three times dyed to impart to it its brilliant lustre."

THE ANGORA GOAT.

The Angora goat, so-called from a province of Natolia or Anatolia, the ancient Cappadocia, in Asia Minor, and the principal place where the wool i bought, sold, and manufactured, has finally, like Cashmere, given its name to the goat inhabiting a large region of country extending from the Black sea on the north to Diarbekir, on the plains of Mesopotamia, on the south, and from Persia and the Caspian sea on the east to near the Mediterranean on the west, of which Angora forms the centre. This goat, though described as the *Capra Angoraensis*, is only an improved variety of the "*Capra hircus*," or common domestic goat, and is closely allied in many respects to the Cashmere, but readily distinguished from the common goat by the greater size of its ears.

The Angora goat, and more especially the varieties it has produced, are probably the most valuable of all the goat family, and have been ably described by naturalists, Buffon, Pennant, Hazelquist, and travellers, as good-sized animals, generally of a beautifully milk-white color, with short legs and wide-spreading, spirally twisted horns, a good view or illustration of which is herewith presented, and may be readily recognized either in the pictures heretofore published in this country under the name of Cashmere, or by reference to the authorities quoted, or a simple view of the animals themselves, now scattered throughout most of the States from Massachusetts to California.

The wool is described as "a very beautiful curled or wavy hair, of silvery whiteness, with a fine downy wool at its base," and this hair is disposed in long pendant spiral ringlets on the whole body. The horns of the female, instead of spreading as in the male, turn backwards, and are much shorter in proportion; those of the male are long, spirally twisted, but the size and direction are very different from the common goat, being generally extended from fifteen to thirty inches in height on each side of the head, while those of the female end near the ears. The hair or wool often sweeps to the ground, and is from five to twelve inches long, especially in the older bucks, but then not so fine.

The fleece of the ewe shears from three to five pounds, and that of the buck from five to nine. The tail is shorter than that of the Cashmere, and usually carried erect. "These goats have the hair very long, thick, and so fine that stuffs have been made of it almost as handsome and glossy as our silks, and have been known under the various names of cashmeres, camlets," &c. This brief description will apply to almost all we saw in Western Asia, Europe, and in this country, (say of several thousands,) save some difference in the ears; for while many have the pendent ears, others we examined have ears exceedingly small and short.

The fleece in some is longer, more curly, pendent, and wavy than in others. The boundary for these goats is set in Asia Minor, from which the natives say if taken they will deteriorate or lose much of their beauty, which, however, has been disproved by successful experiments, both in France and in the United States. They are there generally accustomed to high, dry land, the greater part of Natolia consisting of dry, chalky hills, on which there are bushes rather than trees, or else of valleys, lying from 1,500 to 2,000 feet above the level of the sea, which, however, are quite bare of trees, and but scantily covered with grass. Even in this expanse there are spots that produce finer flocks than others, where the goats are mostly kept on hills, the natives attributing a general superiority to mountain flocks which have a rare atmosphere, more feed, and a larger choice of herbs; and, ranging widely, are kept in good health, on which the quality of their fleece mainly depends.

Some roving tribes are said to keep their flocks out day and night, summer and winter, (except when an unusual quantity of snow falls,) so that they do not soil their fleeces by folding them. They are mostly kept on fresh food in winter by shepherds leading them down and up the mountain sides as the snow and grass appears and disappears, while the flocks of the valleys must be fed on hay or branches.

The fleece of the white Angora is called "tiftick," and is clipped annually, that of the yearlings and females being more valuable than that of the males, and is here manufactured into the most delicate articles.

A curious statement was made to us at Angora, that only the white goats which have horns wear their fleece in long curly locks, which are so much admired, while the hornless ones have a comparatively close coat. The finer the fleece the more readily and naturally it curls, while the fleece is made or kept finer by carefully washing or combing out all impurities, thus giving it a polish.

There is also a second or other variety of Angora or shawl-wool goat beside those generally described. This goat has an unchanging outer cover of long, coarse hair, between the roots of which comes in winter an undercoat of downy wool that is naturally thrown off in spring, or is carefully combed out for use. A remarkably fine species of this breed exists throughout the area to which the white-haired goat is limited, and similar breeds prevail all over the highlands of Turkish and Persian Armenia, Koordistan, and at Kirman; and, although some flocks yield finer fleeces than others, it is called the same wool or underdown as the wool of Cashmere and Thibet, and samples of the wool of the Thibetian and the double-wooled goat of the banks of the Euxine show them to be but varieties of the same species.

This goat is of a larger size than those of the more southern Turkish provinces, and its wool finer, and is probably the variety introduced by Dr. Davis from Asia Minor as the Cashmere, and now erroneously so-called throughout the country, as all the importations to this country, as far as we can learn, were shipped from ports on the Mediterranean or Constantinople, several thousand miles from Cashmere or Thibet, through inhospitable and almost untravelled countries for Europeans, which goes far to prove the so-called "Cashmere goat" to be the Angora.

This double-coated race of goats in these Turkish and Persian districts is also colored black, brown, golden, light dun, grey, and piebald. The colors of the two goats do not necessarily correspond, black hair commonly overlaying brown wool; others differ more or less in depth of shade. Goats of this breed are sometimes mixed with the white-haired goats, especially when a remarkable flock-leader is desired.

The articles of clothing woven and knit from this wool seem to combine in a great degree the qualities which are so much desired in shawls, viz: lightness, softness, and warmth.

So much, briefly, for the goats of Angora. We shall now consider their introduction, adaptation, and value to this country.

INTRODUCTION OF THESE GOATS INTO THE UNITED STATES.

Various attempts have been made to introduce and breed this fine wool-bearing goat into France, England, and Sweden, with only partial success, however, until of late a very valuable cross between the Cashmere, Angora, and common goat has been obtained, producing an acclimated, fine-fleeced animal, from the wool of which some of the finest shawls, velvets, cloths, worsted, and de laines are now manufactured in France and England.

In the Reports of the "Societe Imperial d'Acclimation" full and interesting descriptions are given of the various reported flocks in France and Europe from 1787 to the beautiful flock presented by Abd el Kader to the Emperor, the care of which has been made a national affair. Nothing of interest to the world in their habits, progress, or success has been lost; and of all her industrial pursuits France has considered this of prime importance, and to no other animal has she given more exclusive attention, with the hope of obtaining and possessing the "golden fleece," and upon no other has there been more discussion in the different scientific societies, her naturalists and scientific men always taking the lead until remunerative success has rewarded their expenditures and labors. Some of these improved specimens we had the pleasure of seeing in France, and can bear testimony to their beauty. In England and Sweden, by the last reports, success was attending those experimenting in the Angora crosses, and good results anticipated.

Nowhere, however, has their introduction and breeding been attended with the same cheering results and decided success as in our own country, and this after thorough toil and practical experiments during the last fifteen years, when seven were first imported by Dr. Davis into South Carolina. Since that some three hundred head have been imported from Angora at various times and seasons, *via* Constantinople and Boston, mainly for the south and southwest, from which, with their crosses, a numerous progeny and various small flocks have descended, now numbering several thousands, and scattered from Massachusetts to California, yet still mainly confined to the southwestern States in flocks of from twelve to three hundred, and more, as at Atlanta, Georgia; Gallatin and Nashville, Tennessee; Russellville, Frankfort, Paris, and Georgetown, Kentucky; Greenville, Lebanon, Montgomery, and Bucyrus, Ohio; Green county, Indiana; Chicago, Decatur, and Evanston, Illinois; St. Louis, Maramec, and Fayette, Missouri; Baltimore, Maryland; Leavenworth, Kansas; Brownsville, Pittsburg, Washington, and Philadelphia, Pennsylvania; New York; Boston, Belmont, Massachusetts; Austin, Texas; Iowa, Michigan, Minnesota, and California, with other localities, where they have been thoroughly tried, prospered, and improved.

We have either personally visited and examined most of the above-named localities and flocks, seen or obtained animals or specimens of the wool, comparing them with what we saw abroad and the best specimens of wool to be obtained from abroad, or the best imported ones, and are well satisfied and thoroughly convinced that we have succeeded, and can continue to succeed, in raising this valuable wool-bearing animal, with its precious fleece, almost anywhere throughout our country where sheep will prosper, especially in the higher and colder localities, producing an animal more hardy, with a heavier and more valuable fleece, than the Angora or Cashmere itself in its own country. The specimens of wool in our possession, and raised in this country, are found generally finer, more silky and fleecy than the imported and original ones.

A few quotations, however, from eminent and successful breeders may prove more satisfactory to practical men.

Colonel R. H. Scott, an extensive farmer and stock-raiser at Frankfort, Kentucky, says:

"I have a flock of eighty head, of all grades from half-bloods to pure breeds, and there is not a single sickly one among them, and few if any that are not fat enough for mutton. Their food, except in winter, is obtained exclusively in the pastures, and they are so fond of weeds, bushes, and briers, that they will eat them chiefly if they are accessible, and in this way are valuable in cleaning our fields and pastures of noxious weeds and shrubs. In winter corn fodder is given them on a blue-grass pasture; and grain, though greedily eaten by them, is never required either for health or condition. So far I have found them entirely free from disease, nothing like it having appeared in the flock except an occasional humor in the cleft of the foot, which yields readily to the application of turpentine or bluestone. A peculiar small vermin has sometimes infested them in spring, requiring the application of flour of sulphur and grease along the spine and in spots about the skin of the body.

"A warm shelter I think is necessary for them, as they dislike to be in the rain even in warm weather, and they almost invariably seek their shelter at night, and during storms, without the care of a shepherd.

"I have found them not only healthy but prolific, the females doubling their number each season. Grade ewes are more prolific than full bloods, or pure breeds, the former frequently raising three kids, the latter only one. They do not attain their growth until two years old. Their flesh is tender, juicy, and high-flavored, resembling that of the sheep more than any other animal.

"The wethers will weigh from sixty to eighty pounds, yielding from ten to twenty pounds of very white and firm tallow. The saddles, both cold and hot, are regarded as the highest luxuries of their kind. The wool of the same bloods differs slightly, but there is no material difference between pure breeds and full bloods, the full bloods being five or more crosses on the common goat by a pure bred buck.

"During two or three months of summer they all wear a covering of coarse short hair, which in turn drops out gradually, giving place to the fine wool which attains its growth by spring, when it should be shorn after the cold weather has passed, and before the coarse hair has begun to grow into the fleece. The dressed skins are valuable and in demand for ladies' furs, buggy robes, saddle covers, and cradle spreads; the furs of some animals exceeding them in fineness, but few equalling them in silky richness and glossiness of texture. The skin, or fleece, receives various dyes with great facility.

"I intend to keep about one hundred full bloods, assured by the experience so far that they will greatly exceed sheep in value of their fleece, which is from four to eight pounds in weight annually."

Mr. John Walker, of Fayette, Missouri, a distinguished farmer and stock-raiser, who has a very superior flock of about seventy head, says:

"We raised most of them in this State, and so far they have done remarkably well. They stood the cold weather of this winter better than other stock we have. They are very hardy, and increase rapidly. The does take great care of their young. The cost of keeping these goats is less than any other animal. They graze upon coarse herbs that are not eaten by any other stock, such as iron weed, dock, mullen, briers, buds, and broken sprouts. Their wool possesses the highest felting qualities. My buck sheared nine pounds and three-quarters, and my pure bred ewe five pounds."

Colonel R. Williamson, of Gallatin, Tennessee, agent of the "Sumner Cashmere Company," and who has a large and valuable flock, has published an excellent pamphlet of 36 pages on the goat, detailing much valuable information on the subject of breeding them, but substantially the same as that already given but says, by letter, that so great has been his success in breeding and selling these goats and their crosses, "that during 1858 we disposed of twenty seven thousand dollars' worth, and with an increased success until the war commenced."

Brigadier General E. A. Paine, commanding the United States forces at Gallatin, Tennessee, says:

"I have been stationed at this post nearly eighteen months, and have been deeply interested in making myself perfectly acquainted with the habits, increase, and value of these animals, and am thoroughly satisfied that the Cashmere wool is to be one of the greatest staples of the country. It is to be to the common wools what silk is to cotton."

Charles S. Brown, of New York, writing of his flock of Angora and Cashmere goats, says:

"All these goats can be propagated with great profit. They are easily kept, requiring only the coarsest food, and will thrive better upon low bushes than green pasture. I have found them robust and healthy, and have never known any sickness among them."

Hon. George A. Porter, of Baltimore, Maryland, writing of his flock of Angora goats, says:

"I herewith send you two numbers of the *American Farmer*, April, 1860, and July, 1861, which will give you some interesting particulars respecting these goats, also some idea of their value. I think you will be convinced that the half-breeds will prove quite valuable. I have lived many years at Constantinople, occupying the post of United States consul, and procured and shipped for Dr. Davis the first of these goats that were ever brought to this country. You will see that Dr. Davis and Mr. Peters have made a profitable business crossing back to the full Angora."

The "American Farmer" says:

"The Hon. W. H. Stiles has imported eight of the goats from Smyrna. They are no less curious than valuable, something of the shape and size of our common breed. They differ widely in their hair, which grows so luxuriantly as to give them the appearance of sheep with an immense fleece on. The experiment having been thoroughly tried as to their thriving in our climate, and resulting satisfactorily, there can be no doubt as to the value they will be to our country."

S. S. Williams, Granville, Ohio, writes:

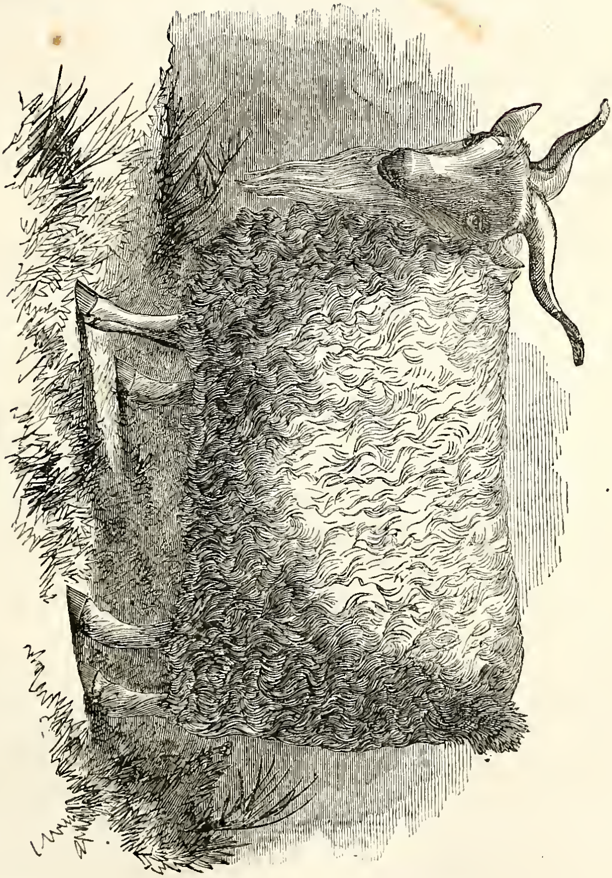
"I have about one hundred goats. In regard to the breed of my goats, whether Angora or Cashmere, mine belong to that breed first introduced by Dr. J. B. Davis as Cashmeres, and which have generally gone by that name to this day. But if the Cashmere goat is the animal bearing a coat of coarse hair, with an undergrowth of only a few ounces of fine fleece, then mine are *not Cashmeres*, though known as Cashmeres in this country; and from the description of Rees and others, mine are the *Angora*, for they describe my goats as correctly as I can myself. I rest satisfied that our goat, whatever it should be called, is valuable, and I care little for the name. I send you a sample of the wool of my buck Sampson, which clips over six pounds. Of course I think he is more valuable than an animal yielding only three ounces of but little finer quality."

General J. S. Goe, Brownsville, Pennsylvania, has a fine flock of twenty in a good condition, beautiful and thriving. He says, "they have stood the severe winter well, and are promising, and I am encouraged with the experiment and prospect."

Dr. F. F. Robinson, Freedom, Pennsylvania, says: "I have been quite successful in breeding from the common goat to my Cashmere buck; find them to be hardy and prolific."

Winthrop W. Chenery, "Highland Farm," Belmont, Massachusetts, one of the most enterprising importers and stock-raisers of the country, has made several successful importations, and has a very choice flock of some twenty pure imported Angoras upon his celebrated stock farm, near Boston, in a good and prosperous condition, where they wintered admirably, standing the rigors of the past severe winter, and are doing well. Mr. Chenery feels much encouraged with his success in importing, and is quite confident of ultimate profit and value:

"The goats will prove profitable in this country, and I would say that, with proper attention, they may be bred and raised as safely and surely as ordinary sheep. One gentleman in



ANGORA GOAT.

Western Pennsylvania, to whom I sold a small flock, writes me that his goats are about a third heavier than they were, and that he has no more fear of raising them than pigs.'

Martin Deal, of Bucyrus, Ohio, has a fine flock, containing several beautiful and valuable imported animals direct from Asia. This flock, from its fineness and beauty, has attracted much attention and admiration. Mr. Deal proposes to import and breed them to a considerable extent, so sanguine are he and his friends of their value and success.

George W. Ogden, of Montgomery, Ohio, possesses a fine flock, and has been quite successful in breeding and crossing these goats with the common goats, and has reported his success through the "Ohio Farmer."

Mr. H. Baldwin, of Philadelphia, Pennsylvania, has a fine flock, mostly raised upon his own farm, near the city.

Thomas Kendrick, of Chicago, Illinois, has experimented considerably and quite successfully in raising these goats upon the lake shore and the prairies of Illinois, amply proving that they will succeed in those localities without deterioration. These brief statements of the results of past experiments evidence encouraging progress in the development of this important interest, and certainly justify strong expectations of ultimate success.

We add a few extracts from some of the various and valuable published reports made upon this subject, showing the interest it has attracted from time to time. The following report on Cashmere goats was made at the exhibition of the United States Agricultural Society, held at Philadelphia, Pennsylvania, in 1856, at which a special premium of $100 was awarded to R. Peters, of Georgia:

"They have become known as Cashmere goats from the pure white color, and fineness of their fleeces, and their undoubted eastern origin. The fleeces from the matured bucks weigh from six to seven pounds, those from the ewes from three to four pounds. The flesh of the crosses is superior to most mutton, tender and delicious, making them a desirable acquisition to our food-producing animals.

"The ease with which they are kept, living as they do on weeds, briers, browse, and other coarse herbage, fits them for many portions of our country where sheep cannot be sustained to advantage, while their ability and disposition to defend themselves against dogs evidence a value peculiar to this race. They are free from all diseases to which sheep are liable, hardy and prolific, and experience has proven that they readily adapt themselves to all portions of the United States. The bucks breed readily with the common goats, the second cross yielding a fleece of practical utility, whilst the fourth is but little inferior to that of the pure breed.

"A flock of valuable wool-bearing goats can be raised in a few years by using grade bucks."

Here is an extract from a report of the special committee appointed by the "American Institute," at their exhibition in New York city, in 1855:

"They have examined with much interest the fleece submitted to them, and as well from their own observations as from the results of a microscopic examination made and certified to by several gentlemen of scientific eminence well known to them, are convinced that the fibre of these fleeces is identical in character, and fully equal in value, to that from which the highly-prized Cashmere shawls are made. The fleeces on exhibition, and now under examination, amount to from four to eight pounds each.

"The enterprize exhibited by the introduction of these animals into this country, and their propagation, cannot be too highly regarded.

"*First*, These animals are long-lived, such being the case with the whole goat race.

"*Second*, They are prolific, breeding at the age of one year, with a period of gestation of about five months, and yielding twins almost universally after the first birth.

"*Third*, They are hardy, experience having shown that they will thrive well in our climate from Georgia to New England, and that they require coarse and cheap food—as the inferior grasses, briers, bushes, &c.—such as is refused by other grazing animals.

"*Fourth*. They produce a fleece of from four to eight pounds, valued at from $6 to $8 per pound in France, or Paisley, Scotland, for the manufacture of those high-priced shawls. These fleeces can be produced, when the animals become numerous, at a less cost than the common sheep's wool, and far superior to it.

"Another fact of great practical value to our agricultural interests is the facility with which the Cashmere goats breed with the common goats of our country.

"From these and other considerations, of the correctness of which your committee have entire confidence, it will be obvious that every encouragement should be shown this new enterprise—a bold and judicious movement.

"B. P. JOHNSON.
"CHARLES J. GOODRICH.
"JAMES J. MAPES."

The following is the report of the committee at the New York State fair, held in New York city, in 1854:

"The undersigned cannot avoid the conclusion, that in the goats imported, and whose descendants have been the subjects of this examination, we have the first known specimens of that valuable race of animals from whose hairy fleece the celebrated shawls are manufactured known in commerce by the inappropriate name of 'red camel's hair.' As the fleece does not appear to have deteriorated in the comparatively warm climate of South Carolina, the distinctive character of the race is hard to be obliterated, while in the northern region of the United States this character cannot well fail to be permanent. Viewed in this light, the introduction of this animal promises to be of more value to the agriculture of the United States than that of almost any other domestic animal.

"JAMES RENWICK.
"JOSEPH R. CHILTON.
"W. H. ELLET."

Numerous other valuable reports have been given by other State agricultural societies and scientific and practical men, all to the same effect, establishing, by a variety of testimony, the value of the animal and its fleece, its adaptation to our country and climate, and the facility with which it can be crossed and bred with the common goat, by which a flock can be readily raised and increased. Almost all the progeny exhibit the strongest tendencies to the higher and nobler grades by assimilating themselves to the male, and putting on the white livery of the more respectable, honored, and valued race.

The half-breeds much resemble the true Cashmere by yielding as valuable an under-down, or fur, as the shawl goat, and even more in quantity. The grades regularly increase the length and quantity of their wool or fleece as they ascend, and being more prolific than the pure breeds, producing a hardier and even more valuable animal, requiring less attention and feed.

Their local attachment is quite prominent and strong when once accustomed to a place. They may range over the hills or fields and pastures for several miles, but return readily and promptly at night or when satiated. They may be and are herded in large flocks, and readily obey a well-known voice or call, attaching themselves readily to their keepers.

WHAT IMPROVEMENTS CAN BE MADE IN THE BREED OF GOATS.

Here, as in all the departments of stock-breeding, no doubt great improvements can be made, since they possess all the characteristics of other domestic animals. A variety of goats exists throughout our own country, collected from various countries of Europe and portions of Asia and Africa, from which improved individuals may be selected and bred from. Varieties exist in Turkey, Persia, India, Tartary, and Thibet, still remaining to be imported and bred in this country, the introduction of which it might be well for our government to encourage as an animal producing a fleece that would ultimately be worth millions of dollars to our country, and giving employment and profit to thousands of our people. They can be readily, easily, and cheaply imported, the experiments showing that at proper seasons, with ordinary care, flocks of from forty to sixty have been shipped on the decks of sailing vessels from Asia to Boston without the loss of one, and in most cases with but few losses.

If France and other countries have deemed this subject of such prime importance as to expend thousands of dollars to obtain these valuable animals, might not we imitate their example and enterprise and possess ourselves of the

COUNTESS AND TULIP, 3d.

Infantado Ewes, bred and owned by H. S. Randall, of Cortland, N. Y.

true "golden fleece?" For all experiments so far have clearly proven that our country, climate, &c., are more admirably adapted than any other outside of Asia.

Machinery is now being erected and perfected by the Lowell, Pacific, and other mills to work up the fleece and manufacture the finest fabrics, thus only awaiting the wools adapted and establishing a market.

Nor does this enterprise conflict with any other of our country, silk raising, heep husbandry, cotton, &c., each having its appropriate fabric, fleece, use, .nd sphere, and its limits of usefulness, which commend it to our government, to the well-wishers of our country and her prosperity.

SHEEP.

SELECTION, TREATMENT, AND DISEASES OF SHEEP IN THE UNITED STATES.

BY HENRY S. RANDALL, LL. D., CORTLAND VILLAGE, NEW YORK.

SELECTING SHEEP FOR A FARM.

WHERE access to large and good city markets is rapid and cheap, and especially on high-priced and high-tilled farms, where sheep are kept but in limited numbers, as part of a system of convertible husbandry, improved mutton sheep are the most profitable. In interior situations, remote from such markets, the Merino or fine-woolled sheep yield the best returns.

SOILS AND CLIMATE.

Mutton sheep, to develop their characteristic qualities successfully, require soils ranging from medium to first class, and consequently those yielding regular and good feed. Some mutton breeds, like the South Downs, thrive best on dry uplands, producing abundant and nutritious but not rank vegetation. Others, like the Lincolns and Leicesters, prefer moist, rich, alluvial valleys, where the grasses are abundant rather than delicate. With the Merinos dryness of soil is indispensable. There may be swamps or other wet lands on their range to which they have free access, but they cannot be confined to these without injury to their health. They will thrive on scantier feed than any other of the improved mutton breeds, and may be made to travel further to obtain it. During the great scarcity of grass in Texas, in the remarkably severe winter of 1860, Mr. Kendall's large Merino flocks daily travelled four r five miles from their folds to fill themselves with the dried and frozen herbage; yet he lost scarcely one per cent. of their number, and they reached the spring in fair condition.

The mutton sheep are sufficiently hardy in temperate climates where they receive due winter protection. The Merinos are capable of enduring greater extremes of temperature with comparative impunity.

THE MUTTON BREEDS.

The improved mutton breeds which have found most favor in the United States are of the long wool—the Leicesters, Cotswolds, and New Oxfordshires; of the short and middle wools, the South Downs, the Hampshire Downs, the Shropshire Downs, and the Oxfordshire Downs.

THE LEICESTERS.

The Leicester sheep, under the most favorable circumstances for their development, perhaps excel others in earliness of maturity, and none make better returns for the amount of food consumed by them. But they require better shelter, keep, and care than any other variety. The ewes are not so prolific nor so good nurses as those of the other mutton families; and their lambs, when first dropped, demand a good deal of attention. The mutton is only medium in quality, and, owing to its great amount of outside fat, is not generally sought to supply American tables. In England, however, these sheep particularly meet the wants of a large class of producers and consumers, and have been more extensively grown there than any of the large mutton varieties. But judging from the sheep shown in the metropolitan—London—markets in 1858 and 1862, the comparative production is diminishing. In the former year 25 per cent. of all the sheep shown were Leicesters, in the latter year but 22 per cent. The wethers are marketed in England at from twelve to fifteen months old, and weigh—says Professor Wilson—from 120 to 150 pounds each. The fleeces are composed of a long combing wool, and average from 6 to 7 pounds each. In small, selected, breeding flocks in the United States, yearlings and wethers have yielded from 10 to 15 pounds of wool, and breeding ewes 8 pounds.

THE COTSWOLDS.

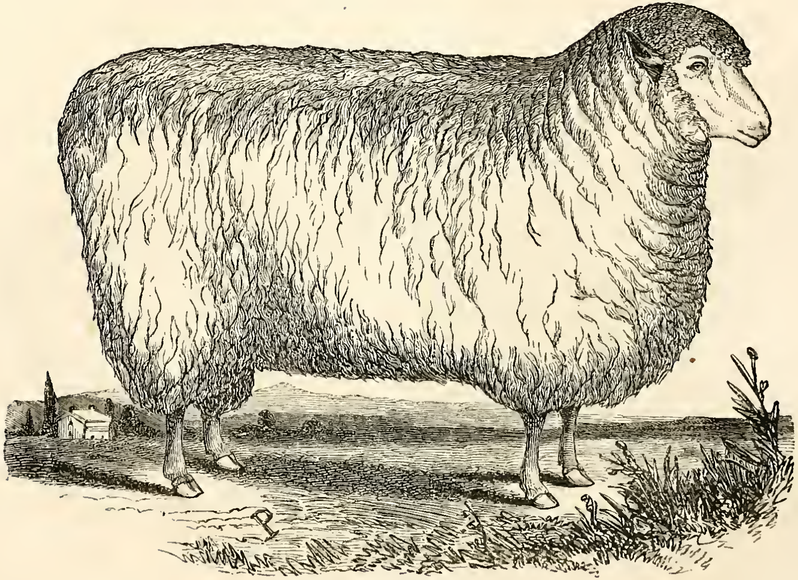
The Cotswolds are a larger, hardier, and more prolific sheep than the preceding, and the ewes are better mothers. They furnish a valuable combing wool, and the average of fleeces in England is from 7 to 8 pounds. Selected flocks produce considerably more wool. Mr. Spooner says that the wethers, fattened at fourteen months old, in England, weigh from 15 to 24 pounds per quarter, and at two years old from 20 to 30 pounds per quarter. They frequently are made to weigh considerably more in this country. Their mutton is superior to that of the Leicesters, the fat being less abundant and better mixed with lean meat. They are much used in crossing other breeds and varieties. They impart more hardiness, with stronger constitutions and better qualities as breeders, to the Leicesters, and thicken them in the hind quarters. They give size, longer wool, and more wool to some of the short-woolled families. They are decidedly favorite sheep with the breeders of long wools in the United States.

THE NEW OXFORDSHIRES.

This is a comparatively new variety produced by a cross between the Leicesters and Cotswolds—the Cotswold blood considerably predominating. In hardiness and in most other particulars they take a middle place between the original stocks; but the few which have been introduced into the United States are pronounced excellent breeders and nurses. Yearling ewes weigh, in ordinary condition, from 125 to 175 pounds; fat wethers at three years old from 175 to 250 pounds.

THE SOUTH DOWNS.

The South Downs are the oldest established short-woolled improved mutton variety. They are too well known to require particular description. The

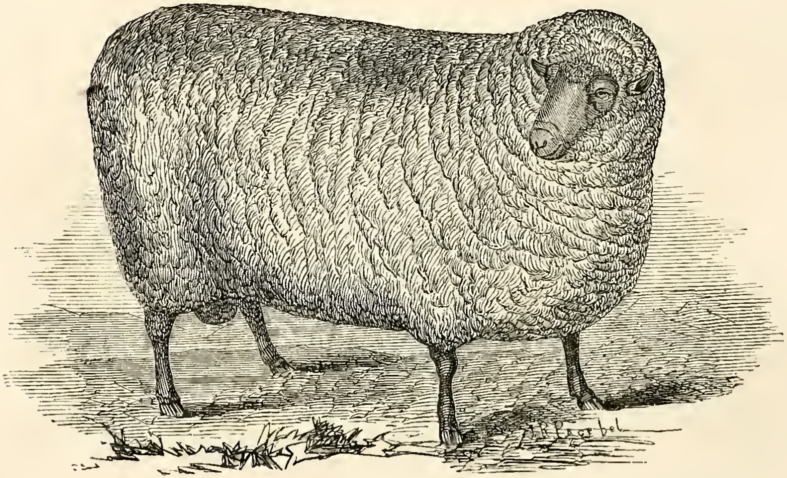


DANDY.

Cotswold Ram, imported and owned by N. L. Chaffee, of Jefferson, Ohio. Bred by John Lane, Cirencester, England.

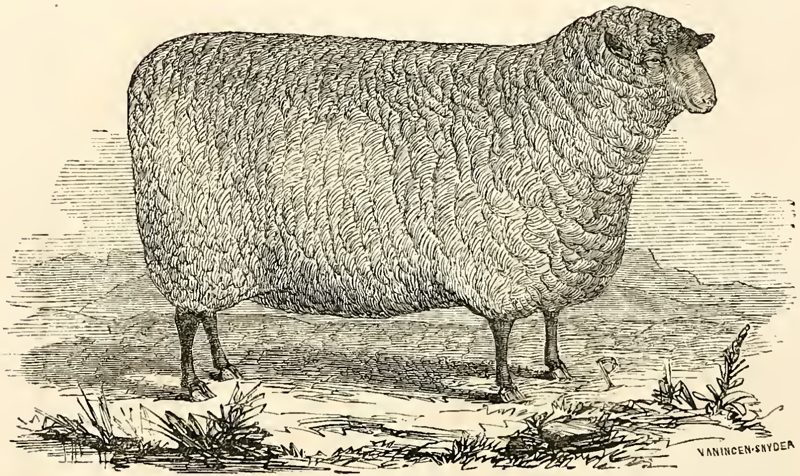
JANE AND KATE.

Cotswold Ewes, imported and owned by N. L. Chaffee, of Jefferson, Ohio. Bred by John Lane, Cirencester, England.



"No. 45."

Shropshire Ram, bred and owned by A. B. Conger, of Haverstraw, N. Y



"No. 14."

Shropshire Ewe, bred and owned by A. B. Conger, of Haverstraw, N. Y.

number of them and of their congeners, the Hampshire Downs, shown in the London markets in 1858, was 10 per cent. of the whole number of sheep shown; in 1862 they had risen to 15 per cent. of the whole number. In prime American flocks, wethers twenty or twenty-one months old at Christmas, dress from 75 to 100 pounds weight. At two years old they weigh from 100 to 120 pounds each. Their fleeces average from 4 to 6 pounds, according to the keeping and breeding of the flock. They are not as hardy as the unimproved South Downs, or as the cross between the South Downs and some other short-woolled varieties, but they still rank among hardy sheep; and they are good workers, being capable of travelling much further for their feed than any of the long wools. Their mutton sells in England for 3½ cents more per pound than Cotswold and Leicester, and half a cent more than the other improved short-woolled families and their varieties. They are prolific and are excellent nurses.

THE HAMPSHIRE DOWNS.

This family is the result of a cross between the South Downs and a short-woolled English variety of greater size and better constitution. Some writers conjecture that they have also a slight infusion of Cotswold blood. They are coarser in appearance than the South Downs, and their mutton sells half a cent less per pound in the market; but they possess nearly all the good qualities of the former and are hardier. They are favorites in many parts of England, but have not been introduced extensively into the United States.

THE SHROPSHIRE DOWNS, OR SHROPSHIRES.

These, like the preceding, have been produced by a South Down cross in a very hardy short-woolled stock; and most of the flocks have also a dip of the Leicester and Cotswold blood. They are nearly as large as the last-named families; and they promise to unite to an uncommon degree the good qualities of the short and long wools, being larger than the former and hardier and more easily kept than the latter; while their mutton is of good quality, and the ewes are highly prolific and are excellent mothers. Superior specimens of them are to be found in the United States and Canada.

THE OXFORDSHIRE DOWNS.

This comparatively modern family is of a cross between the Hampshire Downs or the South Downs and the Cotswolds, and the statements above made in respect to the Shropshires will apply equally well to them, though the two families vary in appearance and in several of their minor qualities. The Oxfordshire Downs have been tested on rough, rocky, briery pastures in Massachusetts, and have given great satisfaction, as hardy, easily kept mutton sheep.

MERINO SHEEP.

The original importation of Merino sheep into the United States from Spain included all the most prominent cabanas of that country. But, as a general thing, the different families, even when preserved pure from foreign admixtures, were crossed promiscuously with each other. The Saxon, French, and Silesian Merinos were of later importation.

Of the original Spanish stock, but two are now represented by distinct families—namely, the Infantado and the Paular.

THE IMPROVED INFANTADOS.

These sheep, originally imported by Colonel David Humphreys, of Connecticut, have been preserved pure to the present day. They are a fourth, if not a third, heavier than their Spanish ancestors, and are the largest family of

American Merinos. Full-grown ewes, in their prime, weigh about 100 pounds, and some of them 120 and 130 pounds. They are much rounder in the rib, broader, fuller in the quarters, shorter proportionably in the limbs, and stronger in the bone than were the Spanish sheep. They are indeed models of compactness and of beauty when judged by fine-wool standards. Their hardiness in respect to locomotion, or, in other words, their ability to travel, is not probably as great as it was sixty years ago; for, having no necessity to drive his sheep eight hundred miles a year, as did the Spaniards, the American breeder, in the place of that useless ability to travel, has developed those qualities which increase aptitude to take on flesh and produce wool. The improved American Infantados appear to be quite as hardy in other particulars as their ancestors—are more prolific, better nurses, and when properly fed, resist other vicissitudes equally well, and endure cold even better; but they probably demand better keeping. They will thrive, however, where none of the mutton breeds above described would find sufficient subsistence. Choice Infantado flocks with the usual number of sheep of different ages, yield from 9 to 10 pounds of wool per head. The fleece is longer, thicker, and covers the different parts of the animal far better than it did on the Spanish sheep. The quality is probably as good.

THE IMPROVED PAULARS.

The improved American Paulars bear the same relation, in several particulars, to the preceding, that the Devons do to the Short Horns among cattle. They are smaller, consume less feed, and perhaps can better endure deprivations of it. Accordingly they are the sheep for cold, meagre soils; for the scanty herbage of mountain districts, and for plains subject to periodical droughts. They have about the same general improved points of form as the Infantados, but are shorter bodied. As breeders and nurses they are equal. Their fleeces are of equal quality, but are a pound or two lighter to the head. For that reason, and on account of the greater size of the former, there is, at the present time, a prevailing inclination to cross the Paular flocks with Infantado rams. This produces an admirable result for the wants of many farmers; but it would be very unfortunate if the present mania for great fleeces should lead to the loss, in its essential family purity, of a class of sheep so well adapted to extensive regions of our country.

THE SAXONS.

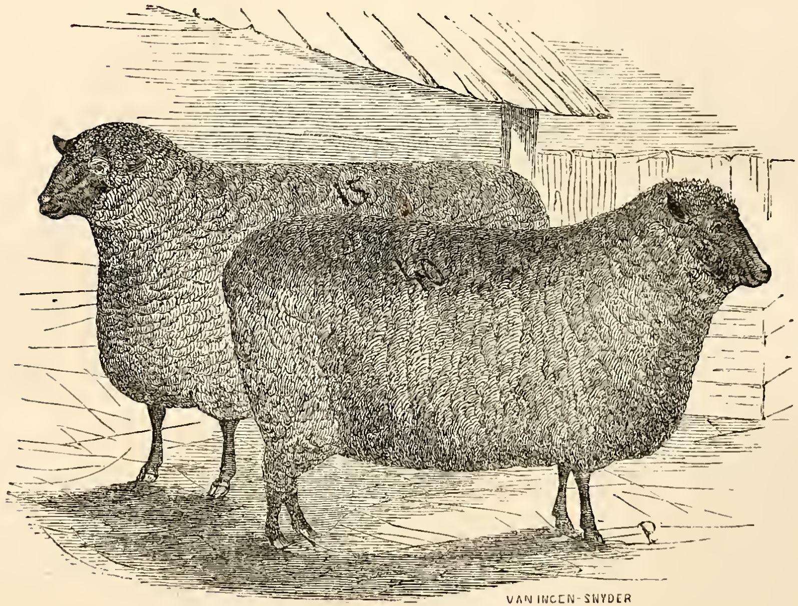
The Saxon sheep formerly had a multitude of zealous and skilful breeders in the United States. But they have so generally disappeared, and are held in so little estimation, that they do not require any description here.

THE FRENCH MERINOS.

The Merinos imported into the United States from France were generally the largest that could be procured in that country, and they were from 25 to 50 per cent. larger than the present American Merinos. The best of them were well formed for animals grown so far beyond the natural dimensions of their breed, and they had a fair degree of compactness. They were also profusely wooled, but none carried as much wool for their weight as the choice American Merinos. Their wool was of good medium quality and quite even on the carcass. A much larger number of them than the preceding were gaunt, flat-ribbed, unthrifty animals, great consumers and hard keepers. Their fleeces were very uneven. Everything goes to show that these were mongrel sheep, grades between Merinos and some large, coarse-woolled variety. The best French Merinos, placed under a system of keeping resembling that of France, or treated as the careful growers of the improved mutton breeds treat their sheep, would undoubtedly be profitable in the United States; but such a sys-

"No. 23."

South Down Ram, bred and owned by Samuel Thorne, of Thorndale, N. Y.



"No. 15 and No. 40."

South Down Ewes, bred and owned by Samuel Thorne, of Thorndale, N. Y.

tem does not accord with the habits or traditions of American wool-growers, and the French Merinos, treated like our American Merino sheep, are wholly incapable of sustaining themselves. They lack ability to withstand either exposure to the weather or short keep. Accordingly, though but little more than twenty years have passed since their introduction among us, the full bloods are now nearly as much out of favor in the northern and eastern States as the condemned Saxons. A quarter of their blood, however, mixed with the American Merinos makes a large sheep, which is a favorite with many farmers. The cross between the French ewe and American ram, after being continued for several generations, ought, with properly selected animals, to produce a striking result; and probably that result will yet be witnessed.

SILESIANS.

The sheep called Silesians in this country were produced in Silesia by breeding one hundred Spanish Infantado ewes to four Negretti rams, and their descendants together from 1811 down to the present day. They are evenly and beautifully woolled, and carry a good weight of it considering its superior quality. They are larger than any American family of Merinos, and they are also longer in the legs and longer and thinner in the neck, in proportion to size. They are, throughout, a less compact animal. Their hardiness has not, so far as the writer is informed, been tested under the ordinary systems of management in our country. Their merits as competitors with the American Merinos will be much better understood when such a test is made.

PRING MANAGEMENT OF SHEEP.

TURNING OUT TO GRASS.

Sheep confined to dry feed in the winter should be put upon grass in the spring gradually—*i. e.*, but for an hour or two a day at first—to prevent scouring or diarrhœa.

TAGGING.

To save wool and add to the health and comfort of sheep, they should be tagged before they are turned out to grass in the spring. This is performed by cutting away the wool around the vent and from the inside of the thighs. Sheep, and especially ewes which have not lambed, should be handled carefully, and laid on their sides while the operation is performed.

BURS.

All dry burs which attach to wool should be exterminated from the pastures before sheep are turned on them in the spring.

LAMBING.

Lambs should be allowed to come as early as the weather will permit with reasonable safety, for it is better to lose two in the spring than one the next winter. Ewes should have sheltered places to lamb in, which can be closed up and made warm in cold nights. Mechanical assistance ought not to be given in case of difficult parturition until a considerable period has elapsed, and until the ewe begins to exhibit signs of failing strength. It should then be rendered with great caution and gentleness; and if the ewe continues her throes, the lamb should be pulled only during the throes. If the ewe becomes very weak before or after lambing, a gill of sound ale will be a benefit to her. If the womb is inverted, cleanse it, if dirty, with tepid water, then wash it with a solution of alum or a decoction of oak bark, and gently return it. If again protruded, return it in the same way and take a single stitch with twine through the lips of the vagina, tying it loosely enough to permit the passage of urine. If this does not suffice, tie a waxed cord round the womb close to the breech, and let it slough off.

MANAGEMENT OF NEW-BORN LAMBS.

If a lamb can help itself, never interfere with it. If it is weak, hold it on its feet and let it suck. Rubbing it on the rump, loins, &c., with a finger is mistaken by it for the licking of its dam, and greatly encourages its efforts. For those cases where the dam has no immediate supply of milk the sucking bottle should be in readiness, with an artificial India-rubber nipple on it; this article is now made and sold expressly for the purpose. The milk of a new milch cow is alone suitable, and it should be given at its natural temperature. If the lamb is found soon after it is dropped, let it suck as much as it will, and four or five times again during the day and evening. If the lamb has been dropped some hours and is very hungry, it is not safe to allow it to fill itself at first.

CHILLED LAMBS.

If a lamb is found chilled by the cold—unable to move or to swallow, it should at once be put in a bath of water about as hot as can be comfortably borne by the hand, or placed in a warm oven, or in the absence of the preceeding, held over a pan of coals and turned and kneaded by the hands until it revives sufficiently to swallow. Then give it a feed of milk containing from half to a teaspoonful of gin or other spirits, according to the size of the lamb and the apparent necessity. If a lamb is becoming chilled, but is still able to swallow, the above stated dose will promptly restore it.

CONSTIPATION, DIARRHŒA, ETC.

An injection of warm milk, with a sufficient infusion of molasses to give it a chocolate color, is by far the safest and most effectual remedy for constipation in young lambs. Hold the lamb up by the hind feet, so that its fore ones just touch the floor, and then with a small syringe administer half a gill or a little more of the above-mentioned fluid. If dung is not soon discharged, repeat the operation. The diarrhœa of a sucking lamb rarely requires attention, but if it does, a spoonful of prepared chalk in a little warm milk should be given at intervals of a few hours until it is checked. The first yellow excrement sometimes adheres about the vent so as to prevent subsequent discharges or render them very difficult. It should be removed and the parts rubbed with dry clay, chalk, or in the absence of anything better, dirt. If the lamb has difficulty in making water, a little pumpkin-seed tea removes the difficulty.

CUTTING TEETH.

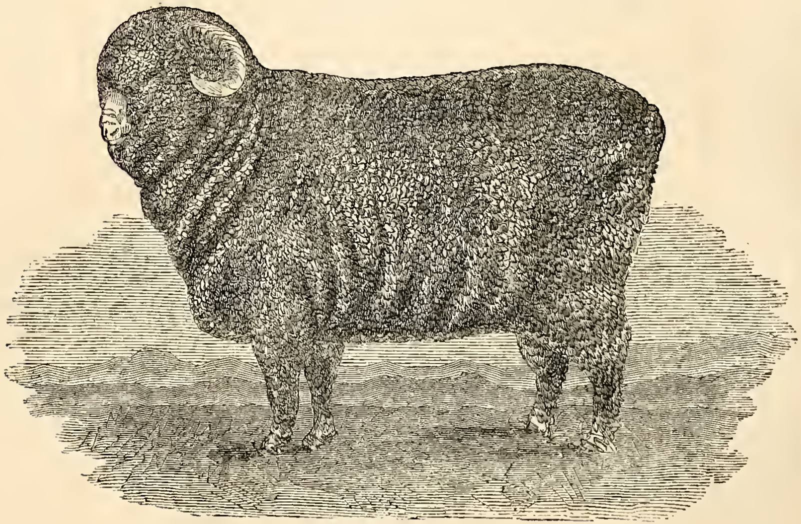
If the lamb appears to suck with difficulty or reluctance, its mouth should be examined, to see whether the front teeth are through the gums. If not, and the gums are inflamed and tender, they should be opened over the teeth with a sharp knife.

SWELLED NECK.

When lambs are born with the glands of the neck enlarged, a strip of woollen cloth should be bound round the neck and wet a few times a day with a strong solution of camphor. If this is not found effective, wet the cloth with tincture of iodine.

RHEUMATISM.

Lambs sometimes are born with stiff necks, or their necks become stiff subsequently. Some, particularly about the period of being turned out to grass,



MOUNTAINEER.

Paular Ram, bred and owned by John S. and Virtulan Rich, of Richville, Vt. Eleven months old.

become lame in their legs, hobble about, and, in some cases, are unable to stand. Put them in a warm, dry place, and give two or three spoonfuls of lard and one of turpentine, once or twice, as may be required, to each lamb; rubbing the affected parts with hartshorn or opodeldoc will assist in the cure.

TREATMENT OF EWES AFTER LAMBING.

A ewe should not be required to move about much for a few hours after lambing. If her teats are closed against the efforts of the lamb, squeeze them out with the wetted fingers. If they have been cut off in shearing and are grown up, reopen them with a needle, followed by a hot knitting needle, inserting neither further than is necessary. The sucking of the lamb will generally keep them open; but if they become inflamed, the ewe must be held for the lamb to suck, and some cooling lotion applied to the part.

GARGET.

If the udder is hard and hot, it should be fomented by frequently and continuously applying to it a cloth dipped in hot water. Repeated washings with cold water produce the same effect, but more slowly, and with a greater tendency to dry up the milk. If the lamb is dead, and there are indurated tumors in the udder, apply iodine ointment.

DISOWNING LAMBS, ETC.

A ewe which disowns her lamb, or one which is required to adopt a foster lamb, should be confined alone with it in a dark place, and, if possible, out of hearing of other sheep, and she should be held several times a day for it to suck. Frightening a ewe when with her lamb, by showing her a strange dog, or a child wearing a bright colored mantle, sometimes arouses her dormant maternal instincts. If a ewe's dead lamb is skinned, and the skin tied on a living lamb, she will generally readily adopt it. If she hesitates, rubbing gin on her nose and sprinkling it on the lamb will facilitate the process.

DOCKING AND CASTRATION.

These processes should be performed when the lamb is not more than two or three weeks old, and before warm weather comes on; and it is an excellent plan to smear the wounds with a compound of tar, butter, and turpentine. The tail should be cut off so that no part of the bone is left uncovered. Castration is an operation sufficiently familiar to most farmers.

SUMMER MANAGEMENT

TIME AND MODE OF WASHING.

It is generally held by those who have tried it that early shearing is preferable for sheep, if they can be subsequently housed in case of severe storms or unusually cold nights. As early washing is improper in cold climates, it is urged that sheep should be shorn unwashed. This is a question on which the wool-grower should be allowed to exercise his own judgment; nor should any buyer attempt to compel washing, or to take advantage of its omission by insisting on a particular and fixed rate of shrinkage on unwashed wools. The shrinkage on every lot should be proportioned to its actual condition, as deduction is made on wheat, other products, or foreign wools which contain impurities. The mode of washing sheep does not require to be here described.

CUTTING HOOFS.

Merino sheep generally require to have their feet trimmed at least once a year. Some do this at washing, when the feet are clean and soaked soft; others immediately after shearing.

SHEARING.

Shearing should take place when the oily-feeling matter, termed yolk, has so far reappeared in the wool as to give it its natural brilliant appearance and silky feeling. The mode of shearing cannot be described here in detail. The wool should be cut off evenly and smoothly, reasonably close, but not leaving the skin naked and red, which renders the sheep very liable to receive injury from cold. "Stubble shearing" and "trimming," *i. e.*, leaving the wool long, so as to give the next fleece the appearance of extraordinary length, or leaving it long in places, in order to affect the apparent shape of the animal, are both frauds.

DOING UP WOOL.

The fleece should be as little broken as possible in shearing. It should be gathered up carefully, placed on a smooth table, with the inside ends down, put into the exact shape in which it came from the sheep, and pressed close together. If there are dung-balls, they should be removed. Fold in each side one-quarter, next the neck and breech one-quarter, and the fleece will then be in an oblong square form, some twenty inches wide, and twenty-five or thirty inches long. Then fold it once more lengthwise, and it is ready to be rolled up and tied, or placed in the press. The improved wool-press, worked by a lever, or by a crank, &c., does the work far more expeditiously, far better, and with much less labor than doing it up by hand. Three bands of moderate sized twine (flax or hemp) once round are enough for the fleece. It is fraudulent to put the unwashed wool of sheep that have died with disease, or of those which have been killed, or unwashed tags, into washed fleeces. It is also fraudulent to sell burred wool so done up as to conceal the burs, without giving notice to the buyer. The burred wool should be put by itself, so that the buyer can open and examine it.

STORING WOOL.

Wool should be stored in a clean, dry room, tight enough to keep out dust, vermin, and insects. If sacked and sent off to market, it is put up in bales nine feet long, formed of two breadths of burlaps thirty-five or forty inches wide.

REGISTRATION.

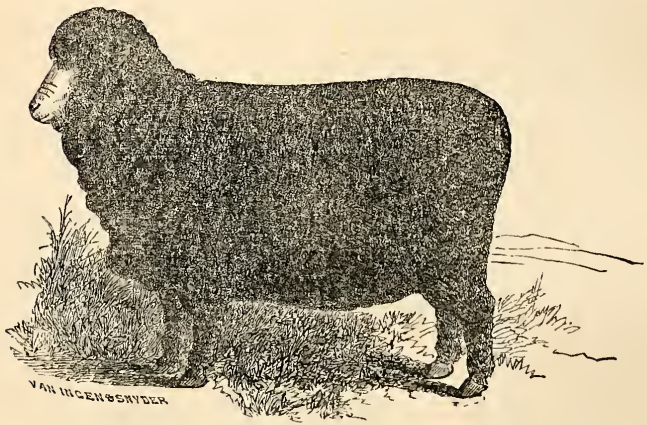
Flock-masters, anxious to improve their sheep by annual and rigorous selection, have them numbered on the side with brands as they are sheared, and in a register set down all the most prominent characteristics of each sheep. The register is made by ruling a blank book into columns, and placing over each the names of the characteristics to be recorded, such as "length of wool," "thickness of wool," &c. The record is made by placing figures in the columns opposite the numbers of each sheep. Figure 1 denotes the maximum; figure 5 the minimum of each characteristic, and the intermediate figures intermediate grades of quality. This enables the flock-master to select the proper sheep to sell, kill, &c., at any period of the year.

STORMS AFTER SHEARING.

Cold storms sometimes come after the proper time of shearing, and prove highly injurious, or even directly destructive to the lives of sheep, unless they are put into barns or under sheds. A dense forest, especially on the lee side of a hill, is vastly better than no shelter under the circumstances.

TICKS.

A fortnight after sheep are sheared the lambs should be dipped in a decoction of tobacco strong enough to kill ticks and their eggs in the wool. This



PAULAR EWE.

Bred and owned by John S. and Virtulan Rich, of Richville, Vt.

is best performed in a box or kettle, with a grated shelf on one side, to conduct back the fluid as the lamb is laid on it and its wool squeezed, or two tubs may be used, dipping the lamb in one, and standing it up and squeezing its wool in the other. In tobacco-growing regions the refuse stems may be used for this purpose; elsewhere the farmer should grow a few tobacco plants in his garden. The dipping of the lambs annually will keep ticks out of a flock. Left in it, they are highly destructive to condition, health, and even life.

ATTENTION TO HORNS, ETC.

It is necessary at shearing to cut off the wool clean between the horns, and from the head of rams. Otherwise the least fracture of the skin on the head would lead to the parts becoming fly-blown, and to the generation of maggots For the same reason horns which press on the head should be sawed off, or sections taken from them, which will prevent such pressure. And as rams do not recognize each other immediately after shearing, and are prone to fight, it is a good practice at shearing to smear them at the base of and behind the horns with tar and turpentine, or fish-oil.

MAGGOTS.

When maggots are produced in any wound or sore on sheep they can be killed by the application of turpentine, and tar should then be smeared over the part. If the ulcer is old and ill-conditioned, a solution of corrosive sublimate (two ounces dissolved in a quart of alcohol) will even more effectually destroy maggots and repel flies, and at the same time act as a good stimulant and caustic.

SALT.

Sheep should have access to salt, placed under cover, all the time, or they should be regularly fed as much as they will eat once a week.

WATER AND SHADE.

Water is not absolutely indispensable in the summer pastures of sheep, but they thrive better with it, especially ewes and their unweaned lambs. The same is true of shade.

FALL MANAGEMENT.

WEANING AND FALL-FEEDING LAMBS.

Lambs should be weaned at four months old, and should have a nice, sweet, fresh piece of feed in readiness for them on being separated from their dams; and they should have prime pasturage until the setting in of winter. If it fails, they should be fed some green substitute for it, or receive an allowance of grain. Those breeding mutton sheep often feed cabbage or roots, or fold their lambs on rape. Lambs of any kind should be kept growing from the day of their birth until they reach maturity. This is the great secret of raising sheep profitably. As soon as the cold, heavy, autumn rains begin to fall, lambs should be housed nights, and as winter approaches they should be sheltered from cold storms in the day time.

FALL-FEEDING BREEDING EWES.

The ewes on weaning their lambs should be put on dry, short pasturage, until their milk dries off, and then on feed which will rapidly restore their flesh. They do not as much as lambs demand shelter and extra feed before winter, but there is no doubt that they amply pay for it in condition, especially ewes that are getting old and beginning to lose their strength. Strong, middle-aged sheep, however, demand no other extra feed than hay or cornstalks until winter sets in. "Sheep well summered are half wintered." To let them become thin before winter, renders it difficult and far more expensive to winter them safely and well; they are not as likely to take the ram, and their product of wool is diminished. And if quite thin, there is an absolute peril to their lives if the winter is an unfavorable one, however well they may be taken care of. The danger is the greatest to the quite young and the old sheep. These sometimes will not improve, but begin to run at the nose and eyes, gradually lose their appetite, grow weaker and weaker, in some cases exhibiting costiveness, and in others obstinate diarrhœa, and perish miserably. When they commence going in this way, medicine, feed, and care are almost thrown away upon them.

COUPLING, ETC.

Before rams are put with the ewes in the fall, the latter should be examined—directly and by the register—and divided into parcels, so that each parcel can be coupled with the ram most suitable to correct the defects of the dam in her offspring. Thus the shortest woolled ewes would be selected out for the longest woolled ram; flat-sided and long-legged ewes for a peculiarly round-bodied and short-legged ram, and so on. A ram running with the ewes ought not generally to be trusted to serve more than fifty. If taken out nights and extra fed, a very strong animal will serve a hundred. By keeping him separate from the ewes, and allowing him to serve them but once each, he will serve two hundred, and some uncommonly vigorous rams have served three hundred, and even more in a coupling season of six weeks. The best feed for the ram, besides good hay or grass, is a mixture of, say, two parts oats, one part peas, with a slight sprinkling of wheat. He should be fed a few days before the coupling season, commencing with not more than half a pint, and increasing gradually to a quart by the time his work commences. Some old rams, which have become used to hard work and high keep, will consume nearly double that quantity. The Merino ram is in his prime from three to seven or eight years of age. The ram lamb gets good stock if not overworked, but this premature use trenches on his subsequent vigor. The periods of heat in the ewe recur from the fourteenth to the seventeenth day. Her average period of gestation is about one hundred and fifty-two days.

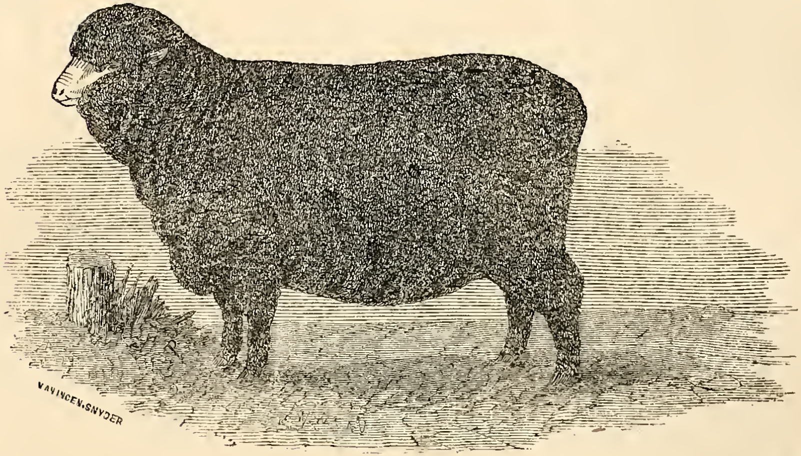
DIVIDING FLOCKS FOR WINTER.

Sheep should be divided according to size and strength before they are put into winter quarters, so that the strong shall not take advantage of the weak at the rack, trough, &c. This is highly important. The smaller the number of sheep kept together in winter the better it is for them, and good farmers rarely allow more than one hundred to occupy the same stable and yard.

WINTER MANAGEMENT.

WINTER SHELTER.

There is no part of the United States, if there is of the world, where sheep are not better for some degree of winter shelter. In western Texas and in the Gulf States, perhaps, they demand no more than a pole-shed or dense clump of trees to break the fury of the "northers;" north of latitude 40° to 42°, close barns or stables, with abundant ventilation, are beginning to be preferred by careful and systematic breeders. Open sheds are too much exposed to drifting snow, and they cannot be shut up and made warm enough for early lambing. A room twenty by forty feet in the clear will properly accommodate seventy-five Paular sheep, and they can all eat at a time, without crowding, at wall racks placed around it. The Infantados want a little more room; and the English breeds still more. Sheep barns should be placed in dry, elevated, but not windy situations. They are usually two stories high, the upper one



INFANTADO EWE.

Bred and owned by W. R. Sanford, of Orwell, Vt. One year old.

being used for the storage of hay. The sheep stables underneath should be at least seven or eight feet high. A room large enough to hold one hundred and fifty Merinos may be partitioned across the middle by feeding racks, and seventy-five sheep kept on each side—their outside yards being also divided—but not more than one hundred and fifty ought to breathe the atmosphere of the same general apartment, however it may be divided on the floor. The rooms should be well lighted, capable of abundant ventilation, and that ventilation constantly employed. Confined, impure air is highly injurious to sheep, and perfectly fatal if a dangerous epizootic makes its appearance in the flock. The slatted box-rack is now generally preferred in sheep barns and yards. The stables should be kept well littered down, and should be thoroughly cleaned out at least three times during the winter, so that the sheep should not lie, especially during thaws, on fermenting beds of manure. It is well, at intermediate periods, to scatter gypsum over the manure before covering it with fresh straw, as this absorbs the escaping gases, and adds greatly to the value of the manure. Sheepyards should, if practicable, be on dry gravelly ground, and should have at least three times as much area as the stables. They should have high, tight fences on the sides most exposed to severe winter winds, and should be kept well littered down. Habitual exposure to mud and filth is highly injurious to sheep.

CONFINING SHEEP TO YARDS.

The close confinement of sheep to stables and small yards operates on them as it does on all other domestic animals: it renders them torpid in habit, and promotes the taking on of fat and flesh. This is well for fattening sheep, but not for breeding ewes. The want of exercise and the increase of condition promotes that tendency to plethora which is natural to pregnancy, and though the evil effects of this are not always visible in the offspring, yet there come seasons when other co-operating conditions render it highly destructive. The lambs are yeaned small and weak, and those that live are of but little value. Breeding ewes should have exercise by having access, at proper times, to a field, or obtain it in some other way.

WATER AND SALT.

Water is indispensable to sheep fed on dry feed in the winter, and they should have constant access to it. Salt is also indispensable to vigorous health. It is improper to salt sheep-hay heavily when it is put in the mow or stack, or to brine all their hay for them at intervals, because in either case the instincts of the animal are not left to guide its consumption. Salt should be placed in boxes in the sheep-house so that they can eat it at will; or the orts taken from the rack may be brined and put in a large rack kept for that purpose where the sheep can come to it at their pleasure.

AMOUNT OF FOOD CONSUMED AND VALUE OF DIFFERENT KINDS.

It is estimated that all sheep daily consume, in the average winter weather of the northern States, about one pound of hay, or its equivalent, for every thirty pounds of their own live weight. All that they will eat of meadow hay is about the amount of nutrition demanded by the Merino sheep in good, plump, store condition. If a portion of more concentrated food like grain, is given, its excess of nutrition may be safely counterbalanced by feeding a corresponding amount of food less nutritious than hay, as, for example, straw. Barley and oat straw, if cut and cured green, are highly relished by sheep. Wheat straw is less so, and they will eat but little besides the chaff and heads of it, if they can obtain other food. Rye straw, unless chopped fine and mixed with meal, is wholly unfitted for sheep feed. Pea-haulm, if cured green, is an admirable fodder, but dry and dead, as it is generally gathered, it is wholly valueless except for manure. The blades and tops of nicely cured cornstalks make prime sheep feed. Fine red-clover hay, cured bright and green, is better than the best meadow hay, and on a full winter allowance of it sheep actually fatten; it is also highly favorable to the milk secretions in breeding ewes. The grains and pulse most used in our country for sheep feed are oats, corn, and peas. Oats are given to store sheep and lambs; corn is given to fatten sheep, and with some it is a favorite for all other classes of sheep. Some excellent feeders, like Mr. Johnston, of Geneva, New York, employ buckwheat. Peas are fed in a few instances to breeding ewes, and they greatly promote the growth of wool and the secretion of milk, but they are too scarce and expensive for common use. The same is true of beans, though they are accounted among sheep-breeders more heating, and therefore less suitable feed. Bran and shorts, mixed with a little grain, make a most excellent feed both for lambs and old sheep. Bran-slop is admirable for promoting the secretion of milk in yeaning ewes. Breeding ewes thrive better, and are better prepared in their general physical condition to bring forth well-developed, strong lambs, if they habitually receive green food during the winter, and other sheep are healthier for it. Colic or "stretches," often so serious a malady among flocks confined to dry feed, does not attack sheep that get green feed. In regions adapted to their culture, Swedes and some other varieties of the turnip are especially adapted to this object. There is a beet which was brought from Silesia by Mr. William Chamberlain, (not the variety sold in seed stores as the Silesian beet,) which some persons who have tried them prefer to turnips. Either root is vastly cheaper than grain of any description for the feed of sheep. Carrots have been tried and do not give satisfaction, and potatoes are too expensive.

REGULARITY IN FEEDING.

One of the important points of successful sheep-farming consists in strict regularity in the time of feeding, and in proportioning the amount of fodder to the wants of the animal. With good attention to these particulars, sheep will do better on moderate keep than on the best food fed with irregularity.

DISEASES OF SHEEP.

Only those diseases of sheep which are known to have appeared in the United States will here be noticed, with the single exception of small-pox. This malady is so dangerous, and there is such a strong probability of its being introduced into our country, that our people ought to have some preparatory information on the subject.

SORE FACE AND LIPS.

Sheep's faces occasionally become quite sore when they are at pasture in summer. It is attributed to the effects of St. John's wort, and to some other causes. It is cured by the application of sulphur ointment, consisting of sulphur and lard.

Swelled and sore lips more frequently appear about the opening of winter, but the causes are unknown. Sulphur ointment, mixed with a little tar, is a very efficacious remedy.

OPHTHALMIA.

This disease is characterized by redness of the eye and the parts about it, intolerance of light, and a flow of tears. Bathe the eye occasionally in warm water, and with a weak solution of sulphate of zinc, combined with tincture of opium.

GRUB IN THE HEAD.

Among farmers this is the name given to various different diseases. The gad-fly of sheep deposits its eggs in their nostrils in the months of July and

August, and these being immediately hatched by the warmth and moisture, the larvæ or young grubs crawl up into the cavities of the head, and attach themselves to the membraneous linings. They remain there until the ensuing spring, when they become thick, plump grubs, more than an inch long. They then descend from the head, drop on the ground, burrow into it, take the form of a chrysalis, and at the proper time again hatch forth gad-flies. Their effect on the sheep is a matter of considerable dispute, some eminent veterinary writers considering them entirely harmless. Others, and a much greater number, believe that the irritation they occasion produces disease and death. If the sheep begin to fall off in condition a little before spring, though previously in good flesh, and their feed kept fully up; if they wander round with movements indicative of pain in the head, and discharge mucus, tinged with blood, from the nose, though oppressed with no catarrhal difficulty, it may be suspected that they are suffering under the effects of grub in the head. Some persons have blown tobacco smoke up their nostrils from the tail of a pipe, the bowl being covered with a cloth, with asserted good effect. Others have injected tobacco-water with a syringe, but this must be prevented from entering the throat in any considerable quantity.

LOCKED JAW.

This has sometimes been produced by cording rams. When discovered, remedial measures are generally too late, and it should be prevented, if possible, by more careful cording.

RABIES.

The period of incubation between the bite of a rabid animal and the appearance of rabies in sheep, so far as observed by the writer, averages about three weeks, though it is said sometimes to appear after several months have elapsed. The first symptom of it is a disposition to ride other sheep. The rabid ewe, though pregnant, acts towards other sheep precisely like the rutting ram, and even employs his peculiar note of solicitation, but if ridden herself exhibits great rage and fiercely fights the one riding her. Rumination and the natural appetite are completely suspended; the animal gnaws wood, wool from its companions, and frequently the most dirty substances. Nothing is masticated regularly, but is hastily swallowed after being bitten rapidly and just sufficient to enable it to be forced down the throat. Rabid sheep neither shun water nor exhibit much thirst. Eight days is the average duration of the disease in the cases observed by the writer. At first the propensity to ride appears; second, depraved appetite and rubbing of the head and also the feet against fences, &c. On the second or third day the scars of the wound inflicted by the rabid animal again look red and inflamed, the patient exhibits more irritability, attacks its companions suddenly and without provocation, and fiercely buts, and in some cases bites at a stick thrust towards it. On the fourth day it rushes at a man if he enters the pen, and frequently dashes against the fence if a hat or handkerchief is shaken at it; in some instances thus charging if a person utters a sound or only approaches its place of confinement. On the fourth or fifth day the edges of the wound reopen. On the fifth or sixth day there is considerable weakness, and in some of the cases less ferocity. On the seventh and eighth days the prostration of strength increases rapidly, the respiration becomes labored and sometimes irregular, the pulse rapid, and the reopened wound again dries up. Where the wound is on the eyelid the cornea becomes white and opaque, and the eye blind. Froth falls from the lips of some, and ropy saliva from those of others, but neither are persistent or conspicuous symptoms of the malady. Finally the debility becomes extreme, but there is no stupor, or insensibility to sight or sound. There is no paralysis. None give up their hostility to men or sheep. The fiercer sheep fight each other when constantly falling down from weakness; some utter short, angry bleats as they fight other sheep or a stick; but as a general rule they remain silent, except to emit a snuffing or snorting sound when bounding forward to make an attack.

There is no remedy for this terrible malady. It is here described so that it may be promptly identified, and the proper measures taken if it appears in a flock. It is doubtful whether the saliva of a rabid sheep will communicate the disease to men or sheep; but no risk should be run by allowing its saliva to come in contact with the hands where the skin is broken, and if it does so, prudence requires that the parts be promptly cauterized with lunar caustic until a thick black eschar, or scab, is formed over them. The same course would also be prudent on sheep whose skin is broken; but there is no probability that sheep *bite* any animal so as to break the skin, and thus bring the saliva in contact with the absorbing vessels of the system. In a number of cases witnessed by the writer, in 1863, the rabid sheep were separated from the flock as the disease appeared, and put in a yard together. They constantly fought, as already described, but were observed in no instance to *bite each other*.

OBSTRUCTIONS OF THE GULLET.

Sheep sometimes get a piece of turnip or other substance lodged in the esophagus or gullet. If it cannot be moved by the fingers, set the sheep on its rump, holding its nose upward, pour some oil into the throat, and then insert a small, flexible probang, and very gently push the obstructing substance into the stomach. The probang, in the absence of a gutta-percha one, should be of strong, flexible wood, like elm, made smooth and round, and five-sixteenths of an inch, or a little larger, in diameter. A small bag of flax-seed should be firmly secured to, and cover, the lower end; and on dipping the rod in hot water, to limber it for use, the bag will become soft and slippery, so as to protect the esophagus from laceration. If no flax-seed is at hand, carefully win the lower end of the probang with tow and dip it in oil.

HOOVE.

If sheep become swollen from being turned on fresh clover, or the like, they should be driven gently about for an hour. If swollen to a dangerous degree, and the distress and oppression are rapidly increasing, a trocar, or, in its absence, a pocket-knife, must be plunged into the left flank, half way between the haunch and ribs, and well up towards the back-bone, so that the pent-up gas will escape through the orifice. An ounce or two of Epsom salts are generally administered after an attack of hoove. If the gas continues to form in the stomach, give a drachm of chloride of lime dissolved in a gill of water.

POISONS.

The narrow-leafed or low laurel, *(kalmia angustifolia,)* and the broad-leafed laurel or "calico bush" or "spoonwood," *(kalmia latifolia,)* are eaten by sheep, particularly when they are unaccustomed to them, or when they are hungry from travelling, and find these bushes growing by the roadsides. A strong decoction, made by boiling the bruised twigs of white ash for an hour, administered in doses of half a gill or a gill, and repeated after an interval if necessary, is believed to be an effectual antidote by persons who have tried it. Drenches of milk and castor oil are also said to have been successfully resorted to. Injecting warm water into the stomach and pumping it out again, and continuing this until vomiting is produced or the poison thoroughly diluted, using a common India-rubber stomach-pump, *i. e.*, a hollow ball with a perforated tube attached, would be highly useful in all cases of poison, by whatever produced. This should be followed up by active aperient medicine. Other plants besides laurel are suspected of poisoning sheep, but very little accurate information has yet been obtained regarding them.

DIARRHŒA.

Common diarrhœa or scours, not attended with constitutional disease, generally requires no remedies. If protracted, two or three days' confinement to dry feed, or an ounce of prepared chalk given in half a pint of tepid milk, will usually put a stop to it. If the purging is severe, or accompanied by mucus slime, a gentle cathartic of an ounce of Epsom salts or oil should be administered to a sheep, and half as much to a lamb six months old, and this be followed up by the dose of chalk and milk above recommended once a day foı two or three days. But "sheep's cordial" is a better remedy than the chalk, and may be kept on hand by every farmer. It is composed of the following ingredients: Prepared chalk, one ounce; powdered catechu, half an ounce; powdered ginger, two drachms; and powdered opium, half a drachm. Mix them with half a pint of peppermint water, and give two or three tablespoonsful morning and night to a grown sheep, and half as much to a lamb.

DYSENTERY.

This differs from diarrhœa in various observable particulars. It is attended by fever; the appetite is irregular and generally poor; the evacuations are as thin as or thinner than in diarrhœa, but they are slimy, sticky, and very offensive in smell. As the disease progresses, they become tinged with blood, and the animal rapidly wastes away. It sometimes dies in a few days, and sometimes lingers along for several weeks. This is treated much like severe diarrhœa, only many persons give two cathartics, instead of one, at the beginning. The English practitioners also bleed, if the malady is detected in its very first stage; but if debility has ensued, it prostrates the system too much. The "sheep's cordial" requires to be given longer, and after a short period tonics are added—more ginger and from one to two drachms of gentian daily. This last is an admirable tonic. In place of the above remedies, some American farmers give a teaspoonful of laudanum and a tablespoonful of gin or rum, mixed and put in a little diluted fluid.

COLIC OR STRETCHES.

This is occasioned by confinement to dry food. During the paroxysms the sheep stretches itself incessantly, and exhibits much pain. A cathartic of one ounce of Epsom salts or castor oil will usually effect a cure. A drachm of ginger and a teaspoonful of the essence of peppermint, put in warm water with the salts, adds to their efficacy. Half of the above dose for lambs. Green feed, even if given only once or twice a week, prevents this malady.

CATARRH.

This is common in winter among unsheltered sheep, or those which are wintered in small, close, unventilated stables. In its simple form it is not dangerous, unless its exciting causes are continued; but frequent colds, rendered chronic by mismanagement, impair the condition of sheep, and eventually lead to low forms of fever, wasting and death. An epizootic catarrh, like influenza in unusually changeable winters, among human beings, occasionally rages with great violence over extensive regions, producing wide-spread destruction in our American flocks. The best course is to *prevent* the disease by proper management. Hardy sheep, in good condition, need not, with reasonable precaution, be exposed to taking cold, and if any number of them chance to do so, certainly the neglect causing it need not be repeated. For simple cold it is not common to do anything, though some careful farmers administer a tablespoonful of tar, and smear a little of it on the nose. Non-exposure, and dry, well-ventilated stables in winter, generally lead to a speedy cure. If the malady becomes chronic, and assumes an epizootic and malignant form, no remedy has yet been discovered which will control it. Perhaps the best practice would be good, careful nursing.

ABORTION.

Abortion is usually produced by a hurt or injury. It has never, in this country, assumed that infectious character that it sometimes does among cows; but it is well to remove the abortive lamb and the "cleanings" from the sheep-yard, and also to withdraw the ewe and place her in "the hospital." She requires care and extra nursing, or she will become very poor and lose a large portion of her fleece.

PARTURIENT FEVER.

This has as yet appeared only among our English sheep. The ewe a few days before lambing appears dull and stupid; her appetite fails, she exhibits giddiness, and a discharge of a dark color takes place from the vagina. She loiters behind her companions, staggers in her gait, her head droops, and her eyes are partly closed. If she now lambs, and is carefully sheltered and nursed, she sometimes recovers rapidly; but if no such relief is afforded, typhoid symptoms begin to occur. She wanders away alone, exhibits great uneasiness and pain, and strikes her body frequently with her hind feet. The prostration rapidly increases, and the dark colored discharge from the vagina continues and has an extremely offensive odor. A lamb or a pair of lambs are frequently expelled at this stage in a high state of putrefaction, and she is now unable to rise and is almost insensible. Death soon closes the scene.

The ewe attacked by this disease should at once be removed from the flock, and if a large English ewe, a dose of two ounces of Epsom salts, with two o three ounces of molasses and one drachm of nitre, mixed with a pint of warm lin seed gruel, should be administered; and if this does not open the bowels in eight or ten hours, it should be repeated. The nitre and molasses are given subsequently, night and morning, in a quart bottle of gruel, until the fever abates, when the nitre is discontinued. If the ewe lives to the third or fourth day, and the stench of the dark discharge from the vagina shows that the fœtus is dead, a small quantity of dry, pulverized belladonna is applied with the end of a finger to the mouth of the womb every hour until it is sufficiently relaxed to allow the removal of the fœtus. After this is effected, the womb is thoroughly syringed with warm milk and water, the ewe put in as easy a position as possible, and her posture changed two or three times every day. She is then carefully nursed until recovery. This treatment has proved very successful.

THE SCAB, ETC.

The scab, like the itch in human beings, is produced by an insect, and to cure it the insect must be killed. Its first appearance is in little swellings of a greenish blue tint. A pustule is formed, and about the sixteenth day it breaks, discharging a horde of insects to burrow in the skin elsewhere. The diseased sheep rubs itself with violence against every object, using its teeth and feet to allay its intolerable itching, and the wool is torn off its shoulders and sides. If unrelieved, it pines away and soon dies. If the wool is short, the mos usual remedy is to immerse the sheep in a strong decoction of tobacco, afte scouring the sores with a shoe-brush, dipped in tobacco-water and soap, sufficien to break the scabs. Some add a little turpentine occasionally to the decoction; some also knead the sores with their hands while in the decoction. The writer once had one hundred and fifty sheep suffering from scab thus treated; they were cured by one application. When it has been performed much more rapidly and carelessly in large flocks, and the sheep returned to their previous pasturage, a number of applications has been found necessary. By using the refuse stems of tobacco the process is not a very expensive one, even though the wool be at its full length. Although it cannot then be performed as effectually, it will at least suffice to check the disease until after shearing, when a complete cure may be effected. The following are favorite remedies in England:

1. "Dip the sheep in an infusion of arsenic, in the proportion of half a pound of arsenic to twelve gallons of water. The sheep should previously be washed in soap and water. The infusion must not be permitted to enter the mouth or nostrils."

2. "Take common mercurial ointment, and for bad cases rub it down with three times its weight of lard; for ordinary cases, five times its weight of lard. Rub a little of this ointment on the head of the sheep. Part the wool so as to expose the skin in a line from the head to the tail, and then apply a little of the ointment with the finger the whole way. Make a similar furrow and application on each side, four inches from the first, and so on over the whole body. The quantity of ointment, after being compounded with the lard, should not exceed two ounces, and considerably less will generally suffice. A lamb requires one-third as much as a grown sheep. This will generally cure; but if the sheep should continue to rub itself, a lighter application of the same should be made in ten days."

The large English sheep are here referred to. The Merinos would not require much more than half the quantity stated.

There are a few other cutaneous diseases which are sometimes taken for scab because they occasion a degree of itching and rubbing. In none of them are the sores so conspicuous or the rubbing and stripping off of wool anything like as extensive. All of them, so far as ascertained, yield readily to the effects of an immersion in the decoction of tobacco.

SMALL-POX.

The first symptoms, as described by foreign writers, are dulness, loss of ppetite and strength, a staggering gait, and slight indication of fever. This asts about four days, when eruption commences. Small violet-colored spots appear in various places on the skin, and in the centre of each a pustule, which, at the end, springs up. These pustules are most abundant on the inside of the legs and the parts which are naked or covered only by hair. The diseased animal is inclined to separate itself from the flock. Its back arches, its ears droop, and its eyes are partly closed. Sometimes the febrile symptoms are mitigated when the pustules become developed, but in severe cases the whole skin becomes inflamed, the pulse rapid, the mouth hot, the breath offensive, and the head swollen. Rumination is suspended, the strength rapidly fails, the pustules die away without forming much matter, fetid diarrhœa takes place, and death rapidly ensues. The appearance of the disease, however, as well as their order of recurrence are quite various. It is not important to describe them any further here than is necessary to the identification of the malady. It attacks sheep in all conditions and at all periods of the year, but lambs sooner than grown sheep. In flocks which take it in the natural way from half to three-quarters frequently perish. No treatment controls it to any considerable extent, and that most generally adopted has consisted of little more than good nursing, medicines calculated to throw out the eruptions, mild aperients during the febrile stage, and tonics in its latter ones. Both vaccination and inoculation have been resorted to, however, with nearly as much advantage as human beings experience by these operations in escaping the natural effects of small-pox. Inoculation is generally preferred on the continent of Europe. But as it occasions trouble and expense, and, under common treatment, some loss of life, it is rarely resorted to until the sheep have been exposed to contagion, and, therefore, while it mitigates, it does not prevent a very great evil.

The appearance of this malady on the American continent would be an incalculable misfortune; and that importer of sheep-pelts, wool, or the like, who introduces it here by any voluntary risk, or even unintentional carelessness, will deserve and receive the execrations of all posterity. The disease, though not regarded as identical to human small-pox, is very closely analogous to it in every particular, and is equally contagious. Almost everything touched by the animal diseased will, during a period not yet determined, communicate the malady. The shepherds who handle the diseased sheep are required to change their clothes and cleanse their hands before they go among healthy sheep. The fields, the trees, and fences which have been rubbed against, the yards and stables, and even the grass and roads trodden by sheep laboring under this malady are believed to retain and spread the contagion. It is not likely to be introduced among our American flocks by clothing, pelts, wool, or other inanimate substances, without a very extraordinary train of circumstances—unless, indeed, a shepherd who had handled it should bring his infected clothing to this country and in that clothing handle American sheep. Perhaps such a specimen of stupidity or wantonness is beyond the bounds of probability. But it is very clearly the duty of every inhabitant of this continent to abstain from importing live sheep from any country where the sheep small-pox prevails or has prevailed at a recent date. A swift-sailing steamer would bring sheep from Europe during the incubatory state of the malady.

HOOF-ROT

This is a soreness commencing in the cleft of the foot, and which gradually extends into it, and disorganizes all its structure. The application of almost any caustic will, in an early or mild stage of the disease, eradicate the ulcer, so far as it is brought into direct contact with the caustic and kept in contact with it until its curative qualities exercise their full effects. But the great difficulty is, that among one hundred sheep every ulcer cannot be or is not so carefully uncovered by the knife, or kept so free from filth, that its entire surface is cauterized. And if such a surface of the smallest extent is protected from the caustic by a covering of horn or filth, then the seeds of the future malady and contagion are left in a soil where they are sure to be productive. Or let us suppose that every particle of ulcerous surface in the foot is touched by a mild caustic, like blue vitriol, and then immediately plunged into wet grass, or into moist manure, or washed by blood spirting from the wounded parts, would there be any probability of a radical cure under any of these circumstances? Experience answers none. The difficulty of eradicating hoof-rot from a large flock, under the rough surgery and haste of the farm, can then be fully understood. The writer of this has had hoof-rot at four different periods on his farm, and at least five thousand sheep affected by it, all of which were cured, and he has a right therefore to speak with some confidence.

For mild cases of the malady, blue vitriol is decidedly the best remedy; for severe cases, butter of antimony. The writer has twice cured a flock completely by one application of the former. In the first instance, each sheep had its feet thoroughly pared for the purpose of exposing every part of the flesh in the least affected by the disease. The sheep was then placed in a tub of saturated solution of blue vitriol and *hot* water three or four inches deep, and held there by the neck by an assistant. A second one was prepared in the same way and placed beside the first one in the water. When the third was ready, the first was taken out, and so on. Each stood at least ten minutes in the solution, which was kept constantly *hot* by dipping out and replenishing from the boiling kettle. The sheep were then placed in a dry situation, and they proved to be completely cured. This was at the opening of winter. Many years afterwards a flock of lambs were treated in the same way, except that as five could stand in the tub of hot solution together each remained in it from twenty to twenty-five minutes. This, too, was at the opening of winter, and again the cure was perfect. Probably the hot liquor would be more effective than cold even on the uncovered ulcers, and it certainly would penetrate better to the covered ones. These are the only instances which ever came to the knowledge of the writer of a diseased flock of sheep being cured by a single application of any remedy.

When the foot is extensively disorganized and a powerful caustic is required to remove the dead structure, butter or chloride of antimony should be used. As it combines readily with the fluids in the parts, it almost immediately loses its strength, and it therefore possesses the admirable property of acting almost purely superficially; consequently its action can be regulated by the wishes of the operator. This is not the case with the other strong caustics, like nitric, sulphuric, muriatic acids, &c. These burn deeply and sometimes injuriously into the flesh, and the sores they produce probably render the sheep more subject to subsequent contagion. That is to say, the virus of foot-rot, probably like vaccine matter, takes more speedy and certain effect when brought in contact with the bare and punctured flesh. A favorite remedy among farmers is compounded as follows: One pound of blue vitriol, half a pound of verdigris, one pint of linseed oil, one quart of tar—the vitriol and verdigris to be pulverized fine, and if convenient ground through a paint-mill with the oil before the tar is added. The oil and tar, if allowed to dry on the feet, form a coating which aids to prevent the application from being washed away by moisture. Whatever application is made, the sheep should be kept out of water, manure, &c., until the treatment has had time to produce its full effect. This thorough paring of the foot, so as to effect a perfect denudation of the diseased surfaces, and an avoidance of wounding the foot, so that blood will not be discharged to wash off the caustic, are the conditions to be principally sought after by the operator. Toe nippers and strong knives may be required to remove the outer growth of the horny covering of the foot; but as the operator cuts down near the quick, he should use a light, thin, very *sharp* knife, so that he can cut away all the horn necessary without wounding and thereby causing a flow of blood from the fleshy sole. This is more important where blue vitriol is the remedy; butter of antimony will of itself speedily stanch the flow of blood.

MODE OF ADMINISTERING MEDICINES TO SHEEP.

Sheep medicines administered internally should be in a fluid form, for otherwise they fall into the rumen or paunch, where they do not produce much effect. Even fluids should be poured into the throat with care and deliberation, or they are likely to take the same course. It is common, as in the case of the horse, to give sheep medicine through a horn. Some persons fasten their mouths open by means of a bit of three-quarter-inch board, about two and a half inches wide and four inches long, with an inch and a half hole through its centre, and a strap attached to each end. This piece of wood is placed in the mouth so as to hold it fully distended, and is confined there by tying the straps over the back of the head. By holding up the head of the sheep and inserting a horn or tube through the hole in the wood, fluid can be poured down the throat without difficulty. A probang can more conveniently be inserted through the same aperture in case of choking.

DISTRIBUTION AND MOVEMENT OF NEAT CATTLE IN THE UNITED STATES

BY SILAS L. LOOMIS, A. M., M. D.

WHATEVER constantly aids the progress of civilization, however feeble its force, is of vital importance to a community. But whenever anything is found that exerts a controlling power, it ought to be carefully investigated, and thoroughly examined in all its bearings.

The supply of food occupies the larger portion of the energies of the human race, and it must be provided for in all communities to secure their prosperity, happiness, and advancement. If the constitution of a community is such that all its energies are absorbed in the production of food and clothing, all its sources of improvement will remain closed, and the community will be at a stand still. No time is left to cultivate the mind, and from exhaustive physical labor it readily relapses into a state of barbarism. On the other hand, when a community is so constituted that all its energies are not required to feed and clothe its subjects, the mind is cultivated, sources of prosperity multiply, and the nation gradually rises to the highest rank in the civilized world.

In the United States, our fertile and extensive agricultural lands, while covered with a comparatively sparse population, have yielded fabulous crops from a virgin soil. Large profits being thus easily obtained, it has not been deemed necessary to husband resources, and the soil has been allowed to become exhausted, thus creating large tracts of so-called worn out lands in a great number of States.

In a similar manner many aids to civilization may be carelessly neglected, and although advancement may not be at the time perceptibly checked, it will soon become apparent. Hence the agriculturist should avail himself of every means of information within his reach, that he may carefully gather up all the varied resources of his country, and reduce the time and strength necessary for the production of food and clothing within the smallest limits, thereby giving greater scope to the development and enjoyment of his and his country's intellectual and moral forces.

In this view the importance which is attached to the agricultural interests of a country is more clearly comprehended. The greater the improvements made in implements of agriculture, the more completely the crops are adapted to the soil and climate, the more the facilities of communication are increased, and the more accurately the agricultural statistics of a nation are obtained, the more will the nation advance with all its other interests.

To aid in this general development, by discussing some of the statistics gathered by the Census bureau in the years 1840, 1850, and 1860, is the object of the present article. It is not claimed that these statistics are absolutely correct, but the error is so small comparatively that the general deductions must be true, and the laws which are developed may be relied upon. These laws will be found to be of vital importance, and the more so as it is the first time they have been placed within our reach.

For the first time we have learned that in the United States every one hundred people require eighty neat cattle; that eight of these cattle must be working oxen, and that this requirement has not varied a single per cent. in thirty years; that twenty-eight of the eighty must be milch cows, and that this number has not varied one per cent. for the past thirty years. For the first time we are enabled to know where a demand for neat cattle exists, and whence a supply may be obtained. Hitherto the supply has met the demand without any definite knowledge of what value was demanded or from what source it could be best supplied. The deficiencies or excesses existing in each State were only very generally or vaguely known, and we rested satisfied while we ought to have availed ourselves of every means to prevent the diminution of the supply already become largely deficient. For example, Massachusetts had less than one-half the requisite number of neat cattle within her limits in the year 1840. In the year 1850 she had less than one-third, and in 1860 but about one-fourth the number of cattle required for the support of her population. She must therefore import beef, butter, and cheese, having a very scanty allowance of milk.

But where will she obtain these articles? New York, Pennsylvania, New Jersey, Delaware, Maryland, and Virginia, have not enough to supply their own wants. Massachusetts must, therefore, actually transport to supply her deficiencies from an immense distance. She must reach into our western regions, and outbid in price all intervening demand. An interesting question here arises, and one of significance to her farmers: Cannot her worn-out waste lands be made to produce beef, butter, cheese, and milk, at a less cost than to transport so far? Cannot the money expended in transportation and profits be more advantageously disbursed within her own borders?

Neat cattle exist in the United States only as domesticated animals. They are kept principally to supply the demand for beef, butter, cheese, and milk. These articles being consumed wholly by the people, and the personal demand being a constant quantity, the ratio between the people and cattle must be constant whatever the number of people may be. That is, the personal demand is the direct ratio of the population to the cattle, and that ratio must be nearly constant, whether the population be ten millions or thirty millions. In the United States this ratio is 80 per cent., that is, every one hundred people require 80 cattle.

Whenever people aggregate faster than cattle, whether in cities, manufacturing districts, or from other causes, or whenever the population of a district increases faster than cattle are produced, a deficiency must occur. Into such districts cattle must be imported, and the prices of beef, butter, cheese, and milk, will depend upon the distance it is necessary to transport them, and the number of profits added to the original cost.

Nothing has been found to supply the place of these articles, and it is safe to say that nothing will be found as a substitute. We therefore regard the necessity for these articles as permanent, and consequently neat cattle must vary as the population varies. Beef, butter, and cheese may be transported, but milk is mainly consumed in the vicinity of its production. This requires that at least one-half the number of cows necessary for a community be kept in its immediate vicinity, as forty-eight per cent. of the entire quantity of milk produced is used at once as an article of food. Working oxen and stock cattle are not so necessarily confined to a people. The character of the soil and the employment of the inhabitants more particularly determine their locality.

Considered as a whole, without eliminating minor disturbing causes, we find that the production, distribution, and consumption of neat cattle in this country follow certain definite well-marked laws, which must be to the agriculturist of inestimable value. From them we can foresee what, under the ordinary condition of things, the future will require, and make provision for its necessities.

Before proceeding further with this discussion, it is necessary to introduce the following tabulated statistics computed from data furnished by the Census bureau in the years 1840, 1850, and 1860:

The total number of neat cattle returned in 1840 was........	14,971,586
The total number of neat cattle returned in 1850 was........	18,378,857
The total number of neat cattle returned in 1860 was........	25,640,337

Table I.

Statement of the number of neat cattle according to the census returns of 1840, 1850, *and* 1860.

States and Territories.	1840.	1850.	1860.
Alabama	668, 018	728, 015	779, 183
Arkansas	188, 786	292, 710	548, 173
California	....	262, 659	1, 174, 434
Connecticut	238, 650	212, 675	241, 907
Delaware	53. 883	53, 211	57, 721
Florida	118, 081	261, 085	387, 227
Georgia	884, 414	1, 097, 528	1, 005, 882
Illinois	626, 274	912, 036	1, 505, 581
Indiana	619, 980	714, 666	1, 170, 005
Iowa	38, 049	136, 621	536, 254
Kansas	....	....	86, 859
Kentucky	787, 098	752, 512	836, 059
Louisiana	381. 248	575, 342	521, 535
Maine	327, 255	343, 339	376, 934
Maryland	225, 714	219, 586	273, 241
Massachusetts	282, 574	269, 994	279, 914
Michigan	185, 190	274, 497	534, 267
Minnesota	....	2, 002	119, 003
Mississippi	623, 197	733, 970	726, 877
Missouri	433, 875	791, 510	1, 168, 984
New Hampshire	275, 562	267, 910	264, 467
New Jersey	220, 202	211, 261	238, 794
New York	1, 911, 244	1, 877, 639	1, 973, 173
North Carolina	617, 371	693, 510	693, 810
Ohio	1, 217, 874	1, 358, 947	1, 659, 850
Oregon	....	41, 729	153, 499
Pennsylvania	1, 172, 665	1, 153, 946	1, 419, 493
Rhode Island	36, 891	36, 262	39, 105
South Carolina	572, 608	777, 686	506, 776
Tennessee	822, 851	750, 762	760, 174
Texas	....	930, 114	3, 503, 596
Vermont	384, 341	348, 848	363, 917
Virginia	1, 024, 148	1, 076, 269	1, 044, 185
Wisconsin	30, 269	183, 433	512, 866
Columbia, District of	3, 274	1, 040	906
Dakota	....	....	972
Nebraska	....	....	28, 715
New Mexico	....	32, 977	89, 793
Utah	....	12, 616	40, 324
Washington	....	....	28, 883
Total	14, 971, 586	18, 378, 857	25, 640, 337

TABLE II.

Statement showing the relation of the number of neat cattle to the total population, according to the census returns of 1840, 1850, *and* 1860.

States and Territories.	1840.	1850.	1860.
Alabama	+ 1.13	+ .94	— .81
Arkansas	— 1.94	+ 1.39	— 1.26
California	....	+ 2.83	+ 3.87
Connecticut	— .77	+ .57	+ .48
Delaware	+ .69	+ .58	+ .51
Florida	— 2.17	— 2.99	+ 2.74
Georgia	+ 1.27	+ 1.21	+ .95
Illinois	— 1.40	+ 1.07	+ .87
Indiana	+ .90	+ .72	+ .87
Iowa	+ .88	+ .71	+ .79
Kansas	....	....	+ .81
Kentucky	— 1.01	— .77	+ .72
Louisiana	+ 1.08	+ 1.11	+ .73
Maine	+ .65	— .59	+ .59
Maryland	+ .55	— .38	+ .37
Massachusetts	+ .38	+ .26	+ .22
Michigan	+ .37	— .69	+ .71
Minnesota	....	— .33	+ .68
Mississippi	+ 1.66	+ 1.21	+ .91
Missouri	+ 1.13	+ 1.16	+ .98
New Hampshire	+ .97	+ .84	+ .81
New Jersey	+ .59	+ .43	+ .34
New York	+ .79	+ .60	+ .50
North Carolina	— .82	— .80	+ .69
Ohio	+ .80	— .69	+ .70
Oregon	....	3.14	+ 2.92
Pennsylvania	— .68	— .50	+ .48
Rhode Island	+ .35	+ .24	+ .22
South Carolina	+ .96	+ 1.16	+ .72
Tennessee	— 1.00	— .73	+ .68
Texas	....	— 4.38	+ 5.79
Vermont	— 1.35	— 1.12	+ 1.15
Virginia	— .83	— .76	+ .65
Wisconsin	— .98	+ .60	+ .66
Columbia, District of	— .07	+ .06	+ .01
Dakota	....	....	— .30
Nebraska	....	....	— 1.00
New Mexico	....	.53	+ 1.08
Utah	....	1.11	+ 1.00
Washington	....	....	2.59
Average per cent	+ .87	+ .79	+ .81

Table III.

Statement of the number of milch cows, working oxen, other cattle, total population, and the ratio of the number of neat cattle to the total population, according to the census of 1840.

States and Territories.	Milch cows.	Oxen.	Other cattle.	Total cattle.	Population.	Ratio.
Alabama	189,042	47,261	431,715	668,018	590,756	1.13
Arkansas	40,981	10,733	137,072	188,786	97,574	1.94
California	....	....	....	....	....	......
Connecticut	74,395	37,197	126,058	238,650	309,978	.77
Delaware	17,179	8,589	28,115	53,883	78,085	.69
Florida	47,395	1,543	69,143	118,081	54,477	2.17
Georgia	276,557	55,311	552,546	884,414	691,392	1.27
Illinois	157,140	57,142	411,992	626,274	467,183	1.40
Indiana	212,618	41,153	366,210	619,980	685,866	.90
Iowa	9,485	5,174	22,390	38,049	43,112	.88
Kansas	....	....	....	....	....	......
Kentucky	210,554	70,185	506,359	787,094	779,828	1.01
Louisiana	74,006	35,241	272,001	381,248	352,411	1.08
Maine	120,430	65,233	141,592	327,255	501,793	.65
Maryland	75,203	42,307	108,204	225,714	470,019	.55
Massachusetts	110,655	44,262	127,657	282,572	737,699	.38
Michigan	55,189	31,840	98,161	185,190	212,267	.87
Minnesota	....	....	....	....	....	......
Mississippi	227,721	63,861	431,615	623,197	375,651	1.66
Missouri	126,622	47,881	259,372	433,875	383,702	1.13
New Hampshire	88,218	50,223	136,121	275,562	284,572	.97
New Jersey	97,060	11,199	111,943	220,202	373,307	.59
New York	752,966	194,314	963,964	1,911,244	2,428,921	.79
North Carolina	188,355	30,137	398,879	617,371	753,419	.82
Ohio	486,229	60,779	670,866	1,217,874	1,519,467	.80
Oregon	....	....	....	....	....	......
Pennsylvania	431,008	51,721	689,936	1,177,664	1,724,033	.68
Rhode Island	15,236	7,618	14,037	36,891	108,830	.35
South Carolina	184,263	17,832	370,513	572,608	594,398	.96
Tennessee	223,887	82,921	516,043	822,851	829,211	.99
Texas	....	....	....	....	....	......
Vermont	151,814	55,470	177,057	384,341	291,948	1.35
Virginia	285,133	86,786	652,209	1,024,148	1,239,797	.83
Wisconsin	6,808	4,951	18,510	30,269	30,945	.98
Columbia, District of	874	437	1,963	3,274	43,712	.07
Dakota	....	....	....	....	....	......
Nebraska	....	....	....	....	....	......
New Mexico	....	....	....	....	....	......
Utah	....	....	....	....	....	......
Washington	....	....	....	....	....	......
Total	4,837,043	1,320,300	8,814,243	14,971,586	17,069,453	.87

TABLE IV.

Statement of the number of milch cows, working oxen, other cattle, total population, and the ratio of neat cattle to the total population, according to the census of 1850.

States and Territories.	Milch cows.	Oxen.	Other cattle.	Total cattle.	Population.	Ratio.
Alabama	227, 791	66, 961	433, 263	728, 015	771, 623	.94
Arkansas	93, 151	34, 239	165, 320	292, 710	209, 897	1.39
California	4, 280	4, 780	253, 599	262, 659	92, 597	2.83
Connecticut	85, 461	46, 988	80, 226	212, 675	370, 792	.57
Delaware	19, 248	9, 797	24, 166	53, 211	91, 532	.58
Florida	72, 876	5, 794	182, 415	261, 085	87, 445	2.99
Georgia	334, 223	73, 286	690, 019	1, 097, 528	906, 185	1.21
Illinois	294, 671	79, 156	541, 209	912, 036	851, 470	1.07
Indiana	284, 554	40, 221	389, 891	714, 666	988, 416	.72
Iowa	45, 704	21, 892	69, 025	136, 621	192, 214	.71
Kansas	....	....	....	....	....	......
Kentucky	247, 475	62, 274	442, 763	752, 512	982, 405	.77
Louisiana	105, 576	54, 968	414, 798	575, 342	517, 762	1.11
Maine	133, 556	83, 893	125, 890	343, 339	583, 169	.59
Maryland	86, 856	34, 135	98, 595	219, 586	583, 034	.38
Massachusetts	130, 099	46, 611	83, 284	259, 994	994, 514	.26
Michigan	99, 676	55, 350	119, 741	274, 497	397, 654	.69
Minnesota	607	655	740	2, 002	6, 077	.33
Mississippi	214, 231	83, 485	436, 254	733, 970	606, 526	1.21
Missouri	230, 169	112, 168	449, 173	791, 510	682, 044	1.16
New Hampshire	94, 277	59, 027	114, 606	267, 910	317, 976	.84
New Jersey	18, 736	12, 070	80, 455	211, 261	489, 355	.43
New York	931, 324	178, 909	767, 406	1, 877, 639	3, 097, 394	.60
North Carolina	221, 799	37, 309	434, 403	693, 510	869, 039	.80
Ohio	544, 499	65, 381	749, 067	1, 358, 947	1, 980, 329	.69
Oregon	9, 427	8, 114	24, 188	41, 729	13, 294	3.14
Pennsylvania	530, 224	61, 527	562, 195	1, 153, 946	2, 311, 786	.50
Rhode Island	18, 698	8, 139	9, 375	36, 262	147, 545	.24
South Carolina	193, 244	20, 507	563, 935	777, 686	668, 507	1.16
Tennessee	250, 456	86, 255	414, 051	750, 762	1, 002, 717	.73
Texas	217, 811	51, 285	661, 018	930, 114	212, 592	4.38
Vermont	146, 218	48, 577	154, 143	348, 848	314, 120	1.12
Virginia	317, 619	89, 513	669, 137	1, 076, 269	1, 421, 661	.76
Wisconsin	64, 339	42, 801	76, 293	183, 433	305, 391	.60
Columbia, District of	813	104	123	1, 040	51, 687	.66
Dakota	....	....	....	....	....	......
Nebraska	....	....	....	....	....	......
New Mexico	10, 635	12, 557	10, 085	32, 977	61, 547	.53
Utah	4, 861	5, 266	2, 489	12, 612	11, 380	1.11
Washington	....	....	....	....	....	......
Total	6, 385, 094	1, 700, 694	10, 293, 069	18, 378, 857	23, 191, 876	+.79

Table V.

Statement of the number of milch cows, working oxen, other cattle, total population, and the ratio of the number of neat cattle to the total population, according to the census of 1860.

States and Territories.	Milch cows.	Oxen.	Other cattle.	Total cattle.	Population.	Ratio.
Alabama	234, 045	92, 495	452, 643	779, 183	964, 201	.81
Arkansas	158, 873	70, 944	318, 355	548, 172	435, 450	1.26
California	198, 859	31, 527	952, 048	1, 182, 434	305, 439	3.87
Connecticut	98, 877	47, 939	95, 091	221, 907	460, 147	.48
Delaware	22, 595	9, 530	25, 596	57, 521	112, 216	.51
Florida	92, 704	7, 787	284, 736	385, 227	140, 425	2.74
Georgia	299, 688	74, 487	631, 707	1, 005, 882	1, 057, 286	.95
Illinois	532, 731	90, 973	881, 877	1, 505, 581	1, 711, 951	.87
Indiana	491, 033	95, 981	582, 990	1, 170, 005	1, 350, 428	.87
Iowa	188, 546	56, 563	291, 145	536, 254	674, 948	.79
Kansas	26, 726	20, 133	41, 000	87, 859	107, 207	.81
Kentucky	269, 215	108, 999	457, 845	856, 059	1, 155, 684	.72
Louisiana	130, 672	61, 008	329, 855	521, 535	708, 002	.73
Maine	147, 315	79, 792	149, 827	376, 934	628, 279	.59
Maryland	99, 463	34, 524	119, 254	253, 241	687, 049	.37
Massachusetts	144, 492	38, 221	97, 201	279, 914	1, 231, 006	.22
Michigan	200, 635	65, 949	267, 683	534, 267	749, 113	.71
Minnesota	40, 386	27, 574	51, 043	119, 003	173, 855	.68
Mississippi	207, 134	104, 184	415, 559	726, 877	791, 305	.91
Missouri	345, 243	166, 588	657,.153	1, 168, 984	1, 182, 012	.98
New Hampshire	94, 880	51, 512	118, 075	264, 467	326, 073	.81
New Jersey	138, 818	10, 067	89, 909	138, 794	672, 035	.34
New York	1, 123, 634	121, 702	727, 837	1, 973, 173	3, 880, 735	.50
North Carolina	228, 623	48, 511	416, 676	693, 810	992, 622	.69
Ohio	696, 309	61, 760	901, 781	1, 659, 850	2, 339, 502	.70
Oregon	53, 072	7, 426	93, 001	153, 499	52, 465	2.92
Pennsylvania	673, 547	60, 371	685, 575	1, 419, 493	2, 906, 115	.48
Rhode Island	19, 700	7, 857	11, 548	39, 105	174, 620	.22
South Carolina	163, 938	22, 629	320, 209	506, 776	703, 708	.72
Tennessee	247, 105	104, 495	408, 574	760, 174	1, 109, 801	.68
Texas	598, 086	172, 243	2, 733, 267	3, 503, 596	604, 215	5.79
Vermont	171, 698	42, 860	149, 359	363, 917	315, 098	1.15
Virginia	330, 627	97, 860	615, 696	1, 044, 185	1, 596, 318	.65
Wisconsin	193, 996	93, 660	225, 210	512, 866	775, 881	.66
Columbia, District of	639	69	198	906	75, 080	.01
Dakota	286	348	338	972	2, 576	.38
Nebraska	7, 125	12, 720	8, 870	28, 715	28, 840	1.00
New Mexico	34, 461	26, 104	29, 228	89, 793	83, 009	1.08
Utah	13, 052	9, 903	17, 369	40, 324	40, 273	1.00
Washington	10, 034	2, 777	16, 072	28, 883	11, 168	2.59
Total	8, 728, 863	2, 240, 075	14, 671, 400	25, 640, 337	31, 417, 331	.81

From Tables I and II we ascertain from actual enumeration the number of neat cattle in each one of the United States for the years 1840, 1850, and 1860, and their ratio to the population for the several periods; that is, in the State of Alabama every 100 inhabitants kept 113 head of neat cattle in the year 1840, 94 head of cattle for 1850, and 81 for 1860. Massachusetts, for every 100 inhabitants, had 38 neat cattle in the year 1840, 26 in the year 1850, and in 1860 had only 22 neat cattle for every 100 inhabitants.

Taking the total number of cattle, and comparing it with the total population of the United States for the years 1840, 1850, and 1860, and the following results are found: In 1840, for every 100 inhabitants there were 87 neat cattle; in 1850, for every 100 inhabitants there were 79 neat cattle, and in 1860, for every 100 inhabitants there were 81 neat cattle.

It probably will not be far from the truth to assume that the ratio of cattle to the inhabitants in the United States is 80 per cent.; that is, *every hundred people require eighty neat cattle.*

For the purpose of better understanding the distribution of cattle, we shall divide the States into three classes, viz: minimum, medium, and maximum. The minimum class includes those States that have less than the normal requirement of 80 per cent.; the medium class, those that contain between 80 and 100 per cent.; and the maximum, those States that contain over 100 per cent. We shall also examine the distribution under three heads, namely, the "Distribution of 1840," the "Distribution of 1850," and the "Distribution of 1860."

DISTRIBUTION OF NEAT CATTLE IN THE YEAR 1840.

1. The minimum class (that is, those States which contain less than 80 cattle to every 100 inhabitants) includes the States of Rhode Island, Massachusetts, Maryland, New Jersey, Maine, Pennsylvania, Delaware, Connecticut, and New York, being the New England States, except New Hampshire and Vermont, the middle States, and Maryland. The western limit of this section is bounded by the Chesapeake bay, the Potomac river, and the western boundary of the State of Pennsylvania. This territory contains the most populous cities in the Union, as well as the principal manufacturing and mining districts, and consequently people must increase at a more rapid rate than cattle can be produced. The soil is not as easily cultivated, taken as a whole, as in some other sections of the country, and we cannot predicate an increase in the ratio of cattle to the population, even under more favorable circumstances.

2. The medium class (that is, those States which contain between 80 and 100 cattle to every 100 people) includes the States of Ohio, North Carolina, Virginia, Michigan, Iowa, Indiana, South Carolina, Wisconsin, and New Hampshire. This district, with the exception of New Hampshire, is situated directly west of the minimum district. It is about three hundred miles in width, and extends in a northwesterly direction from the Atlantic ocean to the lakes. This section may properly be called the eastern division of the great agricultural district of the United States. Cattle will undoubtedly be produced in this region in numbers far exceeding the demands for local consumption for many years to come. Yet, being so accessible to the people of the minimum district, it cannot hope to be able to retain its present status. *Cattle will move to the east* and *capital to the west* of the Monongahela and Potomac with increasing flow, thus effectually and constantly depleting its vast herds of cattle.

3. The maximum class (that is, those States which have more than 100 cattle to every 100 people) includes the remaining States, namely, that tier constituting our southern and western border, and the State of Vermont. This section includes the great valley of the Mississippi, the garden of the New World. It is from this region that the medium class must replenish her de-

creasing numbers, and gather up the immense herds necessary to meet the demands which come from the more eastern sections of the States. It is in this valley that cattle must be produced for the growing wants of the nation.

The general law of the distribution of cattle in 1840 is thus very plainly shown. Beginning on our eastern limit, cattle are found in very small numbers. As we move westward they constantly increase, even to our extreme western borders. The west has nearly *three* times as many cattle as the east in proportion to the number of inhabitants, the smallest ratio being in Rhode Island and Massachusetts, and the largest, nearly six times as great, being in Florida and Arkansas.

DISTRIBUTION OF CATTLE IN THE YEAR 1850.

1. During the ten years intervening between 1840 and 1850 we find the western limit of the minimum class (that is, those containing less than 80 cattle to every 100 people) has moved far to the westward of the Potomac and Monongahela rivers—its position in 1840. It now includes, in addition to its territory of 1840, the States of North Carolina, Virginia, Ohio, Michigan, Wisconsin, Iowa, Minnesota, Indiana, Kentucky, and Tennessee. The limit of 1840, in ten years, passed over in its westward course at least five hundred miles. It now commences at the southern limit of North Carolina, on the Atlantic coast, and follows the boundaries of that State and Tennessee to the Mississippi river, then up that river to the eastern boundary of Illinois, and by that to Lake Michigan.

2. The medium class now occupies only the States of Alabama and New Hampshire. That portion of territory which constituted this class in 1840 has now mostly dropped to the minimum class. North Carolina has remained nearly stationary. South Carolina, of all the medium class of 1840, has risen to the maximum of 1850; its per cent. in 1840 was 96, and in 1850, 116 per cent. At the same time Massachusetts and Rhode Island have dropped from 35 and 38 per cent. to 24 and 26 per cent.

3. The maximum class occupies the same position as it did in 1840, with the exception of Alabama; but those States lying east of the Mississippi have depreciated from an average of 145 per cent. in 1840 to 115 in 1850. We must expect this portion to occupy a medium position in 1860. Florida and South Carolina have made a remarkable increase of their ratios, elevating them from 217 and 96 in 1840 to 299 and 116 per cent. in 1850. But these exceptions, as well as those of Massachusetts and Rhode Island, before mentioned, are to be explained, not so much by their departure from general laws controlling the status of cattle as of men, the States of Florida and South Carolina not having in this decade the increase of population which marks the history of States in general, and which had occurred in Massachusetts and Rhode Island.

The States west of the Mississippi river have also made a remarkable increase from an average of 131 per cent. in 1840 to 159 in 1850. Texas rises to the head of the list, having 438 per cent.

DISTRIBUTION OF CATTLE IN THE YEAR 1860.

Having in the last decade ascertained the general law of the ratio of cattle to the population, it will be more interesting to note the movement from 1850 to 1860. We are led to infer a general reduction in the entire country east of the Mississippi river, with an occasional exception, whilst our great herds will still gather around the pioneers, as, pushing westward, they lay the foundations of civilized life in the dominions of the savage.

1. The minimum class remains nearly the same as in 1850. South Carolina is now included in this class, while Indiana has risen to 87 per cent. New England and many other States in this class have varied each less than 5 per cent. Vermont and New Hampshire still retain their isolated position, the first remaining in the maximum class, and the second in the medium. Louisiana has dropped from the maximum to the medium class.

2. The medium class is now found to contain many of the States which, in 1850, were in the maximum class. We find Alabama, Georgia, Illinois, Indiana, Kansas, Mississippi, Missouri, and New Hampshire, containing each between 80 and 100 per cent. Of these States Indiana alone has made a gain, rising from 72 to 87 per cent.

3. The maximum class is mostly found west of the Mississippi river. Florida and Vermont are the only States in this class east of it. Texas, California, Oregon, Washington, Arkansas, Kansas, Nebraska, and neighboring districts contain the great bulk of this class.

The greatest diminution in this decade has been in South Carolina. That State has lost 44 per cent., Louisiana has lost 35 per cent., and Mississippi 30. The greatest increase has been in Texas, California, Minnesota, Indiana, and Iowa. The supply of cattle in the southwest is far superior to that in the middle or eastern portion of the country; and although the southern States are better supplied than the northern States, their main reliance must be on Texas. The value of this State to the so-called "Southern Confederacy" was not over-estimated.

DISTURBING CAUSES.

Thus far we have considered the distribution of cattle without reference to disturbing causes and deduced great general laws. It is not to be understood that these laws are not to be modified. On the other hand, material modifications do exist, but the great laws must first be ascertained before the modifying circumstances can be applied. I do not in the present article propose to discuss any of the disturbing forces; yet a correct impression of the movement of cattle cannot be conveyed without alluding to one important modification.

The cattle on the Pacific slope, as well as nearly all in Texas, ought to be excluded in considering the excess or deficiency of individual States; for those west of the Rocky mountains are isolated from the United States proper, and those in Texas are mostly wild, or at least not so domesticated as to be driven east in great numbers. Therefore, in discussing the question of demand and supply, or the movement of neat cattle, these sections should be omitted.

This being done, the per cent. of cattle to the people will be reduced from 80 to 68. All those States, therefore, having more than 68 cattle to every 100 people can export, and it is from these States that deficiencies, wherever they exist, can be supplied. The following tables are computed on the basis of 68 per cent. for local use, and show very clearly where the excesses and deficiencies exist, and what the movement of cattle must be to satisfy the demand.

From these tables we find that in four of the New England States there is a deficiency of 785,161 neat cattle, while in Vermont and New Hampshire there is an excess of 190,485, leaving a net deficiency of 594,676 cattle in New England—over half a million.

In the middle States there is a net deficiency of 1,564,526 neat cattle—over million and a half.

In Maryland there is a deficit of 212,985, which, added to the above, makes a net deficit of 2,372,187—over two and a quarter millions of neat cattle east of the State of Ohio. This State has a net surplus of but 46,227 cattle, but could probably spare from ten to fifteen per cent. of her normal requirement for the eastern market, and depend on her western neighbors for a supply to take their place.

TABLE VI.—*Showing the number of cattle of each one hundred people which the several States had for exportation in excess of the requisite number, sixty-eight, retained for local use, in the years* 1840, 1850, *and* 1860; *also, the total number for exportation in each State.*

States.	Number of cattle more than is required for local use.			Total number of cattle for exportation
	1840.	1850.	1860.	
Florida	149	231	206	289, 275
Arkansas	126	71	58	252, 561
Vermont	67	44	47	148, 096
Nebraska	....	....	32	9, 228
Utah	....	43	32	12, 887
Missouri	45	48	30	354, 603
Georgia	59	53	27	285, 467
Mississippi	98	53	22	174, 087
Indiana	22	4	19	256, 581
Illinois	72	39	19	325, 270
Alabama	45	26	13	125, 346
New Hampshire	29	16	13	42, 389
Kansas	....	....	13	13, 936
Iowa	20	3	11	74, 244
Louisiana	40	43	5	35, 400
Kentucky	33	9	4	46, 227
South Carolina	28	48	4	28, 148
Michigan	19	1	3	22, 473
Ohio	12	1	2	46, 790
North Carolina	14	12	1	9, 926
Total	....	....	....	2, 552, 934

As this table contains a list of all the States from which cattle can be exported, we readily perceive the relative value of each State for supplying the deficiencies existing in the other States. The total available excess in these States at the close of the year 1860 was 2,552,934 neat cattle.

TABLE VII.—*Showing the number of cattle on hand and the deficiencies to each one hundred people in the several States, and also the total deficiency in each of the several States, for the year* 1860.

States.	Number of cattle on hand.	Additional number required.	Total deficiency.
Minnesota	68	....	....
Tennessee	68	....	....
Wisconsin	66	2	15, 517
Virginia	65	3	47, 889
Maine	59	9	56, 545
Delaware	51	17	19, 076
New York	50	18	698, 532
Connecticut	48	20	92, 029
Pennsylvania	48	20	581, 223
Dakota	38	30	772
Maryland	37	31	212, 985
New Jersey	24	44	265, 695
Rhode Island	22	46	80, 325
Massachusetts	22	46	566, 262
Columbia, District of	1	67	50, 303
Total deficiency	....	....	2, 717, 153

The great law of the movement of cattle is here plainly developed. Cattle must be moved eastward and capital westward to supply the pressing demands of our people.

A similar computation made for the years 1840 and 1850 shows also that the net deficit in those States east of Ohio is constantly increasing; and notwithstanding all disturbing causes, the prices of beef, butter, cheese, and milk must gradually become greater, and the supplies for the eastern section of the United States be gathered up from the west in constantly increasing quantities.

WORKING OXEN, MILCH COWS, AND OTHER CATTLE.

Neat cattle are divided into three classes, viz: Working oxen, milch cows, and other cattle. Thus far we have considered the movement of neat cattle in gross, but as each of these three classes is produced for entirely different purposes, it will be necessary to consider them separately, in order to better understand the laws which govern their distribution and movement.

WORKING OXEN.

Table VIII presents the number of working oxen in each State and Territory in the years 1840, 1850, and 1860, and their ratio in comparison with the inhabitants of each State and Territory.

The most obvious law educed by this tabular statement is this: that community demands eight working oxen to every hundred people, irrespective of the number of inhabitants; whether 15,000,000 or 30,000,000. For the past thirty years this number has not varied a single per cent. During the last decade the number has somewhat diminished, and the causes of this diminution are conclusively shown by the table. We find the greatest reduction on the prairie lands of the west. In Iowa the number has fallen from twelve to three per cent.; Illinois, twelve to five; Kentucky, from nine to three; and Michigan, from fifteen to nine. These States have, within the past few years, introduced new and important agricultural implements, thereby greatly facilitating the methods of labor, and diminishing the amount of force derived usually from oxen. Working oxen must, in all prairie lands, soon be supplanted to a great extent by steam, and in those regions we must expect to find, in the present decade, a still greater diminution of their number.

In other agricultural districts less favorable to the introduction of agricultural machinery, on account of the unevenness of the surface, there is a diminution, but not so marked. It doubtless arises from the same cause. On the other hand, in those regions among the mountains where the introduction of machinery for agricultural purposes is almost wholly precluded, working oxen are most abundant. Western Pennsylvania, New Hampshire, and Vermont are examples of this condition of things. In these cold, mountainous regions, the Switzerland of America, neat cattle stand in the maximum class, and working oxen are more numerous than in any other locality east of the Mississippi river, Vermont having nineteen and New Hampshire eighteen per cent. As we follow this mountainous region southwesterly through the United States, we find the ox supplanted by the horse, as in New York, New Jersey, and Pennsylvania; but further south he is supplanted by the mule. From the geological features of the surface, including climate and the physical requirements of these animals, it is inferred that their present distribution cannot be materially hanged in many years.

In South Carolina, Pennsylvania, New Jersey, Ohio, Indiana, Florida, Virginia, and Rhode Island, the number of cattle is less than eight per cent., and in no case has varied two per cent. in thirty years. Of those above eight per cent., Tennessee, Louisiana, Georgia, Maine, and Alabama have not varied two per cent. in thirty years. New York, Maryland, Kentucky, Delaware, Wisconsin, Mississippi, New Hampshire, and Vermont have lost from six to nine per cent. in the last thirty years. Alabama, Arkansas, California, Georgia, Minnesota, North Carolina, and Texas are the only States that have made an increase of their per-centage, and of these Georgia and North Carolina have only made a gain of one per cent.

In comparison with horses, mules, and the more important power, steam, working oxen will show a still less per cent. in most of the older agricultural districts of the United States. In the heavier work of hauling material, in mining operations, and for some manufacturing purposes, and for agricultural purposes in some parts, the ox will doubtless always be retained as the cheapest method of obtaining the requisite power. He will also be an essential aid in the cultivation of new lands, and must necessarily be invaluable on our frontier

TABLE VIII.—*Statement showing the number of working oxen for the years* 1840, 1850, *and* 1860, *and their relation to the total population for each period.*

States and Territories.	1840.	Ratio.	1850.	Ratio.	1860.	Ratio.
Alabama	47,261	.08	66,961	.08	92,495	.10
Arkansas	10,733	.11	34,239	.12	70,944	.16
California	....	....	4,780	.05	31,527	.10
Connecticut	37,197	.12	46,988	.13	47,939	.10
Delaware	8,589	.11	9,797	.10	9,530	.07
Florida	1,543	.06	5,794	.07	7,787	.05
Georgia	55,311	.08	73,286	.08	74,487	.09
Illinois	57,142	.12	76,156	09	90,973	.05
Indiana	41,152	.06	40,221	04	95,982	.04
Iowa	5,174	.12	21,892	.11	56,563	.03
Kansas	....	....	....	....	20,133	.10
Kentucky	70,185	.09	92,274	.06	108,999	.03
Louisiana	35,241	.10	54,968	.11	61,008	.11
Maine	65,233	.13	83,893	.14	79,792	.13
Maryland	42,307	.09	34,135	.06	34,524	.05
Massachusetts	44,262	.06	46,611	.05	38,221	.03
Michigan	31,840	.15	55,350	.14	65,949	.09
Minnesota	....	....	655	.11	27,574	.15
Mississippi	63,861	.17	83,485	.14	104,184	.13
Missouri	47,881	.13	112,168	.16	166,588	.14
New Hampshire	51,223	.18	59,027	.19	51,512	.16
New Jersey	11,199	.03	12,070	.02	10,067	.01
New York	194,314	.08	178,909	.06	121,702	.03
North Carolina	30,137	.04	37,309	.04	48,511	.05
Ohio	60,779	.04	65,381	.03	61,790	.03
Oregon	....	....	8,114	.61	7,426	.14
Pennsylvania	51,721	.03	61,527	.03	60,371	.02
Rhode Island	7,618	.07	8,139	.06	7,857	.05
South Carolina	17,832	.03	20,507	.03	22,629	.03
Tennessee	82,921	.10	86,225	.09	104,491	.09
Texas	....	....	51,285	.24	172,243	.28
Vermont	55,470	.19	48,577	.15	42,816	.14
Virginia	86,786	.07	89,513	.06	97,862	.06
Wisconsin	4,951	.16	42,801	.14	93,660	.12
Columbia, District of	437	.01	104	.01	69	.01
Dakota	....	....	....	....	348	.14
Nebraska	....	....	....	....	12,720	.44
New Mexico	....	....	12,557	.20	26,104	.31
Utah	....	....	5,266	.46	9,303	.25
Washington	....	....	....	....	2,777	.25
Total	1,320,300	+ .08	1,700,694	— .08	2,240,075	+ .07

MILCH COWS.

By reference to an article published in the Agricultural Report of 1861, entitled "Consumption of Milk," it will be found that about fifty per cent. of all the milk produced in the United States is directly consumed as food, and that the remainder is manufactured into butter and cheese. It will also be found that more than one-half of the butter and cheese is consumed by the manufacturers, so that at least seventy-five per cent. of the milk produced is consumed at once in the locality of its production.

This constitutes the principal demand for cows, and as nothing can supply their place, the demand can only vary with the population. This is plainly shown by the following statement, which gives + 27 per cent. as the constant requirement for the past thirty years. Nothing could be more plainly stated. In all the varying circumstances that have occurred, while we have doubled our territory and our population, the constant demand has required twenty-eight cows to every one hundred people. In 1870 the demand will be the same, but from the constant decrease of neat cattle in general throughout the country, the number actually reported by the census of 1870 may possibly fall to twenty-seven.

A remarkable feature in the distribution of milch cows is seen by comparing the southern with the northern section of the country. At no time within the last thirty years has any southern State, with the exception of Louisiana, Virginia, and North Carolina, had less than the required number of milch cows, namely, twenty-eight for every one hundred people. On the contrary, their average per cent. is far above. At the same time, Maine, Massachusetts, Rhode Island, Connecticut, New Jersey, Pennsylvania, Delaware, Maryland, Kentucky, Michigan, Minnesota, Tennessee, Virginia, and Wisconsin have not, at any time within the past thirty years, had the average number of milch cows.

Massachusetts and Rhode Island have not one-half the average number required. In these States this deficiency is undoubtedly partly made up by the cows being of a better breed; but it is more probable that in these States a large part of the milk is used for food, and the butter and cheese supplied from other sources. We also find that Florida, Georgia, Alabama, Mississippi, Louisiana, Arkansas, Tennessee, and Kentucky have largely diminished their number of milch cows in the past ten years. In general, all of the southern part of the United States has largely diminished its stock of cows, and yet is better supplied than the northern sections. In the north, Connecticut, Delaware, Massachusetts, Maryland, New Hampshire, New York, North Carolina, Pennsylvania, and Virginia have all, with the exception of New Hampshire and New York, less than the requisite number, and have varied in the last thirty years less than two per cent. Iowa, Indiana, Wisconsin, and Michigan have considerably increased their stock, and doubtless the central west will soon more than supply the east with the required amount of butter and cheese

The following tabular statement shows the distribution and movement for the years 1840, 1850, and 1860:

TABLE IX.

Statement showing the number of milch cows for the years 1840, 1850, *and* 1860, *and their relation to the total population for each period.*

States and Territories.	1840.	Ratio.	1850.	Ratio.	1860.	Ratio.
Alabama	189, 042	.32	227, 791	.30	234, 045	.24
Arkansas	40, 981	.42	93, 151	.45	158. 873	.36
California	4, 280	.05	4, 250	.05	198, 859	.65
Connecticut	74, 395	.24	85, 461	.23	98, 877	.21
Delaware	17, 189	.22	19, 248	.21	22, 599	.20
Florida	47, 395	.87	72, 876	.83	92, 704	.66
Georgia	276, 557	.40	334, 223	.37	299, 688	.28
Illinois	157, 140	.33	294, 671	.35	532, 731	.31
Indiana	212, 618	.31	284, 554	.29	491, 033	.36
Iowa	9, 485	.22	45, 704	.24	188, 546	.28
Kansas	....	....	....	....	26, 726	.25
Kentucky	210, 554	.27	247, 475	.25	269, 215	.23
Louisiana	74, 006	.21	105, 576	.20	130, 672	.18
Maine	120, 430	.24	133, 556	.23	147, 315	23
Maryland	75, 203	.16	86, 856	.15	99, 463	14
Massachusetts	110, 655	.15	130, 099	.13	144, 492	.12
Michigan	55, 189	.26	99, 676	.25	200, 635	.27
Minnesota	....	....	607	.10	40, 386	.23
Mississippi	127, 721	.34	214, 231	.35	207, 134	.26
Missouri	126, 622	.33	230, 169	.34	345, 243	.29
New Hampshire	88, 218	.31	94, 277	.30	94, 880	.29
New Jersey	97, 060	.26	118, 736	.24	138, 818	.21
New York	752, 966	.31	931, 324	.30	1, 123, 634	.29
North Carolina	188, 355	.25	221, 799	.25	228, 623	.23
Ohio	486, 229	.32	544, 499	.28	696, 309	.30
Oregon	....	....	9, 427	.71	53, 072	1.01
Pennsylvania	431, 008	.25	530, 224	.23	673, 547	.23
Rhode Island	15, 236	.14	18, 698	.13	19, 700	.11
South Carolina	184, 263	.31	193, 244	.29	163, 938	.23
Tennessee	223, 887	.27	250, 456	.25	247, 105	.22
Texas	....	....	217, 811	1.02	598, 086	.99
Vermont	151, 814	.52	146, 128	.47	171, 698	.54
Virginia	285, 153	.23	317, 619	.22	330, 627	.21
Wisconsin	6, 808	.22	64, 339	.21	193, 996	.25
Columbia, District of	874	.02	813	.02	639	.01
Dakota	....	....	....	....	286	.11
Nebraska	....	....	....	....	7, 125	.25
New Mexico	....	....	10, 635	.17	34, 461	.42
Utah	....	....	4, 861	.43	13, 052	.32
Washington	....	....	....	....	10, 034	.90
Total	4, 837, 043	— .28	6, 385, 094	+ .27	8, 728, 862	— .28

OTHER CATTLE.

This class, although important, and one from which the other two are solely derived, we have not deemed of sufficient interest in this discussion to present in a tabular statement of distribution and movement.

CATTLE IN TIME OF WAR.

This discussion properly ends in the year 1860, inasmuch as the distribution to this point had proceeded solely from the wants and interests of the people in time of peace and quiet. But when the public peace is disturbed, and property becomes insecure or valueless in certain sections, when the yeomanry of the country are called by millions from the plough to the sword, from the arts of peace to the arts of war, when so vast a standing army is to derive its food, to a great extent, from the cattle of the country, it is evident that this element of national food and strength will be found acting under new laws, to be found in or derived from a sense of security of property and the public necessity, rather than as heretofore in individual interest. We must therefore discuss the distribution and movement of cattle since 1860, as presented in the loyal and disloyal States.

CATTLE IN THE LOYAL STATES.

In this discussion we can only consider those States loyal which have not had an organized rebel force formed within its limits. With this restriction the loyal States are those States lying north and east of the State of Missouri, the Ohio and Potomac rivers, and the Chesapeake bay. The cattle north of this line have not been disturbed by any extraordinary causes, except in a few counties during the short invasion of Pennsylvania by Lee.

Prosperity, as in times of peace, has reigned. Nothing has occurred from which we can predict any sudden or unexpected movement of neat cattle. The consumption of cattle is gradually gaining on production; but the general tendency of the last decade was to increase the ratio of cattle in the west, on the eastern as well as on the western side of the Mississippi river. From the fact that cattle could no longer be obtained from the rebel States, we infer that there must have been a large increase in the production of neat cattle in the loyal west in the past three years. In the eastern section of the loyal States there cannot have been much change.

The loyal States, at the commencement of the rebellion, were wholly cut off from the great southwestern herds of cattle. There remained to them but few States which had sufficient numbers for their own demands.

By reference to Tables VI and VII we find that there are but 951,894 neat cattle in those States which had an excess for exportation, while at the same time there was an aggregate deficiency in the remaining States of 2,669,264, leaving a net deficit of 1,517,370 neat cattle. Other modifying causes, as the exportation of beef, must increase rather than diminish this deficiency. The raising of cattle became at once an important question, and doubtless it will be seen that in those States there is now a larger supply of young cattle than ever before known. This young stock cannot immediately supply beef, butter, cheese, and milk for the increasing demands of the eastern sections, and consequently these articles of food must bear still higher prices.

At no time in the United States has the value of neat cattle been so important. The great deficiencies existing in the eastern sections, the extensive facilities for production in the western, together with the existing ample means for transportation, must inseparably connect these sections by the strongest of commercial ties.

As the war progresses, and the government gradually regains possession of rebel territory and opens communication with the north, those sections formerly inhabited by great herds of cattle will be found to be depopulated. What have not been consumed by the rebels will have been driven off by them for safety. There will be left to us only the west, in our own parallels, from which to make up any deficiency that may exist.

The valley of the Mississippi north of Cairo must constitute the great source from whence the north and east will derive their neat cattle, beef, butter, cheese, and milk for years to come.

CATTLE IN DISLOYAL STATES.

At the close of the year 1860 the southern States were all well supplied with neat cattle. But one or two States were found in which there was a deficit, and where this existed, it was very small indeed. On the other hand, most of these States had a very large surplus. This section of the United States as a whole was overstocked with cattle. In this respect no country could have been better prepared for rebellion. By reference to Tables VI and VII it will be seen that there was a net surplus of 1,553,151 neat cattle within their borders.

In the beginning of the year 1861 the entire northern line of these States felt the shock of war. A cordon of armed men was drawn from the Atlantic to the Rocky mountains, through which cattle could not pass. During this year the greater portion of the southern people enjoyed quiet, and their peaceful homes were undisturbed. Neat cattle could not have been materially affected, and at the close of the year this section of the country could not have diminished its stock of neat cattle sufficiently to have justified any serious anticipations of a deficiency in their supply of beef, butter, cheese, and milk.

The year 1862 opened with a general movement of the armed forces on the northern borders of the rebel territory, and cattle began to move southward. Less attention was paid to the cultivation of the soil, and the great army of the south fed upon its vast herds of cattle. The armies of the north encroached more and more, and consumed all which had not been removed. Nevertheless the close of this year found cattle in abundance in much the larger portion of rebel territory.

The year 1863 produced greater changes. Armed men no longer existed as a cordon on the northern parts of the rebel territory. Kentucky and Tennessee were passed over, the Mississippi valley occupied by northern men, and the territory of the south sundered. Texas, Arkansas, Missouri, and Louisiana could not be said to have been under the direct and entire control of the rebels. Cattle, negroes, and rebels were pressed within less than one-half the territory occupied by them in 1861. The result of this aggregation must have been to have caused the consumption of a large portion of their neat cattle. The ordinary routine of plantation life now had been seriously disturbed, if not effectually destroyed. A large increase of slave population from Kentucky, Tennessee, and the northern parts of Mississippi, Alabama, Georgia, and Virginia, had to be fed, while at the same time they were not as productive as in their former condition. Raids of armed men penetrated the interior of rebel territory from all directions, and at the close of this year there had been a great change within the rebel limits. These causes, together with the extravagant prices prevailing within their borders, and the general deficiency in the ordinary articles of food, must have made a great reduction in their stock of cattle before the opening of the year 1864.

While this condition remains, the agriculturist must close his researches in this direction, and not till peace, prosperity, and happiness regain their proper sway can he hope to pursue his investigations with success.

MAMMALOGY AND ORNITHOLOGY OF NEW ENGLAND,

WITH REFERENCE TO

AGRICULTURAL ECONOMY.

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THE *theory* of so many years ago, and its truth so clearly demonstrated by the most eminent naturalists and scientific men of the present time, that the Creator carefully and wisely provides laws, and also instruments to enforce them, whereby a beautiful and just equilibrium in the elements and workings of nature is maintained, is scarcely, as yet, felt and recognized in its proper and full value by those most practical and, from the nature of their occupation, the most professional of all naturalists—the farmers. They hardly appreciate properly the fact, notwithstanding all that has been written and is being written every day on the subject, that, although numerous elements are created in nature which are continually acting against them and their interests, other elements are provided to operate against the workings of these enemies; and if those that are friendly are not interfered with, they will, to a very great extent, counteract the evil effects of the others.

To understand the workings of the various forces that are acting for or against him, it is not necessary that the agriculturist should possess a complete knowledge of the several branches of natural history; but it is important that he should have a general knowledge of the subject, that he may, at least, be able to distinguish who are his enemies and who his friends; and it is the duty of the naturalist, and those who make the study of nature in her various forms a specialty, to simplify and generalize the study, that all who are interested in its application to agricultural economy may become acquainted with the different phenomena, their causes and effects, without spending valuable time in the investigation of details.

The means adopted to maintain the proper equilibrium are, of course, different in animate from those in inanimate nature. In the latter, elements are employed to counteract or neutralize the effects of other elements; while in animate nature rapacious tribes are created to destroy or prey upon other injurious tribes; but that these rapacious animals shall not extirpate the others, which are to a certain extent useful in different ways, they are slow in multiplying, while the others increase with sufficient rapidity to prevent extinction through these natural enemies. Although a knowledge of inanimate nature in her different forms is undoubtedly of great importance to the success of agriculture, animate nature possesses the greatest interest to the farmer, both because it has a very direct influence upon his success, and the objects in it are generally familiar to him and best capable of being understood by him.

Taking our terrestrial animated nature, or fauna, therefore, and analyzing it, we find it to consist of four great classes—mammals, birds, reptiles, and insects. The characteristics of each of these classes are, of course, familiar to all; they may be described briefly as follows: Mammals are warm-blooded vertebrate animals that suckle their young. They are viviparous—that is, they bring forth their young alive.

Birds are warm-blooded vertebrate animals clothed with feathers; they are invariably oviparous—that is, the young are hatched from eggs by the action of heat imparted from the body of the parent bird.

Reptiles are cold-blooded vertebrate animals; they are oviparous, the young being hatched by the heat of the sun.

Insects are those articulate animals which undergo changes, called metamorphoses, before the perfect animal is formed; these changes are three in number after the eggs are laid: first, the caterpillar stage; second, the pupa stage; and after these the imago or perfect insect stage.

The study of the first class is called mammalogy; that of the second, ornithology; the third, herpetology; and that of insects entomology.

The study of entomology is undoubtedly of the greatest importance to the agriculturist, but the present paper will not treat of it otherwise than in a general description of the characteristics of the different orders, and incidentally in the enumeration of destructive species which furnish food for some of the mammals and birds. Herpetology is of but little importance to the farmer, as we have but few species of reptiles, most of which are, however, beneficial.

The present paper is designed not so much to add new facts to the knowledge of our mammalogy and ornithology, but to emphatically reiterate important facts and observations in these departments for the benefit of the agriculturist; the object being to impress upon his mind the fact that nature furnishes powerful assistants to his labors, and to show him the manner in which they operate.

Beginning with the great class mammalia, we find it divided by naturalists into different classes called orders, each of which is distinguished by peculiarities in structure, habits, and food. Those orders indigenous to this country among the terrestrial mammalia of importance to the agriculturist, either as beneficial or injurious, are: Cheiroptera, (the bats;) Insectivora, (the insect devouring animals;) Carnivora, (the flesh devouring animals;) Rodentia, (gnawing animals;) Marsupiata, (pouched animals;) and Ruminantia, (animals which chew the cud.) Of these animals the Cheiroptera, Insectivora, and Carnivora are beneficial; the Rodentia are generally injurious; and the Ruminantia are valuable only as food, and are (to a slight extent) injurious in the wild state.

CHEIROPTERA.

In this order are included those animals known as the bats; there are several species in the United States, all of which can be properly included in the family *vespertilionidæ*, the characteristics of which are an excessive prolongation of the fingers of the anterior extremities, which are connected together, and with the posterior extremities, which are connected with the tail by a thin, semi-transparent, generally naked membrane, which enables them to fly. Their food, which they almost always capture in the night, (as the habits of the animals are strictly nocturnal,) consists entirely of insects, chiefly nocturnal lepidoptera, which they seize while on the wing. The number of these noxious insects which they destroy is immense; and this fact, together with their harmless dispositions and habits, establishes them as valuable friends to the farmer, who should encourage them to take up their abode on his premises, and protect them as much as possible. At the approach of cold weather, the bats seek convenient quarters in caves, hollow trees, and buildings, where they remain torpid until spring, suspended by the sharp hooked claws of their feet.

INSECTIVORA.

Of this large and important order we have many representatives included in the two families, *Soricidæ*, (shrews,) and *Talpidæ*, (moles.) The shrews may readily be distinguished by their mouse-like form, long and pointed head, diminutive eyes, and attenuated muzzle, prolonged into a movable snout. In the true or typical shrews, included in the genus *Sorax*, the body is rather slender, nearly cylindrical, and covered with a soft glossy fur; the ears are large, but nearly concealed by the fur of the head; the eyes are minute, but visible; and the snout is elongated, flexible, and sensitive; the tail is variable in length, but generally is long; series of glands are placed along the flanks which secrete a fluid of disagreeable odor, in consequence of which they are seldom destroyed and eaten by the *Carnivora*.

The animals of this family are small, some of them the most diminutive of mammals. Their habits are generally nocturnal, and none of one species hibernate, I believe, as individuals are often seen in winter busily engaged in searching for insects in their various forms, in and beneath piles of stones and rubbish. The shrews inhabit the woods, fields, and gardens, and being possessed of voracious appetites they are continually active in destroying numerous noxious insects, of which their food almost entirely consists; consequently they are all eminently beneficial to agriculture, and are certainly worthy the protection of the farmer.

There are also in this country, besides the genus *Sorex* or true shrews included in the *Soricidæ*, other genera, of which *Blarina* is the most important. In this genus are placed the mole-shrews or short-tailed shrews. These may be recognized by their stout body, short tail, and the other features of the genus *Sorex*.

The family *Talpidæ* (or moles) is represented in this country by several species, in all of which the body is short and strong, the snout flexible and very sensitive, and the head is long and tapering. The external ear is wanting, and the eye is so small as to be hardly visible, or is completely covered with the skin of the head. The limbs are short and strong, (the forward ones which are provided with strong claws for digging,) exceedingly so. These peculiarities of form are all adapted to the subterranean habits of these animals. Their food consists of insects and worms; these, which they destroy in great quantities, are all, or nearly so, captured beneath the surface of the ground. They are almost constantly employed in searching for food in consequence of their voracious appetites, and their labors are valuable in destroying these insects.

In reviewing the habits of the different animals that subsist entirely upon insects, we find them to be generally nocturnal in character. This seems to be a wise provision of nature, whereby the birds (generally diurnal in habits) which destroy great numbers of insects, and even in a great many species, subsist entirely upon them, are continually assisted in keeping reduced this formidable and destructive element. Another interesting and valuable fact is, that these animals, to make their work the more sure, hunt in different circles: the *Vespertilionidæ* destroying great numbers of insects in the air; the *Soricidæ* on the surface of the earth, and the *Talpidæ* beneath the surface. In studying these beautiful laws, so nicely calculated for so desirable an end, we admire and wonder. Appreciating them, and noting their efficacy, we learn to respect and even love the instruments by which they are executed.

CARNIVORA.

This great order, generally diffused over the entire globe, is represented in this country by the following families: *Felidæ*, (the cats;) *Canidæ*, (the dogs;) *Viverridæ*, (the civet cats;) *Mustelidæ*, (the weasels, skunks, &c.;) and *Ursidæ*, (bears.)

The external characteristics of the *Felidæ* are—a rounded head, light, elastic, muscular body, strong limbs and sharp *retractile* claws on all the toes, which are five in number on the anterior feet, and four on the posterior. In this family are included our panthers, lynxes, and wildcats. The habits of these animals are both nocturnal and diurnal, but generally the former. In capturing their prey they always spring suddenly upon it from some concealed station, and if they fail in their first attack they seldom repeat it. By nature they are cowardly and cruel; they are gifted with acute senses of sight and hearing; they are only beneficial in destroying many of the injurious herbivorous mammals; and it is a doubt whether or not the damage they inflict by destroying great numbers of beneficial birds and valuable ruminants, does not more than balance the little good they do. At any rate, the hatred all farmers have for them is so great that they lose no opportunity to destroy them, and, probably, this one of their prejudices is founded on reason.

In the family *Canidæ* are included our wolves and foxes; the same remarks will apply to them as to the cats regarding their usefulness.

The family *Viveridæ* has no importance to our agriculturists.

The family *Mustelidæ*, in which are placed our martins, weasels, otters, badgers, and skunks, is the most important of the Carnivora to agriculture. Its characteristics are based principally on peculiarities of the teeth, of which these animals have six incisors in each jaw; two canines; six or eight pre-molars; two molars in the upper, and two or four in the lower jaw. Their bodies are generally long and slender; legs short; feet, five-toed, provided with long sharp claws; the tail is generally long, and sometimes bushy, as with the skunks. These animals generally have glands at the root of the tail which secrete a liquid of offensive odor. With the skunks this secretion is used as a weapon of defence; its offensive odor exceeds anything in nature. The weasels and skunks are the most important members of this family; they are continually active in destroying the mice and rats; the form of the weasels being peculiarly adapted to following them to their most secret haunts. Insects also form no inconsiderable portion of the food of skunks and weasels. Birds, and their eggs, and young, are often destroyed by them, but not to an extent at all balancing the benefit they do; nor is the injury caused by an occasional raid into the poultry yard at all comparable to the immense benefit we receive from their unceasing nightly labors in the destruction of rats, mice, and insects. The otters and badgers are of no importance to agriculture.

The *Ursidæ*, in which are included our raccoons and bears, are omnivorous in nature, although they are placed by naturalists in the Carnivora. In consequence of their depredations in the cornfields and sheepfolds they are in ill favor with the farmers, who improve every opportunity to destroy them. But little can be said of their benefit to agriculture. In closing the order Carnivora, it would be proper to say that these animals are slow to multiply. If this were not the case, they would, in consequence of their voracity, exterminate the other animals on which they subsist, (and which are also valuable as food for man,) and thus defeat the object for which they were created.

RODENTIA.

A knowledge of the characteristics and habits of the animals of this order is of great importance to the agriculturist, from the fact that these animals constitute one of the most destructive elements with which he has to contend. To properly understand these characteristics, it will be necessary to enter into a more careful and less general examination of these animals, and trust less to external peculiarities than we have thus far done; and we will, as far as possible, simplify these examinations, that they may be brought within the comprehension of all who have not already made the subject a study.

The animals of this order are all of small size, the beaver and marmots being among the largest. The species are all very prolific and numerous, and all are destructive, some exceedingly so. The prominent characteristics of these animals is the peculiar formation of the teeth. These are of two kinds, incisors and molars; the canines are wanting; the incisors are generally two in number in each jaw; they are large and powerful, and provided with sharp, cutting, chisel-shaped edges, adapted to gnawing. The constant severe action to which they are subjected would in time destroy them were they not continually growing, or being replaced by a pulpy secretion at their bases. The molars vary in number from twelve in the upper, and ten in the lower, to but two in each jaw; these, like the incisors, are composed of two substances; an external layer of hard enamel, and a softer material in the interior; their surfaces are irregular or tuberculated, adapted for grinding vegetable substances. These teeth are replaced in the same manner as the incisors.

The forms and habits of the animals in this order are of a great variety. They will be discussed in the descriptions of the different families, of which we have in this country five. They constitute each a natural group, with generally familiar representatives. They are called the *Sciuridæ,* (the squirrels;) *Saccomyidæ,* (the pouched rats and gophers;) *Muridæ,* (rats and mice;) *Hystricidæ,* (porcupines;) and *Leporidæ,* (rabbits and hares.) The detailed peculiarities of these families cannot be, in the present paper, discussed at great length, but those most prominent will be mentioned sufficiently to have them understood.

The *Sciuridæ* of the United States are included in the two natural divisions or sub-families *Sciurniæ,* (squirrels and woodchucks;) and *Castorinæ,* (beavers.)

The sub-family *Sciurinæ,* in which are placed the squirrels, both ground and arboreal, the wood-chucks and spermophiles, is very numerous in this country, and the members of it are generally injurious, from the fact that the great bulk of their food, of which they generally secure large quantities for their winter subsistence, consists principally of the various seeds, nuts, and grains which are valuable as a means of subsistence to man and the domestic animals. These animals also consume great quantities of cultivated fruits, and even vegetables, to an extent, in some districts, involving to the farmer considerable pecuniary loss. Wood-chucks, especially, are very mischievous, not only in what they eat, but to the crops of clover, grass, and grains, which are destroyed by numerous trails or paths leading from their burrows. This family is of small value, either for food or for their fur.

The *Castorinæ,* or beavers, are of no great importance, economically speaking, to agriculture. They are valuable for their fur, which always commands a ready sale at a high price. These animals are rapidly becoming extinct, and are only found in the wildest and most retired districts of the country.

In the family *Saccomyidæ* are included all the gophers and pouched rats. They may be readily distinguished by their large cheek pouches. These animals are all eminently injurious. They burrow in the earth in grain fields and grass lands, and often do considerable mischief by visiting the gardens, orchards, and nurseries, where they eat the roots of the plants and gnaw the bark from the trees. In this manner large numbers of fruit trees are destroyed yearly. The cheek pouches are used in conveying food to their burrows. This food consists of roots, grains, grasses, seeds, fruits, and nuts. Of these they devour great quantities. Various methods have been devised for their destruction, the most successful being by poison. Great numbers are destroyed by the carnivorous animals and birds, and were it not for these they would, in consequence of their numbers and rapid increase, be a serious pest. These are, however, not found in New England.

The great family *Muridæ* is, economically speaking, the most important in our indigenous *Rodentia.* In it are included the rats and mice, all of which are injurious, in some genera, seriously so. These animals have characteristics in common, but they naturally fall into several groups, which possess peculiarities sufficiently marked to rank them as sub-families. They are called the *Dipodinæ,* (jumping mice;) *Murinæ,* (rats and mice proper;) and *Arvicolinæ,* (short-tailed field mice.)

In the sub-family *Dipodinæ* we have but one genus, *(Jaculus,)* in this country. These animals are readily distinguished from the field mice by their very long posterior limbs and tail, and their progression by long leaps. This genus is not a large one, and consists in this country of but one or two species. They are not abundant in any districts, and can hardly, from their retiring habits, and the nature of their food, which consists largely of the seeds of wild plants, be called greatly injurious. Their number will probably be kept reduced by the *carnivora* and reptiles,

The sub-family *Murinæ* is largely and widely distributed. It is characterized by a robust body, moderately short limbs, strong and fully developed clavicle, and the tibia and fibula are united below. The anterior feet are four-toed, with a wart-like tubercle supplying the place of a thumb; the posterior feet are five toed; the tail is generally long, and covered more or less thickly with scales, which are arrayed in whorls, and between which spring scanty hairs which partially conceal them. In this sub-family are included our common rat, *Mus decumanus*, (Pallas;) black rat, *M. rattus*, (Linn.;) common mouse, *M. Musculus*, (Linn.;) the field mice, *(Rithrodon;)* the white-footed mice, *(Hesperomys;)* the bush rats, *(Neotoma;)* and the cotton rats, *(Sigmodon.)* These animals are all injurious generally in the highest degree. In the fields and gardens, in the grain houses and hay ricks, their depredations are innumerable, and the farmer has to pay for their support a large share of his produce.

These species are all prolific and numerous, and their rapidly increasing numbers are already a serious evil. They should be destroyed at every opportunity. The farmer will find that he will have able and willing assistance in their destruction in one or two small terriers if he keeps them about his premises. They are as natural enemies to the rat tribe as the cats are, and as constantly and successfully on the alert for them. In conclusion we can say that, with the exception of the *Arvicolinæ*, to be treated of next, they are the most injurious of all mammals.

The animals included in the sub-family *Arvicolinæ* are certainly the most injurious of all farm pests, excepting the insects. They are divided into three genera, *Arvicola*, (field mice;) *Fiber*, (muskrats;) and *Myodes*, (Lemmings.) Of these, the last mentioned are not of much consequence agriculturally.* It is the animals in the genus *Arvicola* that constitute one of the greatest of farm nuisances. They are characterized, and may be readily distinguished, by a rat-like, but rather stout, form; short ears, nearly concealed in the fur; large head and short tail. They are known in different sections by the names: field mice, short-tailed field mice, bull-head mice, and bear mice. These animals are numerous, in some districts extremely so, and prolific to an alarming degree, and exceedingly voracious. In summer they live in the cultivated fields and meadows. In this season they eat the different grains by cutting down the stalks to get at the ears. They also eat the roots and seeds of the different grasses and clover, and devour carrots, turnips, and other vegetables. In the barns and hay ricks they spoil the hay by cutting it into fragments and filling it with their peculiar odor, thus rendering it unacceptable to the cattle.

Robert Kennicott, who has obtained a rich fund of knowledge of the habits of these animals, wrote a most invaluable report on them, which was published in the Patent Office Report for 1856. I cannot refrain from giving a few extracts from it here, which the importance of the subject justifies. He says:

"Few if any escape their depredations, though the full amount of damage done by them is but little known, and yet they are usually thought unworthy of consideration. Such of

* Muskrats are very mischievous among crops which lie near their haunts, but they ought to be utterly exterminated by every means in the farmer's power, on account of the immense and unceasing injury in cutting through dams and embankments, breaking the banks of ditches, and burrowing in, through, and across drains, opened and covered. No more mercy should be shown them than to the pestilent field-mouse.

our farmers as cut their corn and leave it standing in shocks for some time in the field, as is usually done here in Illinois, will find upon examination that in many, if not in every one of the shocks, there may be found one or more pair of meadow mice, which have dug for themselves burrows in the ground beneath, and have often carried thither a store of corn; while in these, or ensconced in the protecting cornstalks above, they have built themselves a nest, in which they can lead a very comfortable sort of life, regaling themselves when hungry upon the corn. Now, a pair of mice will not, it is true, eat enough corn to alarm a farmer for the safety of his crop; but let any one examine a large field of corn thus cut and left standing on the ground a month or two where these mice abound, and carefully estimate the average amount of corn destroyed in each shock, observing that which has been buried in the burrow, and then multiply that by the number of shocks inhabited by these pests, and it will be often found that they have consumed or destroyed a large amount. In meadows they do much injury by devouring the roots and stems of timothy, clover, and other plants used for hay."

"In a nursery where apple seeds were planted in autumn I have observed that, during fall and spring, so many of the seeds were dug up by these mice as to leave long gaps in the rows of seedlings, the empty shells of the seeds being found lying about the rows from which they had been taken. They congregate in stacks of hay and grain, sometimes in exceedingly great numbers, destroying all the lower parts by cutting galleries through them in every direction."

"The greatest mischief done by meadow mice is the gnawing of bark from fruit trees. The complaints are constant and grievous, throughout the northern States, of the destruction of orchard and nursery trees by the various species of arvicolæ. The entire damage done by them in this way may be estimated, perhaps, at millions of dollars. If any think this too large an estimate, let them inquire, even in a small neighborhood, where much attention is paid to fruit-growing, and it will be found that, wherever they abound, the injuries committed by these pests are frequently among the most serious difficulties encountered by the pomologist. This is especially the case at the west, where no care is taken to protect the trees against them, careless orchardists allowing grass to grow about the roots of their fruit trees, and thus kindly furnishing the arvicolæ with excellent nesting places in winter, and rendering the trees doubly liable to be girdled. In the nurseries in northern Illinois I have seen whole rows of young apple trees stripped of their bark for a foot or two above the ground. Thousands of fruit trees, as well as evergreens and other ornamental trees and shrubs, are at times thus killed in a nursery in one winter. The mice are most mischievous in winters of deep snow. It is usually thought that they only gnaw bark when no other food is to be obtained; but it is more probable that this is palatable to them at all times. Confined specimens, while abundantly supplied with food of all kinds, ate the bark from twigs placed in their cage. One reason why fruit trees are most girdled in times of deep snow is, that the meadow mice can then best move about at a distance from their burrows, being protected by the snow, under which they construct numerous pathways, and are thus enabled to travel comfortably in search of food, always to be obtained in abundance where there is any kind of perennial grass or the seeds of annual plants. Aided by the snow, too, they climb up at the sides of the trees to gnaw the bark at a considerable height from the ground. Rabbits are often accused of gnawing the bark from trees, when the mischief has really been done by meadow mice."

If the *Arvicolinæ* had not numerous enemies they would soon become unbearably numerous, for they are all very prolific, rearing several litters of from five to seven in each, yearly. They are destroyed by all the carnivora and rapacious birds. Indeed, some species subsist almost entirely upon them. The animals most efficiently active against them are the *Mustelidæ* and some of the large snakes. These, if protected by the farmer, and they should be, would do much to keep these pests reduced in numbers. They can readily enter the burrows of the mice, and, possessing voracious appetites, destroy great numbers. But the farmer, the moment he sees a snake, no matter if it is perfectly harmless, (and but few are venomous,) kills it, thus destroying one of his greatest benefactors, living as it does on insects principally, but often catching these mice. Domestic cats are also extremely fond of them, and destroy great numbers. In spite of all this destruction *Arvicolinæ* are still abundant.

"Our farmers kill the small birds of prey with a zeal that would be highly commendable if exhibited in a better cause, while the man is rarely found who does not kill the harmless mouse and insect-eating snakes, with as much eagerness as he would destroy the really objectionable rattlesnake, which is the only venomous reptile on the prairie of Illinois and other western States." Let one of our prairie farmers who regards these pests as "inoffensive little mice that only steal a few kernels of corn" investigate their habits carefully for a year, and he will be very apt to conclude that meadow-mice are a kind of farm stock that are "hardy and excellent breeders," but rather expensive to keep. It may be, he will think it best to forbid killing, too, on his farm the prairie hawks, owls, and shrikes, as well as harmless snakes.

Before dismissing the destructive family *Muridæ*, it will be proper perhaps to mention some of the methods that have been adopted on the farm for their destruction, or to prevent their ravages. Numerous traps have been devised. some of them ingenious and effective.. Of these, the best I have seen—one for barns and granaries and another for the fields—are as follows: Place a barrel half full of water beneath a trap-door in the floor of buildings infested with these animals, so that the top of the barrel will be just on a level with the floor; around this scatter grain or meal at night, and by morning numbers will have fallen in and been drowned. In the fields and nurseries where they abound, a trap made on the favorite Scotch plan is very effective. Dig in the earth at the beginning of cold weather short trenches four feet wide at the bottom, and three feet wide at the top, and about four feet deep; the ends inclined at the same angle as the sides. The earth walls of these trenches after becoming frozen, are impassable to mice that have fallen in, as they will in great numbers. I am informed by a Scotch gardener, that he has killed upwards of *nine thousand* in one winter in this manner.

Different poisonous preparations have been used with effect on these vermin. The following are among the best: two ounces of carbonate of barytes mixed with one pound of suet or tallow; place portions of this within their holes and about their haunts. It is greedily eaten, produces great thirst, and death ensues after drinking. This is a very effective poison, as it is both tasteless and odorless. Mix one ounce of finely powdered arsenic and one ounce of lard with meal into a stiff dough; put it about the haunts of the rats; they will eat it greedily, and it makes them so thirsty that they will die near the water, of which they drink until they burst. Other effective poisons are composed as follows: make a paste of one ounce of flour, one-half gill of water, one drachm of phosphorus; or, two ounces of lard, half a drachm of phosphorus, and one ounce of flour; or, one ounce of flour, two ounces of powdered cheese-crumbs, and one-half a drachm of phosphorus; add to each of these mixtures, if convenient of access, a few drops of oil of rhodium. Mix into a paste or pills, and scatter about the fields and nurseries. Or, two ounces of finely powdered arsenic, two ounces of lard, ten drops of oil of rhodium, mixed with flour or meal into a thick dough, and pills of it scattered about the orchards and nurseries.

In the family *Hystricedæ* are comprehended the porcupines, &c. Of these we have but two species included in the genus *Erethizon;* they are the white-haired or Canada porcupine, *E. dorsatus*, (Cuv.,) and the yellow-haired porcupine, *E. epixanthus*, (Brandt.) These animals are not numerous or troublesome; they are injurious only in destroying trees, of which they eat the bark and leaves. Sometimes these trees are found stripped almost entirely of bark, and it is said that a single porcupine will thus denude a hundred trees in a season. They also eat fruits and vegetables, but not to any great extent.

In the family *Leporidæ* are included our rabbits and hares. Their characteristics are: long and erect ears; large and prominent eyes; four incisors in the upper, and two in the lower jaw; the two middle ones in the upper jaw much the largest; posterior limbs long and strong, adapted to leaping; anterior feet five-toed; posterior feet four-toed; tail short or wanting. Some of the animals in this family are injurious in gardens and nurseries to an extent hardly appreciated. I have known acres of peas to be destroyed in a few weeks when situated near small swampy woods, in which these animals for the most part reside. Fruit trees are often injured by them, sometimes seriously, by their eating the bark in winter from the trunk; cabbage fields are also visited in the summer, and great damage done. Fields of clover, of which they are fond, are trampled and cut up, if they are near woods, to an extent only known by the enraged farmer. I have seen many of these fields with well-beaten paths running in all directions made by the rabbits and woodchucks. The *Leporidæ* are very prolific; were they not they would soon be exterminated, for they furnish food for man, and are destroyed in great numbers by the carnivorous animals, (especially lynxes, weasels, and foxes,) rapacious birds, and reptiles.

RUMINANTIA.

The animals of this order have peculiarities that constitute this a very natural group. They have in all the families the following common characteristics: No incisors in the upper jaw, their place being supplied by a callosed gum; eight incisors in the lower jaw; generally twelve molars in each jaw; feet bifurcate. These animals, as their name indicates, *chew the cud;* that is, they masticate their food a second time. The manner in which this is done is as follows: Their stomach is compound, being composed of four different compartments. The food, which is always vegetable in nature, is but little chewed when passed into the first or largest compartment called the "paunch." From this it passes into the second compartment, from which it returns to the mouth where it is completely masticated, and then passed to the third stomach, from that to the fourth, and thence to the intestines.

In this order are found two of our most valuable domestic animals—horned cattle and sheep. These animals, in their order indigenous to this country, are included in but two families; *Cervidæ* in which are placed our moose, elk, and deer, and *Cavicornia* which includes the goats and bison. The *Cervidæ* are distinguished by solid deciduous horns; the *Cavicornia* by permanent hollow horns. These animals are all valuable for food, and for their hides, of which different kinds of leather are made. They are generally wild and retiring in their habits, seldom approaching human habitations. The deer in some districts are injurious by visiting corn and grain fields, which they eat and destroy, sometimes to a considerable amount. They also injure young fruit trees in nurseries by biting off the twigs and gnawing the bark. The thoroughness with which they have been hunted has driven them into the most retired and thinly settled districts, and the time is not far distant when they will be extinct in all but the unsettled territories of the continent.

MARSUPIATA.

In this curious order, which does not, however, exist in New England, are included those animals the young of which are brought forth prematurely, and received, in most instances, into a peculiar pouch situated on the lower part of the abdomen of the female. This order is represented in this country by the opossums, which are confined to the southern and middle States. The following interesting account of them is given by Goodrich in his "Illustrated Natural History." He says of the common American opossum:

"It has a pointed head, wide gape, numerous sharp teeth, a rough tongue, ears large and naked, small eyes, the tail long, tapering, flexible and prehensile; the toes are armed with sharp, strong, curved claws. Its size is nearly that of a cat, but the form is low and squat; the color is a grayish-white; the face near the snout pure white; the ears black. In its habits it is mostly nocturnal and arboreal, feeding alike upon insects, eggs, small birds, and fruit. It sometimes invades the barn-yards and destroys the poultry, it is said, for their blood. It is a good deal hunted, and manifests much dexterity in escaping by creeping away amid the grass, and sometimes pretending to be dead. In defending itself it bites severely. It is sluggish in its movements, and will sometimes lie on its back for hours. It often suspends itself from the branch of a tree by its tail. It is very prolific, producing from six to fifteen at a birth. The young at this period are well formed, and weigh from three to four grains each. As soon as produced they are shoved into the pouch by the mother with her snout, and pushed near the nipples, which they find and grasp by instinct. Their growth is very rapid; at a week old they weigh thirty grains. They remain in the pouch attached to the nipples till they are able to move about."

In winter, if the climate is cold, the opossums become sluggish, but not torpid, like the woodchucks.

INSECTS.

Before proceeding to a consideration of the characteristics and habits of our native birds, it will be necessary to give a brief general description of the different orders of insects, which constitute a large proportion of their food. It will not be necessary to enter into details regarding species, more than to mention those most injurious, or to select familiar species as types of the various families. We found in the introductory description of insects that they all undergo certain changes or *metamorphoses* after being hatched from the egg. This peculiarity briefly describes, or rather distinguishes, animals of this class from all others. The different orders into which they are divided are all based upon characteristics which place them in seven natural groups readily distinguished: they are called Coleoptera, (beetles;) Orthoptera, (cockroaches, crickets, grasshoppers, &c.;) Hemiptera, (bugs, locusts, plant-lice, &c.;) Neuroptera, (dragon flies, lace-winged flies, May flies, &c.;) Lepidoptera, (butterflies and moths;) Hymenoptera, (saw flies, wasps, bees, ants, &c.;) and Diptera, (mosquitoes, gnats, flies, &c.)

The Coleoptera (literally sheathed wings) include some of the most injurious insects of the farm. The characteristics of this order are that the wings "are covered and concealed by a pair of horny cases or shells, meeting in a straight line on the top of the back, and usually having a little triangular or semi-circular piece, called the scutel, wedged between their bases."—(Harris.) Some families in this order are carnivorous, and, consequently, beneficial; these are the *Cicindeladæ*, (tiger beetles;) *Carabidæ*, (predaceous ground beetles;) *Dytiscidæ*, (diving beetles;) and the *Coccinelladæ*, (lady birds or lady bugs, as they are often called.) The *Cicindeladæ* may be recognized by the metallic lustre of their wings and bodies, their agile movements, and their habit of frequenting sandy roads and dry sandy fields, "starting from under the feet of the traveller with a swift and noiseless flight, only to alight a few feet ahead, facing about to meet the threatened danger as they touch the ground. This operation is often repeated several times before they will take refuge in the grass or other herbage." The *Carabidæ* are generally pretty well known, as are also the *Coccinelladæ*. The *Dytiscidæ*, or diving beetles, are aquatic insects; they destroy multitudes of those insects that pass through their first transformation in the water.

Nearly all the other families of the order *Coleoptera* are injurious; among them are found the *Scarabacidæ*, (tree beetles, dung beetles, dor beetles, May bugs, and rose bugs, or beetles properly,) which subsist upon the leaves of trees, shrubs, &c.; the *Cetoniadæ*, (flower beetles;) the *Lucanidæ*, (stag beetles, horn bugs, flying bulls, &c.;) the *Buprestidæ*, (saw-horned beetles,) the larvæ of which are injurious to trees; they are called "wood-eaters or borers." Our forests and orchards are more or less subject to their attacks, especially after the trees have passed their prime. "Some of these beetles are known to eat leaves and flowers, and of this nature is probably the food of all of them. The injury they may thus commit is not very apparent, and cannot bear any comparison with the extensive ravages of their larvæ." The *Elateridæ*, (spring beetles,) which may be distinguished by their habit of jerking themselves upward and over when laid on their backs; their larvæ are also tree-borers; the *Rhynchophoridæ*, (weevils,) which may be known by their lengthened snouts, are injurious by attacking plums and other fruits, grains, and seeds; the *Cerambycidæ*, (borers,) which may be known by their habit, when taken into the hands, of producing a squeaking noise "by rubbing the joints of the thorax and abdomen together." These beetles are called the Capricorn beetles; their larvæ are the most powerful and destructive of our borers. The *Crioceridide*, (oblong leaf beetles;) *Hespidæ*, (little leaf beetles,) and other leaf-eating beetles, included in several families, are also very injurious. Those most destructive among them are the striped cucumber beetles that attack squash and other vines, and the various flea beetles that attack the leaves of turnips, &c. The *Cantharidæ*, (blistering beetles,) are also injurious to vegetation. For full and accurate descriptious of the above insects and those mentioned hereafter, see Harris's "Insects Injurious to Vegetation," published by the legislature of Massachusetts in 1841 and 1852, and republished and illustrated in 1862.

ORTHOPTERA.

The insects of this order, with the exception of the family *Mantidæ*, (camel crickets,) are injurious to agriculture. They may be recognized by their straight wings when folded along the back, "being covered by a pair of thicker wing-like members." In this group are included the grasshoppers, locusts, crickets, cockroaches, and others of this description. Their food consists of grass, fruits, the leaves and bark of trees, and shrubs. In some sections these insects are exceedingly numerous, and they inflict a great amount of damage. They are greedily eaten by the various insectivorous mammals and most of the birds; snakes also capture them in great numbers.

NEUROPTERA.

This order includes all those insects known as dragon flies, darning needles, water flitters, and all the others that have the peculiar *nerved wings* of these species. These insects are all beneficial; they are carnivorous, or rather rapacious, and subsist entirely upon other insects, principally Lepidoptera, of which they destroy great quantities.

HEMIPTERA.

The insects of this order are all injurious; they are distinguished by having, instead of jaws, like the three preceding orders, "a slender beak, which, when not in use, is bent under the body, and lies upon the breast between the legs. This instrument consists of a horny sheath, containing in a groove along its upper surface three stiff bristles as sharp as needles. Bugs have no jaws, but live by sucking the juices of animals and plants, which they obtain by piercing them with their beaks." Some of these insects have no wings, like the common bed-bug. Probably the most noxious insects of this order are found in the *Aphididæ*, of which the grain aphis, or grain louse, so well known in this country of late years, is the type. The *Coccidæ* (bark lice) are also very injurious to trees.

LEPIDOPTERA.

The insects in this order are all very destructive, principally in the caterpillar form. The different butterflies and moths are included in it, and their characteristics are well known, their name is suggested by the manner in which their wings are clothed with scales; these are exceedingly minute, resembling a dusty substance when rubbed off the insects on the finger. The caterpillars of the apple-tree moth are probably the most injurious in this order, although for a few years past the army worm, the caterpillar of *Leucania unipuncta*, (Haworth,) has created great damages in grain and grass fields.

HYMENOPTERA.

These insects, like the bees, wasps, &c., "having four membraneous wings, biting jaws, and a sting in the extremity of the abdomen, belong to this order, together with the ants, gall-flies, ichneumons, and almost all the parasitic tribes which deposit their eggs in the eggs or larvæ of others." They are generally beneficial. The greatest exceptions are the saw flies, (*Tenthredinidæ,*) the *Uroceridæ,* (boring or wood-wasps,) and the *Cynipidæ,* (gall flies.)

DIPTERA.

In this order are included those insects that have but two wings, and instead of jaws, have a mouth adapted to sucking. The different flies are placed in this group. These are both beneficial and injurious; in fact their habits and food are of a great variety. "Some subsist upon the blood of living animals; others on fungi; many construct galls in various annuals. The blow fly and others of that class live upon putrefying matter; the common house fly passes its preparatory stages in excrement; the *Tachinidæ* glue their eggs on the skin of various caterpillars, and their larvæ enter and devour the juices of the animal resembling the ichneumon in their habits; some are said even to attack and feed upon the eggs and bodies of spiders, the traditional enemies of the race, thus consummating a species of just retribution. The Hessian fly, the wheat midge, the onion fly, and others, are among the most noxious of insects. The black fly, (*Simulium,*) the mosquito, (*Culex,*) the golden-eyed forest flies, (*Chrysops,*) the *Tabanidæ,* or horse flies, and others, are the cause of intense annoyance and irritation, during the hot months, to both men and animals." Summing briefly the habits of these insects, we find that the *Coleoptera* are generally injurious in the larvæ state by boring into trees; the *Orthoptera* are injurious by feeding upon the leaves of trees, shrubs, and grasses; the *Neuroptera* are beneficial by destroying noxious insects; the *Hemiptera* are injurious by sucking the juices of plants, trees, &c.; the *Lepidoptera* are injurious chiefly in the caterpillar form, by eating the leaves of trees, &c.; and the *Hymenoptera* and *Diptera* are both beneficial and injurious, but rather incline to the latte quality.

BIRDS.

The most concisely emphatic treatise that could be written in favor of our native land birds would be the statement of the fact that, with the exception of most of the diurnal birds of prey, they are all beneficial to agriculture; and if this fact were recognized by the farmers, (than whom none are more affected by its existence,) and if they were to extend their protection and encouragement to these benefactors, the grain and fruit crops of this country would be the value of millions of dollars greater than they are. A few familiar illustrations will show the importance of protecting birds on the farm.

It is the custom in some districts of this country, as soon as the planting is finished, and other spring work done on the farm, for all the men, both old and young, to assemble together, with guns, &c., and after choosing sides, as the expression is, to have what is called a "shooting match;" that is, each party endeavors to kill the greatest amount of birds and animals within the circuit of several miles, or within the limits of the county. Such a match came off in a town in Pennsylvania a few years since. The party was numerous and the slaughter immense; in fact nearly all the birds were killed off, and as the migrations had passed—this was about the last of May—scarcely a bird was to be seen in the neighborhood the ensuing summer. The result was, the cut-worms ravaged the cabbage fields; the apple-tree caterpillars and borers were so numerous that whole orchards were destroyed, and army worms and other injurious insects were so abundant that there was scarcely a single grain field that was not damaged to the extent of at least one-third the value of the entire crop. Nor were these injuries confined to that year, but many succeeding seasons bore witness to the folly and wickedness of that wholesale destruction

On another of these occasions, "about the year 1820, in North Bridgewater, Massachusetts, the birds were killed in such quantities that cartloads of them were sold to the farmers for fertilizing the soil. There was consequently a great scarcity of birds in all that vicinity. Soon the herbage began to show signs of injury; tufts of withered grass appeared, and spread out widely into circles of a seared and burnt complexion. Though the cause and effect were so near each other, they were not logically put together by the inhabitants at that time. Modern entomology, however, would have explained to them the cause of this phenomenon in the increase of the larvæ of injurious insects, usually kept in check by the birds which had been destroyed at that shooting match." These are not isolated cases, nor even rare instances. Let the curious student consult local newspapers from the different sections of the country in the spring months, and he will find many instances of these shooting matches, with long accounts of the different birds and animals destroyed.

In Europe a similar system of extermination is prevalent, and seems to be steadily on the increase. Frederick de Tschudi, the president of the Agricultural Society of Canton St. Gall, Switzerland,* writes of this practice as follows:

"But the cause which exercises a still more fatal influence on the diminution of our most useful birds of passage is the extraordinary hunt they are subjected to on the part of the Italians. It is a well known fact that, at the period of their spring migrations, and still more in autumn, Itailans are seized with a mania for killing small birds. Men of all ages and conditions—nobles, merchants priests, artisans, and peasants—all abandon their daily tasks to attack, like banditti, the troops of passing visitors. By the river-side, in the fields, all around is heard the report of fire-arms; nets are laid, traps set, twigs covered with bird-lime hung on every bush. On every hill adapted to the purpose is placed a sort of trap, (*roccolo*,) full of owls and sparrow-hawks, to attack and slaughter the little stranger." "To form some idea of the slaughter which for weeks together is the chief delight of the population of Italy, it is sufficient to mention that in one district on the shores of the Lago Maggiore the number of small birds annually destroyed amounts to between 60,000 and 70,000, and that in Lombardy, one single *roccolo*, 15,000 birds are often captured daily. In the neighborhood of Bergamo, Verona, and Bresca, several millions of birds are slaughtered every autumn. We cannot prevent the Italians from indulging in their absurd and barbarous amusements, but we can lessen the evil in some degree, and it would be but consistent with the proverbial good sense of us Germans if we were to protect all the bird tribe with a solicitude proportionate to the mad attacks upon them southwards, and thus in some degree reinstate the order of nature, and aid in re-establishing the necessary balance between the insect world and its enemies."

Unfortunately the destruction of valuable birds by our farmers is not confined to their shooting matches, but on many farms the boys are provided with guns and ammunition, and instructed to destroy those birds which are traditionally injurious, such as the robin, common crow, blackbirds, thrushes, and numerous others, all of which are beneficial.

The investigations of ornithologists and other students of nature have within a few years disclosed interesting and valuable facts regarding this branch of rural economy, showing the importance of the subject to be far from trivial. It will not be necessary in this paper to enter into an extended consideration of these investigations, but the most important facts obtained by them will be presented, together with such suggestions as are appropriate.

In the great class—birds we find groups possessing peculiarities of form, habits, and food sufficiently marked to place them in permanent natural orders. Of these, our land birds, important to agriculture, are included in the following: *Raptores*, (birds of prey;) *Scansores*, (climbers;) *Insessores*, (perchers;) *Rasores*, (scratchers;) and *Grallatores*, (waders.) The characteristics of these orders are well marked and easily distinguished.

* Translated by Henry L. B. Ibbetson, in the Ohio Agricultural Report for 1862.

RAPTORES, (LITERALLY, ROBBERS.)

The birds of this order are divided into two groups, the diurnal and the nocturnal birds of prey. The eagles, hawks, &c., are included in the former, and the owls in the latter. The diurnal birds of prey are generally characterized by their strong, hooked bill, and long, sharp, curved claws, called talons; lateral eyes, "with lashes surrounded by a naked or woolly orbital circle; the feathers above, below, and behind the eyes directed backwards, as on the rest of the head;" nostrils opening in the cere. The owls are distinguished from the others by their "eyes directed forwards," more or less completely surrounded by a crown of radiating bristly feathers; lores and base of bill densely covered with bristly feathers directed forwards; the nostrils opening on the anterior edge of the cere; a crown of peculiarly formed feathers on the side of the head and above the throat; head fully feathered; plumage very soft and downy." These characteristics are recognized by the most prominent ornithologists of the day.

The diurnal birds of prey are divided into two families, *Vulturidæ*, (vultures,) and *Falconidæ*, (falcons.) The *Vulturidæ* are represented in this country by but three or four species, of which only two are of any importance to agriculture. They are the turkey buzzard, (*Cathartes Aura*, Linn.,) and the carrion crow, (*C. atratus*, Bartram.) These are only beneficial as scavengers, their food consisting of dead animal matter, usually in a state of decomposition. These birds are mostly confined to the southern States, where they are protected in most districts by the usage of the people. In habits they are filthy and indolent, and in consequence of their good treatment by man they are much more familiar and tame than any of our other birds of prey. They are not found in New England, and do not require a more extended mention here.

In our *Falconidæ* are included all our falcons, hawks, and other diurnal birds of prey. They are divided into numerous sub-families, of which the following are of importance to agriculture: *Falconidæ*, (falcons,) *Accipitrinæ*, (hawks,) *Butioninæ*, (buzzards,) *Milvinæ*, (kites, &c.,) and *Aquilinæ*, (eagles.) In the first of these sub-families are included our true falcons, of which the pigeon hawk, (*Hypotriorchis columbarius*, Linn.,) and the sparrow hawk, (*Tinnunculus sparverius*, Linn.,) are familiar types. These birds are of rapid flight, and always seize their prey while on the wing. They accompany the migrations of the other birds, and prefer wooded countries to the more open districts. They cannot be called beneficial, as their food consists almost entirely of small birds and sometimes reptiles. The *Accipitrinæ* includes our hawks, of which the gos hawk or slate-colored hawk, (*Astur atricapillus*, Bonap.,) and the sharp-shinned hawk, (*Accipiter fuscus*, Bon.,) are well-known representatives. The birds, like the preceding species, are of powerful and rapid flight. They are generally resident with us throughout the year; they subsist almost entirely upon small birds, and are consequently injurious. The *Buteoninæ* or buzzards of the United States are generally well known. The red-tailed buzzard or hawk, (*Buteo borealis*, Vieillot,) and the red-shouldered buzzard or winter hawk, (*B. Lineatus*, Jardine,) are well known in many districts by the name of hen hawks. They are injurious, their food consisting chiefly of small birds and reptiles, which they often seize while on the wing, but generally pounce upon from a tree or other elevated position. Their flight is usually a succession of soaring sweeps, often at a great height.

The birds of the *Milvinæ* are beneficial. In this sub-family are placed our kites and harriers. Of these, the swallow-tailed hawk, (*Nauclerus furcatus*, Vigors,) and the marsh hawk, so well known and abundantly distributed throughout the continent, are familiar types. The former of these species subsists almost entirely upon injurious insects, and the marsh hawk destroys immense numbers of field mice, (*Arvicolinæ,*) which are found to be very injurious. In the *Aquilinæ* are placed our eagles, of which the golden eagle, *(Aquila canadensis,* Cassin,) the bald or white-headed eagle, *(Haliætus leucophalus,* Savigny,) and the fish hawk or osprey, *(Pandion carolinensis,* Bon.,) are well known. The golden eagle is not abundant in this country. Its food consists principally of the larger *Rodentia* and birds. It seldom eats carrion, but prefers to capture its own prey. The white-headed eagle subsists almost entirely upon fish, which it robs from the osprey, or finds cast upon the shore. It also destroys some of the larger birds and mammals. The osprey is of no importance, economically speaking, to agriculture, as its food consists entirely of fish, which it captures while on the wing by diving into the water and clutching it with its talons.

We find, therefore, that the diurnal birds of prey are not beneficial, or are injurious, with but two or three exceptions, namely, the swallow-tailed hawk, marsh hawk, and osprey. The first and last of these species are well known and require no description here, and that the marsh hawk may be recognized by the farmer, I have thought it proper to give the following brief unscientific description: The adult bird is of a cinereous blue color above, and on the head and breast beneath, and the upper tail coverts, white; there are numerous spots of reddish brown on the feathers of the abdomen. This description is necessarily general, as the object is to secure the identification of the bird while in the air. It may also be known by its frequenting the marshes almost entirely, a habit none of our other hawks have that could possibly be mistaken for this species.

The *young* birds in the plumage of the first or second year will be much more difficult to identify. They are of a dark brown above, except *the upper tail coverts, which are white.* The knowledge of this fact will be of material assistance in the identification of the bird, as this white patch on the rump shows plainly in the young and old birds while in the air.

Our nocturnal birds of prey, or *Strigidæ,* are divided into several well-marked sub-families. It is not necessary in this paper to refer to their peculiar characteristics, as they are all beneficial, some of them greatly so. These sub-families are called the *Striginæ,* of which the barn owl, *Strix pratincola,* (Bonap.,) so well known in the southern States, is the type; the *Buboninæ,* (horned owls,) of which the great horned owl, *Bubo virginianus,* (Bon.,) is well known over the entire continent; the *Syrninæ,* (gray owls,) of which the great cinereous owl, *Syrnium cinereum,* (Aud.,) is the typical representative; the *Atheninæ,* in which are included our different burrowing owls; and the *Nycteininæ,* (day owls,) of which the snowy owl, *Nyctea nivea,* (Daudin,) is a familiar representative.

The food of owls consists almost entirely of rats, mice, and field-mice, *Arvicolinæ.* Many of the smaller species destroy multitudes of nocturnal insects, (chiefly *Lepidoptera,*) and but few of the birds are destroyed, comparatively, by any of the species. Those that are most diurnal in habits partake somewhat of the nature of the hawks, and kill birds which they pursue and capture while on the wing. But the little injury done by these is but trifling when compared with the benefits they are constantly doing by destroying the noxious animals, which, as I have already said, constitute the great portion of their food.

SCANSORES.

The birds of this order, greatly dissimilar in characteristics and form, are readily distinguished by the peculiar formation of their feet, which have two toes in front, and almost always two behind, (a few exceptional cases have but one behind.) This arrangement is admirably adapted to enable these birds to climb trees, to which their habits are nearly confined, and in which they usually seek their food, which consists in the different families of insects, fruits, and seeds. This order is divided into several groups, each with marked peculiarities of habits and form. Those represented in New England are the *Cuculidæ* (cuckoos) and *Picidæ*, (woodpeckers,) both of which are of importance to our agricultural interests.

The cuckoos, of which we have but two species, the yellow-billed cuckoo, *Coccygus americanus*, (Bonap.,) and the black-billed cuckoo, *C. erythropthalmus*, (Bon.,) are eminently beneficial, notwithstanding their bad practice of sucking the eggs of smaller birds when met with. Their food consists almost entirely of noxious insects, chiefly the hairy caterpillars, which nearly all the other birds refuse to eat. These caterpillars are the larvæ of some of the most injurious *Lepidoptera*, of which the well known apple-tree moth is a familiar type. In destroying these larvæ the cuckoo may be often seen standing on the branch on which their tent-like nest is made, or upon the nest itself, tearing it with its bill; the swarming inhabitants are exposed, when the bird, seizing by the head insect after insect, gives them a shake, or beats them against the branch, and swallows them. Thus a large nest is soon depopulated, the bird returning several times a day until none of the pests are left.

In the *Picidæ* are placed all our woodpeckers, all of which are among our most beneficial birds. They may be distinguished from the other *Scansores* by their sharp, wedge-shaped bill, which is strong and adapted to digging, together with their undulating flight, and habit of alighting on the trunk of a tree and rapidly moving sideways or otherwise along the bark, supported by the stiff feathers of the tail. These subsist almost entirely upon the larvæ of the injurious beetles, the *Scarabacidæ*, *Buprestidæ*, *Cerambycidæ*, and others which live in the trunk and limbs of trees. In procuring these the woodpecker is guided by its keen sense of hearing in detecting their presence, when a hole is bored or dug by a succession of powerful blows of its beak; the long barbed tongue is introduced, and the grub withdrawn. The injury these insects do to our fruit and forest trees may be safely estimated at millions of dollars annually in the United States; and as we know their ravages would be unchecked were it not for the woodpeckers, who are their principal enemies, we should at least extend our protection to these birds, if not encourage their presence. It is not necessary here to discuss the habits and characteristics of the various subfamilies of these birds. They are generally arboreal, and their nest is built in holes and excavations in trees made by the birds for the purpose. The eggs are pure white in color.

Some of our species are migratory, but most are resident in the same locality throughout the year.

INCESSORES, (PERCHERS.)

Passing from the *Scansores*, we come to the great order *Incessores*, or perchers, from the Latin word signifying to perch. The birds in this order, although possessing the greatest dissimilarity in character, have one peculiar characteristic in common, viz: they have almost invariably three toes in front, and one on the same level behind the foot, adapted to perching. These birds, although possessing in common this feature, are so entirely different in form and habits, that they have been divided into several great natural sub-orders, and these into families. The characteristics of the sub-orders represented in this country are given by Professor Baird as follows:

"STRISORES.—Toes, either three anterior and one behind, (or lateral,) or four anterior; the hinder ones, however, usually versatile or capable of direction more or less laterally forward. Tail feathers never more than ten, the first long"

"CLAMATORES.—Toes, three anterior and one posterior, (not versatile.) Primaries always ten, the first nearly as long as the second. Tail feathers usually twelve."

"OSCINES.—Toes, three anterior, one posterior. Primaries, either nine only, or if ten, the first usually short or spurious."

In the first of these sub-orders are included our humming birds, (*Trochilidæ*,) swifts, and chimney swallows, (*Cypselidæ*,) and goat suckers, so called, (*Caprimulgidæ*.)

These birds are all very beneficial. The humming birds of the United States are of some importance to agriculture. Their beautiful forms and plumage, and their familiar habits have endeared them to the farmers, who pitied them, and even encouraged their presence in various ways. Their food consists principally of small insects which harbor in flowers; these they capture by thrusting their long tongues into the flowers, and securing them by the action of the saliva.

Our chimney swallows, familiar representatives of the family *Cypselidæ*, are very beneficial in consequence of the immense numbers of insects they destroy. These birds are almost constantly on the wing from early dawn until late in the night, and the noxious insects which entirely compose their food, are always taken while flying. They seem to constitute, with the other swallows and night-flying insectivorous birds, the extreme outer circle for the destruction of the insects, apparently created to secure those which have escaped their other enemies on or near the earth. They should be protected and encouraged instead of destroyed, as too many are by the superstitious or ignorant, who drive them from their dwellings because of the absurd belief that they bring ill-luck. This is but one of the ridiculous fancies too prevalent among our rural population at the present enlightened period.

In the *Caprimulgidæ* are included our whip-poor-will and night hawk. These birds are almost entirely nocturnal in habits; they subsist entirely upon nocturnal insects, mostly *Lepidoptera*, of which they destroy great numbers. There is an absurd notion prevalent in some districts of the United States that if the whip-poor-will sings on the door step of a dwelling-house, it foreruns the death of some member of the family in that house. This belief has caused the destruction of multitudes of these birds, the farmer or others almost always killing them whenever met with. It is almost incredible to what an extent these absurdities are carried, and if they were harmless they would be ludicrous; but unfortunately they are not. The mole is killed because, if it runs against the leg of a cow, she will go lame. The toad is destroyed because it spits in the eyes of cattle and blinds them. Snakes are invariably killed because they are disagreeable looking, and so on in all cases, to the damage of the farmer, for these animals are his friends, and are continually active in his interests.

CLAMATORES, (SCREAMERS.)

The families in this order in the United States are the *Alcedinidæ* (king fishers) and *Coleopteridæ*, (fly-catchers.) The former of these families is of no importance to agriculture, as the birds subsist entirely upon fish, which they capture by diving for them in the water while on the wing. It is in the *Coleopteridæ* that we find some of the most valuable and beneficial birds to agriculture that we have. The king bird, *Tyrannus carolinensis*, Baird, and the pewees are familiar types of this family, and their habits are so well known that it is hardly necessary to give them further mention here. Their food consists entirely of insects, which they capture while on the wing, not in the manner that swallows practice, and which is necessary from their conformation, but in and among the trees, where they destroy immense multitudes of noxious *Lepidoptera*, and often *Orthoptera*. In capturing these insects, the fly-catchers remain perched on the tree until they fly into the air, when the birds pounce upon them and destroy them. They constitute the next circle to the swallows in the cordon surrounding the insect world.

OSCINES, (SINGERS.)

In this order are placed the *Turdidæ*, (thrushes;) *Sylvicolidæ*, (warblers;) *Hirundinidæ*, (swallows;) *Bombycillidæ*, (chatterers;) *Laniidæ*, (shrikes;) *Liotrichidæ*, (mocking birds, wrens, &c.;) *Certhiadæ*, (creepers;) *Paradæ*, (titmice;) *Alaudidæ*, (larks;) *Fringillidæ*, (finches, sparrows, &c.;) *Icteridæ*, (blackbirds, troopials, &c.;) and *Corvidæ*, (crows, jays, &c.)

The family *Turdidæ*, of which our common robin *Turdus migratorius* Linn., is a familiar representative, includes all our true thrushes. These birds are all beneficial, although they occasionally eat the smaller fruits and berries; their food consists principally of the larvæ of insects, which they obtain either on the surface of the ground or just beneath it. I cannot refrain from introducing the following extract from an essay on the utility of birds,* by Wilson Flagg. This gentleman is one of the most careful and intelligent observers of the habits of our birds, and his experience as it is given in this essay is interesting and valuable. He writes as follows:

"One circumstance that attracts frequent attention in the feeding habits of the thrushes is their apparent want of diligence; but this appearance is delusive, for the immense quantity of insects consumed by them could not be obtained without proportional industry. The common robin will exemplify the general habit of the thrushes, though he carries their peculiarities to an extreme. When he hunts his food he is usually seen hopping listlessly about the field. Sometimes a dozen or more robins may be seen in one field, but they are always widely separated. Observe one of them and you will see him standing still with his bill inclined upwards and looking about him with seeming unconcern. Soon he makes two or three hops, and then stands a few more seconds apparently idle. Presently he may be seen pecking vigorously upon the ground, when, if you were near enough to see it distinctly, you would find that he is pulling out a cut-worm from his retreat, or devouring a nest of insects which are gathered in a cluster. Last summer, (1861,) having been confined nearly all the season to the house by illness, I had ample opportunity to watch the habits of the few birds that could be seen from my windows. These were chiefly robins, bobolinks, grakles and other blackbirds, as well as multitudes of sparrows. Though a continual warfare was waged against the grakles by the owners of the fields, I saw enough to convince me that they were warring against their own friends and servants. The robins were very numerous and familiar in my neighborhood, (the west end of Somerville and North Cambridge.) One pair had a nest very near my house, and were rearing a second brood in the month of July, when the soil was so greatly parched by drought, that if robins lived only upon berries and earth-worms they must have starved to death. I had often seen these birds at a distance pecking vigorously upon the sward, and then drawing out a worm. I knew that there were at this time no earthworms near enough the surface to be within the reach even of the long-billed snipes; but when the bird was near enough, I could distinctly see, by the form and appendage of the creature, that it was invariably a cut-worm of a large species, and of an olive green color. The female bird was the most industrious. She would carry off one of the grubs as often as once in five minutes, whenever I watched her movements, and very often she would have two in her bill at a time. One day, close under my window, I saw her bear off three cut-worms at once, all of which were taken before my sight in a space of about a rod square. Never did I see at any time an earthworm in the mouth of this bird during this month, nor anything else except cut worms, of which this single pair must have destroyed an incalculable number. The old birds probably swallow all the hard insects, and save the larvæ exclusively for the young."

In dismissing the thrushes, I would call attention to a very valuable and interesting paper on the food of the robin, written by Professor Jenks, and published in the proceedings of the Massachusetts Horticultural Society for 1858-'59. This gentleman is one of our most careful students of ornithology, and his researches are worthy of attention.

The *Sylvicolidæ*, of which the Maryland yellow throat, *Geothlypis trichas*, (Cabanis,) and the yellow warbler or summer yellow bird, *Dendroica æstiva*, are familiar illustrations, are also very beneficial to agriculture. They constitute the next line in the war against the insects to the fly-catchers. We found those birds to destroy the insects that fly among and from trees and shrubs,

*Proceedings of the Essex county (Massachusetts) Agricultural Society for 1861.

the warblers hunt for them *in and among the foliage.* Their food consists entirely of these pests, and they are employed almost continually in their destruction. The family *Hirundinidæ,* in which are included our swallows, is pretty well known and appreciated in this country, much more so, generally, than any other birds. Indeed, so great favorites are they in some sections that the farmers so far encourage them or permit their presence as to provide comfortable houses for them, or allow them to nest in their barns and other buildings. The same remark will apply to these birds as to the *Cypselidæ,* except that the latter are partly nocturnal, and the others entirely diurnal; their food consists of flying insects which they obtain while on the wing. The cedar bird or common cherry bird, *Ampelis cedrorum,* (Baird,) is the best known of our *Bombycillidæ;* and, taking this bird for the type of the family, so far as habits are concerned, we cannot but say they are beneficial; for, although in the cherry season this bird is a nuisance to pomologists, it much more than repays all the damage it thus does by destroying myriads of caterpillars and other noxious larvæ, besides capturing many insects on the wing. From the first of May until September the cedar bird is found in our orchards, where it builds its nest and rears its young; here it finds an abundance of its favorite food, apple-tree caterpillars. The number of these insects that one of these birds eats in a day is beyond all calculation; it is for the farmer to watch it for but ten minutes, when he will be satisfied that the destruction of one of these birds on the farm would be a direct loss to him.

The *Laniidæ,* in which are included our shrikes *(Laniinæ)* and vireos, *(Vireoninæ,)* are well known to the agriculturists of the United States. The former sub-family, of which the common butcher bird, *Collyrio borealis,* (Baird,) is familiar to all, although destroying great numbers of field mice, are not so beneficial as some of the other birds, from the fact that at least two-thirds of their food consists of beneficial small birds, which they capture on the wing in the manner of the hawks. The vireos constitute the most valuable portion of this family. These birds subsists entirely upon insects, which they destroy both while on the wing, like the true fly-catcher, in the foliage, like the warblers, and on the bark, in the larvæ state, like the creepers, titmice, &c. They generally prefer the solitudes of the forests, but some of the species make their homes in the orchards, where they build their pensile nests in the small limbs of the trees, and rear their young as familiarly and confidingly as some of our most common birds. They should be protected by the farmer. In the great system of warfare which is so apparently existing between the birds and insects, the vireos come next in importance to the warblers and fly-catchers, to which they seem to constitute a grand auxiliary force.

In the family *Liotrichidæ* are placed our mocking birds *(Mimus)* and wrens, *(Troglodytes.)* It is hardly necessary here to recommend these birds to the farmer, for they are already known and appreciated; but there is one species in the mocking birds that, in consequence of the antipathy with which it is regarded by nearly all classes, no opportunity is lost to procure its destruction. I allude to the cat bird, *Mimus carolinensis,* (Gray.) The school-boy always makes it a point to destroy its nest and eggs; the embryo gunner practises on the bird as an object a little better than a stationary mark; and the farmers' boys have *carte blanche* to shoot it at all seasons, because it takes in cherry time a few of these luscious fruits for dessert to its insect meal. Does the farmer know that this bird is one of his best friends?—that its whole life is spent in his service, constantly employed in destroying his greatest enemies, the insects? Does he know that it will eat in forty-eight hours its own weight of cut-worms and other injurious larvæ? If so, is not the almost wholesale destruction with which it is followed almost everywhere not only injudicious but wicked? I leave these facts to his consideration, and am certain, when an impartial judgment is given, that he will do away with this absurd prejudice, and protect, as he always should have done, the cat bird.

The *Certhiadæ* (creepers,) and *Paridæ*, (titmice,) are both of importance to agriculture, their food consisting principally of the larvæ of insects which they find in the bark of the trunk and limbs of trees. The chick-a-dee or black-capped titmouse, so well known throughout the country, represents the *Paridæ*, and its habits in capturing its insect prey are so well known that I will not make further mention of them here.

Briefly noticing the *Alaudidæ*, (larks,) which destroy multitudes of injurious insects in the grass and on the surface of the ground, chiefly *Orthoptera* (locusts, grasshoppers, &c.,) and the *Fringillidæ* (finches, sparrows, &c.,) which, although subsisting chiefly upon the seeds of various plants, usually the wild grasses, &c., "feed their young entirely upon the larvæ of insects," we come to the important family *Icteridæ*, in which are included our blackbirds, orioles, &c. These birds, notwithstanding the dislike with which some of them are regarded by the farmers, are all eminently beneficial; the orioles, of which our common golden robin or hang bird, *Icterus Baltimore* (Daudin,) is a familiar type, destroys great numbers of caterpillars and other larvæ equally injurious. These they obtain on the limbs and in the foliage of trees in a manner similar to the cuckoos and warblers. The blackbirds are constantly employed in the destruction of insects and their larvæ in the grass lands and meadows which they capture in a similar manner with the thrushes. The following interesting instance given by Buffon, the great naturalist, will go to show the value of these birds:

"The Isle of Bourbon, where the grakle was unknown, was overrun with locusts, which had been accidentally introduced from Madagascar, the eggs having been imported in the soil with which some plants were brought from that island. The governor-general and the intendent deliberated seriously on the means of extirpating these noxious insects, and for this purpose caused several pairs of the Indian grakle to be introduced into the island. This plan promised to succeed; but, unfortunately, some of the colonists seeing the birds eagerly thrust their bills into the earth of the newly-sown fields, imagined they were in quest of grain, and reported that the birds, instead of proving beneficial, would be highly detrimental to the country. On the part of the birds, it was argued that they raked in new-ploughed grounds, not for the sake of the grain, but for the insects, and were therefore beneficial. They were, however, proscribed by the council, and in the space of two hours after the sentence was pronounced against them not a grakle was found on the island. This prompt execution was followed by a speedy repentance. The locusts gained the ascendancy, and the people, who only viewed the present, regretted the loss of the grakles. In a few years afterwards a few pairs were again introduced Their preservation and breeding were made a state affair; the laws held out protection to them, and the physicians, on their part, declared their flesh to be unwholesome. The grakles accordingly multiplied, and the locusts were destroyed."

The *Corvidæ*, in which family are placed our crows and jays, are also valuable assistants to the farmer, notwithstanding the former pull up a few hills of corn, (which may be readily prevented by stretching strings about the fields,) and the jays destroy the eggs and young of small birds. The insects they destroy more than counterbalance the evil effects of these depredations. The field mice that a pair of crows kill and feed to their young are beyond computation, and it is a gratifying fact that the farmers are at last becoming aware of the value of the crows on the farm, and many already extend them their protection.

RASORES (SCRATCHERS.)

In this order are included the grouse, quails, turkeys, and, by modern naturalists, the doves. These last birds are placed in this order, however, more from their peculiarities of form, than because of their habit of searching food by scratching beneath the surface of the ground. The distinguishing characteristics of the rasores, are, according to Professor Baird, "hind toe raised above the level of the rest." Nostrils arched over by an incumbent thick, fleshy valve. Bill not longer than the head, obtuse anteriorly. Nails broad, obtusely rounded." This order has been divided into several families, which are more interesting to the naturalists than to the farmer. As they have but little importance agriculturally speaking, and as my subject has been already too extended, I shall dismiss them with but a few general remarks.

The *Columbæ* (pigeons) are injurious in some districts, eminently so by their ravages in the grain fields. Some species are gregarious, and their immense flocks sweep through the rich fields of wheat with a destructiveness hardly credible ; they have no redeeming traits, economically speaking, as they destroy but very few insects, and the best use to which they can be put is to furnish food to some of their former victims.

The other indigenous rasores are of no importance on the farm with the exception of the quails or partridges (*Perdicidæ.*) These birds, although a great portion of their food consists of the various seeds, destroy immense numbers of insects, chiefly *Orthoptera*. I think that I am safe in saying that three-fourths of their food from May until October, consists of these insects and others, both in the larvæ and perfect forms. The following extract will serve to illustrate this fact :

"A farmer's boy in Ohio, observing a small flock of quails in his father's cornfield, resolved to watch their motions. They pursued a very regular course in their foraging, commencing on one side of the field, taking about five rows, and following them uniformly to the opposite end, returning in the same manner over the next five rows. They continued in this course until they had explored the greater portion of the field. The lad, suspicious that they were pulling up the corn, fired into the flock, killing one of them, and then proceeded to examine the ground. In the whole space over which they had travelled he found but one stalk of corn disturbed. This was nearly scratched out of the ground, but the kernel still adhered to it. In the craw of the quail he found one cut-worm, twenty one striped vine bugs, and one hundred chinch-bugs, but not a single kernel of corn."

This is but one instance of many on record, in which birds and animals hitherto deemed injurious, were found on examination to be not only harmless but positively beneficial.

GRALLATORES (WADERS.)

The birds of this order are of no great importance to agriculture ; some of them are beneficial and others to a certain extent injurious. The characteristics of these birds are their lengthened neck and legs adapted to wading in the water, in or near which they procure their food. They are divided by modern naturalists into the two great sub-orders.

"HEREDIONES.—Face or lores more or less naked, or else covered with feathers different from those on the rest of the body, except in some *Gruidæ*. Bill nearly as thick at the base as the skull ; hind toe generally nearly on the same level with the anterior ; young reared in nests, and requiring to be fed by the parents. And *Grallæ*, lores with feathers similar to those on the rest of the body. Bill contracted at base, where it is usually smaller than the skull ; hind toe generally elevated ; young running about at birth, and able to feed themselves."

In the first of these sub-orders are included our cranes, herons, bitterns, ibises, &c. These birds, although subsisting partly upon insects, are generally injurious, by destroying the smaller beneficial reptiles, (such as the toads, frogs, and small snakes,) which with small fishes constitute the principal portion of their food. They are not sufficiently numerous however in most districts to be considered pests, and further observation may discover facts that will entitle them to the forbearance, at least, of the farmer.

In the *Grallæ* are placed the plovers, woodcocks, snipes, sandpipers, rails, or meadow-hens, &c. Of these, the rails are the only directly beneficial birds, as they subsist almost entirely upon *Orthopterous* and other injurious insects. The others feed upon worms (the woodcocks and snipes) and small shellfish and often insects, as the plovers, sandpipers, &c. The spotted sandpiper or pect-weet, *Tringoides macularius* (Gray,) is often seen in the ploughed fields and even in the cornfields eagerly searching for insects.

In a brief general survey of the habits and characteristics of the different birds and animals, and a similar review of the facts which have been presented by scientific men regarding them, we find two great classes, one beneficial and the other injurious. Of the mammals we found injurious mice and other *rodents* which were being constantly destroyed by the different *carnivora*. We also found the bats feeding entirely upon insects which they capture in the air; on the surface of the ground the shrews are busy at the same work, as are also the moles beneath the surface. In the birds we found different tribes with as distinctly marked features. The diurnal birds of prey we found to be generally injurious, because of their destroying small beneficial birds; and the nocturnal birds of prey we found to be beneficial in subsisting almost entirely upon injurious mammals. We also found other whole orders whose lives are spent in destroying insects. The manner in which this destruction is effected we found to be varied and evidently intended by the Creator to be effectual; for we found those birds disposed in different circles or spheres, in each of which are placed those best adapted both by form and habits—for instance, the blackbirds, thrushes, larks, starlings, &c., destroy the insects infesting the grass crops and other vegetations near the ground; the creepers, titmice, &c., destroy the insects, both in the larvæ and perfect states, which are found on the limbs and bark of trees; the woodpeckers destroy the borers in the wood of trees; the warblers, cuckoos, and orioles capture the insects and caterpillars in the foliage; the fly-catchers are almost continually busy through the day, and the night-hawks and whip-poor-wills in the night, capturing the flying insects near the earth; and the swallows, that the insects shall have no loophole for escape, are on the wing from daylight until dark, and even later, securing those that have escaped through all their enemies.

With these wise provisions for the very existence of man, and with these beautiful laws for his protection, how ungrateful is he in disregarding them, as he too often does even to the extent of actual interference and wilful neglect in their execution. Farmers, henceforth let there be an honest and kindly appreciation of the animals that have been created for our services. Love and respect them. And the birds, think them not of too little importance to receive your notice, for it is written: "Are not two sparrows sold for a farthing, and one of them shall not fall on the ground without your Father?"

Encourage them, protect them, drive them not from you. Observe them, study their habits, notice how their whole lives are given for your benefit; and although sometimes they may seem to be doing you an injury, be lenient and patient with them, for "nothing was made in vain," and they certainly at some time or another, will repay you more than tenfold all that they may have taken from you.

AGRICULTURAL ORNITHOLOGY.

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[The following paper was originally intended to embrace a list of all the birds known to have been found in Chester county, Pennsylvania; but finding that would be too voluminous for the space allotted, I have omitted the water birds, as they do not specially affect the interests of agriculture by their manner of feeding. E. M.]

INSECTIVOROUS BIRDS OF CHESTER COUNTY, PENNSYLVANIA

"In the construction of the universe the Divine Architect, whose creative conceptions and consummate arrangements display the perfection of wisdom, formed it a harmonious whole, amply provided with well-regulated checks and balances. So long as these adjusting powers were not disturbed by extraneous forces, interposed by human agency, an inordinate increase of noxious insects was restrained by the physical operation of the elements, and by the instincts and natural propensities of certain insectivorous animals. Among the latter may be enumerated many of the smaller quadrupeds,[1] reptiles,[2] insectivorous birds,[3] and the parasitic and predacious insects.[4]"

"The harmony of creation has been interrupted by the wanton destruction of birds and reptiles, and by the intervention of other causes; and in consequence of this derangement in the economy of nature, the insect vegetable feeders have become more abundant, and consequently more destructive."—*Dr. Brinkle.*

It must be plain to all observers that most of our common birds are partly, and many of them almost wholly, insectivorous—that is, insect-eaters. We cannot, for a single hour, watch their movements, their industry and dexterity in capturing insects, without being impressed with the vast numbers which they must every day devour. It is no less certain that the number of birds is being constantly and rapidly diminished from year to year. We need not, therefore, feel surprised that, in proportion as the number of birds has been diminished, the insects have increased in a corresponding ratio. Reason should have taught us that it would be so, and experience has verified the fact; and we can hardly err in ascribing the increase of the one to the decrease of the other. Hence it becomes an important inquiry, What are the causes which have so greatly reduced the number of our birds? In pursuing this inquiry it will be convenient to divide them into forest birds and field birds.

The forest birds appear rather to shun the company of man, and to recede as the arts of civilization advance. This may be owing in part to the destruction of the forests, which afforded them both food and shelter, and in part to the wanton destruction of them with their eggs and nests. It is some consolation, however, to reflect that forest birds feed mostly on forest insects, and therefore do not so immediately affect the interests of the agriculturists as those which dwell in the fields.

The field birds, on the contrary, seem to court domestication, and to seek the protection of man by their familiar approach to his dwelling. They incline to accompany the settlements, and delight to dwell in the field, the orchard, or the garden. Living, as they do, in the very midst of those scenes of insect devastation of which we so often complain, and feeding, as most of them do, on the authors of that devastation, we must be blind, indeed, not to perceive how much we owe to them as a direct check upon the increase of noxious insects.

1. Rats, mice, shrews, moles.
2. Snakes, frogs, toads, lizards.
3. Woodpeckers, swallows, crows.
4. Ichneumons, dragon flies.

It is not the more familiar species only which instinctively seek man's protection. Even the shy and retiring forest birds will sometimes do so in seasons of extreme peril. I have seen the timid and wary pheasant, *(Bonassa umbellus,)* when pursued by a hawk, alight on the ground within six feet of my door, where I was standing, and quietly remain until the danger had passed by, apparently well assured that the enemy would not molest it while there, and rightly judging that I would not betray the confidence reposed in me by doing it an injury.

It would, indeed, seem irreverent to Him who gave them for us to doubt or to disbelieve that the instincts referred to were intended by their Divine Author to establish and maintain a reciprocal interest between the birds which possess them and ourselves, and to promote the welfare of both. "Both are as the Lord hath made them; organized and controlled by laws as wise as himself; universal as his presence; and potent as his power. He who assails these laws assails Deity himself."

Now, if it be so that the birds were designed to maintain the balance of insect life, and prevent their inordinate increase, how unwise in us to break the balancing power by their wanton destruction! But the birds have been cruelly and most unwisely persecuted. The balance has been broken, and an increase of destructive insects from year to year has been the consequence. The question then arises, how shall we restore the balance which has been lost? The simple answer is, as in every other case of wrongdoing, "cease to do evil; learn to do well." Cease to violate the laws of nature, and of nature's God, by the destruction of these his creatures, and by every available means afford them protection, and promote their comfort and consequent multiplication.

But to whom shall the plea for their protection be addressed? It is not the cultivator of the soil alone who sustains loss from the depredations of insects upon his crops. When these fail the supply is diminished, and the market value enhanced. Hence the consumer suffers along with the producer. The appeal, therefore, comes home to every one who subsists on the productions of the soil. It affects the pecuniary interests and the life comforts, not only of him who holds the plough, but of the merchant at his desk, and the cobbler in his stall. It is made, not to a class, but to the whole community. Nevertheless, the owners and occupiers of the soil—the agricultural class—hold a position which seems, necessarily, to constitute them the special guardians of the feathered race. To them, therefore, I particularly address this special plea.

Appeals for the birds have often been made, and have as often passed unheeded. Their constantly diminished numbers still suffer unmerited persecution, and the complaints of noxious insects grow louder and stronger from year to year. Why is it so? Are men so wilfully blind to their own interests? Or has the evidence furnished been insufficient to convince their understandings that the birds are really their friends and benefactors? This seems the most rational conclusion. Farmers, as a class, cannot be called scientific, but they are intelligent, reflecting, practical men, accustomed to look after their own interests; and if convinced that those interests lie in the protection of the birds, I have a better opinion of them than to suppose that they would not adopt a practice correspondent therewith.

Under this feeling of confidence in the good sense of the farming community, I have undertaken the preparation of this plea on behalf of the birds. Peradventure a brief detail of facts may satisfy the reason, while mere inferences drawn from them would fail to do so.

Let every farmer and occupier of the soil cease from the needless destruction of birds, their eggs and nests, and consider himself as their Heaven-appointed guardian. Let every one be careful, according to his opportunity and means, to provide for their wants by putting up suitable boxes for martins, bluebirds, wrens, &c., and by planting shrubbery and trees, especially evergreens, to afford them shelter from their enemies, and a place to build and rear their young Let every child be taught to admire the beauty, and to know the value, of birds, and the sanctity of their nests, and be made to feel the penalty for disobedience. Let every vagrant sportsman and truant schoolboy know and feel the rigid restraints of the law* whenever they trespass upon the premises with dog or gun after having been duly notified.

The following extract taken from the *Ohio Farmer* several years ago is worth preserving in this connexion:

"On no pretext whatever should farmers and gardeners permit their birds to be disturbed. Instead of killing them, or frightening them away, they should make use of every means in their power to induce them to increase in numbers, and become more tame and familiar. The worst of them earn twenty times what they eat; and then what exquisite pleasure to have your garden, yard, orchard, or wood alive and vocal with the music of merry birds! Plant trees for them; if necessary, build houses for them; and let no cat, dog, or boy ever molest them, and they will teach you lessons of domestic bliss, preach you sermons, and warble you such hymns as you never heard elsewhere. Be kind to the birds."

In the preparation of this paper my primary object has been to furnish a brief economical history of the ordinary food and feeding habits of the different species of birds. I have also endeavored to make it an exponent of the ornithological fauna of the district which it represents, thus interposing a connecting link between economical and scientific ornithology. It may be objected that the district is too limited to afford satisfactory results. The objection is more specious than real. Many of the Chester county birds are found throughout large portions of the United States, while others are replaced by kindred species possessing similar habits. To extend the basis, therefore, would greatly increase the labor and cost, without adding much to the value of the work.

THE PLAN.

A system of classification has been adopted with the names of the families, genera, and species, with their authors. Immediately after will be found the common or familiar names.

It is convenient to designate the species as—

1. *Constant residents.*—Some portion, at least, of which remain with us throughout the year.
2. *Summer residents.*—Greater or less numbers of which spend the summer with us and breed.
3. *Winter residents.*—Mostly northern species, which spend the severe part of the year with us.
4. *Migratory.*—Those birds which pass and repass in spring and autumn.
5. *Wandering.*—Birds which migrate irregularly, wherever their food may be most abundant.

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* Many States have made laws for the protection of birds. An act of the legislature of Pennsylvania, of April 21, 1858, provides:

"SEC. 1. It shall not be lawful for any person within this commonwealth to shoot, kill, or in any way trap or destroy any bluebird, swallow, martin, or any other *insectivorous* bird, at *any season* of the year, under the penalty of two dollars."

"SEC. 4. That no person shall at any time wilfully destroy the eggs or nests of any birds mentioned in the different sections of this act, within this commonwealth, under a penalty of two dollars for each and every offence."

"SEC. 6. And if the offender shall refuse to pay the said forfeitures, he shall be committed to the proper county jail, for every such offence, for the space of two days, without bail, or any mainprize."

Other birds are also protected, by this and other acts, *as game birds*. Much of this protection, however, is not intended to benefit the agriculturist, but to preserve the game for *gentlemen gunners*, who pursue their sport in violation of the rights of the landholder, and frequently to the injury of his property, other than by killing the birds.

The reader will no doubt find many seeming exceptions to these divisions; for instance, the turkey vulture mostly migrates further south in winter, yet I have seen it in midwinter, when the mercury was below zero, striving with a crow for the possession of a dead mouse.

Birds are also either—

1. *Carnivorous:* flesh-eaters—vultures, hawks, &c.
2. *Piscivorous:* fish-eaters—kingfishers, herons, &c.
3. *Insectivorous:* insect-eaters—woodpeckers, flycatchers, &c.
4. *Granivorous:* grain-eaters—pigeons, sparrows, &c.
5. *Omnivorous:* all-eaters—crows, blackbirds, &c.

These terms are even more exceptional than the preceding ones. In a variable climate, or where the species migrates from warm summer to cold winter regions, or the contrary, its food must often vary with the season, &c. Hence, both as regards residence and food, the terms are only the expression of a general fact, and having only a relative applicatior

LAND BIRDS.

I. FAMILY VULTURIDÆ, (THE VULTURES.)

1. Genus *Cathartes*, (Illiger, 1811.)

1. *C. aura*, (Linn., 1766, Illiger, 1811,) turkey vulture. Resident, common in summer; rare in winter; carnivorous; with us its chief food is carrion; "feeds on all sorts of food, and sucks the eggs, and devours the young of other birds." The turkey buzzard, rendered so repulsive by its habits, is nevertheless a most useful scavenger for the speedy removal of every form of putrescent animal matter, so offensive to our olfactories, so prejudicial to our health. It well deserves the protection with us that both it and its cousin the black vulture receive in southern climates where they are almost domesticated.

II. FAMILY FALCONIDÆ, (THE HAWKS.)

2. Genus *Falco*, (Linn., 1766.)

1. *F. anatum*, (Bon., 1838,) duck hawk. Winter resident, very rare; carnivorous; feeds on ducks, pigeons, blackbirds, &c.

2. *F. columbarius*, (Linn., 1766,) pigeon hawk. Wandering, very rare; carnivorous; feeds on pigeons and smaller birds, field mice, &c.

3. *F. sparverius*, (Linn., 1766,) sparrow hawk. Resident, common; less so in winter; carnivorous. As its name implies, it feeds on sparrows and other small birds, field mice, shrews, and small reptiles.

3. Genus *Astur*, (Lacepede, 1803.)

1. *A. atricapillus*, (Wils.,) Bd., goshawk. Winter resident, not common; carnivorous; preys on partridges, birds, field mice, &c.

4. Genus *Accipiter*, (Briss., 1760.)

1. *A. cooperii*, (Bon.,) Bd., Cooper's hawk. Winter resident, rare; carnivorous. Its principal food consists of birds and small quadrupeds; when hungry, will not refuse a chicken for its dessert.

2. *A. fuscus*, (Gmel.,) Bd., sharp-shinned hawk. Resident, or nearly so; never abundant; carnivorous; feeds on small birds, mice, &c.

Observation.—The smaller members of this family mostly resort to the woods, fields, and meadows in quest of food, and seldom visit the poultry yard, unless pressed by hunger. The farmer can well afford them this small pittance for their service in destroying mice, shrews, moles, &c., in his fields.

5. Genus *Buteo*, (Cuv., 1817.)

1. *B. borealis*, (Gmel.,) Bd., red-tailed hawk. Resident, common; carnivorous. The predatory habits of this powerful bird have rendered him the terror of the poultry yard. Partridges, larks, and other birds, rabbits, squirrels, mice,

and even reptiles, form his less dainty fare. I must leave the farmer to balance the account as he best can.

2. *B. lineatus*, (Gmel.,) Jardine, red-shouldered hawk. Winter resident, frequent in season; carnivorous; habits somewhat similar to the preceding species, with which it is often confounded; but is much less troublesome to the farmer.

3. *B. pennsylvanicus*, (Wils.,) Bd., broad-winged hawk. Resident, and quite rare; carnivorous; feeds on birds, mice, reptiles; rarely on chickens.

6. Genus *Archibuteo*, (Brehm, 1828.)

1. *Lagopus*, (Gmel.,) Bd., rough-legged hawk. Winter resident, not common here; carnivorous; affects meadows and the marshy borders of streams, where it feeds on such birds, mice, and reptiles as are found in those places. "The number of meadow mice which this species destroys, ought, one would think, to insure it the protection of every husbandman." (Aud.)

2. *A. sancti johannis*, (Gmel.,) Bd., black hawk. Winter resident, rare; carnivorous; habits similar to those of the last-named species

Observation.—Audubon considers this the same as the rough-legged hawk in more mature plumage.

7. Genus *Circus*, (Lacep., 1808.)

1. *C. hudsonius*, (Linn.,) Bd., marsh hawk. Wandering, mostly seen in winter; carnivorous; affects meadows and marshy grounds, hence its name; feeds on small birds, but more especially on mice and other small quadrupeds, and, when in season, on frogs, snakes, &c.

8. Genus *Aquila.*

1. *A. canadensis*, (Linn.,) Bd., golden eagle. Wandering, very seldom seen here; carnivorous. With courage equal to his strength, he fearlessly pounces on a swan or a goose, a kid or a lamb, and, when instigated by extreme hunger, has been known to seize on little children and bear them off to his mountain eyry. "Young fawns, raccoons, hares, wild turkeys, and other large birds, constitute a portion of his bill of fare." (Aud.)

9. Genus *Haliætus*, (Savig., 1809.)

1. *H. leucocephalus*, (Linn.,) Bd., white-headed eagle. Wandering, not common; piscivorous. The principal food of the bald eagle is fish, and this is mostly plundered from the fish hawk; sometimes preys on ducks and other water birds; when these fail, he will even feed on carrion, and, like his older brother, attacks lambs, fawns, pigs, &c. Instances are related of his seizing small children and carrying them away to his nest.

10. Genus *Pandion*, (Savig., 1809.)

1. *P. carolinensis*, (Gmel.,) Bd., fish hawk. Wandering, frequent along the larger streams; piscivorous; affects our rivers and bays, and passes from one to another as the occurrence of ice, &c., may require. Feeds almost wholly on fish, which it catches with wonderful dexterity; too often, as has been noticed, to be robbed of its prize by the white-headed eagle.

III. FAMILY STRIGIDÆ. (THE OWLS.)

11. Genus *Strix*, (Linn., 1766.)

1. *S. pratincola*, (Bon.,) barn owl. Winter resident, rare; carnivorous. "I am satisfied that our bird feeds entirely on the smaller species of quadrupeds." (Aud.) This, of course, refers to mice and other nocturnal animals.

12. Genus *Bubo*, (Cuv., 1817.)

1. *B. virginianus*, (Gmel.,) Bd., great horned owl. Resident, frequent; carnivorous. "Its food consists of half-grown turkeys, pheasants, and domestic poultry of every kind; also hares, young opossums, and squirrels." (Aud.) This is our most noteworthy robber of the hen-roost.

13. Genus *Scops*, (Savig., 1809.)

1. *S. asio*, (Linn.,) Bd., red screech-owl. Resident, common; carnivorous; preys on mice, small sparrows, &c., and very often catches nocturnal beetles

and other insects. It thus destroys a large number of field mice, and the large cockchafer, so injurious to our fruit trees. In winter it familiarly enters our barns and outhouses, where it becomes an expert and industrious mouser.

2. *S. nævia*, (Gmel.,) Michener, mottled owl. Resident. common; carnivorous; habits similar to the last.

Observation.—Most ornithologists consider the red and gray screech-owls identical. This may be so. Bonaparte, Audubon, and others say the *red* is the young and the *mottled* the mature bird; others just reverse it. Audubon says the "feathers change their colors as the pairing season advances, and in the *first spring* the bird is in its perfect dress;" consequently the young or red bird could not be expected to breed; yet I have found red parents with a red brood, and also mottled parents with a mottled brood. Although presenting an anomaly perhaps unknown in any other species of bird, I have therefore reseparated them for the present.

14. Genus *Otus*, (Cuv., 1817.)

1. *O. wilsonianus*, (Gmel.,) Less., long-eared owl. Resident, rare, or seldom seen; carnivorous. "It preys chiefly on quadrupeds of the genus *arvicola*, (meadow mice,) and in summer destroys many beetles." (Aud.)

15. Genus *Brachyotus*, (Gould, 1837.)

1. *B. cassinii*, (Forst.,) Brewer, short-eared owl. Resident, frequent in winter, rare in summer; carnivorous; habits and food similar to those of the preceding species, which it somewhat resembles, except that it is more diurnal, and consequently feeds more on day food. When hungry, it will approach the farm-house in quest of garbage ejected from the kitchen.

16. Genus *Syrnium*, (Savig., 1809.)

1. *S. nebulosum*, (Forst.,) Bd., barred owl. Resident, frequent—most so in winter; carnivorous. "A great destroyer of poultry, particularly of chickens when half grown; it also secures mice, rabbits, and small birds," and, like other gourmands, "is especially fond of a kind of frog common in the woods of Louisiana." (Aud.)

17. Genus *Nyctale*, (Steph., 1826.)

1. *N. acadica*, (Gmel.,) Bd., little owl. Resident, not common, or rarely seen; carnivorous; "feeds on mice, beetles, moths, and grasshoppers," (Nutt.,) "small quadrupeds and birds." (Aud.)

18. *Nyctea*, (Steph., 1826.)

1. *N. nivea.*, (Bona.,) Bd., snowy owl. Winter resident, very rare; carnivorous; rather diurnal or crepuscular than nocturnal. "Its usual food while it remains with us consists of hares, squirrels, rats, and fishes." (Aud.) It also catches the pheasant and other kindred birds.

IV. FAMILY CUCULIDÆ, (THE CUCKOOS.)

19. Genus *Coccygus*, (Vieill., 1816.)

1. *C. americanus*, (Linn.,) Bon., yellow-billed cuckoo. Summer resident, common; insectivorous. They seem to prefer insect food, but suck the eggs of other birds, and also feed on berries, &c. It should, however, serve as a special plea on their behalf, that they not only devour but even feed their young on the hairy caterpillars of our orchards, which are rejected by most other insectivorous birds.

2. *C. erythrophthalmus*, (Wils.,) Bon., black-billed cuckoo. Summer resident, frequent; insectivorous. This and the preceding species very closely resemble each other, both in appearance and habits.

V. FAMILY PICIDÆ, (THE WOODPECKERS.)

20. Genus *Picus*, (Linn., 1748.)

1. *P. villosus*, (Linn.,) hairy woodpecker. Resident, common; insectivorous; feeds on the larvæ of insects, and on the insects themselves; although in autumn it seeks berries, &c.

2. *P. pubescens,* (Linn.,) downy woodpecker. Resident, common; insectivorous; habits and food similar.

3. *P. borealis,* (Vieill.,) red-cockaded woodpecker. Accidental; very rare; insectivorous; habits similar. These are highly useful birds in destroying worms and insects which lodge under dead bark and in rotten wood.

Observation.—Some of these birds have a singular habit, the purpose of which is not well understood, "of puncturing the smooth, thin bark of orchard trees in regular circles, so near to each other that eight or ten of them may be covered by a dollar." (Nutt., after Wils.) This has obtained for them the common name of "sap-suckers." They even puncture resinous trees in the same manner. I have not observed the trees to be injured by them.

21. Genus *Sphyropicus*, (Bd., 1857.)

1. *S. varius,* (Linn.,) Bd., yellow-bellied woodpecker. Resident, rarely seen during summer; insectivorous; secluded in the forest. Its "food consists of wood-worms and beetles, to which it adds small grapes and berries."

22. Genus *Hylotomus,* (Bd., 1858.)

1. *H. Pileatus,* (Linn.,) Bd., pileated woodpecker. Resident, almost extinct with us; insectivorous. This shy bird feeds, like its congeners, on the beetles, and their larvæ, which always abound among dead and decaying timber. If these fail, he resorts to acorns, nuts, and berries.

23. Genus *Centurus,* (Sw., 1837.)

1. *C. carolinus,* (Linn.,) Bd., red-bellied woodpecker. Resident, frequent; rare in summer; insectivorous; feeds on various kinds of insects and larvæ, and on berries, &c., in the manner of its yellow-bellied cousin.

24. Genus *Melanerpes,* (Sw., 1831.)

1. *M. erythrocephalus,* (Linn.,) Bd., red-headed woodpecker. Resident, very common; insectivorous. This elegant and familiar species is extremely expert in finding and catching the insects which conceal themselves beneath he bark of trees. He also eats juicy fruits and berries, as well as the ripening orn. The farmer often thinks that he takes more in cherries and garden fruits than his services are worth.

25. Genus *Colaptes,* (Sw., 1827.)

1. *C. auratus,* (Linn.,) Sw., golden-winged woodpecker. Resident, common—rare in winter; insectivorous; feeds on insects, wood-lice, ants, &c., with cherries, various berries, and even corn. "The farmer, forgetting his past services, and only remembering his present faults, closes his career with the gun, and unthinkingly does to himself and the public an essential injury." (Nutt.)

VI. FAMILY TROCHILIDÆ, (THE HUMMING BIRDS.)

26. Genus *Trochilus,* (Linn., 1748.)

1. *T. colubris,* (Linn., 1766,) ruby-throated humming bird. Summer resident, common; insectivorous. This beautiful little bird has so long been considered *millivorous* (honey-eater) that the reader will hardly admit its claim to be insectivorous; "but it is essentially an *insect hunter*, and not a *honey-sucker*. Its long, delicate bill enters the cup of the flower, and the protruded, double-tubed tongue, delicately sensible, and imbued with a glutinous saliva, touches each insect in succession, and draws it from its lurking place to be instantly swallowed." "Their food consists principally of insects, generally of the coleopterous order, with some equally diminutive flies." (Aud.)

VII. FAMILY CYPSELIDÆ, (THE SWIFTS.)

27. Genus *Chætura,* (Steph., 1825.)

1. *C. pelasgia,* (Linn.,) Steph., chimney swift. Summer resident, abundant; insectivorous. If the reader will reflect on the myriads of insects which fill the air on the approach of eventide, and watch these birds, as they wing their rapid

flight in ceaseless circles, gathering their evening repast, he will not grudgingly endure the little annoyance which they may occasion in his chimney.

Observation.—The chimney swallows incline to be gregarious, especially in their roosting places. Audubon tells of a hollow tree in which he estimated that over nine thousand had collected, and were in the habit of collecting nightly to roost. An old chimney in a neighboring county was found, on one occasion, to contain a still larger number; and a very few years since there were some four thousand of them taken from a chimney (which had been unused) of one of my neighbors.

VIII. FAMILY CAPRIMULGIDÆ, (THE GOAT-SUCKERS.)

28. Genus *anthrostomus*, (Gould, 1838.)

1. *A. vociferus*, (Wils.,) Bon., whip-poor-will. Summer resident, common; insectivorous; habits nocturnal; feeds on moths and other night-flying insects.

29. Genus *Chordeiles*, (Sw., 1831.)

1. *C. popetue*, (Vicill.,) Bd., night hawk. Summer resident, very common; insectivorous; habits much like the preceding, but more crepuscular or diurnal; often seen out in cloudy weather. "Its food consists entirely of insects, especially coleoptera; it also seizes on moths and caterpillars, and is very expert at catching crickets and grasshoppers, with which it sometimes gorges itself." (Aud.)

IX. FAMILY ALCEDINIDÆ, (THE KINGFISHERS.)

30. Genus *Ceryle*, (Boie, 1828.)

1. *C. alcyon*, (Linn.,) Boie, 1828, belted kingfisher. Resident, frequent along streams; piscivorous; feeds on fish and a few water insects.

X. FAMILY COLOPLERIDÆ, (THE FLY-CATCHERS.)

31. Genus *Tyrannus*, (Cuv., 1800.)

1. *T. carolinensis*, (Gmel.,) Vieill., kingbird fly-catcher. Summer resident, common; insectivorous. "Beetles, grasshoppers, crickets, and winged insects of all descriptions form his principal summer food; in autumn berries constitute a favorite repast." (Nutt.) Reader, see him perched on an old mullen stalk, watching all around, and capturing every insect that comes in his sight, and say whether he does not pay for the few bees he may destroy.

32. Genus *Myiarchus*, (Cab., 1844.)

1. *M. crinitus*, (Linn.,) Cab., 1855, great-crested fly-catcher. Summer resident, frequent; insectivorous; dwells mostly in forests and feeds on such insects as are found there.

33. Genus *Sayornis*, (Bon., 1854.)

1. *S. fuscus*, (Gmel.,) Bd., peewee fly-catcher. Summer resident, common; insectivorous. This familiar and industrious destroyer of insects needs no introduction, and is capable of telling its own story.

34. Genus *Contopus*, (Cab., 1855.)

1. *C. borealis*, (Sw.,) Bd., olive-sided fly-catcher. Summer resident, not frequent; insectivorous; feeds on others of the genus.

2. *C. virens*, (Linn.,) Cab., wood peewee fly-catcher. Summer resident, common; insectivorous. These two species are very similar and among the most active and industrious fly-catchers.

35. Genus *Empidonax*, (Cab., 1855.)

1. *E. trailii*, (Sw.,) Bd., Trail's fly-catcher. Summer resident, frequent; insectivorous.

2. *E. minimus*, (Bd.,) least fly-catcher. Summer resident, frequent; insectivorous.

3. *E. acadicus*, (Gmel.,) Bd., small green-crested fly-catcher. Summer resident, common; insectivorous

4. *E. flaviventris*, (Bd.,) yellow-bellied fly-catcher. Summer resident, frequent; insectivorous. All the species of this genus—indeed all the family—possess similar habits. We can hardly walk out on a summer day without seeing some of them perched on a fence stake or dead bough intently watching for their prey, and woe betide the insect, whether beetle, moth, or fly, which may dare to show itself either on the ground or wing. The feat accomplished, they return to the same perch to await the appearance of other prey Surely no observer can be so obtuse as not to appreciate the service thus rendered.

XI. FAMILY TURDINÆ, (THE THRUSHES.)

36. Genus *Turdus*, (Linn., 1735.)

1. *T. mustelinus*, (Gmel., 1738,) wood thrush. Summer resident, common; omnivorous. "Beetles, caterpillars, various insects, and, in autumn, berries, constitute its principal food."

2. *T. pallasi*, (Cab.,) hermit thrush. Summer resident, frequent; omnivorous; feeds on various insects and small berries.

3. *T fuscescens*, (Wils.,) Steph., Wilson's thrush. Summer resident, frequent; omnivorous. Like the preceding, its food is principally coleopterous insects and autumnal berries.

4. *T. swainsonii*, (Wils.,) Cab., olive-backed thrush. Summer resident, frequent; omnivorous; food and habits similar.

5. *T. aliciæ*, (Bd.,) gray-cheeked thrush. Summer resident, very rare; doubtful; omnivorous; unknown, except from analogy.

6. *T. migratorius*, (Linn.,) robin. Resident, frequent; rare in winter; omnivorous. In early summer they feed much on the ground, picking up the various worms and insects of the season. In autumn they often resort to small fruits and berries. When winter arrives many of them retire to the tide marshes of our rivers, where seed and insect food are still found. When these have been long covered with snow, the robins have returned to our orchards and found subsistence in the rotten apples still hanging on the trees. This was the case in the winters of 1831 and 1836.

37. Genus *Sialia*, (Sw., 1837.)

1. *S. sialis*, (Linn.,) Bd., bluebird. Resident, very common; rare in winter; insectivorous. This favorite of every household, the lovely and confiding bluebird, seeks its food on the ground among grass. It seems to prefer coleopterous beetles, but also devours other insects, caterpillars, spiders, &c., and sometimes ripe berries. It well repays the use of the box, so often provided for its habitation.

38. Genus *Regulus*, (Cuv., 1799.)

1. *R. calendula*, (Linn.,) Licht., ruby-crowned wren. Migratory, frequent in season; insectivorous.

2. *R. satrapa*, (Licht.,) golden-crested wren. Migratory, frequent in season; insectivorous. These species, very nearly identified by appearance and habits, are wholly insect-feeders. Ever vigilant, they may be seen closely scanning the bark and leaves of trees and shrubs, in the orchard or garden, in quest of small insects or larvæ, spiders, &c. Sometimes they pursue and capture them on the wing. Their scrutinizing habits have obtained for them the name of wrens.

XII. FAMILY SYLVICOLIDÆ, (THE WOOD WARBLERS.)

39. Genus *Anthus*, (Bechts., 1802.)

1. *A. ludovicianus*, (Gmel.,) Licht., titlark. Winter resident, frequent; gregarious; insectivorous; mostly affects ploughed and bare fields on the margin of waters where it seeks various insects, seeds, &c.

40. Genus *Mniotilta*, (Vieill., 1816.)

1. *M. varia*, (Linn.,) Vieill., black and white creeper. Migratory, frequent; insectivorous. "It lives principally on small ants and their larvæ," which it mostly gleans from the rough bark of orchard and forest trees.

41. Genus *Parula*, (Bon., 1838.)

1. *P. americana*, (Linn.,) Bon., blue yellow-backed warbler. Migratory, frequent; insectivorous; somewhat of a creeper; very active and useful in destroying small insects during the opening bloom of spring.

42. Genus *Protonotaria*, (Bd., 1858.)

1. *P. citrea*, (Bodd.,) Bd., prothonotary warbler. Summer resident, ex tremely rare; insectivorous; feeds on small insects, worms, caterpillars, &c.

43. Genus *Geothlypis*, (Cab., 1847.)

1. *G. trichas*, (Linn.,) Cab., Maryland yellow throat. Summer resident, frequent; insectivorous. Lives secluded in thickets and coarse tangled grass near streams where it feeds on small insects. "Caterpillars and spiders form its principal food." (Aud.)

2. *G. philadelphia*, (Wils.,) Bd., mourning warbler. Summer resident, extremely rare; insectivorous; habits resemble the former.

44. Genus *Oporornis*, (Bd., 1858.)

1. *O. agilis*, (Wils.,) Bd., Connecticut warbler. Migratory, very rare; insectivorous. Audubon saw them "chasing a species of spider which runs nimbly over the water, and which they caught by gliding over it."

2. *O. tephrocotis*, (Nutt., 1840,) Michener's warbler. Migratory, very rare; insectivorous; affects margins of woods, thickets, and old fences; keeps near the ground when seeking insects.

Observation.—The type of this species was obtained by the writer in the autumn of 1839 in Chester county. It was described and published by Nuttall in the following year. Some have doubted it being a good species, it being too near *O. agilis;* others suppose it to be genuine. I shall retain it for the present Several specimens have been obtained.

3. *O. formosus*, (Wils.,) Bd., Kentucky warbler. Migratory, very rare, north of Maryland; insectivorous. "This species destroys great numbers of spiders." All the species are active insect-hunters, and affect the woods and neighboring fields, orchards, and gardens.

45. Genus *Icteria*, (Vieill., 1790.)

1. *I. viridis*, (Gmel.,) Bon., yellow-breasted chat. Summer resident, fre quent; insectivorous; affects thickets, near water, and feeds on shelly-winged beetles, sometimes on berries and seeds.

46. Genus *Helmitherus*, (Raf., 1819.)

1. *H. vermivorus*, (Gmel.,) Bon., worm-eating warbler. Migratory, or very rare in summer; insectivorous. "They are very active and indefatigable in sect-hunters." (Nutt.)

47. *Helminthophaga*, (Cab., 1850–'51.)

1. *H. pinus*, (Linn.,) Bd., blue-winged yellow warbler. Summer resident, rare, and very secluded; insectivorous. "They feed on the eggs and larvæ of various insects, as well as flies, caterpillars, ants, and coleoptera." (Nutt.)

2. *H. chrysoptera*, (Linn.,) Cab., golden-winged warbler. Migratory, quite rare; insectivorous. This scarce bird is only seen in spring, when it frequents the tops of forest trees, and collects its food among the leaves and branches.

3. *H. ruficapilla*, (Wils.,) Cab., Nashville warbler. Summer resident, very rare; insectivorous. "Its food consists of insects and larvæ, which it procures by searching actively and diligently among the leaves and buds of low trees." (Aud.)

4. *H. peregrina*, (Wils.,) Cab., Tennessee warbler. Migratory, very rare; insectivorous; "an expert catcher of flies."

48. Genus *Seiurus*, (Sw., 1827.)

1. *S. aurocapillus* (Linn.,) Sw., golden-crowned thrush. Summer resident, common in woods; insectivorous. "Feed wholly on insects and their larvæ, particularly small coleopterous kinds, and ants collected on the ground." (Nutt.)

2. *S. noveboracensis*, (Gmel.,) Nutt., water thrush. Migratory, frequent in marshy thickets; insectivorous. Feeds on such insects and their larvæ as inhabit marshy localities.

3. *S. ludovicianus*. (Aud.,) Bon., large-billed water thrush. Migratory, more rare than the last; insectivorous. Very closely resembles the preceding species in appearance and habits.

49. Genus *Dendroica*, (Gray, 1842.)

1. *D. virens*, (Gmel.,) Bd., black-throated green warbler. Migratory, rather rare; insectivorous. "May be occasionally seen for an hour at a time carefully and actively searching for small caterpillars and winged insects amidst the white blossoms of the shady apple tree." (Nutt.)

2. *D. canadensis*, (Linn.,) Bd., black-throated blue warbler. Migratory, rare; insectivorous. "An expert catcher of flies."

3. *D. coronata*, (Linn.,) Gray, yellow-rumped warbler. Migratory, abundant; insectivorous. "Feeds on insects, &c.; is expert in catching flies, and is a great devourer of caterpillars." (Aud.)

4. *D. blackburniæ*, (Gmel.,) Bd., Blackburnian warbler. Migratory, rather rare; insectivorous. "An exceedingly nimble insect hunter, keeping towards the tops of trees."

5. *D. castanea*, (Wils.,) Bd., bay-breasted warbler. Migratory, quite rare; insectivorous. "Sometimes seen searching for insects along fences," &c.

6. *D. pennsylvanica*, (Linn.,) Bd., chestnut-sided warbler. Migratory, frequent; insectivorous. "In the spring they are generally restless, and intently engaged in the chase of insects amidst the blossoms and tender leaves."

7. *D. cærulea*, (Wils.,) Bd., blue warbler. Migratory, quite rare; insectivorous. 'Feeds principally on insects and their larvæ."

8. *D. striata*, (Forst.,) Bd., black-poll warbler. Migratory, frequent; insectivorous. "An active fly-catcher."

9. *D. æstiva*, (Gmel.,) Bd., yellow warbler. Summer resident, frequent; insectivorous. "Feeds on the smaller insects, and a variety of small larvæ and caterpillars."

Observation.—Nuttall remarks: "It is amusing to observe the sagacity of this little bird in disposing of the egg of the vagrant and parasitic *cow troopial.* The egg being deposited before the laying of the rightful tenant, and too large for ejectment, is ingeniously incarcerated in the bottom of the nest, and a new lining placed above it, so that it is never hatched, to prove the dragon of the brood."

10. *D. maculosa*, (Gmel.,) Bd., black and yellow warbler. Migratory, common; insectivorous. Very active in searching for their insect and larvæ food.

11. *D. tigrina*, (Gmel.,) Bd., Cape May warbler. Migratory, extremely rare, insectivorous. Feeds on insect food, but its habits are little known.

12. *D. palmarum*, (Gmel.,) Bd., yellow red-poll warbler. Migratory, rare in swampy thickets; insectivorous. Industrious insect-eaters.

13. *D. discolor*, (Vieill.,) Bd., prairie warbler. Migratory, rare; found in open woods; insectivorous. "Feeds on caterpillars and flies."

50. Genus *Myiodioctes*, (Aud., 1839.)

1. *M. mitratus*, (Gmel.,) Aud., hooded warbler. Summer resident; very rare so far north, insectivorous. "It flies swiftly after its insect prey, securing the greater part of it on the wing." (Aud.)

2. *M. pusillus*, (Wils.,) Bon., green black-capped warbler. Summer resident, very rare; insectivorous. "It has all the habits of a true fly-catcher, feeding on small insects, which it catches entirely on the wing." (Aud.)

3. *M. canadensis*, (Linn.,) Aud., Canada warbler. Migratory, or summer resident, frequent; insectivorous. A truly insect-catching species. Audubon says: "I found it breeding in the pine forest."

51. Genus *Setophaga*, (Sw., 1827.)

1. *S. ruticilla*, (Linn.,) Sw., American redstart. Migratory, common in dense woods; insectivorous. "He is no pensioner on the bounty of man. He does not wait the accidental approach of his insect prey, but, carrying the war among them, he is seen flitting from bough to bough, or at times pursuing the flying troop of insects from the top of the tallest tree, in a zigzag, hawk-like manner, to the ground." (Nutt.)

52. Genus *Pyranga*, (Vieill., 1807.)

1. *P. rubra*, (Linn.,) Vieill., scarlet tanager. Summer resident, frequent in woods; omnivorous. "Its food consists chiefly of winged insects, wasps, hornets, and wild bees, as well as smaller kinds of beetles, and other shelly tribes.". He rarely visits the orchard and tastes the early and inviting, though forbidden cherries." (Nutt.)

2. *P. æstiva*, (Linn.,) Vieill., summer redbird. Summer resident, rare; omnivorous. Habits very similar. Both species become more fructivorous in autumn.

XIII. FAMILY HIRUNDINIDÆ. (THE SWALLOWS.)

53. Genus *Hirundo*, (Linn., 1735.)

1. *H. horreorum*, (Barton,) barn swallow. Summer resident, very abundant; insectivorous. "Its food consists entirely of insects, some being small coleoptera." (Aud.) The swallows, like the swifts, feed entirely on the wing, and thus devour vast numbers of flying insects, which otherwise might annoy us.

2. *H. lunifrons*, (Say, 1823,) cliff swallows. Summer resident, now become frequent; gregarious; insectivorous. Its feeding proclivities are similar to the barn swallow. This bird was unknown here until within the last twenty years. Being gregarious and of a wandering habit, it has established various colonies in the county within the period mentioned. Its curious, bottle-shaped mud tenements may now be seen beneath the eaves of buildings in several localities.

3. *H. bicolor*, (Vieill., 1807,) white-bellied swallow. Summer resident, frequent; insectivorous. "Like all other swallows, it feeds on the wing, unceasingly pursuing insects of various kinds." Once the tenant of the forest, it is fast changing its habits, and in some parts has taken possession of martin-boxes in preference to hollow trees.

54. Genus *Cotyle*, (Boie, 1822.)

1. *C. riparia*, (Linn.,) Boie, bank swallow. Summer resident, abundant, gregarious, insectivorous. The bank swallow builds in holes excavated in the sandy, steep banks of creeks, &c.; hence is more frequent near watercourses, and, consequently, feeds on such insects as inhabit them. Its food, "which consists of small insects, principally of the hymenopterous kind," is taken on the wing.

2. *C. serripennis*, (Aud.,) Bon., rough-winged swallow. Summer resident, frequent; insectivorous. Closely resembling the preceding species, and often associated with it in the same community, until recently the two appear to have been confounded.

55. Genus *Progne*, (Boie., 1826.)

1. *P. purpurea*, (Linn.,) Boie, purple martin. Summer resident, abundant; gregarious and insectivorous. Familiarly domiciled in the martin-box, our bird seems specially commissioned to rid the neighboring premises of noxious insects. "The food of the martin is usually the larger winged insects, as wasps, bees, large beetles, such as the common *Cetonias* or goldsmiths, which are swallowed whole." (Nutt.) "They seldom seize the honey bee." (Aud.)

XIV. FAMILY BOMBYCILLIDÆ, (THE WAX WINGS.)

56. Genus *Ampelis*, (Linn., 1735.)

1. *A. cedrorum*, (Linn.,) Bd., cedar bird, cherry bird. Resident, common, rare in winter; granivorous; an eminently fructivorous species, as its common names imply. Too well known to fruit-growers as the cherry bird, yet, as an *amende honorable*, he feeds in spring on "small caterpillars, beetles, and small insects. For hours together he may be seen feeding on the all-despoiling canker worm, which infests our apple and elm trees." (Nutt.)

XV. FAMILY LANIIDÆ, (THE SHRIKES.)

57. Genus *Collyrio*, (Moehr., 1752.)

1. *C. borealis*, (Forst.,) Bd., butcher bird. Winter resident, rare; insectivorous. "Fond of crickets, grasshoppers, and various insects." In winter when these become scarce, he grows more predatious, seizing small birds, mice, &c., with the vigor and dexterity of a hawk; to which its robust form and hooked bill give it some resemblance.

58. Genus *Vireo*, (Vieill., 1807.)

1. *V. olivaceus*, (Linn.,) Vieill., red-eyed vireo. Summer resident, frequent; insectivorous. Its food consists of insects and their larvæ, especially caterpillars. He is an animated and melodious songster. "Wantonly to destroy these delightful aids to sentimental happiness, ought to be viewed not only as an act of barbarity, but almost as a sacrilege." (Nutt.)

2. *V. gilvus*, (Vieill.,) Bon., warbling vireo. Summer resident, frequent; insectivorous. "The principal food of this species consists of small black caterpillars off the poplars." The most familiar of the vireos, it approaches the orchard and garden, where it carefully searches for insects among the leaves and branches of the trees.

3. *V. noveboracensis*, (Gmel.,) Bon., white-eyed vireo. Summer resident, not common; insectivorous. Like its kindred, its food in spring consists of insects; in autumn, berries are added to its bill of fare.

4. *V. solitarius*, (Wils.,) Vieill., blue-headed vireo. Summer resident, rather scarce; insectivorous. "Its food consists of insects and berries."

5. *V. flavifrons*, (Vieill., 1807,) yellow-throated vireo. Summer resident, not common; insectivorous. Habits similar to those of the preceding species.

Observation.—It is probable that *V. philadelphicus*, (Cassin,) and even *V virescens*, (Vieill.,) may yet occur within the limits of Chester county.

XVI. FAMILY LIOTRICHIDÆ.

59. Genus *Mimus*, (Boie, 1826.)

1. *M. Polyglottus*, (Linn.,) Boie, mocking bird. Summer resident, rare; omnivorous. "Insects, worms, grasshoppers, and larvæ are the food on which they principally subsist when so eminently vocal. In winter, on the berries of the red cedar, wax myrtle, holly, &c., &c." (Nutt.)

2. *M. carolinensis* (Linn.,) Gray, catbird. Summer resident, abundant; omnivorous. This songster, which rivals even the mocking bird itself, and feeds during a large part of the season on the very insect races which are injuring the crops of the cultivator, is often greatly persecuted. "The vulgar name which it bears has served to bring it into contempt with persons not the best judges of the benefits it confers on the husbandman in early spring, when with industrious care it cleanses his fruit trees of thousands of larvæ and insects, which in a single day would destroy, while yet in the bud, far more of his fruit than the catbird would eat in a whole season. But alas! selfishness, the usual attendant of ignorance, not only heaps maledictions on the harmless bird, but dooms it to destruction. The boys pelt it with stones and destroy its nest whenever an opportunity presents; the farmer shoots it to save a pear, the

gardener to save a raspberry; and some hate it not knowing why. In a word, excepting the poor crow, I know no bird more generally despised and tormented than this charming songster." (Aud.)

60. Genus *Harporhynchus*, (Cab., 1845.)

1. *H. rufus*, (Linn.,) Cab., brown thrush. Summer resident, common; omnivorous. This is another mimic rival of the mocking bird. "Its food consists of worms and insects generally; also caterpillars, beetles, and other coleopterous tribes, as well as various kinds of berries." (Nutt.) He may scratch a few hills of corn or plunder a few cherries, but rest assured that his services have already paid for these; and his music, while it is sweeter, will cost less than that of the flute or the piano.

61. Genus *Thriothorus*, (Vieill., 1816.)

1. *T. ludovicianus*, (Lath.,) Bon., Carolina wren. Resident, frequent; insectivorous. This has much the habit of the common house wren, exploring dark nooks and corners, and piles of wood, brush, &c., where it finds spiders, moths, and other insects in abundance. Its powers of song and mimicry are excelled by few birds.

2. *T. bewickii*, (Aud.,) Bon., Bewick's wren. Resident; insectivorous; Nearly related to the foregoing, its habits are very similar, feeding on spiders, moths, and other insects.

62. Genus *Cistothorus*, (Cab., 1851.)

1. *C. palustris*, (Wils.,) Cab., long-billed marsh wren. Summer resident, frequent about marshes; insectivorous. Feeds on aquatic insects and others which frequent wet places.

2. *C. stellaris*, (Licht.,) Cab., short-billed marsh wren. Summer resident, frequent; insectivorous. Habits similar to the preceding. Secluded among the brushwood and rank grass of their favorite swamps, they elude observation.

63. Genus *Troglodytes*, (Vieill., 1807.)

1. *T. ædon*, (Vieill., 1807,) house wren. Summer resident, common; insectivorous. "Our bird keeps up frequent squabbles with his neighbors, like other busybodies that are never happy but in mischief. He is still, upon the whole, a real friend to the farmer and horticulturist, by the number of injurious insects and their destructive larvæ, on which he and his numerous family subsist." (Nutt.)

2. *T. americana*, (Aud., 1834,) wood wren.

Observation.—This is perhaps too near the preceding species to warrant a separate notice.

3. *T. hyemalis*, (Wils.,) Vieill., winter wren. Winter resident, frequent; insectivorous. Its habits are much like those of the house wren; but is distinguished by season, the length of the tail, and the food which season may afford.

XVII. FAMILY CERTHIIDÆ, (THE CREEPERS.)

64. Genus *Certhia*, (Linn., 1735.)

1. *C. americana*, (Vieill.,) Bon., American creeper. Resident, frequent, but eludes observation; insectivorous. "Its food consists chiefly of ants, larvæ, and small insects, and small particles of lichens; and if one be placed near the nose, it is generally found to emit an odor like that of ants." (Aud.)

65. Genus *Sitta*, (Linn., 1735.)

1. *S. carolinensis*, (Gmel., 1788,) white-bellied nuthatch. Resident, frequent; insectivorous. "It searches and shells off the bark, in quest of his lurking prey of spiders, ants, insects, and their larvæ in general. (Nutt.)

2. *S. canadensis*, (Linn., 1766,) red-bellied nuthatch. Winter resident, rare in forests; insectivorous. The scarcity of insect food in winter often obliges our sojourner to resort to the seeds of the pine for subsistence.

XVIII. FAMILY PARIDÆ, (THE TITMICE. ETC.,)

66. Genus *Polioptila*, (Sclat., 1855.)

1. *P. cœrulea*, (Linn.,) Sclat., blue-gray flycatcher. Resident, frequent in summer; insectivorous. "A very dextrous, lively insect-hunter; among other small insects, it preys on the troublesome mosquitoes. (Nutt.)

67. Genus *Lophophanes*, (Kaup., 1829.)

1. *L. bicolor*, (Linn.,) Bon., tufted titmouse. Resident, frequent; insectivorous. This well-known species seeks its food in summer in crevices and among rotten wood; in winter it has recourse to seeds and small berries, in addition to refuse from the kitchen and garbage from the butcher's stalls.

68. Genus *Parus*, (Linn., 1735.)

1. *P. atricapillus*, (Linn.,) black-capped titmouse. Resident, frequent; insectivorous. "Feeds on insects, their larvæ, and eggs of destructive moths: especially those of the canker worm, as well as every sort of small fruits, berries, and seeds."

2. *P. carolinensis*, (Aud.,) Carolina titmouse. Summer resident, rare; insectivorous. Has the habits of the black cap.

XIX. FAMILY ALAUDIDÆ, (THE LARKS.)

69. Genus *Eremophila*, (Boie, 1828.)

1. *E. cornuta*, (Wils.,) Boie, shore lark. Winter resident, frequent; granivorous. "Their food consists of various kinds of seeds which remain on the grass and weeds, and the eggs and dormant larvæ of insects when they fall in their way." (Nutt.)

XX. FAMILY FRINGILLIDÆ, (THE SPARROWS.)

70. Genus *Pinicola*, (Vieill., 1807.)

1. *P. canadensis*, (Briss.,) Cab., pine grosbeak. Winter resident, very rare; granivorous. "Its food consist of buds and seeds of almost every sort of trees, and occasionally a passing insect."

71. Genus *Carpodacus*, (Kaup.. 1829.)

1. *C. purpureus*, (Gmel.,) Gray, purple finch. Winter resident, frequent; granivorous. "Its food is chiefly seeds and berries of red cedar, &c., with a sprinkling of insects and larvæ."

72. Genus *Chrysomitris*, (Boie,) 1828.

1. *C. tristis*, (Linn.,) Bon., American goldfinch. Resident, common; rare in winter; granivorous. Its food consists of many kinds of small seeds, especially of the thistle, lettuce, and other composite plants. Many pernicious seeds are thus destroyed.

2. *C. pinus*, (Wils.,) Bon., pine finch. Winter resident, rare; granivorous. Consumes the seeds of the thistle and allied plants, and those of the pine tree.

73. Genus *Curvirostra*, (Scop., 1777.)

1. *C. americana*, (Wils.,) red crossbill. Winter resident, very rare of the pines; granivorous. Affects pine forests, the peculiar structure its bill having a peculiar adaptation for extracting seeds from the cones.

2. *C. leucoptera*, (Gmel.,) Wils., white-winged crossbill. Winter resident rare away from pine woods; granivorous. Same habits with the preceding species.

74. Genus *Aegiothus*, (Cab., 1851.)

1. *A. linaria*, (Linn.,) Cab., lesser red-poll Winter resident, very rare; granivorous. Feeds on various small seeds, especially of the alder, buds of the maple, &c.

75. Genus *Plectrophanes*, (Meyer, 1810.)

1. *P. nivalis*, (Linn.,) Meyer, 1825, snow bunting. Winter resident, very rare; granivorous. Feeds on various seeds, grains, and small insects. Min-

gles with the snowbird in its familiar visits to the garden and house yard to glean the refuse from the kitchen. It is then noted as the white snowbird.

2. *P. Lapponicus*, (Linn.,) Selby, Lapland longspur. Winter resident, very rare; granivorous. "Its foods consists chiefly of seeds, and also of grass, leaves, buds, and insects."

76. Genus *Passerculus*, (Bon., 1838.)

1. *P. Savanna*, (Wils.,) Bon., Savanna sparrow. Summer resident, common; granivorous. It subsists on various grass and other seeds, with such small insects and larvæ as may fall in its way.

77. Genus *Pooecetes*, (Bd., 1858.)

1. *P. gramineus*, (Gmel.,) Bd., bay-winged bunting. Resident, common in summer, rare in winter; granivorous; feeds on the seeds of grasses and a spice of the more savory insects. In search of the latter it sometimes visits ploughed fields.

79. Genus *Coturniculus*, (Bon., 1838.)

1. *C. passerinus*, (Wils.,) Bon., yellow-winged sparrow. Summer resident, frequent; granivorous; dwells among grass, where its food, the grass-seeds, is abundant. It delights to add a few insects to its common fare.

2. *C. henslowi*, (Aud.,) Bon., Henslow's sparrow. Summer resident, very rare; granivorous; habits similar to those of the preceding species.

80. Genus *Zonotrichia*, (Sw., 1831.)

1. *Z. leucophrys*, (Forst.,) Sw., white-crowned sparrow. Winter resident, not common; granivorous; subsisting on grass-seeds, berries, coleopterous insects, &c.

2. *Z. albicollis*, (Gmel.,) Bon., white-throated sparrow. Winter resident, frequent; granivorous; habits similar to the last.

81. Genus *Junco*, (Wagler, 1831.)

1. *J. hyemalis*, (Linn.,) Sclat., snowbird. Winter resident, very numerous; granivorous. Every one must be familiar with this little accompaniment of cold and storm, as it picks its scanty fare of grass and other seeds from the lawn, the garden, or the yard, wherever the winds or the housewife's broom have left the ground uncovered with snow.

82. Genus *Spizella*, (Bon., 1838.)

1. *S. monticola*, (Gmel.,) Bd., tree sparrow. Winter resident, frequent; granivorous. Sometimes seen during winter in company with the snowbird, and feeding in a similar way.

2. *S. pusilla*, (Wils.,) Bon., field sparrow. Resident, common in summer; granivorous. "The food of this species consists of seeds and insects. They search the leaves and branches for moths, of which they seem to be fond."

3. *S. socialis*, (Wils.,) Bon., chipping sparrow. Summer resident, very common; granivorous. Its habits resemble those of other small sparrows; but being confiding and self domesticated, it feeds and breeds among the trees and shrubbery in our orchards, gardens, and yards, and even boldly crosses the threshold to pick the crumbs which accident or design may have thrown in its way.

83. Genus *Melospiza*, (Bd., 1858.)

1. *M. melodia*, (Wils.,) Bd., song sparrow. Resident, common; granivorous. This lovely songster dwells in the orchard and garden, where it subsists on small seeds and insects. In winter it often associates with the snowbird, and exhibits the same familiar habits. Its song is one of the earliest harbingers of spring.

2. *M. lincolnii*, (Aud.,) Bon., Lincoln's sparrow. Migratory; extremely rare; granivorous; habits resemble those of the former species; "feeds on seeds, berries, and insects."

3. *M. palustris*, (Wils.,) Bd., swamp sparrow. Migratory, frequent in

proper localities; granivorous. "Feeds principally on the seeds of grasses, with a few insects." (Aud.)

84. Genus *Passerella*, (Sw., 1837.)

1. *P. iliaca*, (Merrem.) Sw., fox-colored sparrow. Winter resident, frequent; granivorous. During their winter sojourn they frequent brier patches and thickets to search among the fallen leaves for seeds and the remains of insects, larvæ, &c.

85. Genus *Euspiza*, (Bon., 1838.)

1. *E. americana*, (Gmel.,) Bon., black-throated sparrow. Summer resident, common; granivorous. "Their food consists of seeds, eggs of insects, and in the early part of summer of caterpillars and small coleopterous insects." (Nutt.)

2. *E. townsendii*, (Aud.,) Bd., Townsend's sparrow. Summer resident, unique; granivorous. Its food inferred from analogy to be, as in other sparrows, seeds and insects.

Observation.—The following extract from my diary may be properly introduced here:

"NEW GARDEN, 11*th of 5th month*, 1833.—This morning my friend John K. Townsend, in company with John Richards, while in quest of birds for my cabinet, shot a bunting in William Brown's cedar grove, near New Garden meeting-house, which is believed to be a nondescript. We have given it the provisional name of *Euspiza albigula*, or white-throated bunting. The following brief description was drawn from the recent bird before it was skinned:

Male. Upper mandible, black; middle edge, white; lower, light blue, with a longitudinal stripe extending half way from the point to the base; head, dark plumbeous; cheeks and breast, lighter plumbeous; line over the eye, white; back, varied with black and brown; the first and second primaries, equal, and longest; the two lessor coverts edged with paler; throat, white, margined with black, extending down upon the breast, beneath which is a small spot of ocherous; sides, plumbeous; belly and vent, brownish white; length, $5\frac{3}{4}$ inches; extent 9 inches." (The sex was determined by subsequent dissection.)

86. Genus *Guiraca*, (Sw., 1827.)

1. *G. ludoviciana*, (Linn.,) Sw., rose-breasted grosbeak. Summer resident, very rare and recluse; granivorous. "The food of this beautiful bird consists of the seeds of cereal plants, of grasses, and those of different kinds of berries, along with insects, &c." (Aud.)

2. *G. cærulea*, (Linn.,) Sw., blue grosbeak. Summer resident, very rare; granivorous. They feed on grains, hemp-seed, millet, and the kernels of different sorts of berries.

87. Genus *Cyanospiza*, (Bd., 1858.)

1. *C. cyanea*, (Linn.,) Bd., indigo bird. Summer resident, frequent; granivorous. "The usual food of this species is insects, and various kinds of seeds." (Wils.)

88. Genus *Cardinalis*, (Bon., 1831.)

1. *C. virginianus*, (Briss.,) Bon., cardinal grosbeak. Resident, frequent; granivorous. "Indian corn constitutes their chief and favorite food when attainable. The seeds of apples, cherries, and of many other sorts of fruit, are also eaten by them."

89. Genus *Pipilo*, (Vieill., 1816.)

1. *P. erythropthalmus*, (Linn.,) Vieill., towhee bunting. Summer resident, common; granivorous. He scratches continually among fallen leaves along the fences, in thickets, and brier patches, in quest of the seeds, and worms, &c., which are concealed there.

XXI. FAMILY ICTERIDÆ.

90. Genus *Dolichonyx*, (Sw., 1827.)

1. *D. oryzivorus*, (Linn.,) Sw., reedbird, bobolink. Migratory, frequent in

season; granivorous. The reed or wild rice of all our tide-water marshes is, in autumn, the essential food of this bird. To this may be added grain and grass-seeds generally, with insects of various kinds, grubs, mayflies, and caterpillars. They sometimes collect in very numerous flocks, and if they happen to alight on a grain field, either ripe for harvest or newly sown, the farmer, to use the language of Wilson, "may look upon them as a devouring scourge, and worse than a plague of locusts."

91. Genus *Molothrus*, (Sw., 1831.)

1. *M. pecoris*, (Gmel.,) Sw., cow blackbird. Summer resident, abundant; omnivorous. To the ordinary habits of the common blackbird it adds that of following cattle in the pasture, to feed on the insects which are attracted by their ordure. Some say it is to feast on the intestinal worms dropped by the cattle at certain seasons of the year.

Observation.—The cow buntings have ever been a race "of foundlings." They are remarkable for a total want of the natural instincts of maternity. They do not provide themselves a nest; they never incubate their own eggs; they feel no parental care for their young, which they never nurse. Like the European cuckoos, they possess a wonderful degree of instinctive cunning in employing the maternal instincts of other birds for the performance of their own parental duties, which they ignobly refuse to render. The offspring of the foster-mother is generally sacrificed in her attempt to raise the foundling of another.

92. Genus *Sturnella*, (Vieill., 1816.)

1. *S. magna*, (Linn.,) Sw., meadow lark. Resident, common; omnivorous. "Their food consists of caterpillars, grub worms, beetle, and grass-seeds." (Wils.)

94. Genus *Icterus*, (Briss., 1760.)

1. *I. spurius*, (Linn.,) Bon., orchard oriole. Summer resident, frequent; insectivorous. "I have good reason for believing that the species of insects on which he feeds are almost altogether such as commit the greatest depredations on the fruits of the orchard." (Wils.)

2. *I. baltimore*, (Linn.,) Baltimore oriole. Summer resident, frequent; insectivorous. Their food consists of worms, caterpillars, beetles, and bugs, particularly one of a brilliant glossy green, (the goldsmith.) In autumn both species partake of seeds and small berries.

95. Genus *Scolecophagus*, (Sw., 1831.)

1. *S. ferrugineus*, (Gmel.,) Sw., rusty blackbird. Migratory, frequent; omnivorous. They feed on grasshoppers and other insects, berries, &c., and in autumn, on corn.

96. Genus *Quiscalus*, (Vieill., 1816.)

1. *Q. versicolor*, (Linn.,) Vieill., crow blackbird. Summer resident, very abundant; omnivorous. "Every industrious farmer complains of the mischief committed on his corn by the crow blackbird. But were I placed in his situation, I should hesitate whether to consider these birds most as friends or enemies, as they are particularly destructive to almost all the noxious worms, grubs, and caterpillars that infest his fields; which, were they allowed to multiply unmolested, would soon consume nine-tenths of all the production of his labor, and desolate the country with the miseries of famine." (Wils.)

XXII. FAMILY CORVIDÆ, (THE CROWS.)

97. Genus *Corvus*, (Linn., 1735.)

1. *C. carnivorus*, (Bartram, 1793,) raven. Resident, now very rare or extinct; omnivorous. Audubon writes: "The more intelligent of our farmers are well aware that the raven destroys numberless insects, grubs, and worms; that he kills mice, moles, and rats whenever he can find them; that he will seize the weasel, the young opossum, and the skunk; that, with the persever-

ance of a cat, he will watch the burrows of the fox, and pounce on the cubs." * * "Yes, good reader, the farmer knows all this well, but he also knows his power, and, interfere as you may, with tale of pity or of truth, the bird is still a raven." (Aud.)

2. *C. americanus*, (Wils.,) Aud., American crow. Resident, very abundant; omnivorous. This more familiar epitome of the raven is known to every one. "Our crow feeds on fruits, seeds, and vegetables of almost every kind; it is equally fond of snakes, lizards, frogs, and other small reptiles. It looks upon various species of worms, grubs, and insects as dainties; and, if hard pushed by hunger, will devour even putrid carrion. It is fond of the eggs of other birds, and it plunders the fields of their superabundance. It is blamed for so doing, but seldom praised when it chases the thieving hawk from the poultry yard." (Aud.) With such a ledger it is often difficult for the farmer to settle the accounts with his tenant to mutual satisfaction.

3. *C. ossifragus*, (Wils.,) fish crow. Resident, rare; omnivorous. The fishing habits of this crow lead it more about the water, where it finds many aquatic insects, reptiles, &c.; otherwise it is a mere epitome of its older brother.

98. Genus *Cyanura*, (Sw., 1831)

1. *C. cristata*, (Linn.,) Sw., blue jay. Resident, common; omnivorous. This gay and gaudy bird has very much the same habits as its more sombre relatives, the crows. Like them his organs of destructiveness and acquisitiveness are very large, without a sufficient balancing power. He is both cruel and dishonest. He feeds indiscriminately on flesh, reptiles, insects, seeds, and fruits.

XXIII. FAMILY COLUMBIDÆ, (THE PIGEONS.)

99. Genus *Ectopistes*, (Sw., 1827.)

1. *E. migratoria*, (Linn.,) Sw., wild pigeon. Wandering; at times very abundant and gregarious; granivorous; feeds on beech mast, acorns, grains, and seeds of various kinds. It sometimes attacks the newly sown grain of the farmer, and when the flock is large, does much injury.

100. Genus *Zenaidura*, (Bon., 1854.)

1. *Z. carolinensis*, (Linn.,) Bon., turtle dove. Resident, frequent; granivorous. It feeds on small acorns, various kinds of grains and seeds; also on the fruits of the dogwood, holly, poke, &c.

XXIV. FAMILY PHASIANIDÆ, (THE TURKEYS.)

101. Genus *Meleagris*, (Linn., 1835.)

1. *M. gallopavo*, (Linn., 1766,) wild turkey. Resident, perhaps extinct in this county; omnivorous. The turkey in a wild state feeds on nuts, acorns. grains, and berries, together with various insects, tadpoles, lizards, &c. The domestic bird has the same habits, but feeds especially on grasshoppers and the seventeen-year locusts when abundant, on which they become fat. The great destruction of insect pests by turkeys, added to their market value, makes them a profitable crop for the farmer.

XXV. FAMILY TETRAONIDÆ, (THE GROUSE.)

102. Genus *Cupidonia*, (Reich., 1850.)

1. *C. cupido*, (Linn.,) Bd., pinnated grouse. Resident, now become extinct in this country; granivorous. Their food consists of acorns, of the dwarf-oaks, fruits and berries, and the buds of trees, especially the apple tree, and sometimes insects, such as grasshoppers, &c. Audubon says: "I have counted more than fifty on a single apple tree, the buds of which they entirely destroyed in a few hours."

103. Genus *Bonassa*, (Steph., 1819.)

1. *B. umbellus*, (Linn.,) Steph., ruffed grouse, pheasant. Resident, frequent; granivorous. The habits and food are very similar to those of the pinnated grouse. During the snows of winter, when their favorite berries have been exhausted, or are concealed, they feed on various buds, &c., and may then be found in the trees of the apple orchard.

104. Genus *Ortyx*, (Steph., 1819.)

1. *O. virginianus*, (Linn.,) Bon., partridge, quail. Resident, common; granivorous. "The food of the partridge consists of grain, seeds, insects, and berries of various kinds. Buckwheat and Indian corn are particular favorites." (Wils.) In winter it becomes more familiar, and sometimes enters the farm-yard to feed with poultry.

WATER BIRDS.

XXVI. FAMILY ARDEIDÆ, (THE HERONS.)

105. Genus *Botaurus*, (Steph., 1819.)

1. *B. lentiginosus*, (Forst.,) Steph., American bittern. Resident, not common; piscivorous. The habits and food of this bird do not appear to differ essentially from the last.

106. Genus *Butorides*, (Blyth., 1849.)

1. *B. virescens*, (Linn.,) Bon., green heron. Summer resident, frequent; piscivorous. "Small fish and frogs are his principal food, with small reptiles and aquatic insects."

XXVII. FAMILY CHARADRIIDÆ, (THE PLOVERS.)

107. Genus *Charadrius*, (Linn., 1735.)

1. *C. virginicus*, (Wils.,) Borkh., golden plover. Migratory, frequent; insectivorous; feeds on insects, worms, grasshoppers, small shell fish, and sometimes a few seeds and berries, according to season.

108. Genus *Aegialitis*, (Boie, 1822.)

1. *A. vociferus*, (Linn.,) Bon., killdeer, plover. Resident, or nearly so, frequent; insectivorous; feeds on various insects, grasshoppers, snails, and worms.

109. Genus *Squatarola*, (Cab., 1817.)

1. *S. helvetica*, (Linn.,) Cab., black-bellied plover. Summer resident, rare; insectivorous; feeds on insects, water snails, worms, and in season on small berries.

XXVIII. FAMILY SCOLOPACIDÆ, (THE SNIPES.)

110. Genus *Philohela*, (Gray, 1841.)

1. *P. minor*, (Gmel.,) Gray, woodcock. Resident, frequent; insectivorous. The food of the woodcock consists principally of earth worms and such other insects and worms as occur under fallen leaves and in soft bogs, which it probes with its long slender bill, and which is so sensitive at the tip as to enable the bird to discover and drag out its prey.

111. Genus *Gallinago*, (Leach, 1816.)

1. *G. wilsonii*, (Temm.,) Bon., Wilson's snipe. Summer resident, or very rare in winter; insectivorous. They continually bore in marshes, like the woodcock, for food, which appears to consist of worms, leeches, and water spiders.

112. Genus *Gambetta*, (Kaup., 1829.)

1. *G. melanoleuca*, (Gmel.,) Bon., tell-tale tattler. Summer resident, not frequent; insectivorous; affects marshy meadows and margins of streams "Feeds on small fish, insects, worms, water snails, &c." (Aud.)

2. *G. flavipes*, (Gmel.,) Bon., yellowshanks, tattler. Summer resident, frequent; insectivorous; nearly related to the last. "Feeds on fishes, shrimps, worms, and aquatic insects." (Aud.)

113. Genus *Rhyacophilus*, (Kaup., 1829.)

1. *R. solitarius*, (Wils.,) Bon., solitary sandpiper. Summer resident; insectivorous. Feeds on caterpillars, water insects, spiders, &c., &c.: mostly found about muddy ponds and ditches.

114. Genus *Tringoides*, (Bon., 1831.)

1. *T. macularius*, (Linn.,) gray-spotted sandpiper. Summer resident, common; insectivorous. Feeds on insects and worms, which it often seeks by probing the marsh mud.

115. Genus *Actiturus*, (Bon., 1831.)

1. *A. Bartramius*, (Wils.,) Bon., Bartram's sandpiper. Summer resident, frequent; insectivorous. Feeds on coleopterous insects, crickets, grasshoppers, and sometimes on the seeds of grasses.

FARMERS' BOYS.

BY MRS. L. B. ADAMS, DETROIT, MICHIGAN.

No fact is more evident among farming communities than that the boys almost universally grow up with a distaste for farm pursuits. No sooner are they of age than they turn to seek for more varied if not less laborious duties in town and city life. Thus agriculture is yearly robbed of what should be its strength and hope; the places these boys should have been qualified to fill, and should have filled, with the gathered wisdom of experience aided by the light of progressive science, are left to doubtful experimenters; while aged parents, deserted at a time when filial care is most needed, can only look upon their loneliness and say, "there must be something wrong somewhere."

Yes; in regard to farmers' boys, there has been "something wrong" a great while. In the first place, many of them never should have been farmers' boys at all, at least not farm boys, though they may happen to have been born upon a farm. It is not every nature, even among boys, that is or can be accommodated to the requirements of such an occupation, though parents are far too prone to think that being boys a farm is the only proper place for them, and the weapons best suited to them in the warfare of life the shovel and the hoe. Their physical, mental, and intellectual peculiarities are seldom taken into consideration. The strong, rough nature, the delicately organized, sensitive one, and the one with a craving hunger for the intellectual or scientific,'are all kept together on the farm that they may grow up and be taught to work, out of temptation's way. The father invests them like so much capital, on which he is to receive a per diem interest in the improvements of his farm, and works them to the limit of endurance under sanction of a short-sighted interpretation of that sophism of "securing the greatest good to the greatest number." The necessities of the family, it is thought, justify the sacrifice of individuality

The usual expectation is, that when the pecuniary ends of the farmer are accomplished, or the boys grown out of his hands, they will accept a portion of so many acres each, and settle down to plod through the same routine with the next generation. Much seeming wisdom and parental affection are thus manifested; but the wisdom too often proves unwise, and the affection only mistaken form of well-developed selfishness. The possibility is, that out of a family of three or five one may fulfil the desire of anxious parents, accept the acres, and, with the homestead in prospect, settle down to be the stay of their old age; but the greater probability is, that as soon as legally free, Nature will assert her claims in each, and they will go out into the world seeking for the life that should have been theirs through early years of preparation for it; but having been cheated of that preparation, neither the world nor parents need wonder if they come forth ill-developed, discontented spirits, seeking their places and finding them not.

As farming has heretofore been considered a business that any ignoramus might engage in successfully, it has not been thought necessary to lighten or brighten the labors of the farm by any rays of science or gleams of intelligence from the world of thought and action without. Work was the one thing wanted from sunrise till bedtime, and the physical nature, often overwrought, had neither strength nor sympathy to give to the mental, which of course grew dwarfed and distorted in the unnatural atmosphere. Struggle against it as they might with bits of candle and lighted firebrands in the chimney corner, overwearied nature has been more than a match for fancy, philosophy, and metaphysics; and where one boy with such culture has come forth a perfect man, mentally, morally, and physically, nine hundred and ninety-nine have proved unhappy failures.

Boys on the farm, as well as in college, have a future before them, and should be educated in reference to the place in that future which their natural abilities entitle them to fill. Parents who do not act upon this principle, but simply drive their boys like horses or oxen to the plough, will find their farm improvements paid for at a dear rate, and need not wonder at finding themselves deserted and left to a lonely old age.

The class of farmers now fast coming upon the stage are beginning to learn that they must progress with the times, that they must admit science and intellect into their fields and barnyards where they want their boys to work, or the boys will soon grow restless, performing their labor like so much mere drudgery, and longing for their days of freedom when they can go out into the world and be like other people; and they will go, as generations past have found to their sorrow, unless employment is given to the brains as well as to the hands. Formerly it was not thought necessary for farmers to have brains at all; at least, it was not supposed that there was any necessity for using them in connexion with farming operations. The main thing was to work, and anybody with ordinary senses and two good stout hands could do that. It all did very well, perhaps, in those quiet old times, when one generation trudged on after another oblivious of the existence of elements in water, earth, and air, that were waiting but the electric touch of science to make them burst forth into the blaze of light, flash after flash of which has startled the agricultural world with new developments almost numberless during the past ten or twenty years.

How obstinately the mass of those old-time farmers shut their eyes against the light! They had their hands and hoes and ploughs and oxen; what use had they for brains or brain work in books or papers? They closed their doors against knowledge, and put up their bars and padlocked their gates against any threatened innovations of science. It was work they wanted of the girls in the house, and work they wanted of the boys in the fields. And th boys and girls did work, but they were listening and looking too—and thinking. Listening to the sounds of new life waking in the world without, looking with great longing toward the distant and forbidden lights, and thinking, not as they should have been taught to do, how they might kindle new fires on their own hearthstones; not how they might open the gates of prejudice to let in something of the life that so tempted them from without; but only of the day when they should be legally free from parental control, and at liberty to turn their backs upon the old homestead and the monotonous drudgery of farm life together and forever.

This has been what thousands of farmers' sons and daughters have done, and is what thousands more will do, till farmers as a class are willing to welcome improvement, to seek for light, and use it when they get it. They are learning to do so gradually, individually. The good leaven thrust into the old meal tubs by diligent and earnest thinkers is working and spreading. Men see that only in the light of science can labor such as the farm requires be made attractive and elevating. It is true, men and boys can dig and plough and sow and reap in the old way, and make a living at it; but the further behind the times they are, the more frequent will be the desertions from their ranks of the young and strong, who bend toward the excitement of change and improvement as young plants bend toward the light of day. Changes, innovations, improvements, are going on everywhere else; why not in the fields and household of the farmer as well.

Another way in which great wrong has been done the boys is through the habit many parents and sisters have of treating them as inferiors. It is a habit thoughtlessly acquired, and thoughtlessly practised; but for all that, not the less unjust and cruel in its results. It is a very common thing in farmers' families to see great partiality shown the girls in regard to attentions bestowed upon personal appearance, and time and opportunities allowed for the cultivation of those little accomplishments which give young people ease and confidence in society and in themselves. It is not thought that the boys, great rough fellows, with their big hands and rusty boots, have any need of accomplishments. What company fit to be admitted into the parlor would ever wish to see them, or how could anybody expect that they could be made fit to be seen in the parlor? Those boys with their coarse, dusty clothes and rough air, no, indeed; nice chairs and lounges and carpets were not made for such s they. When company comes to spend the evening, the girls can brush their hair, slip on a clean dress, and assist their parents in entertaining them; but the boys are seldom thought of as a part of the family on such occasions.

A case in point was where the visitor at a wealthy farmer's house had withdrawn, with the farmer and his wife and two daughters, to the parlor after supper. They were social, pleasant people, and the girls exerted themselves to make the evening pass cheerfully. One of them gave some passable music on the melodeon, but remarked, looking wistfully at her mother, that her brother George played and sung so much better than she it was a pity he could not come in. She was met by the reply that if one of the boys came in all the rest must follow, and they were so rough the kitchen was the only place they were fit for.

So the boys stayed in the kitchen with the hired man, not because they were not as smart and intelligent as their sisters, but because, as they were only boys, the parlor was too nice for them. They were particularly noticed the next day, and as far as fine forms moved by active limbs, and good features lighted up by bright eyes could go to make sons to be proud of, there was certainly cause for parental pride in them; but they were shy of being spoken to, awkward and ungainly in manner, and ate their meals and went about their work in a sort of dogged, care-for-nothing way, as if that were all they new, and all they expected to know.

Another thing was noticed. The house being a large and new one, the owner was not a little proud of it, and desired his daughters to show the company through all the rooms from cellar to garret. Comfort and convenience seemed to reign everywhere, with but two exceptions—in the parlor and in the boys' chamber. There was too much furniture and formality in the former, and far too little in the latter. The girls had a beautiful, light, airy room, nicely carpeted. There was a toilet stand with all its tasteful appliances, a table with a few books and magazines upon it, and two or three pretty pictures hung against the walls. Passing this, there was a door standing open which gave a view of a large, cheerless looking chamber in which stood two beds in opposite corners. There were three windows, two of which were curtained by an old sheet which had been divided between them, and the other was bare as the glazier had left it. There was no carpet on the floor, no picture on the walls, and the only furniture besides the beds was two or three chairs, a row of clothes hung along the wall at one end, and several pairs of coarse boots and shoes under them. One of the sisters stepped on a little in advance and drawing the door shut, remarked, "O, that is only the boys' room; there's nothing in there you'll care to see." Enough was seen, such as it was.

Now, let common sense ask if it is doing the boys justice to treat them so. There they are, working faithfully in the fields day after day and year after year. The fruit of their labor has gone very far towards building and furnishing the house, and yet what enjoyment have they of it? They get their meals there, and sleep there, and it is called their home. As much may be said of the old watch-dog in the yard. But mothers protest that boys are always so rough, especially farmers' boys; nothing else can be expected of them.

Of course not, with such treatment. If they are brought up rude and rough, no one can wonder or blame them if they act so. But should they not in justice have the same chance for life and the full, free, home enjoyment of it as their sisters have? Let parents try the boys, and see if they will not improve as well as their daughters in matters of deportment and personal appearance. When they have company let the sons be treated as members of the family, equally entitled to notice and respect as their sisters, and it will soon be found that they will not be behind in contributing to the interest and entertainment of the home circle. Furnish their rooms in a way that will be comfortable and attractive, and see if they do not show a proficiency in the arts of order and neatness that will convince these skeptical mothers that their sons are as capable of being gentlemen as their daughters are of being ladies. Boys should be encouraged to respect themselves, and to try to be somebody; and should have material given them to do it with. That is, they want a toilet table and glass in their room, with combs, brushes, and conveniences for washing. It is always to be supposed that they have a second suit to put on if occasion requires, and at a very trifling expense a pair of slippers or house shoes could be provided, so that the heavy dusty boots might no longer stand between them and the parlor door. If mothers and sisters were more thoughtful, or less negligent and blamable in this matter, there would be fewer discontented farmers' boys in the world, and there would be far more self-respect and refinement among farmers than can be found now.

Again, sisters are often in the habit of thinking that it is no matter how they dress or talk when "only the boys" are present. That is the very time they should most care. Home is the one place where, of all others, the boys should learn how good, how lovely, and loving woman can be. Sisters can be the making or the ruin of their brothers as they choose. By neglect, unkindness, and unattractive ways, they may create in them a dislike of home, which soon results in the acquirement of loose habits, leading to more vicious company abroad, and too often ending in idleness, profligacy, or crime. Sisters should give their warm home affections to their brothers; confide in, love, counsel, and encourage them. Above all things should their speech be pure, and their dress and person neat. The boys of to-day are the men of to-morrow; whatever they are made by their home education now, such, in a great measure, will be the character they give to the future homes they are destined to make in the world. A sister's actions should always say, "All that is lovely, virtuous, and pure shall adorn my character, my conversation, and my presence, for the boys are here, and are taking lessons of me which will be repeated to future generations." If boys grow up to be noble-hearted, pure-minded men, it is from homes made pleasant and happy by such mothers and sisters that they spring.

That homely old saying, "Just as the twig is bent the tree 's inclined," has no truer application than in regard to the treatment young boys receive from their sisters, especially boys reared in the isolation of farm life. In towns and villages they are less dependent on home associations, and, in a measure, less influenced by them; but on large farms, particularly in our western States, where neighbors are far apart, there is no other resource, no other nursery or school for the cultivation of social and domestic virtues. As the boys find the women of their own households, so will they be very likely to judge of womankind at large. These lessons begin very early in life, too.

A man who is now living, a man of years, a man of the world, remembers thoughts he had on this subject when but a mere child, and says the memory of the scene connected with them can never be blotted from his mind while life lasts. His mother was busy in the kitchen and could not have him there; he had no brother; his sisters, older than himself, would not let him join their plays, and he went out and stood alone to think, ankle deep in snow on the farm-house doorstep. The great cheerless yard before him was a broad, blank sheet of snow; every rail on the fence was white, great drifted heaps were lying in the fence corners, the old tree at the north end of the barn had all its arms full of snow, and the barn itself, and the straw stack with its peaked top, and the patient cattle standing so still in the yard, all looked like so many icebergs frozen fast in the midst of a frozen sea. The long rows of corn set up in shocks in the field below the barn, with their tasselled heads and their snowy blankets but half covering their dusky forms, seemed like troops of savages suddenly checked in their march, and now standing in sullen silence with their backs to the storm. Dismal and dreary enough everything looked to the little boy. His father had gone down to the thick woods to chop, and now and then came up a ringing echo of his axe that sounded like music in the cold purple ears of his son. He could not go to his father for the depth of snow that lay between them; his mother had driven him out of her way, she was a notable housekeeper; he heard the cheerful voices and merry laughter of his sisters who had called him cruel names and sent him from them because he was a boy; and he stood, with the snowflakes melting into his tears, wondering how God would punish women and girls who were so wicked to little boys.

"Girls," he says, "who treat their brothers as I was habitually treated, crush out the tenderest, the noblest, and most kindly feelings of our nature; feelings that seldom spring up again in after life, but are too often superseded by a harsh and sullen temper, and a selfishness equal to that which blighted their first pure and generous emotions."

Little sisters, therefore, have much to do in forming the characters and tempering the dispositions of their brothers. When a boy has no playmates of his own sex, girls should conform their amusements in a measure to his boyish tastes; be patient with his awkwardness, and encourage all gentle and amiable feelings, that he may outgrow the harsher qualities of his nature. Thus he may be made an obliging, affectionate boy, and an unselfish, noble, and pure-minded man, who will respect and honor woman for his sisters' sake.

"Take care of the minutes, and the hours will take care of themselves" is another good and true saying applicable to this subject: take care of the boys, and the men will take care of themselves.

Most boys, especially those belonging to farmers, are rough, awkward, ungainly material to begin with; but look at the block of marble before it is chipped and polished to the perfect statue; or at the ore as it comes rough and shapeless from the earth, and grows through refining arts and proper mouldings to the precious coin that controls the commerce of the world; or the implements of war that, with voices of thunder and blades of keenest edge, decide the destinies of nations.

Yes; these young boys are rough, ungainly looking little animals to take in hand for the purpose of making gentlemen of them. They are, in this early stage, chiefly remarkable for dirty faces, chapped hands, enormous appetites, and a wonderful propensity of knees and toes to go through thick and thin; for, however thoughtless and improvident the boys may be, these members are pretty sure to be "looking out" for themselves. What a trouble to mothers, and what sources of vexation and mortification to ambitious sisters! Yet, in these very boys, looking through their eager eyes, speaking out in their ill-timed inquisitiveness, and manifesting itself in most extraordinary experiments, is the germ of the future perfect man, the fire, the dawning consciousness of power that needs but proper guidance to enable it to control the social and political world. Little barefooted, ragged-kneed, freckled-faced, bright-eyed boys! hardly more need be done with them at this stage than to feed them well and let them grow; only watching for, and tenderly encouraging the growth of all that is good in their natures, and sowing with judicious care such seed of good as nature may have been at fault in supplying.

A little further on in life, when the boy-man has outgrown the child, he wants something more than air and sunshine and food; yet wants these not the less, especially the food; the air and sunshine he will have by virtue of his sex and his occupation; the food must come by favor of others, and should be in quantity and in nourishing qualities all that the vigorous growth of bone, muscle, and sinew requires. But now little evidences of pride in personal appearance are manifest—toes, knees, and elbows less so. The hair, once seldom attended to voluntarily, is now an object of care; the looking-glass is slily consulted, and face and hands are scrubbed to smarting in the secret hope of getting at the bottom of freckles and tan. It is at this age that boys most want sympathy and help from mothers and sisters, and, unfortunately, it is at this very time that they are least likely to get either. It is just here that they are beginning to be valuable as workers, and every moment out of the fields and barnyards is looked upon as so much lost time; while the little attentions to personal appearance, if not broadly ridiculed, are made light of or discouraged till the objects settle down in the sullen conviction that it is no matter how they look or what they try to make of themselves. Mothers and sisters are too much occupied in household affairs, and, the latter especially, in little toilet artifices for their own adornment, to think or care much about the tastes or wishes of those overgrown, uncouth-looking boys, who never seem fit to be seen anywhere but in the kitchen and back yard.

It is not strange that boys thus shut away from the world, deprived of womanly sympathy, and kept in kitchens and back yards, should grow discontented with farm life, possess neither respect nor veneration for woman, and turn out at length to be slovens and tyrants in houses of their own.

A word or two now to fathers. Boys have a right to be considered as not only members of the family in all its social relations, but as proprietors in part of the farm they help to till, and the stock they help to raise. It would greatly encourage habits of industry and foster a manly ambition in them if fathers would treat them more as partners than as servants or mere underlings working for their board. They should have a sheep, a calf, a lamb, a colt, or a pig, which they might call their own, and the increase of which should in reality be theirs to be reared or disposed of for their benefit. Give the boy something to begin with, anything of substance enough to establish a proprietorship in; and add to this a patch of ground with time and means for its cultivation, the produce and proceeds of which shall be the boy's own. These little attentions and concessions of right will work wonders towards developing a lad's manliness, and attaching him to the occupation and the homestead of his father.

Farmers need a hint or two in another matter, also. As a class they are far more niggardly and close with their boys than any other. They keep them more rigidly at work without recreation, allow them fewer holidays, fewer home pleasures, and less spending money to seek variety elsewhere, than the sons of parents in other employments have. Most others, it is true, live in towns, and have recreations at command which cannot be reached in isolated country life; but even those that do offer to farmers are yielded to, if at all, in a grudging and surly manner that takes half the pleasure from them by damping boyish enthusiasm with sordid calculations of time and money wasted. If fathers could only remember their own boyhood, and make up to their sons the privileges and pleasures that were denied to themselves, there would be much gained to each successive generation.

First of all, then, parents should not pervert Nature by trying to make farmers of their boys when she intended them for something else. But having once settled the fact that they are to be farmers, or, at least, that their early years are to be spent on the farm, let the home they there help to make be theirs jointly with other members of the family, to adorn, to enjoy, to honor, and to look back upon from the distance of years with pleasant memories. Here is where the true woman's rights movement should have begun, and must begin: in educating and training up a race of men attached to home, and loving and honoring woman in her relations as mother and sister. The most tyrannic and illiberal men are those who have once been tyrannized over, and debarred from the enjoyments and privileges that nature told them should be theirs. When power does come into their hands they are inclined to use it to excess. Their rights have been disregarded, their pleasures abridged, their desires made light of; why should they consult the wishes, pleasures, or rights of others?

Begin, then, by making home happy for the boys. If it is a happy home for them, it will be for all. Mothers and sisters hold the destinies of men in their hands, and through them the destinies of future wives, mothers, and sisters also. By the sweet influences they may throw around the fireside and the homestead, they may begin and carry to perfection a grander scheme of moral reform than has ever yet originated in the brains of the loudest-mouthed and strongest-minded women of the age. Woman at home is the true reformer, and boy, the incipient man, is the true starting point, from which, if she turns her face in the right direction, she may read success in a brighter and not very distant future.

FARMERS' HOUSES

BY DR. W. W. HALL, OF NEW YORK.

Where to build and what shall be the plan of the house are questions which have to be decided every year by thousands and thousands of enterprising farmers all over the country—either young men just married, who are about "opening" a farm in the boundless west, or by men more advanced in life, who, having done well, have decided to treat themselves and their faithful wives to a new and better house than the one in which they have lived and striven so long and so well together. In either case it is of the first consequence, and is necessarily the first step to be taken, after having decided to build, to fix upon an answer to the question—

WHERE SHALL I BUILD?

Upon the wise decision of this important inquiry depends to a greater or less extent the health, the consequent happiness, and eventual success in life of every young farmer. It has been the experience of tens of thousands who began life hopefully, and who went to work with willing and brave hearts to "clear" a farm, and make it a home for life for themselves and families, that they did well until sickness came. under which their strength and energy wilted away like a flower without water: they fell behindhand, lost their energy, ran in debt, and, finally, settled down in the poor ambition of only meeting their expenses from month to month, their idea of getting ahead having been abandoned forever.

It is demonstrably true that the difference of a few hundred yards—of a dozen rods sometimes—in locating a dwelling for a family, is precisely the difference between its extinction in a few years by disease, and its prosperity, its health, and a large family of industrious, manly sons, and of refined, educated, and notable daughters. A citizen of New York purchased a beautiful building site for a country residence, and, after spending two years and a large amount of money in preparing it for the reception of his wife, children, and servants, he moved into it. Everybody was delighted with the "prospect" which it afforded of river, and field, and woodlands, and distant mountains. With autumn came chills and fevers among his servants. He abandoned it, and never occupied it afterward, being wholly unwilling that his family should live where such a disease was possible.

A publishing house in this city erected a private residence in the country at an expense of over thirty thousand dollars. It could be seen for many miles around; while its spacious piazzas afforded near and distant views, which delighted every visitor, During the very first year such a deadly pestilence broke out among the inmates that it was at once abandoned, and was eventually "sold for a song." It is now known by residents on the banks of the Hudson as "Blank's Folly."

A wealthy and retired citizen of New York built for himself a splendid mansion up town, about four years ago, anticipating that it would be his home for life. He had occupied it but a short time, when one by one the members of his family were taken sick. A strict examination discovered the fact that the house had been erected over a "filling," the emanations from which, constantly ascending, impregnated every room in the building with deleterious gases. It was at once abandoned for another home.

The hospitals and barracks in and near Bengal are now almost useless, having been built in a locality utterly unfitted for human habitations, as far as health was concerned. Their erection cost the British government sixty-five millions of dollars. This great waste of money might have been altogether avoided by the application of a very limited knowledge of the causes of disease.

From official papers presented to the British government, it is shown that of each hundred British soldiers in India, ninety-four disappear from the ranks before the age of thirty-five years, when, from military returns, it is known that "the average standard of health for Europeans in India would compare with that existing anywhere else in the civilized world, if the known sources of disease were dried up." It is admitted that in forty years one hundred thousand men might have been saved, "if proper localities had been chosen for their dwellings."

It is undoubtedly true that the difference of a few feet in the locality of two buildings is the difference sometimes between life and death. These things being so, it is a matter of personal happiness and pecuniary interest to every farmer who contemplates building a house, which is to be a home for himself and family probably as long as he lives, to possess himself of such information as to enable him to ascertain certainly why are certain localities so prejudicial to the health of families residing therein; or, in other words, what is the agent which causes disease in this mysterious manner? It may seem discouraging at first view to state that this destructive agency is as invisible as the viewless wind. At the same time, it will afford encouragement to be assured that its nature is known, as also some of the laws by which it is regulated, and that by an easy attention to them the Samson may be shorn of his locks, and the great destroyer may either be avoided or rendered as harmless as the gentlest touch of infancy. The name of this remorseless destroyer of human life is

MIASM,

From a Greek word, which means *emanation;* that is, arising from, because it comes up from the surface of the earth. It is a short word; but it brings weary sickness and agonizing death to hundreds of thousands every year. It will bring sickness and death, sooner or later, to many a reader of this article, but a sickness and death which could have been avoided.

Miasm is the principal cause of nearly every "epidemic" disease; that is, of every sickness which "falls upon the people," attacking numbers in any community, such as fever and ague, diarrhœa, dysentery, cholera, bilious, intermittent, congestive, and yellow fevers. But it is gratifying to know that it is an avoidable cause of disease. Money and wisely directed efforts can banish it from almost any locality. All that is needed is to know the laws of miasm, and wisely adapt ourselves to them.

In 1860 one of the daily papers of New Orleans stated:

> "The yellow fever has broken out in the city under every conceivable variety of circumstances: when the streets were clean and when they were filthy: when the river was high and when it was low; after a prolonged drought, and in the midst of daily torrents; when the heat was excessive, and when the air was spring-like and pleasant; when excavations and disturbances of the soil had been frequent, and when scarcely a pavement had been laid or a building erected. Almost the only fixed and undeniable fact connected with the disease is, that its prevalence is simultaneous with the heats of summer, and that frost is its deadly enemy."

Here, then, are two important laws of miasm; and scientific observation directed to that special point in all countries confirms the two great truths, that—

First. Miasm prevails in hot weather.

Second. Miasm cannot exist as a cause of disease in cold weather.

Third. An inference is drawn embodying a third law of miasm, which is, that it is a cause of disease only from June to October in our latitudes.

Fourth. A fourth law of miasm is confirmed by the now historical fact that for three summers yellow fever has not been known as an epidemic in New Orleans, because, from the scientific views held by those in power in that city in the early summer of 1861, it has been kept *well drained.* In other words, it has been kept clean and dry.

It is within the memory of the present generation that, some thirty years ago or more, the city of Louisville, in Kentucky, was one of the most pestilential spots in the habitable west. But by a wise system of filling and draining, it is now one of the healthiest, as well as one of the most beautiful cities of the great valley.

We have, then, arrived at four controlling facts in reference to miasm: that heat and moisture are essential to its production in any locality; that it cannot exist where there is severe frost or great dryness.

But as it is known the world over that miasm never exists in deserts, where there is nothing but dry sand and a burning heat, it is clear that something more than heat is necessary to cause miasm. But it is further known that when miasm is so malignant in localities where it is certain death to sleep on shore for a single night, a man can go a mile and sleep on shipboard, and keep in perfect health. This shows that something more than heat and moisture are necessary to the production of miasm. The third element is vegetation—anything that grows from the earth in the nature of grass, leaves, or wood

These three things in combination are the great agents for the production of miasm: no two of them can produce it. They all must be present together, and for a considerable time, so as to produce destructive decay of the vegetation, which requires a degree of heat exceeding eighty degrees Fahrenheit. These three elements will always produce miasm, whether out of doors, under the influence of the heat of the sun, or on shipboard, or in an uncleanly kitchen, by the heat of stoves or fireplaces.

If, then, a farmer builds his house over a "filling," he will have sickness in his household. If he builds on "bottom lands," "made land," where running streams have in the course of years been depositing decaying and dead leaves, mud, &c., he will certainly have various diseases in his family, unless a system of thorough and constant draining is put in operation.

Ponds, sluggish streams, or any accumulations of water in a productive soil, always yield miasm, and a dwelling in their vicinity will be certainly visited with miasmatic diseases, unless attention is paid to certain circumstances which may modify the result.

Miasm is not supposed to pass a swift-running stream; hence if a stream runs through a farm, and one bank of it is level and rich, the other higher and rolling, better far build on the latter, for then the miasm of the flat land cannot cross the stream to the house. If there is no stream, but a pond or flat land, and the house must be built in the vicinity, build it so that the prevailing winds from June to October shall blow from the house toward the pond or flat land, for miasm, being a gas or air, is carried before the wind.

It is a hazardous experiment to build on an eminence, if it gradually slopes to the water's edge, or to a low, flat piece of ground, unless there is a growth of trees or other shrubbery intervening, because miasm, like the clouds, will sometimes "roll up" the side of a hill or mountain. It is known that vigorous growing bushes, or hedges, or trees, between a miasm-producing locality and a dwelling, antagonize the miasmatic influences, the living leaves seeming to absorb and feed upon the miasm; but there should be a space of fifty yards at least between the hedge and the house, and the thicker and broader and higher the hedge the better, and the nearer the leaves are to the ground the better; for the miasm gropes on the surface in its greatest malignity, and is seldom concentrated enough at the height of ten feet to be materially hurtful to man, unless it comes up a slope. Hence in the old cities of the world, in the times of plagues and pestilences, the people who could not "go to the country" had a custom among them to live in the upper stories of their dwellings while the sickness raged. They would not even come down stairs to obtain marketing, but would let down baskets by ropes to the country people for the provisions they had to sell. But they failed to discover why the country people could come to town with impunity, while they themselves were safe from disease in proportion as they lived in the upper stories of their dwellings. But a law of miasm has since been determined, which beautifully unravels the mystery. Miasm is condensed by cold, made heavy, and falls to the earth, hovering, as it were, within a foot of its surface; hence is not breathed, unless a man sleeps on the ground. On the other hand, heat so rarefies miasm as to make it comparatively innocuous. Hence the coolness of the early morning and of sundown throw the miasm to the surface by condensing or concentrating it, and thus making it heavy; while the heat of the day of a summer's sun so rarefied and lightened the miasm as to send it upward to the clouds. The country people came to town in the daytime!

Less than fifty years ago the yellow fever and other deadly diseases prevailed in Charleston, South Carolina, and it was known to be certain death, except to the very hardy or the acclimated, to sleep in the city a single night; yet the merchants came to town at midday, under a blistering July sun, with perfect impunity. Hence, from June to October, it is best for farmers' families to sleep in the upper stories of their dwellings. In this connexion it is practically useful to know that the most malignant agencies of nature may be rendered harmless by a little observation and the wise use of a little knowledge. Miasm is most pernicious about sunset and sunrise, because the cooling of the atmosphere at the close of the day causes it to become condensed above, to become heavy and fall to the earth, where it is breathed, while after sundown, it has settled so near the earth as to be below the mouth and nostrils; hence it is not breathed. When the sun begins to rise in the morning the miasm begins to warm and to ascend, but after breakfast it is so high as to be above the point at which it can be breathed; and besides, it is so rarefied, so attenuated, as to be innocuous. Therefore the great practical truth beautifully follows, that miasm exerts its most baleful influence on human health about sunrise and sunset; hence, of all the hours of the twenty-four, these are the most hurtful in which to be out of doors, and, for the same reason, the hours of midday and midnight are the most healthful to be in the open air in miasmatic seasons and countries, that is from June to October, north of the thirty-fifth degree of north latitude. But, unfortunately, the cool of the early morning and the late afternoon are the most pleasant times in the twenty-four hours for field work, and the industrious farmer will be exceedingly loth to spend these hours in doors, should his house be already located in a miasmatic situation. There is, however, an almost infallible preventive of any ill effects arising from such an exposure to miasm about sunrise and sunset, and one that is easy of practical application under almost any ordinary circumstances, and it ought to be made known and repeated millions of times through the public prints every year, until the information has reached every farmer's dwelling throughout the United States. Farmers, whose houses are already built in malarial districts, such as in low "made" lands, near ponds and stagnant water, or in the neighborhood of sluggish streams or marshy places, may exempt themselves almost altogether from the whole class of malarial diseases, such as diarrhœas, dysenteries, chills and fevers of nearly every grade, by eating a hearty and warm breakfast before they put their heads out of doors in the morning, and by taking their suppers just before sundown. The philosophy of the matter is that a hot or hearty meal so excites the circulation, and so invigorates the whole frame, that it acquires the power of resisting the disease-engendering influences of miasm. A neglect of such a simple precaution, in certain districts where malaria is known to exist in a concentrated form, is a cause of death so common as to be known and guarded against by the most uneducated laborers. A gentleman, a native of the city of Rome, informed the writer that multitudes of agricultural laborers, who have been employed during the day in the low, level, damp fields near the city, come into town about sundown, and sleep in the streets and on the steps and stoops of houses, in order to avoid the sickly atmosphere of the evening in the "marshes." No less a personage than a young king lost his life within two years, under the following circumstances: Having to pass the night in one of his journeys at a house located in the midst of an extensive lowland or marsh, and wishing to be on horseback early in the morning for a hunt, the landlord pressed upon him the danger of being out early, and that, at least, he should take his breakfast first. The impatient youth was observed early next morning sitting at his open window, enjoying, as he thought, the delightful air, as it blew in upon him, and soon after ordered his horses. He became ill, and died of a fever in a few days.

The writer has lived among the Creoles of Louisiana, where vegetation is rank in swamps, upon which the hot summer's sun beams with fiery power for many hours every day, but they are proverbially exempt from fevers, as are northerners, also, who adopt the habits of the Creole—that is, to have their breakfast, or at least a cup of hot, strong coffee, with milk, brought to their bedsides *before they get up* of a morning. The value of this practice is known and appreciated all over the south, so that, while it is greatly better to locate a house where miasm cannot reach it from ponds, or sluggish streams, or bottom lands, a farmer whose house is already thus situated is not without an efficient remedy in the plan proposed above.

But there is another infallible remedy against miasmatic diseases as to families who feel themselves compelled to live in a house exposed to miasm. It was stated awhile ago that heat so rarefied miasm as to render it innocuous. No family can be troubled with fever and ague in any ordinary locality where that disease prevails, if from June to October a brisk fire is kindled in the family room, to burn for an hour about sunrise and sunset, and if the family are required to repair to that room morning and evening, and remain there at least until they get their breakfast in the morning, and their supper at the close of the day. It follows, then, that ordinarily, there is nothing unhealthful in the night air after supper. On the contrary, health would be promoted, and important social benefits would accrue to country neighborhoods, if two or three nights of every week after tea were spent in friendly visiting, remaining not later than ten, thus encouraging that interchange of social associations which diffuses intelligence, promotes kindly feeling, enlarges the views, expands the ideas, and elevates the whole character by cultivating the tastes as to dress, tidiness of person, and the imitation or copying after any ornament or improvement of the grounds and dwellings of the neighborhood. In this way one intelligent, practical farmer in a neighborhood, by occupying a house which he has built or remodelled for himself, so as to have all the comforts and conveniences which knowledge and observation and experiment have found to contribute largely to the health, happiness, and thrift of the occupants, will prove a leaven which shall spread from one habitation to another in a comparatively short time, until every dwelling in a circuit of many miles will be more or less improved, and thus the face of the whole country be changed for the better, with the promise and realization of a further progress onward and upward.

RECAPITULATION.

Although the statements which have been made were presented in connexion with the selection of the most healthful locality for building a new family residence, they are practically applicable to all cases wherein it may be desirable to make a house already built more comfortable and more healthful than it is, because, from what has been stated, it will be seen that a dwelling already erected should not be hastily and blindly abandoned merely on account of its insalubrity, for, in the light of the above statements, it may be found that the causes of any present sickness are of a transient or of a remediable character, which may thus be illustrated.

The most favorable circumstances for the production of a miasmatic epidemic—speedy, malignant, and wide-spreading—are the exposure of the muddy bottom of a pond or sluggish stream to the beaming heat of a summer's sun. In less than a week whole neighborhoods have been stricken with disease, yet, under such circumstances, and according to the well-established laws of miasm, five families may dwell within half a mile of a drained mill-pond, and yet only one will suffer from it, while the other four will remain exempt from unusual disease.

First. If a rapid stream of considerable width runs between the drained pond and the house.

Second. If there is interposed a thick hedge or growth of living, luxuriant trees or bushes. A treble row of sunflowers is known to have answered the purpose in repeated cases.

Third. If the prevailing winds from June to October are from the house toward the pond.

Fourth. If the house be on a steep hill.

The reasons for the above exemptions are here shortly recapitulated:

First. Miasm does not cross a wide, rapid stream.

Second. Miasm is absorbed by thick, living, luxuriant foliage.

Third. Miasm cannot travel against the wind.

Fourth. Miasm cannot ascend a high, steep hill.

There is no mystery in these variations, nor any complexity, when the laws of miasm are thoroughly understood.

It will be practically useful for the young farmer, in a pecuniary point of view, to understand, further, that in one year a house on the banks of a mill-pond or sluggish stream may be visited with sickness; the very next year that same house may be exempt, because it is a very cold summer; the third year it will escape, because it is a very hot summer; the fourth year it will be a very healthful habitation, because it has been a very wet summer. Why these variations?

First. Miasm cannot form, or if it does, cannot rise through a foot or two of depth of water, and the wet summer kept the pond covered.

Second. The hot summer dried the bed of the pond to dust, and there can be no miasm without dampness.

Third. The cold summer did not give the degree of heat necessary to the generation of miasm—that is, eighty degrees of Fahrenheit.

These principles fully explain the apparent mystery of the epidemics in New Orleans, already referred to in the first part of this paper.

An illustration of the laws of miasm, which the writer will never forget, was had during a cholera summer in Boston, under the following circumstances: The city authorities inaugurated a most perfect system of cleanliness. Efforts were made to procure the services of the most reliable men to visit every house from cellar to garret, and compel the removal of everything which could have even a remote tendency to invite the fearful scourge. The results were admirable; there was not a single case of cholera, except in a very restricted district; in fact, only one family was attacked. A more special examination was instituted, when there was found, in a remote corner of the cellar, a large pile of the accumulations of bad housekeeping for years, and this was in a state of putridity. On its removal, and the plentiful use of the most powerful disinfectants, the disease at once disappeared, and did not return.

CELLARS IN DWELLING-HOUSES.

With a fact like the above staring one in the face, and in connexion with another, that farmers generally make their cellars the winter and summer receptacles of every variety of vegetables and fruits, more or less of which are put away in a bruised, rotted, or unripe condition, and thus speedily become putrid by fermentation without the aid of much heat, it is apparent that these gases are constantly ascending, and must unavoidably impregnate every room in the house with a vitiated and unwholesome atmosphere; and in consequence of another known fact, and unfortunately almost universal, that the cellar, being convenient and "out of sight" of visitors, is made the receptacle of all that is old and unseemly, as well as of kitchen offal, by the laziness of bad housekeepers or unprincipled servants. For these considerations, it is clear that it would be better if no cellar should be built under that part of a house which is to be occupied as a place to eat and sleep and live in, whether in town or country. But, as in the country, the cellar is regarded as an indispensable part of the house, the greatest precaution should be exercised to insure cleanliness and pure air with ventilation, preventing it from becoming the fruitful source of sickness and suffering.

In a family in one of the healthiest villages of Massachusetts a few years ago the father and three children died of an obstinate slow fever, and the mother and two other children were "hard at death's door" for weeks. Before the fatal results, but too late to prevent them, an examination of the house by order of the physician disclosed in the cellar a barrel partly filled with decayed onions, the undoubted cause of the disease. If there is any obscure or slow disease in the family of any reader of this article, and a cellar is attached to the building, it is worth the experiment to secure the following "alterations" as to the cellar: Let the cellar be emptied of every movable thing; let the walls and floor be thoroughly swept, and, if practicable, washed; and after being allowed to "air" for a week or two, have the ceiling plastered. The walls should be smoothly plastered, and the floor covered with a hard cement, thick, smooth, and strong; and both walls and ceiling should be well white-washed once a year, and the old whitewash should be swept off before the new is applied. The best, because the cheapest and most universally available whitewash, is made as follows: Put unslacked lime, that which is in the form of the original rock, in a vessel; pour boiling water on it until it is covered; place a cloth over the vessel so as to confine the most minute particles of the lime, they being the ones which most perfectly "penetrate" the surfaces to which the wash is applied, and consequently remain the longest. Subsequently dilute the wash to the consistence of thick cream, and apply it thoroughly and thickly, thus accomplishing two objects, a white, light-giving surface, having a "body," as painters term it, which is capable of absorbing, and thus rendering harmless the "bad" airs or gases which may be formed in the cellar.

Every partition and every shelf in a cellar should be made of smoothly planed boards, well covered with good white paint, thus preventing the accumulation of dust, and aiding in making the cellar light, cheerful, and clean; for the more light you can have the better. Every cellar should be so contrived that either by its grating or windows or doors it may be easily and thoroughly ventilated an hour or two at least every day in the year; this is often very perfectly done by a flue running into the chimney.

It is scarcely necessary to remark that if a cellar is liable at any time of the year, even for a few days, to have water rise and stand on the floor, or even to have the floor a little wet, draining tiles should be put under it before the floor is "cemented." All shelves in a cellar should be so arranged that you can go all around them; it is not advisable to put any shelving against a cellar wall; and if all the shelves are suspended from the ceiling, so much the better on several accounts, not the least of which is that more "floor room" is thus obtained.

When a house is to be erected in a new locality, and it has been wisely determined to have the cellar off from the family building, but yet to be easily accessible from the kitchen without having to go "out of doors"—say under the kitchen itself, or under the wood-house, or simply under the ground, its roof being a part of the front yard or garden, if you please, but so covered over with soil and grass, bushes, &c., that it would not be known to be there—the next point is to arrange that the foundation of the house should be laid on stone, at least three feet deep, and on a spot descending, if possible, in every direction. The walls of the house should be at least two feet above the surface of the earth, crevices having been left at intervals on each side, so as to admit a free circulation of air, but not large enough to admit mice. There should be an open ditch all around the inside of the wall, as a drain to any dampness, with a sufficient descent, at least at one point, to insure the drain to be passed off.

It is well to plaster a foundation wall inside and out, and to have every stone well laid in a good mortar, not being sparing of lime or sand in its preparation. Too much "loam" or common dirt is generally used, so that the mortar crumbles to powder, has no tenacity, no binding power, instead of hardening and becoming a part of the wall itself.

The space between the lower edge of the joists of the ground floor and the upper edge should be filled with dry sand, ashes, or, which is much better, charcoal, for the three-fold object of, first, keeping the lower floor dry ; second, keeping it warmer in winter; third, absorbing any deleterious gases which might arise from the ground. As to the materials for building, each locality has its peculiar conveniences; but it should not be forgotten that wooden buildings are best for the country, because they are dryer, and consequently more healthful.

The best kind of roof for a country house is the old-fashioned steep roofs, with a "comb" in the centre, with no "hips" or dormer windows; these may make a building more picturesque, but they so generally leak that a plain, steep, shingled roof is safer, more economical, and more universally available.

WATER.

The first consideration is pure, soft water. That from a spring is most to be desired, and can easily be procured by means of pipes when the spring is above the residence. If the spring is on a level with or below the house, and is copious, with some fall, a portion can be thrown up into a reservoir at the dwelling by means of a water-ram or other simple and unexpensive machinery. And by the same means, and from the same source, the dairy (and, if possible, the barn also) should be well supplied.

If no sufficient spring is convenient, a well (with an old-fashioned pump in it) where soft water can be obtained by digging, is probably the next best source of supply, as it, too, is always cool and lively. Every part of the kitchen, the wash and bake house, the dairy and barn can be supplied from the pump by the aid of pipes, saving much labor at small cost.

But in limestone and other sections where pure soft water cannot be obtained from a spring or by digging, by all means provide a capacious cistern for the dwelling and another for the barn buildings. That is a miserable and costly economy which substitutes barrels, hogsheads, stands, and other such insufficient contrivances to procure rain water for cleansing purposes to save (?) the cost of a good large cistern in the first place! By means of properly constructed filters attached to the cisterns, and by keeping roofs free from pigeons and other poultry, clean pure soft water can always be provided in great abundance; and by the aid of an ice-house (which may be provided in most localities at comparatively small expense) the water can also be made refreshingly cool. But of ice-houses in another place.

The roofs of barn and dwelling will furnish an ample supply of rain water for any farmer's use, and, next to pure spring or well water, it is the most healthful for drinking and bathing, as well as best for cooking and washing. "Hard water," as it is commonly called, not only lays a foundation for many tormenting chronic complaints, but fails to soften meats and vegetables in preparing them for food; and for cleansing purposes it involves expense for additional soap or other alkaline substances, and increased labor in its applications. Even for farm stock it is not as good as soft water, and is very apt to give animals a rough "staring" coat.

But, whatever kind of water, provide it in abundance, and by all means have it convenient for all purposes. The expense of these conveniences will be more than saved in health, in labor, in time, and even in comfort alone. No woman should ever be required to go from the warm kitchen, the steaming wash-tub, or glowing oven, into the cold or damp outer air for a pail of water, when it can so easily and so cheaply be conducted to her hand in the kitchen, bake, and wash-house, or dairy. Many screaming babes (and the sleepless household commiserating the little sufferers) have protested against this unthinking barbarity inflicted on them through their much-suffering mothers. And many blooming maidens and useful wives are now "under the clods of the valley" because of colds caught by running out in the bleak winds or frosty air for a pail of water while over-heated. And even the parsimony which required these sacrifices has been pained to the very bottom of the purse by the reflection that the doctor's and undertaker's bills, to say nothing of the loss of valuable services, would have far more than paid all the cost of conducting the water to where it was needed for use from spring, well, or other reservoir.

But whether spring, well, or cistern be employed, examine them often and carefully, and especially each spring and fall, and have them thoroughly cleansed when needed.

WATER PIPES.

Due care and caution should be used in the selection and use of pipes for conveying and distributing water to the buildings. Where suitable timber is cheap, the large pipes (or mains) may be most easily and cheaply made of logs. Iron is probably the next in cheapness in some sections. Earthen mains, when properly vitrified (hard-burnt and glazed) are sometimes preferred. And for distributing pipes, where zinc or tinned pipes cannot be afforded, lead is the most common material—and against the action of vegetable matter, and of some kinds of water, on this mineral, the utmost caution should be used. Some water, as the Schuylkill, which supplies Philadelphia, contains an element which forms on the inside of the pipe a film which is absolutely impervious by the water, and protects the lead against all corrosion or chemical change. And in cities and large towns, where the water is kept running almost incessantly, time is not allowed for chemical action on the lead, where the same water, through the same pipes, would produce speedy sickness in a farm-house. It is water stagnant in a lead pipe which causes mischief, so that every faucet should be allowed to run the water waste for at least one minute the first thing in the morning, especially in the kitchen. Comparatively little harm would result under ordinary circumstances if, while the leaden pipes are laid, the most special care should be taken as to these points:

Allow no angles in the pipes.

Let every piece of pipe which is horizontal lie perfectly straight.

Have all curves as large as possible.

Have no indentation on the outside of the pipe for this may cause a projection on the inside.

Be at great pains that no pebble or other thing shall be left in the pipe at the time of its being laid.

In all cases (if alone to prevent clogging and uncleanness) have a suitable screen or coarse woollen filter placed at the point where the spring enters the pipes or where the rain water from the roofs pours into the pipes by which it enters the cistern, so as to exclude all moss, leaves, insects, or other matter liable to decomposition.

All these look to one point—that is, the prevention of any sediment lodging at any one point, for where this occurs there will be found the elements of corrosion and chemical change from which the poison comes.

KITCHEN.

All persons of cultivation and refinement must instinctively shrink from cooking in the dark. Hence, it should be arranged that this department should have all the daylight possible, and also that the "back-yard," as it is called, and which is usually in the rear of the kitchen, should have the advantage of abundant sunshine, so as to keep it dry and healthful.

A little sink near a kitchen door-step, inadvertently formed has been known, although not exceeding in its dimensions a single square foot, to spread sickness through a whole household. Hence everything of the kind should be studiously avoided, so that there should be no spot about a farm-house which can receive and hold standing water, whether it be pure rain from the sky, the contents of a wash-basin, the slop-bowl, or the water-pail.

As to the shape and size and height of the rooms, each builder must decide for himself, according to his taste and the length of his purse. A square building gives most room for the same money, and a broad hall in the center of the building affords greater advantage than any other arrangement.

"High ceilings," as they are called, are now much the fashion, but they are more costly in the first place, and occasion an unnecessary waste of fuel. They are commended for their spaciousness, but they sometimes give a barn-like appearance to a house, and are never so cosy as rooms which are not quite so high.

Winding stairs are objectionable everywhere, but especially in the country, where persons rise by daylight or sooner, and where there are old persons or young children, as in haste or darkness there is danger of falling and breaking or disjointing the limbs or neck.

It is a great saving in the cost of furniture, if, in the erection of new buildings, and in the modification of old ones, large, light, and roomy closets are plentifully supplied, and with them shelves, hooks, and drawers. Many persons in the country when "dressed" show bad house-keeping and characteristic slovenliness, by having their outer garments marked with innumerable "creases," showing that they have been thrown negligently into a drawer and allowed thus to remain from one "going out" to another. The outer dresses of both sexes should be hung up in closets, protected by doors from dust; and to this end every farm-house should have a great abundance of closet room. These closets should always be large, and all the doors should be hinged within two or three inches of the wall, so that there may be no dark corners for the collection of dust or other improper things, or for the hiding of what is valuable, occasioning the loss of valuable time in searching for it. For the same reason there should be no "closets" arranged under the stairways unless they are lighted in some way.

Every room should be so arranged, if possible, that there should be at least one window opposite another, or a door, so that the room may be speedily and thoroughly ventilated by opening both at the same time. Transoms or movable sash over the door are very essential in bed-rooms in securing ventilation.

CHAMBERS.

One of the most general and, at the same time, one of the most pernicious errors in modern architecture, especially in the construction of private dwellings, is founded on the mischievous supposition that almost any place is good enough to sleep in. It is common everywhere to set apart the smallest rooms in the house for sleeping apartments. To show what a ruinous mistake this is, let the reader remember that at least one-third of a man's existence is spent in bed in sleep. Eight hours out of every twenty-four we are in our chambers. And when it is considered that air is essential to health, that without it we cannot live two minutes, it must be of material importance whether we breathe a pure or impure air for a third of our existence. A full-sized man breathes—takes into his lungs—at each breath about a pint of air; while in there all the life-nutriment is extracted from it, and, on its being sent out of the body, it is so entirely destitute of life-giving power that if rebreathed into the lungs again, without the admixture of any pure air, the individual would suffocate—would die in sixty seconds. As a man breathes about eighteen times in a minute, and a pint at each breath, he consumes over two hogsheads of air every hour, or about sixteen hogsheads during the eight hours of sleep: that is, if a man were put into a room which would hold sixteen hogsheads of air, he would, during eight hours of sleep, extract from it every atom of life-nutriment, and would die at the end of the eight hours, even if each breath could be kept to itself, provided no air came into the room from without. But when it is remembered that however pure the air of the whole room was at first, it becomes contaminated by the first expiration, hence only the first inspiration is pure, and each one thereafter becomes more and more impure unless there is some ventilating process going on.

Every individual has, in his own experience, demonstrative proof of the impurity of the air of a room in which a person has slept all night by the "closeness" he has observed on entering a sleeping apartment after a morning's walk, and this, even when more or less fresh air has been coming in through the crevices about the doors and windows during the whole night. The most eminent physiologists, at home and abroad, have estimated that no sleeping apartment, even for a single person, should have a floor surface of less than what would equal twelve feet long and twelve feet broad, or one hundred and forty-four square feet, and eight or ten feet high, or about twelve or fifteen hundred cubic feet to each sleeper. But the sleeping apartments of hotels, the state-rooms of ships, steamboats, and steamships, do not average one-third of that cubic space to each sleeper. The state-room of a steamer is ordinarily eight feet long, seven broad and seven high, and even these are adapted for two sleepers. As, therefore, each out-breathing vitiates the whole air of a room, as a drop of milk will discolor the whole bulk of water in a tumbler, the chambers for the members of farmers' families should not only be large and commodious, but should be so arranged that a system of ventilation, at least to a small extent, shall be going on all the time, not only in spite of inattention, but a system which cannot be easily prevented, which is accomplished by the simple expedient of having a fireplace in each room which cannot be closed with screens or "summer blowers;" for by this means a draft will be made by the cold air coming in at the bottom of the doors and from other places, passing over the floor towards the open fireplace, driving the heavy carbonic acid gas before it up the chimney.

For the purpose of more perfect ventilation of each apartment, especially those which are to be occupied as chambers, the sashes should be so arranged that they can be let down from above as well as raised from below, for the reason that the foul air of a room rises to the ceiling in warm weather because it is lighter than cold air. This makes room for the cold air from without to rush in at the lower part of the window; thus a "circuit" or draught of air is soon formed, admitting pure air from below and driving the foul air out of the room above. But every chamber should be so constructed that a window can be kept open or raised, more or less, without having the draught come right in upon the sleeper, and it is safer that whatever draught there is should pass the foot of the bed rather than the head, because the feet are always covered. Hence it is not so easy to take cold nor so dangerous. The air blowing in upon a sleeper's head, for even half an hour, has often caused quinsy, or other form of sore throat, to prove fatal in the course of a very few days.

Where windows are already constructed so that they cannot be let down from the top, there is an admirable contrivance by which a draught is less dangerous than in from the window recommended above. Have a planed board made the breadth of the window in length and five or ten or more inches broad, raise the window, then close the space made, with this board, allowing the lower part of the window sash to rest on this board so as to hold it in its place. This allows an open space between the glass of the upper and lower sash, through which the cold air will come with considerable force. with the current directed upward, toward the ceiling, thus making it quite safe as to the sleeper. When there is only one opening into a room from out-doors, the physical law which governs the atmosphere operates so that the warm, impure air goes outward at the upper part of the opening, while the pure air from without comes in below. This may be proven any winter's night by placing a lighted candle or other flame at the lower opening, when the flame will turn inward; if put at the top it will tend outward.

If a neglect of these things were invariably followed by death before morning, attention to them would be compelled. But, although the deleterious effects do not thus speedily and impressively follow, they do inevitably result to all persons under all circumstances; coming on slowly, it is true, but none the less surely and disastrously. To show what a little taint in the atmosphere not natural to it may affect the whole system, it is only necessary to state an observed fact, that a man who sleeps near a poppy field, with the wind blowing towards him from the field, will die before morning. A canary bird, in its cage, hung to the ceiling of a curtained bed where there were two sleepers, was found dead in the morning. Professor Carpenter, the first physiologist in Great Britain, ascertained that an atmosphere containing six per cent. of carbonic acid gas would produce immediate death; and that less than half that amount would prove fatal in a short time. But every expiration of a sleeper brings out with it some portion of carbonic acid gas, and disperses it through the room; and if six per cent. of carbonic acid gas will cause speedy death, the effects of breathing it nightly, even in very small quantities, for twenty or thirty years, cannot be otherwise than pernicious to the whole system, must lower the standard of human health, and materially shorten life.

But not only is the air in a close room thus constantly being impregnated with carbonic acid gas to the amount of about twenty-eight cubic inches per minute for each adult sleeper, but the lungs and pores of the skin are constantly discharging an equal amount by weight—that is, three and a half pounds in twenty-four hours—of effete, decaying animal substance, in the form of invisible vapor, which we often see condensed in drops upon the window glass of crowded rooms, rail cars, or other vehicles. These drops, if collected and evaporated, have been found to leave a thick, putrid mass of animal matter, which is believed to be quite as injurious as carbonic acid gas if breathed into the lungs; but if not at all injurious, the idea must be abhorrent to every feeling of purity of taking such a substance into our bodies, and incorporating it into the very blood which is at the next instant to be dashed to the lips and tongue for food and nutriment.

In the winter of 1860 a man named Robertson, his wife, and three children were in the habit of sleeping in one small, ill-ventilated room. One morning, about five o'clock, the wife woke in a very exhausted state, and found her infant of nine months dead in her arms. She immediately aroused her husband, who had barely strength to get out of bed. They next discovered that their son of three years of age was also dead, and a daughter of nine in an apparently dying condition, but recovered on being removed to another apartment. Facts like these show that breathing a bad air for a single night is perilous to life, and ought to have an impressive effect on the mind of every man who has a family when he is contemplating building or arranging for them a home for life.

Every chamber, then, should be arranged to have a ventilating process going on all the time, when it can be done by having an open fireplace in it; and as there can be no advantage, but a positive injury, resulting from sleeping in any room colder than forty degrees above zero of Farenheit, a little fire should be kept burning in the grate or fireplace under such circumstances. This creates a draft up the chimney, and keeps the atmosphere of a sleeping room comparatively pure. In cases of sickness, where an actual fire cannot be kept, an admirable substitute will be found in placing a large lamp in the fireplace, to be kept burning all night. This creates a draft without making much heat, and is a good means of ventilating a sick chamber when warmth is not desirable, such, for example, as in measles, scarlet fever, and other skin diseases, where a cool air, and at the same time a pure one, is an indispensable means of a safe and speedy cure. But let it always be borne in mind that cold air is not necessarily pure, nor is warm air necessarily impure.

With a little fire in a cold bed-room not only is the chamber kept ventilated, but fewer bed clothes are needed; less clothing does more good next day, while there is a freer escape of gases and exhalations from the body of the sleeper, and the person wakes up in the morning more fresh and vigorous.

Chambers should not only be constructed with a view to a constant, thorough, and unpreventable ventilation, but also with an eye to their perfect dryness and their free exposure to the sun for the greater portion of each day.

Florence Nightingale, whose beautiful name and more beautiful character, which will go down to posterity with that of John Howard and Dorothea Dix, and others of nature's nobility, writes, after long years of experience with the sick and suffering:

> "A dark house is always an unhealthy house, always an ill-aired house, always a dirty house. Want of light stops growth and promotes scrofula, rickets, &c., among children, People lose their health in a dark house, and if they get ill, they cannot get well again in it. Three out of many negligences and ignorances in managing the health of houses generally I will here mention as specimens. First, that the female head in charge of any building does not think it necessary to visit every hole and corner of it every day. How can she expect that those under her will be more careful to maintain her house in a healthy condition than she who is in charge of it? Second, that it is not considered essential to air, to sun, and clean rooms while uninhabited, which is simply ignoring the first elementary notion of sanitary things, and laying the ground for all kinds of diseases. Third, that one window is considered enough to air a room. Don't imagine that if you who are in charge don't look after all these things yourself, those under you will be more careful than you are. It appears as if the part of the mistress was to complain of her servants and accept their excuses, not to show them how there need be neither complaints nor excuses made."

In reference to the same subject, and in confirmation of what has been already stated in this article, Dr. Moore, the metaphysician, thus speaks of the effect of light on body and mind:

> "A tadpole confined in darkness would never become a frog, and an infant being deprived of heaven's free light, will only grow into a shapeless idiot, instead of a beautiful and responsible being. Hence, in the deep, dark gorges and ravines of the Swiss valleys, where the direct sunshine never reaches, the hideous prevalence of idiocy startles the traveller. It is a strange melancholy idiocy; many citizens are incapable of any articulate speech; some are deaf, some are blind, some labor under all these privations, and are misshapen in almost every part of the body."

I believe there is in all places a marked difference in the healthiness of houses, according to their aspect with regard to the sun, and those are decidedly the healthiest, other things being equal, in which all the rooms are, during some part of the day, fully exposed to the direct light. Epidemics attack inhabitants on the shady side of the street, and totally exempt those on the other side; and even in epidemics such as ague the morbid influence is often thus partial in its labors.

SMOKY CHIMNEYS.

This household calamity can easily be prevented, and always in building new houses; thus, let the throat of the chimney be so constructed that immediately inside of it the space shall be abruptly increased several inches in length and breadth. Let it increase upward for two or three feet, and then be gradually "drawn in" to the dimensions necessary, and let the whole inside of the chimney be plastered with cement, which will harden with time.

A very convenient method of ventilating a room already built is to arrange that one of the panes of glass in the upper sash shall move on a pivot at the centre of each side, so that it can be turned, the upper end outward, the lower end inward, or *vice versa;* or, to prevent breakage, a thin board painted white, or a piece of tin or zinc, may be made to replace the glass. A similar arrangement in new houses will have its conveniences. But in every room this device should be near the ceiling, above the fireplace. For ordinary rooms the orifice should be a foot long and five or ten inches broad, arranged so that a cord shall open or close it, without the necessity of getting on a chair or step-ladder. There should be a door opposite every fireplace. This diminishes the chances of having a smoky chimney, for in fire-time of year the cold air will be always entering the room at the crevices of the door, and in the direction of the fireplace, and upward through the chimney. The draught of a chimney may be increased by the simple expedient of cutting out a small part of the floor with a saw, so that it may be easily replaced after the fire is kindled. No chimney will "draw" well if there is any wall or other thing near which is higher than the chimney itself.

In building a house in the country it will save expense and trouble, besides preparing the way for a great deal of comfort on emergencies, to have a neat opening left for a stove-pipe near the ceiling in every room in the house, so that, in case of excessive cold weather, a common stove for burning wood (or coal) may be put up, and thus have the facilities of making at least each room in the house comfortably warm during any "spell" of bitter cold weather, and warmed, too, at a comparatively small expense; for let it be remembered that with a common fireplace or grate more than one-half the heat goes up the chimney, and is an utter waste. The longer a stove-pipe the more heat is saved in a room; hence the advantage of having the arrangement for receiving the stove-pipe near the ceiling. Many persons, for the sake of appearance, or a mistaken notion of economy as to the cost of pipe, have the pipe adjusted so as to open into the fireplace, by which a very large amount of heat is lost.

Much has been said of the injurious effects of a dry stove air, and to obviate this it has been recommended that a vessel of water be kept standing on the stove. If this is left to be attended to by the servants it is far better to have nothing of the kind, because, unless the pan is of white stone-ware, and is emptied, washed, and filled with pure fresh water every three or four hours, it collects dust, dirt, gases, and emanations which, by being kept warm, generate a most pernicious malaria, which is much more likely to produce disease than a simple dry air. It should be remembered that a room is very little ventilated, and even that very slowly, by simply opening a folding door. Many persons ignorantly, and to their own injury, rely upon this method of ventilation when they sleep in the same room in which a fire has been kept all day; and for this reason, also, every chamber should have a ventilation arranged in the original construction of the house.

The coolest part of a room in warm weather for sleeping is the floor; but, by the operation of the same law of nature, that cool air is heavy and falls to the surface. The healthiest part of a chamber in very cold weather is the higher. A sleeping person consumes two hogsheads of air an hour—that is, deprives it of all its oxygen, and replaces it with carbonic acid gas, which is a negative poison, leaving it so destitute of any life-giving property that the person breathing it will die in a short time. This is the operation going on in a close room where charcoal is burning in an open vessel. The oxygen is consumed in burning the coal, and its place is supplied by carbonic acid.

Cold condenses this carbonic acid, makes it heavy, and causes it to settle on the floor. It has been so condensed by cold as to be made visible in the shape of a snow-white substance, just as the invisible warm moist air by the application of cold is reduced to mist, to dew, to rain-drops, and to solid hail-stones.

There are some localities in Italy and elsewhere into which, if a man and his dog come, the dog will die in a minute or two, while his master will remain uninjured. There was carbonic acid there. It was concentrated, condensed, made heavy, and settled on the surface where the dog breathed it; but the man's nostrils being four or five feet higher took in none of it. From these facts two practical lessons of very great importance to human health and life are drawn.

First. There is more need of ventilating a chamber in winter than in summer.

Second. There is no advantage, as to health, in sleeping in a very cold room—cold enough to have ice formed in it during the night. Thousands of persons who have gone to bed in perfect health at night have waked up next morning with pneumonia—that is, inflammation of the lungs—and have died in a few days, because the room was too cold for them, to say nothing of the debilitating effect of breathing an atmosphere more or less loaded with carbonic acid gas, which deprived the system of its ability to resist the approach of disease. Had the room been well ventilated, the attack would have been less severe, or there might have been none at all, because the breathing of a pure air would have given power to ward off any ordinary attack of sickness. Hence they are the most conclusive reasons for building houses, or remodelling them, so as to have the utmost facilities for ventilation.

Really every chamber should have two systems of ventilation—internal and external—so that either may be employed according to the season of the year, and the health and vigor or peculiarity of the sleepers. The internal ventilation—that is, openings above the fireplaces—for feeble persons, or for very cold weather, or in the autumn; the external—that is, through the windows from all out-doors—for the vigorous, and in moderate weather.

To some persons in any latitude, and to all in some sections of the country, it is certain suffering to sleep with an open window, especially in August and September; and by understanding the reason of this fully, the necessity may be removed from some families of selling out, or of building elsewhere.

Before changing a residence on account of its being unhealthful, it should first be noticed whether it is connected with any special season of the year, with any special part of the house, or any particular habit of the persons who are attacked; in other words, does the sickness appear during the autumnal months? Does it appear among that part of the family sleeping on the same side of the house—on the northern side for example—keeping the rooms always more or less damp, or in that part of the building nearest to some pond, or marsh, or sluggish stream, or whether, of several persons sleeping on the same side, only those are attacked who sleep with their windows open?

As a general rule young children, invalids, infirm and old people, should have their chambers during the night ventilated from within, and so should all families living in bottoms on low lands, near ponds, sluggish streams, marshes, or recently cleared lands, especially during the autumnal months, or where there is more or less chill and fever, fever and ague, etc. The reason for this is, that from these localities miasm constantly rises and comes through the open windows upon the sleeper, who breathes it into his lungs corrupting and poisoning his whole blood in a night.

Many cases are given in standard medical publications where persons sleeping in certain parts of a building suddenly became ill, although they formerly had good health, and had occupied the same chambers, and had slept with open windows all the time. But a change of dwelling, or a determination to build elsewhere, should not be hastily made by the farmer, for some standing water may have been drawn off recently for a mere temporary purpose—the repairing of a mill-dam for example—and when reflooded, so as to cover the wet, muddy bottom several feet in water, the sickness will immediately disappear, or a belt of timber between the dwelling and some standing miasm-producing water may have been cut down; if so, a substitute should be provided by planting a thick hedge of sunflowers, or other rapidly growing and luxuriant vegetation.

The lower floor of every country house should be on the same level, for every step upward taken by domestics and women in the family, is not only a useless expenditure of strength, (and a large portion of it, too, when it is considered how many times a day the cook and housemaid and the wives and daughters who do the household work must go in and out, and pass and repass from one room to another,) but it is physiologically a great strain upon those internal organs which are peculiar to the sex; and when too much of it is done, diseases are every day induced which are to embitter the whole after existence. It is very easy to wink the eye—an inappreciable effort—but if a man attempts to do it a hundred times in succession, its repetition becomes a painful effort. It is very easy to step up a step or two, but the strongest will pant and blow if a hundred have to be gone up as briskly as an ordinary cook steps about.

It may be said that the objection does not apply because only one step is taken at a time; but it must be remembered that those who do housework almost always have something in hand—a bucket of water, a pile of plates, an armful of wood, a scuttle of coal, etc.—and these must be raised that one step, besides the body of the person, altogether weighing between one and two hundred pounds. A certain amount of strength is expended in this unnecessary effort, and however small it is, each repetition of it is that much taken from the store of strength with which the person arose in the morning. A purse containing a hundred dollars is as much depleted by taking out a dollar at a time until fifty are withdrawn, as if the whole fifty were extracted at once.

The kitchen should, as far as practicable, be central to the whole house, having the dining-room on one side, the wood-house, and the place for meats, milk, and vegetables on another, unless these are all kept in the cellar, located as previously advised. If, however, the dairy is an important item about the farm—that is, if it is intended as a source of income, it should be arranged by all means to be on the side of a hill or rising ground, if possible, over a spring, otherwise in such a way that a natural stream should flow through it, or that the surplus water of the well, or spring, or cistern should do so; but by all means let the dairy be approached from the kitchen by a raised gravel walk, with a view to have it as dry as possible at all seasons, for this walk must be passed over many times a day, and if not dry it dampens the feet and thus endangers the health.

WATER CONVENIENCES.

If water is not supplied by artificial means, so as to come into the kitchen by pipes and a faucet, it should be arranged to have the well or cistern or spring deliver its supply in an apartment immediately adjoining the kitchen, on the same level, and without going outside of the house. It cannot be truthfully denied that multitudes of women lose health and life itself every year by having to step out from the dry warm floor of the kitchen upon the cold stones and wet path outside, going to the spring, wood-yard, and "smoke-house." And, with the experiences and harrowing narrations which daily come to physicians from this direction, that farmer is criminally remiss who, in building a new house or reconstructing an old one, does not arrange to have a dry and level floor for those who do the cooking, washing, and general housework of the family, so as to make dairy, cellar, wood-house, water-closets, and smoke-house easily accessible by a dry pathway.

PRIVIES AND WATER-CLOSETS.

The location of these in connexion with a family residence has an important bearing on the health of any family, or a greater influence on the destiny of many than would be supposed by other than a medical practitioner, from the operation of a single law of the animal economy in connexion with a fact to be afterwards stated, which no observant person can truthfully deny. It is of the very first importance that the water-closet should be always and instantly and easily accessible, as in proportion as this is not the case, the calls of nature are postponed. This never can be done with impunity, for nature never does anything in vain nor out of time. But it is singular to observe how she never allows herself, as it were, to be trifled with; if her call is not heeded, it is less and less urgent; her appeals to the nerves of sensation are less and less strong, until they cease to be felt; the inclination passes off, and it may be hours before she has recovered strength to call again, but with this unvarying result: the next day the call is made later, and later, and later, until after a while it is omitted for a whole day, and before the person is aware of it it is found that the bowels are constipated—that several days pass without an evacuation, and with this certain uncomfortable feelings are observed entirely new to the person in question; they are simply "symptoms," the indications that disease is setting up in the system, such as headache, cold feet, bad taste in the mouth on getting up in the morning, an irregular appetite, qualmishness, an absence of accustomed vivacity; and in due time there is actual disease in the shape of sick headache, sour stomach, piles, wasting diarrhœa, catarrh, "the least thing in the world gives me a cold," dyspepsia, with all its horrors, or a general decline of the whole system. Every observant physician knows that more than half of all ordinary diseases have their foundations laid in a constipated condition of the bowels—that is, a failure in them to act every day with almost the regularity of the rising of the sun; and he further knows that the beginning of this irregularity was brought about by deferring the calls of nature until company was gone, until the chapter was finished, until the newspaper was looked over, until some work in hand was completed, or until "the coast was clear." It is in this as in thousands of other cases that the greatest of calamities arises sometimes from almost inappreciable causes; and in all human record there is not a stronger exemplification of it than in the case in hand. There are thousands and tens of thousands of intelligent and observant persons in mature life, and still later on in years, who would cheerfully give a large portion of what they possess if they could have a natural, regular action of the bowels every day without any artificial aid, and who can and do look back in vain remorse to the times when there was a proper and healthful regularity, and to the occasions and manner of their first breaking into it, simply for the want of a little personal energy, a little self-denial, a small modicum of force of will, which would resolutely, and even impatiently, clear out of its path those trifling, those cobweb obstacles which were in the way of our physical duty, as it were. But it is not always that nature allows persons to escape with a moderate or protracted or slow punishment. There are multitudes of cases recorded where, from motives of false delicacy, as riding in public vehicles, waiting for others, or for daybreak to come, or from sheer laziness, the power to pass water has been taken away, acute inflammation has set in, and death has followed in two or three days. It is well worth while, then, to say all that has been said, if by it a single family should, in the erection of a new house, or in the remodelling of an old one, be led to make a wise and practical use of the facts which have been presented, in having a privy constructed with two or three apartments, appropriated to the different classes of the family, so that one may never need have to wait on another for a single instant, and also that approaches may be made with as much privacy as practicable, and by a path protected from the weather, to be used when inclement, and by another to be used in good weather, and still as distant from the house as can be conveniently arranged; for example, to be approached through the wood-house or perhaps through the garden. The deposits should be made in a water-tight plank box, placed on the surface of the earth, on runners or wheels, to be removed and emptied once a week, and buried in a compost heap. The fæces of one individual will fertilize an acre of ground every year to an extent greater than any ordinary compost. In addition, for the seven warmer months of the year, lime or fresh ashes of wood should be scattered around the receptacle every fortnight, while a gallon or two of the following solution should be thrown into the receptacle itself every week or two: one pound of copperas, known as "sulphate of iron," costing but a few cents, dissolved in four gallons of water, will most completely destroy all offensive odors, whether in sinks, privies, or cellars. The warmer the weather the oftener must the application be repeated. Sprinkling the copperas itself is advantageous, and, if in cellars, is one of the best means of keeping rats away.

One of the most sensible thoughts in this connexion, and one which could scarcely occur to any other than one of the members of the Society of Friends, so remarkable for their thoughtfulness and happy talent of having about them all the conveniences and appliances which so much add to the comforts and enjoyments of domestic life, was in having a privy connected with his barn, for the convenience of his gentlemen friends who visit him in the summer at his delightful mansion on the banks of the Hudson. This is one of the earliest pieces of information given to those coming for the first time. To this they can repair at any hour with a feeling of perfect privacy.

PIAZZAS.

There can be no good reason why a piazza, from eight to twelve feet broad, should not extend the whole front or end and part of the rear of every farm-house; and considering the personal advantages of such an arrangement, and the air of coolness and beauty and liveliness which they present in summer, it must be put down as a great oversight in that they are not more common than they are. It cannot be denied that they contribute greatly to the coolness of the lower rooms in warm weather, and afford facilities for play to the children in inclement or muddy weather, and for exercise to grown persons, which are of inestimable value in promoting health. It would surprise most persons greatly to know how many girls in the country have fixed diseases grafted in them before they leave their teens; this is most strikingly the case with the daughters of farmers who are "well off" and actually rich. This comes about largely from the fact that they have not the inducements of exercise half equal to similar classes in large towns and cities. They, perhaps, sweep a room, or dust the parlors, or make up a bed or two in the morning; and that is about all the exercise they take on foot during the day, except when they have visitors; the remainder of the time they sit and sew, or read, or loll about, not altogether because they do not want to exercise themselves, but because there are not the facilities of doing so in the way most agreeable to them. Few farmers have a spare horse suitable for a girl to ride, and if they did, she must have some one to ride with her; that requires a second horse, and the brother or father must accompany her. These circumstances narrow down the chances of horseback exercise, exclusive of church-going days, to about a dozen or two hours in a year to eleven farmers' daughters in a dozen. And however inclined to walk, it is impracticable in winter, because they must step from the door-sill into mud, or slush, or snow. In summer it is too hot in the middle of the day; in the morning the grass is bedewed; and so in the evening, unless it is early—say just before sundown—when it is not altogether safe to be out of sight of the house. All these are deemed satisfactory excuses for neglect of a plain duty. If there were commodious piazzas, there would be admirable facilities for walking at all seasons, and every day for games, rope-jumping, plays, and promenades of every description; and by reducing it to a system, an amount of exercise in the open air could be taken every day, the value of which upon the physical health, the mental power, and general vivacity cannot be readily estimated.

In building a new house, or remodelling an old one, the upper rooms—the chambers especially, when practicable—should be so arranged that the sun should shine into them as much as possible to give the light and dryness and cheerfulness which so much contribute to the healthfulness of a chamber, and the lively, cheerful temper of those who occupy them. All farm-houses should be arranged, as far as possible, so that the rooms which are most generally occupied should have most of the sun during the day. It is too often the case that the parlor, the company room, is the largest, lightest, and best room in the building; this parlor is barricaded with curtains, window shutters, and closed doors, except when there is "company," which will, perhaps, average not a dozen half days in the year; the remainder of the time all its sweetness is

"Wasted in the desert air."

By all means let the best room in the house be enjoyed every day by the members of the family; give the room which is largest and lightest to your own wife and children all the time, instead of saving it for other people for a dozen hours in the year. Besides, such a room, almost always closed up, is a positive injury to every person who enters it; for, in winter, it has a pernicious "closeness" about it, while in summer there is a mustiness and dampness, often a "chilliness," present, which makes it feel almost sepulchral the moment it is entered.

HOUSE-WALLS.

Wall-papers, like carpets, are the inventions of laziness and filth; they conceal dirt and noisomeness of every description. The milk-white floors and white-plastered walls of olden time have almost entirely disappeared, to the great detriment of family purity and personal health. It is greatly to be regretted that this is the case to the extent that it is. White-plastered walls can be kept clean for a number of years; the lime in them has the effect to purify them Next to this the painted wall, covered well with a suitable varnish; for it can be readily washed without injury, and is easily kept free of dust. In cases where walls must be papered, if for the first time, there are two important precautions: use no paper which has a green color, especially a "fuzzy green," which is composed of arsenic, and is capable of causing convulsions and fatal disease in a single night. Children have been taken extremely ill after playing a few hours in a small room covered with paper which had considerable green-colored patterns on it. Care should be taken that the paste should be fresh, and put on equally and thin, and that any holes in the wall should be filled up with plaster. A tidy room in a certain dwelling was appropriated to lodgers. It was noticed, after a time, that as certainly as a person slept in that room a single night, severe sickness next day was the result. The authorities ordered an investigation, when it was found that a depression in the wall had been filled up by one of the workmen by gathering up a bucketful of pieces of paper and some remnants of paste to make them adhere. After a time decomposition began to take place, giving out emanations of the most poisonous character; and for this reason, if any wall of plaster or of wooden partition is to be papered or repapered it should be thoroughly cleaned first, then made smooth; every particle of old paper should be removed.

The way in which the smallest amount of money can be made to go farthest on a farm, morally and pecuniarily, is by investing it in lime and white lead. Filth, dirt, darkness, and untidiness, always and inevitably degrade those who dwell among them. Cleanliness purifies and elevates. If white-wash is used, it should be applied every year to whatever is exposed to wind and weather; that which is, perhaps, the cheapest, most durable, and most generally available, is made thus: one ounce of white vitriol—that is, sulphate of zinc—and three ounces of common salt to every four pounds of fresh lime, which is lime not fallen into any powder from exposure to the atmosphere, with water enough to make it sufficiently thin to be applied with a brush; this makes a durable outdoor whitewash. When white paint is used, two precautions are necessary: first, obtain a good article of white lead from a dealer whom you know to be honest. There is, perhaps, not one pound of pure white lead in a million that is sold for pure white lead, as there is a substance called barytes which can be purchased by the ton for, perhaps, less than a cent a pound, which, when mixed with white lead, cannot be distinguished until some time after it is spread, when it becomes dark. When it is remembered that white lead sells for ten times as much per pound, the temptation to adulterate is too strong for the honesty of any white lead manufacturer known to the writer. The proportion of this adulteration is from ten to ninety per cent. Zinc paint is used especially for inside work, and makes a beautiful glossy white finish; second, the preservative power of white paint depends, in considerable measure, on the time of year. If in hot weather, the water of the oil evaporates so quickly that the paint itself is not carried into the wood, and remains as a powder on the surface, and can be wiped off with the fingers. If in the inclement weather of winter, it is apt to be washed off by the rains before it has sufficiently dried. The autumn is best, when the ground is not likely to be dusty, and when the weather is long enough dry to allow the paint to get thoroughly dry itself. Out-door woodwork should be painted once in every three years, if white, but colored paints last much longer; nor is white the most desirable color for a farm-house in all situations, and if done as just proposed, it not only preserves the building far beyond the cost of its application, but it gives an air of thrift and life and beauty of which almost every reader has had personal experience. And in case of wishing to sell a farm thus kept painted and whitewashed, as to its fences and buildings, a better price can always be had, and from a better and more elevated class of purchasers.

ICE-HOUSES

are beginning to be considered indispensable appendages to a farmer's house, and, indeed, to every man who owns his premises. They are not a necessity, and where there is a good spring, or never-failing well, they can be dispensed with, especially as they do not contribute to the general health of any family, unless the use of ice is wisely controlled. The free use of ice-water tends to the decay of teeth prematurely, is liable to produce dangerous inflammations of the stomach, and certainly is the immediate cause of dyspeptic diseases in multitudes of cases where it is freely indulged in at the regular meals of the day. At the same time, as many will prefer building ice-houses, it is proper here to give some directions in reference to the subject.

That ice keeps better ordinarily above ground than below, and that ventilation is necessary in order to its well-keeping, are two indisputable facts. The more compact the ice is, the longer will it keep; hence plans have been devised of letting a stream of water run slowly into the ice-house after it has been filled, so that all the crevices may be filled up; or, where a running stream is available, some persons have arranged to let the water in a foot deep during very cold weather; when this has frozen solid, let in a few inches more until the house is entirely filled; or, it can be done with less trouble and attention if during very severe weather the water is conveyed into the ice-house during the night, by or from a running stream, in a very fine spray, freezing as it falls. There should be a double roof; the under part of the rafters should be boarded closely, and between that and the shingles a space of eight or ten inches, or more, should be filled up with saw-dust, spent tan-bark, or other porous substances. There should be a space between the straw on the surface of the ice and the roof for purpose of ventilation, to prevent the air from becoming damp and close, with a wooden chimney of eight or ten inches square piercing the roof; or a sliding panel in the door would answer; the ventilation must not be a current of air. If the eaves of the roof extend a foot or two over the sides, a greater protection is afforded against rain and the rays of the sun. The roof of an ice-house should be steep. Great care should be taken against leakages of this, as well as of all other farm buildings. A cement may be applied with a trowel or case-knife to all leaks in roofs, or about chimneys, &c., made thus: Take pure white lead and mix it with boiled oil until it is of the thickness of thin paint, add to this common sand until of the thickness of common mortar; there is, perhaps, nothing better than this. A space twelve feet in the clear in every direction will hold enough ice for a large family.

Ice-houses should be located, as a general rule, on the north side of a hill, if built under ground, so that the ice can be approached on a level with the ground on which it is built. On many farms such a location is impracticable, and the only alternative is to build one on the surface, which is now, on the whole, considered the most approved way. The general construction should be a wooden frame building, with another outside of it, with a space intervening of from fifteen to thirty inches, which should be filled in with coal-cinders, tan bark, or, which is better than either, pulverized charcoal. It would be better if the inner building were made of solid timbers close together, and about three inches thick; the outer one, or the shell, may be a common frame, neatly weather-boarded, and kept well painted with white lead, so as to repel the heat of the sun. It will add to the convenience of an ice-house if the bottom, or at least a part of it, is arched, so as to form a place for a larder under this arch, or the drainings of the ice should be made to pass through the dairy or "spring-house."

The following extract, from Moore's Rural New Yorker, shows how a farmer may build an ice-house cheaply. This has been built ten years, and is perfectly sound except the inside boarding, which requires renewing once in five or six years:

"The size is eight by ten outside, six feet high. I took two-inch plank, twelve inches wide, for sills and plates, halved together at the corners. I used studs on the inside, and boarded up and down outside. The cracks should be covered with battens to prevent the air striking the ice. The inside should be boarded the other way, to within a foot or so of the plates, which should be left until the space is filled. The rafters should be five or six-inch stuff, boarded on the inside, and the space filled with either sawdust or refuse tan bark. I place poles or scantling in the bottom, and cover with slabs, which will afford all the drainage necessary. The door should always be on the north side. The cracks in the north gable-end should be left open for the purpose of ventilation. I consider sawdust the best to fill the sides with, but tan-bark, turner's shavings, chaff, or straw, will do. The size of this house may be objected to by some, but mine holds enough for a large family, and also a dairy of twenty cows. I don't believe any dairyman who has had ice to use one year would be without it for ten times the cost.

One thing more about the house: It should be banked up at the bottom, for any circulation of air through the ice will melt it as fast as water poured through it."

Many farms have small streams of water running through them. In such cases the locality for an ice-house should be selected with reference to the convenience of damming this stream near it, before Christmas, in such a way that a lake of a hundred feet or more in diameter, and about two feet deep, may be formed, and properly protected from cattle and all nuisances. This body of water would yield enough ice for a large farm, and by its shallowness would be more certain to yield a crop of ice, because a less degree of cold would be required to freeze it solidly than in a deeper stream, or one which was running, even with a sluggish current. One freezing over would yield thirty or forty one-horse loads of this summer luxury. While the lavish use of ice and ice-water cannot be prejudicial to the health of any family, common ice is one of the most valuable of remedial means in case of sickness in various forms.

To a person burning up with internal fevers ice is a comfort beyond expression. Swallowing ice freely in small lumps is the chief treatment in inflammation of the stomach. The constant application of ice pounded fine and enveloping the head with it by means of a cushion or other contrivance is the most reliable remedy for that dangerous malady, inflammation of the brain, which so often sends its victim to the grave in a few days, or to that living death, the mad-house.

In all inflammations, whether internal or external, ice diminishes rapidly the size of the blood-vessels, and thus relieves the pain they give when thus swollen by their pressing against the nerves, which are always in the neighborhood of the arteries of the system.

Diptheria and some of the worst of other forms of sore throat have been arrested in a very short time by pounding a piece of ice in a bag, then laying the head back, take the lumps of ice and swallowing them continuously until relieved, allowing them to be detained in the throat as long as possible, there to melt.

In all forms of diarrhœa and dysentery, where there is great thirst, the gratification of which by drinking any liquid increases the malady, they are promptly controlled, and in many cases perfectly cured, by simply swallowing as large lumps of ice as possible.

Epilepsy itself, one of the most uncontrollable of human maladies, is said to be treated successfully in London by the application of ice to the spinal portion of the system.

A piece of ice laid on the wrist will often arrest profuse and dangerous bleeding of the nose.

In croup, water as cold as ice can make it, if applied freely and persistently to the throat, neck, and upper part of the chest with a sponge or cloth, often affords an almost miraculous relief, especially if followed by drinking copiously of ice water, wiping the wetted parts perfectly dry, then wrapping the child closely up in dry flannels, allowing it to fall into a delightful and life-giving slumber.

These statements may induce the farmer to be at pains, if he does conclude to build an ice-house, to have it done in the most thorough manner, and after the most approved pattern.

SHADE TREES.

It looks well in the midst of summer to see a tidy farm-house almost hidden from view by trees and bushes; but the influence they have in keeping a dwelling damp in summer, and in producing a raw and chilly atmosphere in winter, thus engendering disease the year round, are sufficient reasons for exercising a wise discretion in this direction. Persons who have visited England have often admired the country-places of the gentry, one very uniform attendant being a beautiful green lawn in front of the buildings, not a single bush or tree, unless it may be in a diagonal direction from the front corners of the buildings, forward and away. It would subserve the purposes of health, especially in level, or low, or damp localities, to have neither tree nor bush within twenty or thirty feet of the front of the farm-house, unless it be a flowering plant here and there, or some stately and ancient denizen of the forest, to give an air of antiquity and substantialness to the surroundings; but even these should not be so near as to keep the roof of the building always more or less damp, nor to darken the best and most frequented rooms of the house; for the first, the most indispensable requisite in building or remodelling a farm-house should be to arrange for its healthfulness.

BARNS.

These should be erected in as dry a locality as possible, where the sun can shine upon them the whole day, and where the ground descends in every direction. Special attention should be paid to the roofing, so that the rain may be turned off rapidly, and that the snow may melt very soon, without the possibility of large accumulations.

THE STABLE

should be arranged to be above ground, to be well ventilated, and to have abundant light; in short, to be cool in summer and warm in winter. He can never be a successful farmer who does not shelter his cattle effectually and well in all seasons from the inclemencies of the weather. It is not only a humanity, but a great pecuniary saving on every farm where there is a single living animal. Some build stables low for warmth, but the advantage is more than lost by the vitiation of the atmosphere. A warm bad air is worse than the cooler and still atmosphere of a stable. The ceiling of a stable should be at least ten feet high, with an aperture for the escape of foul air; the walls or partitions should be close, and arranged to have abundant light admitted through glass windows. In summer the sash may be removed.

The American Agriculturist for December, 1863, gives a description of a stable for draught and farm horses which contains the most important points on this subject, though, perhaps, not practicable for farms generally:

"The stable should not be less than eighteen feet wide, and of such length as will allow six feet standing for each horse. It should be ten feet high. The horses stand in a single row, and the harness is hung on pegs in the wall behind them. This width admits of thorough ventilation to the stable without subjecting the horses to draughts. Each standing should be parted off by an upright post reaching from the ground to the ceiling rafter, placed three feet from the wall at the horse's head. The partitions should be closely boarded up three feet above the manger and hay-crib to prevent the horses quarrelling about the food and biting each other. To each of the posts a bale, eight feet long and twenty inches wide, should be hung by a strong chain to divide the standings and suspended by another strong chain at the hinder end from the ceiling rafter. Each chain should have a hook and eye within reach that may be readily unfastened. This arrangement will leave a space of six feet opposite the head of each horse available for feeding purposes. The manger for corn and chaff (cut feed) may be two and a half feet long. It should be two feet wide at the top, one foot two inches at the bottom. The hay and straw, which should be cut into six-inch lengths, will require a larger receptacle, which should be three feet six inches long, two feet wide at its upper part and half that width below. It should be so constructed that while it is even with the manger above, it should reach to the ground, two feet above which should be fixed to the wall a bottom, sloping to one foot above the ground in front, where some upright openings should be cut to allow the escape of seeds and dirt. At the top of this hay and straw crib, an iron rack with bars six inches apart, should be so hung as to open up and fall back against the wall to let the fodder be put in, and then be put down upon it for the horse to eat through. It should be so much smaller than the opening that it can fall down with the fodder as it is consumed, by which means not a particle is wasted. The manger may be constructed of yellow deal one and a half inches thick for the front, back, and ends; the bottom, of slate, three-quarters of an inch thick. The top of the front and ends should be covered with half round iron, two and a half inches wide, screwed on to project over the front, a quarter of an inch outside and three-quarters of an inch inside the manger. This prevents the food being tossed out and the manger being gnawed. A short post must be put up as near the centre of the standing as possible to support the manger, into which a large screw ring must be put to let the chain or rope of the headstall pass freely up and down without constant friction. The manger may be three and a half feet from ground to top; the hay-crib of course the same height. The paving of the standings to three and a half feet from the head, should be flat, then with a fall from both sides to the centre, where an angle iron drain of four inches wide from end to end, with a removable flat iron cover fitted to the inside of it, should be placed straight down the standing, with a fall into another larger cross main drain ten feet six inches from the head, so placed as to carry away the urine from all the smaller drains into a tank outside the stable. This main drain so placed, takes the urine from the mares, and has a loose cover also fitted to it, easily removed for sweeping out when necessary, perhaps once a week. This system keeps the stable healthy, economizes the urine and the straw also, the latter very important where it can be sold, or consumed as food. The width of eighteen feet for the stable gives room for narrow corn bins three feet high, so that each carter may have his horse's corn separate."

In the above, paving has been alluded to for standings, but a hard, dry dirt floor is greatly better than stone or plank. A nice, smooth, hard, and dry floor may be secured with small stones packed like a McAdamized road, the interstices being filled up with good cement, or with the dust made by breaking up limestone rock. This will make a floor which water cannot penetrate nor horse-shoe disturb. The cheapest and best bedding, at least near mills, for such a floor, or for any other if kept dry, is saw-dust, which should be laid in abundantly when dry, in the fall of the year.

It may be added that a good farmer and a generous man, having arranged his house for the comfort, health, and happiness of his family and the elevation of the tastes of his neighborhood, will not rest satisfied as long as the noble horse, the useful cow, and the patient ox and mule are without comfortable quarters, warm in winter, cool in summer, and all the year round abundantly fed and kindly treated, extending these with a right good will to pigs and poultry too.

FARMERS' GARDENS.

BY HON. SIMON BROWN, CONCORD, MASSACHUSETTS.

A GOOD vegetable garden is conceded by most farmers to be both convenient and profitable, and yet comparatively few farmers have one. The reason usually given for the neglect is that they do not have time to attend to it. The truth in the case is that the garden requires a little care daily, and demands thought, patience, and system, in order to secure success and profit. Unhappily these are just what most farmers dislike, preferring to tend the larger crops, where less thought and more muscular power are required. They would be glad of the rich products of the garden upon their tables, and the pleasure, health, and profit they would yield to the family, but the habit of neglect in this particular has become so deeply implanted that no common influence will break it up.

With the knowledge that half an acre, or even less, devoted to garden culture would annually produce more profit than four or five times as much land in any of the other crops of the farm, thousands of our farmers still remain without a kitchen garden even that is worthy of the name. It would seem that pecuniary interests, and a regard for the health and comfort of the family, would overcome the dislike to cultivate a garden; but the aversion to systematic care overrides all these considerations, and the garden remains only in anticipation, or in some out of the way place, consisting of a few rows of potatoes, onions, and beets, and a sage root or two, with a swamp of weeds, whose only redeeming feature is, at the end of the season, the presence of winter birds in search of a daily meal of seeds.

Without a garden the winter diet of the family must be mainly confined to bread, meat, and potatoes. When warm weather returns, the system requires less stimulating food, and demands cooling and juicy vegetables, fresh from the soil; yet many farmers have no garden—not even an apology for one. I knew a case where the wife of a farmer worth ten thousand dollars went to a neighbor's garden to beg a few fresh vegetables when company was expected. Thousands of farmers' tables are rarely graced with early vegetables, such as lettuce, radishes, early beans, potatoes, and peas, when they might be crowned with all these luxuries peculiar to each season by a little labor and systematic care.

An observing gentleman from another State, in writing to me on this subject, says: "No part of the farm pays as well as the kitchen garden, if well taken care of. I do not mean by this that every farmer can make money by raising vegetables for market, because that is impracticable; but it is a self-evident fact that a farmer must procure the support of his family from his farm, and a well-conducted garden will produce more towards this than any other part of the farm of five times the extent."

It is said by medical men that vegetables and fruits as diet are conducive to health, and as most people, and especially children, are fond of garden fruits, it is policy for every farmer to provide a plentiful supply for home consumption. It would seem that people possessing all the conveniences that farmers have, as regards land and leisure to take care of a garden, would consume the largest amount of vegetable food, but the truth is that more is used by the people in cities and villages than by the same number of land owners. Take a look among the farmers and it will be found that one-half of them have no gardens at all, or at most, a little corner in a grain field, which is half overrun with weeds. Others have a place set apart for the purpose, but do not find time to do anything in it until all the spring farm-work is done, thereby making it too late to secure any of the vegetables requiring early planting. This is a great loss when we take into consideration that such things are relished much more in the hot weather of June and July than later in the season. What is more aggravating than to know that one's neighbor has green peas, new potatoes, string beans, and the like, and his own but just up, and all through his own neglect in not planting in season? And the farmers' wives and daughters also feel the effect of this neglect when, during the first two or three summer months, they have to rack their brains to think what to get for dinner; for when the men, weary with labor, come in from the fields their stomachs are apt to revolt against salt pork and old potatoes. But if there are early potatoes, peas, beans, and other vegetables in the garden, there is no trouble in getting up a dinner that the men can eat with a relish; and few things are more gratifying to the faithful housewife than to see her husband enjoy the food she has prepared for him.

The garden should be near the house, as housekeepers do not always have time to go far; and if it is near by, a great many leisure moments can be spent in weeding and taking care of it. It should also be so enclosed that neither fowls nor stock can enter it. No success can reasonably be expected if fowls are allowed to range in a garden, as their instincts lead them to the freshly-moved soil for some of their most essential food. They are, therefore, always ready to scratch where the gardener has just fashioned his new beds, planted his choice shrubs, or scattered his early seeds. If enclosed, the space alongside the fences may be occupied by raspberries, blackberries, tomatoes, and other climbers, which will serve the double purpose of affording fruit and providing a shelter for more tender plants. If a path runs between these and the more central portions of the garden, these climbers can be conveniently cultivated from it, and their spreading be very easily prevented.

The manure for the garden should be well rotted, and if allowed to remain in a vault or cellar through the summer, all seeds would be killed, thus saving a vast amount of work in weeding. Apply the manure in the fall and plough in immediately, ploughing again in the spring, which thoroughly mixes it with the soil. As soon as the weather will permit, plant early potatoes, peas, and all kinds of early vegetables which are not liable to be killed by frost. Put in others along as the season advances, and when they come up, keep them well hoed and free from weeds, and you will enjoy the satisfaction of having something good as well as your neighbor.

LOCATION OF THE GARDEN.

Every man should do his best to own a home. The first money he can spare ought to be invested in a dwelling where his family can live permanently.

There is something agreeable to our better nature in having a home that we can call our own. It is a form of property that is more than property; it speaks to the heart, enlists the sentiments, and ennobles the possessor. The associations that spring up around it as the birthplace of children, as the scene of life's holiest emotions, as a sanctuary where the spirit cherishes its purest thoughts, tend to improve and exalt the moral sensibilities. Our happiness of to-day is increased by a view of the place where we were happy yesterday. The scenes and circumstances by which we are surrounded have much to do, not only with our character, but with our happiness. On this account we should do all in our power to make our homes attractive; to adorn them with those charms which good sense and refinement so easily impart to them. It costs little to surround our homes with those simple beauties that delight the eye far more than expensive objects. Nature delights in beauty; she loves to brighten the landscape and make it agreeable to the eye; she hangs the ivy around the ruin, and over the stump of the withered tree twines the graceful vine. Beauty is a divine instrumentality; it is one of God's chosen forms of power. He who does not appreciate and enjoy the beauties of nature, loses one of the most precious gifts of his being.

Perhaps there are few things that mark the progress of civilization and the arts more than a correct taste in architecture and gardening. So long as men are indifferent to the appearance of the house they live in, and the grounds that surround it, they will rarely exhibit a true taste in anything else. We are happy in the belief that our farmers are gradually improving in this respect. As intelligence and wealth increase, so do refinement and good taste. During a recent ramble in the western part of Massachusetts, I found much to strengthen this belief. The houses are of a better class, well finished and painted; the fences better; smooth and velvety lawns, instead of door-yards filled with rubbish; shade trees around the houses and along the highways; land set apart for garden purposes, into which a few hardy shrubs are introduced, with small fruits, asparagus, and other esculents; and a variety of apples, coming into use from July to July. The garden on the farm was one evidence of the happy changes that have taken place, and was observable all along my route.

The cheerful influences of better buildings and productive gardens have developed a taste for the cultivation of flowers,

> "Whose voiceless lips are living preachers,
> Each cup a pulpit, and each leaf a book."

There is scarcely a farm-house now but has its flowers. They give a pleasant and cheerful aspect to the homestead, and attract the grateful admiration of the passing traveller. Their almost universal cultivation indicates a refined taste and higher intellectual attainments. Such evidences of improvement are full of promise for the future. The thriving occupants of residences in the vicinity of all our large towns and cities are doing much by their example to stimulate the farmers in this direction. The creations of beauty which wealth and taste have produced, attract their attention, awaken in them the love of the beautiful, and lead them to attempt their reproduction on a cheaper and simpler scale.

The garden should conform in style and character to the homestead and its surroundings. It should be in the immediate vicinity of the house, so that it may be readily accessible, and under the constant supervision of the household. If a portion of it is devoted to the culture of flowers, that should, if possible, be so located that the passing neighbor and stranger may enjoy its beauty and fragrance. Flowers are like sunlight and pure breezes—we enjoy them none the less because others enjoy them too. A good garden needs a variety of soil, and if it can be so managed that it will embrace a high and dry soil, and that which is lower and more moist, it will be an advantage. Early vegetables, as lettuce, peas, beans, and early potatoes need a warm, dry location. Those which come later in the season, as strawberries, pears, and some other plants, thrive best in a more moist soil. A situation on a southerly slope, if the slope is very slight, near the foot of a knoll or moderate elevation, is desirable. The surface may be worked into terraces, or cultivated on its natural inclination. Such a location affords a shelter which most garden vegetables require in their early and tender stage.

When situated near the house the garden will be more frequently visited by the women and children of the family, and they will become more interested in its products and cultivation. There should always be a dry and well-kept walk from the house to the garden, and, if practicable, this walk should be bordered by shrubs and flowers, so as to tempt the feet of visitors, as well as the inmates of the house. Such a path is not one of those flowery ones that lead the young astray, but, like the "straight and narrow way," it leads to virtue and peace, and should be made, in every respect, as inviting as possible. As farm buildings are usually erected without reference to a garden, it cannot always be located in the most desirable situation.

PROPER SOIL FOR THE GARDEN.

The best location that circumstances will permit having been secured, the next step will be to get such a soil as will best suit a majority of the plants we wish to cultivate. It is a mistake to suppose that some specific soil is indispensable to success. There is probably no farm in the country that does not afford a spot near its buildings which, by skilful management, may be made to produce all the varieties of fruits and vegetables adapted to the climate; but there is a diversity in them, and if we do not find such as we desire prepared by nature, we must resort to art. Soils perform at least three grand functions in reference to vegetation. They serve as a basis on which plants may fix their roots, and sustain themselves in their erect position; they supply food to vegetables at every period of their growth, and they are the media in which many chemical changes take place that are essential to a right preparation of the various kinds of food destined for the growing plant.

The character of the soil, by which I mean its capacity to afford a habitation to the plant appropriate to it, and at the same time to afford the required aliment, as all gardeners must see, is of the first importance.

First. it should be such as to afford sufficient moisture to the roots, and to admit the air to penetrate it freely. The soil consists of decayed vegetable matter, mixed with particles of rock reduced to fineness by the action of the atmosphere and of water, and sometimes by the roots of plants. It is unnecessary to describe the different kinds of soils in regard to adaptation to supplying moisture.

Secondly, it should afford a supply of carbonic acid. This is furnished by the decay of vegetable matter, or by absorption from the atmosphere. This faculty of absorption is assisted by mixing with it charcoal, muck, or other matters having great absorbing power. Charcoal consists chiefly of carbon; and it has been found that plants will grow more luxuriantly in soil containing a large proportion of carbonaceous matter, if well supplied with water, than in any other soil. Charcoal is not only a medium of absorption, but when water is present it is decomposed, and its oxygen combining with the carbon of the charcoal, carbonic acid is furnished to the vessels of the plant.

Thirdly, the soil should be capable of furnishing a supply of ammonia to the roots. This is also much assisted by the presence of gypsum or charcoal, which absorb it from the atmosphere. The usual mode of supplying it is by the addition of animal matter from the stable. Ammonia imparts its nitrogen to the plant, and it is to this that much of the nutritive value of the cereal grains and many esculent vegetables is due.

Fourth, it should contain those mineral ingredients which are necessary to the growth of plants. These, if wanting, must be supplied. The usual mode of doing this is by mixture of other soils, as will be presently stated. This is also advantageously resorted to when the soil is too little or too much retentive of moisture, in consequence of being too loose, or sandy, or calcareous, or too compact and stiff. This is called tempering the soil. When the soil is too loose and porous, or too stiff, the mixture of the opposite kind in just proportions will bring it to a more suitable condition. In this way a body is given to those lands that are too porous, and those which are too heavy and tenacious are made more light and loose. This process brings no nutriment to the plant directly, but only mediately by attaining a retentive power in the right degree, and thus furnishing nutriment by a proper supply of water; and it also acts favorably on the health and quality of plants.

A decidedly gravelly or sandy soil is unsuitable for garden purposes. So is a heavy clay soil. Such a soil would be wet in its natural state, and a wet soil is a cold one. But all these may be so altered and attempered by drainage and combination of materials as to make a sandy loam that will meet all the wants of common plants. Moist, heavy soils that rest upon clayey subsoils are better adapted to pasturage, mowing fields, and the production of trees, and can only be made suitable for a vegetable garden by thorough draining. and then by trenching or deep ploughing, and the intermixture of sand and muck. Without these helps such land is too wet in rainy seasons, and is liable to become hard upon the surface during dry seasons, and in either case is unfavorable for the free growth of plants. But by the removal of the water the physical properties of the soil are in a remarkable degree improved. "Dry clay can be easily reduced to a fine powder, but it naturally runs together when water is poured upon it. So it is with clays in the field. When wet they are close, compact, and adhesive, and exclude the air from the roots of the growing plant. But remove the water and they gradually contract and crack in every direction, become open, friable, and mellow, and are more easily nd cheaply worked, and pervious to the air in every direction." Thorough drainage, then, and the intermixture of sand, and coarse and warming dressings from the hoise stables, will bring a heavy soil into a condition favorable to the growth of any plant.

Many farms are made up entirely of sandy, plain lands upon which there is no soil of a different character. When such a soil is highly cultivated it will bring certain early vegetables to perfection, but fails to mature crops that require a longer growth. It may be amended, however, by a mixture of clay and muck. These should be hauled in and spread upon it in the autumn or winter, so that frosts and rains may pulverize and sweeten them; then by ploughing and by other means they should be thoroughly mingled with the soil. In this way, and with suitable manuring, a sandy loam may be formed, which is the best soil for all garden purposes. But it may be necessary to drain even a sandy soil. If springs rise to the surface, as they frequently do, it must be drained. In many sandy soils water is obtained in wells by digging only eight or ten feet, because the sand rests upon a hard or clayey bottom. In such cases draining is indispensable to success. The action of manures on light. sandy soil increases its cohesibility, its capacity for absorbing and retaining moisture, and renders it more compressible. Applied in sufficient quantity it renders the soil unctuous or pasty, and less likely to be affected by sudden atmospheric alternations of wet and dry. It also forms a better medium for the roots of vegetables, which, in a light and excessively porous soil, do not take hold with sufficient firmness.

The depth of a cultivated soil is always a matter of importance. Lands on which the vegetable stratum is thin are deficient in permanent productive power, and require much more manure and more thorough working than those of greater depth. Digging two spits deep, as is the practice in Europe, or gradually going deeper with the plough, tends to improve such soil, and will eventually render it productive, if the requisite care can be exercised in cropping and manuring.

When the upper stratum is thin and reposing on a poor subsoil, a speedy change may be effected in the following manner, although, on account of the great cost of labor in this country, it may not be advisable to attempt it except on a limited scale: Along the margin of the piece to be improved throw the soil, subsoil, sods and all, into a winrow on one side to the depth desired, say twelve or twenty-four inches. Then commence on the side in the direction the improvement is to proceed, and deposit all the mould and sods taken from the top in the bottom of the first trench, throwing that taken from the bottom of the second trench over on the top of the first, and in this manner proceed till the work is done Then cart on old, well-decomposed compost, mixed with an equal volume of green, unfermented stable manure, and work the whole thoroughly into the yellow earth until the virgin soil is approached. A liberal allowance of manure is required in order to hasten the decomposition of the soluble silicates contained in the fresh earth, as well as to insure the more ready absorption of the fertilizing gases from the atmosphere, which are necessary to impart vigor and activity to its latent powers. A small quantity of fresh manure, sprinkled in as the filling goes on, will be of great service; and, indeed, any kind of vegetable matter, such as straw, forest leaves, or chip manure, will materially assist the process of enriching the land, and will furnish food for the plants. Lands treated in this manner stand the drought much better than untrenched grounds, and are always found to be more productive, with the same amount of manure, than the deepest soils in their natural and unworked state.

In gardens I have seen this tried repeatedly. It is well known that sand and coarse gravel taken from wells and cellars will, when exposed to atmospheric influences, imbibe principles of fertility rapidly, where no manure is used, and become in a short time covered with verdure. I have known the common yellow sandy loam taken from the pit and spread on upland mowing fields with the best results. This loam is full of fertilizing salts, which, upon being brought to the surface, under the influence of the air and rains, are imparted to the roots of grasses with surprising effect.

Plaster and charcoal, each, are powerful absorbents of enriching principles from the air, and in all experiments like the one I have suggested they can be profitably employed. The second year after digging a very marked improvement will be apparent, and a single operation will have a decided influence for many years.

Those who have but little land should attend to this suggestion if they wish to make a garden productive. I have done it on garden lands, accompanied with thorough draining, and think I have doubled the crop, using no more manure than I did before the trenching.

When a soil is brought into the genial and healthful condition I have attempted to describe, it has a vital action energizing every portion of it, and as really breathes as animals do. An ingenious and philosophical writer says:

"A few years since if one had asserted that trees had lungs and breathed, he would have been held to an argument to prove it, just as a few years earlier nobody would have believed that the gills of a fish, the leaves of a tree, and the lungs of an animal, all performed the same office—that of aërating or airing the blood or sap. The soil breathes. How does it breathe? Its circulating fluid (the blood of the soil) is water. This comes from the air, and is already aërated—that is, filled with air. It soon loses its gases by contact with the soil, just as the arterial blood fresh from the lungs loses its oxygen when passing its circuit in all parts of the body. The blood comes back to the lungs for more oxygen; but the blood of the soil cannot do this, so we must let the air in, to come in contact with it."

From this exposition of nature's workings the gardener will see the necessity for "stirring the soil as deeply as practicable during drought, without interfering with the roots of growing plants, so that a deep and light soil shall invite a free circulation of air beneath the surface. Hot air the moment it passes beneath the surface becomes very moist, owing to the condensation of the water it contains, and which it deposits, thus not only airing the soil but adding to its moisture. Cold air holds but little moisture, while hot air dissolves an immense quantity which it deposits when it cools, or on cool surfaces. Who has not noticed on a winter day a locomotive leaving behind it a snowy cloud of vapor like a comet's tail, often floating for a minute after the train has passed? Think of this, and watch the steam car on days when the hot breath, just as full of water as in winter, is puffed out into the eye of the sun, and not steam enough shows to make a shadow, it is so quickly absorbed by the air."

These general remarks will suggest to any observing and reflecting person how he may secure at small cost a garden plot that will give him scope enough to raise all the fruits and vegetables needed by a family for its own use. It will require some labor and thought and care; but so does the ploughing of his fields, the building of his house, or the selling of his merchandise. The soil once brought into condition and followed by generous dressings and clean culture, may be heavily cropped for generations without having its fertility impaired.

SHELTER FOR GARDENS.

Where it is desirable to raise early vegetables and the finer fruits shelter is an important matter in most of the northern States, and one that is less attended to than it should be. Under the head of "Location," I referred to the shelter afforded by the form of the ground.

Where a garden lies upon a gentle inclination to the south, if the ground above is occupied by an orchard, or by forest trees, and especially by evergreens, little other shelter is needed. But such situations cannot always be obtained. Where the garden is on level ground, fences of boards or stone walls are the shelters most commonly resorted to; but there are objections to cutting up the grounds around the home into small enclosures. It detracts much from their beauty, and the constant opening and shutting of gates and bars is attended with much inconvenience.

Belts of white pine, hemlock, arbor vitæ, or Norway spruce, planted in double or triple rows on the northerly and easterly sides of gardens, furnish a better protection than walls or fences, and at the same time add much to the beauty of the ground. Where early vegetables and the finer fruits are to be raised such shelter is absolutely necessary. Vines and the more delicate pears are often greatly injured, and even ruined, by rain-storms accompanied by northeast winds. A fence five or six feet high, or an evergreen hedge will generally save them. Under such a shelter beds for early vegetables may be arranged, and next to them the more tender varieties of pears may be planted. In such situations the ground will not freeze as deeply in winter, and will be in condition to be worked several days earlier than open ground. The climate is greatly modified in places thus protected, and is actually found to be several degrees warmer on cold and windy days than in unsheltered situations.

One of the most remarkable instances of amelioration of climate by artificial shelter is found in the garden of Mr. Tudor, of Nahant. This is a rocky promontory projecting from the coast of Lynn into Massachusetts bay. It consists chiefly of rocky ledges, and is not more than half a mile wide. It is exposed to the full sweep of the easterly winds, which bring the salt spray over the whole surface. The soil is thin, and with such fierce visitations of wind and salt water, the vegetation is meagre and only of the hardiest kind. Yet in such a situation science and labor have triumphed over natural obstacles, and made the almost barren rocks to blossom as the rose. Corn and waving grain, trees of various climes, fruits, flowers, shrubbery, and rich lawns now meet the eye where only desolation held sway but a few years ago.

Mr. Tudor found that trees, even those of a hardy character, would not grow, or scarcely live, swept and twisted by the winds and coated by the salt spray, and he set himself at work to ameliorate the climate. Cold winds surcharged with acrid salts must be kept out, while warm sunshine and gentle airs must be admitted; and he has so far changed the climate of the locality as to enable him to rear tender plants and to produce fruits scarcely attainable in sheltered spots in the interior. Around one garden he has erected fences from ten to twenty feet high of common laths nailed to strong cross pieces, leaving interstices about two inches wide between them. Around another garden the fence is of brick, the lower five or six feet being built close and the upper portion full of holes about two inches square. These fences so break and sift the winds as to deprive them of all power of either straining the trees or conveying the salt spray to their foliage. The temperature is so changed that several degrees of difference may be noticed between the inside and outside of the enclosure. On a cold day there is a genial, soft atmosphere in the garden, while out of it November winds may howl along the coast with icy breath. With this change of temperature Mr. Tudor has succeeded in clothing this part of the promontory with rich varieties of plants. I here saw pear trees only four years from the transplanting loaded with fruit. The Northern Spy fruited in perfection; also the new, tender raspberries, and nearly all the fruits found in our best gardens. Mr. Tudor has set ten thousand trees among the rocks on the handful of earth he could come at where he desired to plant, so that now the currents of wind being broken, and evaporation in a measure retarded, vegetation will spring up spontaneously, and trees of a less hardy character than those commenced with will succeed.

His example exerts a wide influence. Other cultivators take the hint from his operations, and by means of fences and shrubbery are enabled to accomplish what would otherwise be impossible.

I have seen on Cape Ann a granite wall fifteen feet high, erected by the owner of a quarry, for the purpose of protecting his garden from the east winds.

The market gardeners in Belmont, West Cambridge, and other towns in the vicinity of Boston, erect tight board fences on the northern and eastern sides of their grounds, and against these they make long ranges of hot-beds covered with glass or with straw matting. Here with the aid of horse manure from the city stables, they raise lettuce, radishes, early cabbages, turnips, beets, cucumbers, and tomatoes, and large numbers of these plants, which, at the proper season, are either transplanted into their own fields or sold to gentlemen in the vicinity. Indeed quite a profitable trade has recently sprung up between the gardeners and people from the country, who resort to them for early plants for their own gardens. Proofs of the benefit of shelter to gardens meet us on every hand.

There are few good grapes that will ripen in New England in unsheltered grounds, but protected by a wall or hedge many fine grapes will attain perfection. One of the finest nurseries within my knowledge is protected by a thick belt of forest trees, and here the choicest pears, which will rarely pay for cultivation in unsheltered places, yield their fruit in perfection. Shelter will do more towards securing the early maturity of fruits, so that they may escape autumnal frosts, than can be done by high culture and heavy manuring. These, in grapes and pears, will produce a luxuriant growth of wood and large, plump fruit; but the wood is so filled with sap that the maturing of the fruit is rather retarded than hastened. For ripening fruit the atmosphere needs to be cultivated rather than the soil, and this can only be done by shelter, which protects the fruits from searching winds and surrounds them with a warmer and more uniform temperature.

We formerly attempted to force early maturity by high culture, but experience has proved its futility. In climates where the season is long it will give fine fruits, but will not ensure that early maturity which is the great desideratum in the northern States, especially in regard to those fruits and plants that have come to us from countries of warmer climates and longer seasons.

HOT-BEDS FOR FARMERS' GARDENS.

Market gardeners, commercial florists and amateurs understand well the absolute necessity of hot-beds in the economy of their operations. But few farmers are willing or able to incur the expense and afford the time which they imagine necessary for their construction and management. Various plans have been suggested for making cheap and simple hot-beds, almost any of which will answer for a garden for a common family. Every farmer may have at trifling cost a few feet square covered with glass to bring forward at least some lettuce, tomatoes, cabbages, early cucumbers, and a few flowers for his wife and daughters. October is the proper time to prepare the hot-bed.

Sashes three feet wide by five or six feet in length are the most convenient. Three such sashes will cover a bed of sufficient size for most families.

A frame nine feet long and of a width corresponding to the length of the sash may be made of plank or inch boards; it should be twelve inches deep at the front and eighteen inches at the back, the bed should be prepared on the southerly side of a wall, board fence, hedge, or some building; dig out a space as large as the frame eighteen inches deep; fill up with horse manure intermixed with leaves, straw, or litter of any kind one foot deep; tread it down moderately; cover this with good garden soil mixed with a little ashes, plaster, and fine compost; put on the frame, bank up the outside with coarse manure, straw or mulch of any kind, and cover with boards: put on the glass in March, and let it remain until the bed has become warmed by fermentation; the glass should be covered at night to prevent the radiation of the heat.

When the soil, which should be at least six inches deep, is in a proper state, sow the seed in rows at suitable distances; a portion of the bed may be reserved for pots, which should be imbedded in the soil to their rims. When the seeds begin to sprout sprinkle the surface occasionally with the watering pot; in the middle of pleasant days slide off the glass to give them air. It is important to attend to this, as growing plants need a plentiful supply of fresh air. After the plants are well above the surface the sash should be lifted whenever the sun is shining clear and warm, lest they be scorched. Sometimes a few hours' neglect of this precaution will greatly injure or entirely ruin the plants.

The fermenting manure will keep the soil warm at the bottom and the sun will warm the surface; thus the germinating seeds will find a warm soil and a warm air which will bring them forward two or three weeks earlier than they would come in the open air. In this way strong and vigorous plants may be grown and ready to transplant about the time seeds are usually sown in garden beds. After transplanting use some slight cover to protect the plants from the cold night air and the wind, and, if needful, from black flies and other insects. Thus a supply of early vegetables will be secured, such as tomatoes, cucumbers, cabbages, and so forth, which will be much enjoyed. This may seem a small matter to many farmers and not worth the trouble, but if tried will be found one of those little things that contribute to the pleasure of life—that keep us cheerful, contented, and in a happy frame of mind. We shall watch with great interest these plants growing green and vigorous before other vegetation shows itself above the ground. They tell us of what is coming; they strengthen our faith in the certainty of nature's arrangements, and encourage our hopes in the future. There is a satisfaction in having our early peas, radishes, or lettuce that well repays all the trouble they cost.

Ten or fourteen days may be gained even without the use of glass by making a bed of fine, rich soil well filled with warm compost, under the shelter of a wall, and covering it at night and on cold days with boards or matting. When the plants have been transferred to the garden cover them at night with inverted boxes, screens, or even by shingles inserted on the north sides of the hills and inclined over the plant like a roof. Every farmer must be governed in this matter by circumstances, and guided by his own ingenuity. Only market gardeners, flower dealers and amateurs need incur much expense. But every one will find both pleasure and profit in some simple arrangement for bringing forward early flowers snd vegetables.

Another very simple, cheap, but effective style of hot-bed we have often made, by making a pile of fresh litter from the horse stable on the top of the ground, about eighteen inches deep and a foot wider all around than the frame intended to be put on it.

The manure should be trodden evenly, firmly, and made level; upon it place a frame of the size of the sash to be used, which may be made of inch boards, ten inches high in front and fifteen inches high at the back, with the slope to the south, and a small stake in each corner driven firmly through the manure to keep it steady.

After the manure begins to heat put in from four to six inches of soil, made fine and level, and when in the course of a day or two that becomes warm enough, which can be ascertained by thrusting in the finger, sow the seed in rows running with the slope of the frame.

The bed must be carefully watched, watered, and opened every day, so that neither the seeds nor young plants shall suffer from too great heat.

If the weather is very cold, or if the bottom heat seems to fail, bank up the frame all round to the top with fresh, hot manure firmly trodden.

In making a hot-bed it is a very good plan to take the soil from some spot in the garden upon which in the fall the rubbish has been burnt, as many foul seeds and insects will thereby have been destroyed, and the ashes won't hurt the bed.

A hot-bed made in this way can be removed as soon as the plants from it are set out, which will be soon after the garden is made. This style of hot-bed is within the means of any farmer who can get a load of horse manure and has an old window sash.

CULTURE OF VEGETABLES IN THE GARDEN.

With a supply of seasonable vegetables the farmer can, with very little meat, furnish his family food that is not only economical, but palatable and healthful. With asparagus, rhubarb, early and late peas and beans, potatoes, turnips, cabbages, onions, beets, green corn, early and late squashes, cucumbers, tomatoes, strawberries, currants, raspberries, grapes, and the larger fruits, a diet may be provided fit for a royal table; and if to these are added the egg plant, celery, salsify, and various pickles and preserved fruits, what more can be desired? There are numerous varieties of most of these articles, which come into use at different times during the season, and can thus be had in their best condition. When gathered fresh from the garden they have a delicacy of flavor that is wanting in those obtained wilted from the market, and they supply those juices and acids that the health of the human system demands, especially during the warm season.

Now, in our climate, this almost unlimited variety of delicious and wholesome vegetables may be had upon every farmer's table from June to November, at very little cost of money, and at a very reasonable outlay of labor and systematic care; and potatoes, parsnips, squashes, cabbages, beets, turnips, tomatoes, apples, dried fruits, peas and beans may be had in abundance from November to June. With this bountiful supply of nutritious vegetables, with milk, butter and eggs, who can live better than the American farmer? If he does not have a well-furnished table it is his own fault. He cannot blame our skies or our soil, for in no other part of the world can a greater variety of luscious and well-flavored vegetables be produced.

In a letter which I received some years ago from a distinguished American gentleman then in Liverpool, it is said, under date of August 17:

"The supply of vegetables in an English market is much inferior to that in our own market-houses at this season. Potatoes are of excellent quality, better than in New England. Turnips are plenty, and cabbages in all their varieties are exceedingly abundant. But these are the great staples in the vegetable line on an English dinner table, now that green peas, which are never equal to our own, are going out of season. The bean tribe is very poorly represented by a few string beans, which are almost tasteless when cooked, and though shell beans occasionally appear, they never have the richness to which an American taste is accustomed. Indian corn in its green state is, of course, utterly unknown, and England will never be able to appreciate the luxury of a dish of succotash. All the squash family are strangers to the English table, although I have known of an attempt to raise them under glass, and have seen one or two diminutive specimens of the results.

"One vegetable, or rather fungous delicacy, which we comparatively lack, is the mush room, and you may just now see here bushels of these poisonous looking toadstools heaped up among the scanty supplies of better esculents. In view of these facts it is no wonder that the Englishman should be a grosser flesh eater than the American, and it seems very certain that a vegetable diet can never be a luxurious or fattening one in this climate.

"As regards fruits, the inferiority is still more lamentable. An untravelled Englishman has no idea of the deliciousness of a peach, a pear, or even an apple, although I have been told of a certain apple called the Ribston pippin, which is said to have been equal to the best of our own, but which is now almost extinct. So far as my experience goes, the pigs of America would not thank you for better specimens of either of these fruits than I have ever seen in England, of native growth, excepting in a hot-house. It is only by extending the branches against a brick wall, heated by interior flues, that the horticulturists produce even the semblance of fruit in the open air. Their strawberries, it must be owned, are very large, but look much better than they taste. But after all the wonder is, not at the failures, but at the successes of English horticulture, for a person accustomed to the almost tropical heat of our summer months cannot help being surprised that anything whatever should thrive in the watery sun beams of what the English call their summer."

After having secured a suitable location, properly prepared the soil, and provided necessary shelter, the seeds should be sown or the plants set in rows at a proper distance from each other. A common fault in kitchen gardens is the crowding of plants too closely together. Each plant should have room to spread its roots, and to admit a free circulation of air to every part of it. In beds which are to be cultivated wholly by the hoe, the rows may be somewhat nearer to each other than where the horse hoe is to be used between them. Where culture by the horse hoe is practicable, it will save much labor, and is always desirable, except, perhaps, at the last hoeing, when the large plants will be more liable to injury. The hills of cucumbers, squashes, and melons should be at least eight feet apart, and ten would be better. Beets, parsnips, and carrots, should not be less than six inches apart in the rows. Nothing is ever gained by crowding them nearer than this. Sow plenty of seed, and, at the proper time, thin out the plants with an unsparing hand, and it will be found good economy at harvest time.

As spade cultivation would take too much time, a farmer's garden should be so arranged as to be ploughed easily. A very convenient form is to lay out the garden in squares twelve or sixteen feet each way. Around the border of the squares sow, in a single row, beets, carrots, onions, parsnips, bush-beans, &c., and in the squares, plant melons, squashes, cucumbers, pole beans, peas, sweet corn, &c.

In this way all the vegetables are much easier cultivated, have plenty of air, sun, and room, and grow fairer and to a better size.

It has been said the good farmer is known by the clean culture of his fields. This is more emphatically true of the gardener. In the rich, warm soil of the garden weeds grow apace, and will not only stifle the more slow-growing plants, but will withdraw from the soil the elements of nutrition they need as their size increases. Constant and careful hoeing is necessary to rapid and vigorous growing. It keeps the soil loose and mellow, so that it can be more easily penetrated by the warm air, and can absorb the dews and gentle rains, and gives opportunity for the tender roots to stretch out in search of food. The hoe should be used till the plants cover the ground; after that it would be likely to injure them.

Jethro Tull, one hundred and thirty years ago, said:

> "As soon as the ploughman has done with his work of ploughing and harrowing, the soil begins to undo it, inclining towards, and endeavoring to regain, its natural specific gravity. The broken parts by little and little condense, unite, and lose some of their surfaces. Many of the pores close up during the seeds' incubation and hatching in the ground. As the plants grow up they require an increase of food proportionable to their increase of bulk; but on the contrary, instead thereof, that internal superficies, which is their artificial pasture, gradually decreases. The earth is so unjust to plants, her own offspring, as to shut up her stores in proportion to their wants—that is, to give them less nourishment when they have need of more. Therefore, man, for whose use they are chiefly designed, ought to bring in his aid for their relief and force open her magazines with the hoe, which will thence procure them, at all times, provisions in abundance, and also free them from intruders; I mean their spurious kindred, the weeds, that robbed them of their too scanty allowance."

But attention to the plants in a garden should not cease with the use of the hoe. Dead leaves and branches and diseased plants should be removed. Injurious insects should be kept out if possible, and, if that cannot be done, the plants they infest should be thrown into the hog sty, that no eggs or larvæ may be left in the garden. Weeds should never be allowed to mature their seed there, unless it is desirable to secure a crop of them for the next year. Many farmers keep their gardens clean and take much pride in their neat appearance during the early part of the season, but permit the weeds which spring up rapidly under the August and September rains to remain and ripen their seeds. This insures them plenty of work for the following year. Clean culture during the entire season should be the invariable rule. Where plants are crowded, such culture is difficult, and this is another reason for giving them plenty of room.

From long observation and experience I am satisfied that no part of the farm of the same size, cultivated in whatever crop, is so profitable to the farmer as the garden, and no equal portion yields so rich a harvest of pleasure, comfort, and health to his family.

It is not to be expected that every farmer will raise all the varieties of plants in his garden. Let each select those that he and his family value most, and make them the objects of his special care. But there are some kinds which I think should never be wanting in any garden, and these are asparagus, rhubarb, currants, and tomatoes. The first three are perennial, and when once established in a good soil will, with clean culture and an annual dressing, continue to yield fruit for an entire generation. The first two are among the earliest products of our climate, and are relished by almost every one. Currants and tomatoes come at a later period, and furnish delicious and healthful acids at the very season when our systems, debilitated by the heat, require their cooling and refreshing influence. Both of these fruits may be eaten in a ripe state almost without stint in the months of August and September, not only without injury to the health, but as among the most effectual preventives of those diseases that are apt to prevail during the heats of that season.

Garden vegetables not only afford a pleasant and healthful diet to the laborer's family, but they are especially conducive to the health of sedentary men. Their bulk and laxative qualities furnish the stimulus which the digestive organs require. For the soldier and sailor living upon salted meats and dry bread their juices and acids are the only effectual safeguards against the scurvy, to which so many fall victims. Preserved vegetables and fruits are now put up in large quantities for sea voyages, and, when fresh ones cannot be obtained, are an agreeable substitute. Among the most valuable for this purpose are horse-radish, potatoes, tomatoes, pickled cabbages, onions, cucumbers, and peppers. Those vegetable juices that contain lime are especially efficacious in all scorbutic affections. Malate and citrate of lime abound in the juices of the apple, the lemon, the currant, the grape, and the tomato. With a supply of these fruits, or, when the fruits themselves cannot be had, with the juices in concentrated form, furnished as a part of their daily rations, many men might have been saved for the service of the country who are now laid in distant graves or discharged from the army with enfeebled or broken constitutions. With the facilities for transportation we now have all our hospitals might be well supplied with fruits, vegetables, and vegetable acids. In the vicinity of our forts and permanent camps they may be easily raised, as in Prussia, by the soldiers themselves.

Asparagus and rhubarb both require a rich, deeply-worked soil. Late in autumn they should be well covered with horse manure, or with a compost containing night soil. This should be well worked into the ground with the fork. The ground should then be mulched with straw, coarse hay, or fine boughs. In the early spring the mulching should be removed, and the ground made light and clean by the fork and rake. No other care is necessary but to keep the ground free from weeds. Coal ashes have been found useful when placed around the roots of currants; they should be applied in autumn, and forked in in the spring. Spent tan bark may be spread in the rows between the bushes; it keeps the ground moist around their roots, prevents the growth of weeds, and is thought to be some protection against the borer, to whose attacks the currant is so liable.

As an appendix to the above remarks on garden vegetables I present the following table given me by a friend in Providence, Rhode Island, showing the cost per week of the vegetables and fruits consumed in his family of twelve to fifteen persons. He purchased day by day all that were used in his household, and kept an accurate account of the same. It shows the importance in an economical view of the vegetables used by New England families, to say nothing of what they contribute to health or the pleasures of life. With the exception of the large fruits, I think all the vegetables named in this estimate might easily be produced on one acre well cultivated as a garden.

Cost per week of vegetables for a family of from twelve to fifteen persons.

Spring.		Summer.		Autumn.		Winter	
Potatoes......	$1 00	Potatoes	$1 00	Potatoes	$1 00	Potatoes	$1 00
Turnips	75	Turnips	1 50	Turnips......	1 00	Turnips	75
Beets....	50	Beets	1 00	Beets	1 00	Beets	50
Squashes	62	Squashes	1 25	Squashes	1 00	Squashes	62
Onions........	12	Onions	13	Onions	12	Onions	12
Parsnips	25	Greens	75	Beans.......	1 00	Pickles.......	25
Cabbage	50	Lettuce......	75	Green corn...	1 50	Cabbage......	50
Celery.... ...	1 00	Radishes	2 00			Celery.... ...	1 00
Pickles.......	25	Beans.......	1 00			Beans........	33
Beans........	33	Peas	2 00				
		Green corn...	1 50				
		Cucumbers ..	50				
		Tomatoes....	1 50				
	5 32		14 88		6 62		5 07
For 13 weeks..	69 16	For 13 weeks.	193 44	For 13 weeks.	86 06	For 13 weeks..	65 91

Total vegetables, $414 57. Fruit per week: Apples, $1; peaches, $2; strawberries, $5; raspberries, $1; pears, $0 50; cherries. $1; blackberries, $1; melons, $1. Total fruits. $12 50.

FRUITS IN THE GARDEN.

In soil suitable for a garden, apples, pears, peaches, plums, cherries, quinces, and grapes may be cultivated with success, especially if proper shelter is provided. The trees in the garden should be so arranged as not to injure by their shade the other plants. When trees have become so large as to shade the greater portion of the ground, scarcely any vegetables can be profitably cultivated among them. Currants, gooseberries, and beans will do better than any others. Grass can be raised with profit under trees, but trees will not do well in grass, unless, perhaps, where the land is freely top-dressed every year. When young trees are making wood so freely that they do not produce fruit, which is sometimes the case in a highly manured soil, it may be expedient to lay down to grass for two or three years. The land should then be ploughed, and the decomposition of the sod fertilizes the soil.

A successful fruit grower of my acquaintance has practised the following rotation in the culture of his orchards: The first year, plough, manure, and plant potatoes; the second year, plough, manure, and sow oats and clover, and mow the oats for fodder; the third year, take off the clover crop and plough in the fall, preparatory to the potato crop which is to follow. Thus the land is manured two years out of three, and good crops of oats and clover are taken off, and a tolerable crop of potatoes, without apparent injury to the trees.

Of all fruits grown in the northern States the apple is the most easily raised, the cheapest, the most durable, is capable of being used in more ways than any other, and is probably the most wholesome and nutritious. Every family uses apples to a greater or less extent. Where sweet apples can be had at low prices they are used as commonly on the table as potatoes, and, since the high prices of the latter have prevailed, have been even more extensively used in some districts. Sweet apples require no sweetening, and baked, stewed, or made into puddings or pies are delicious and nourishing food. The garden cannot take the place of the orchard, but every garden should contain an "Early Harvest" tree, a "Sops-of-wine," a "Williams," a "Porter," and a "Fall Pippin," and two or three early sweet apple trees if possible. In a large garden, a part of which is appropriated to fruit, many other varieties, such as come into use at different seasons, should be introduced, so as to secure a supply for the whole year. By a little care when planting the trees this may easily be done. One acre in well selected varieties of apples will yield more food to the farmer's family than the same amount of land in corn or potatoes with half the outlay in money and labor.

A common error in apple culture is the setting of the trees too near each other. Thirty feet apart is better than nearer. Apples need sun and air No fruit, unless it be the grape, is more dependent on the sun for its flavor and color than the apple. Where it is intended to cultivate the soil by the plough and horse hoe, the trees should not be permitted to branch too near the ground. Some varieties, as the Rhode Island Greening and the Bellflower, have the habit of branching low. These should be planted where the soil may be cultivated with the spade. By properly pruning the lower limbs when the trees are small they may be trained to a better habit. Trees that have branches too low in the nursery should be rejected.

Pruning is an important matter, and one which I have not place here to discuss. I will only remark that spring pruning should never be allowed. From long experience I am satisfied that June and November are the best months for this work.

PEARS.

In the cultivation of pears a deep, rich soil, well drained, is absolutely necessary to success. In a cold, wet soil disease commences at the root; the juices become stagnant and unfit for vegetation. Pear trees will suffer from drought in a thin soil, but in a thoroughly drained one they send their roots deeper and obtain moisture. Pears upon pear stocks will live longer, become larger trees, and in general are less subject to disease, but those varieties that will thrive on the quince stock will yield fruit earlier than on their own. In setting pears grafted on the quince they should be set into the ground three or four inches deeper than the junction of the scion with the root and *kept covered,* and in due time the pear wood will throw out roots from its own substance. Those varieties that naturally grow large and thrifty are not suitable to put on to quince stocks, as they make wood faster than the root can sustain it, and the root becomes exhausted.

Pear trees should always have clean culture. Plenty of fine compost should be well mixed with the soil in the autumn by means of a fork, and the ground around the trees mulched. In the spring the mulch should be removed, the ground stirred thoroughly with the fork, and the mulch replaced. Where salt hay or rock-weed can be had they are preferable to anything else for mulching pears, on account of the salt they contain. Where they cannot be obtained a small quantity of salt is a valuable addition to the manure.

Pear trees require rather severe pruning, which may be done with a sharp knife in the spring. Large limbs should never be taken from them, as the stumps heal with difficulty. The common fault of pear growers is to allow the trees to bear too large crops. When they are young, and the fruit sets abundantly, a great part of it should be picked off. The remaining fruit will be much finer, and the trees will not be exhausted by the crop, which is apt to be the case when all the fruit that sets is suffered to grow. An almost unlimited variety of pears may now be obtained at the nurseries, and cultivators may indulge their taste and fancy in the selection, but no man will find it profitable to attempt the cultivation of a great number of varieties. A dozen kinds in a garden are better than a larger number. Indeed, the possessor of a dozen good sorts has no occasion to envy him who possesses more.

Many gardeners complain of repeated failures in their attempts to grow the pear upon the quince stock. I think if the two following conditions were carefully attended to such complaints would be less frequent: In the first place, select such varieties only as are suitable to be grown on the quince; and secondly, set the roots at such a depth in the soil that the place of joining shall be at least four inches below the surface, and keep the earth well pressed around the body of the tree. When these conditions are faithfully observed fruit will be obtained some years earlier than when the pear stock only is used, if not as permanently.

The following varieties are stated by Mr. Wilder, one of the most extensive pear growers in the country, to be those which succeed well on the quince: *Beurré d'Amanlis, Louise Bonne de Jersey, Belle Lucrative, Urbaniste, Duchesse d'Angoulême, Beurré Diel, Beurré d'Anjou, Vicar of Winkfield, Winter Nelis, Glout Morceau,* and *Easter Beurré.* Some varieties do well in one situation which will fail in another. Hence experience is the only guide. A well drained, clayey loam may be set down as the soil best adapted to pears, though they will often succeed on others.

Near a good market, and where circumstances are favorable, pear culture may be made extremely profitable. In the pear orchard of Mr. Bacon, of Roxbury, Massachusetts, which contains about six hundred trees, there is one, the crop from which, in 1861, was sold for forty-eight dollars; and another, a *Beurré Diel,* the crop from which, in 1859, was sold for eighty-two dollars. Mr. Bacon sells many pears every season at prices ranging from $1 50 to $4 00 per dozen.

Most of the finer pears should be gathered before they are quite ripe, and kept upon shelves or in shallow boxes in a cool, moist atmosphere. They may be removed to a warm, dry place a few days before they are to be used.

PEACHES.

In former years peaches were among the most beautiful and delicious of our fruits. In no part of the country were they finer or more highly flavored than in the southern parts of New England. But for a few years past an epidemic disease has prevailed among them, by which in many sections they have been wholly destroyed. It is believed, however, that the crisis has now passed, and within the last two years cultivators have again been planting them.

The peach tree likes a warm, gravelly soil, grows rapidly, and comes into bearing in three or four years from the bud. It is short-lived, and after bearing a few crops begins to fail. The best way to cultivate the peach is to have a succession of young trees to take the place of the old ones as they fail.

PLUMS.

Few fruits are more beautiful on the tree or more tempting in the dish than plums. As a dessert they are everywhere in favor, and are extensively used as a preserve; in either form they are wholesome and nutritious. Beauty around us adds to our happiness, if our tastes are rightly cultivated, and what can be more beautiful than a well-managed plum orchard near a favorite window, where, after the fragrant blossoms are gone, we can look upon the rich dark red of the Golden Drop, the faint green of the Imperial Gage, the golden yellow of the Jefferson, and the pale crimson of the Washington?

Plum trees are hardy and easily cultivated. They are suited to our climate, unless the black wart is a climatic disease. They flourish better on rich loams than on sandy soil. Of late years many gardeners and orchardists have been deterred from setting them on account of the black wart and the curculio. No remedies seem yet to have been found for the former. The curculio continues its ravages only for a short time and may be prevented from doing much mischief by timely application of fine lime, plaster, or ashes. These should be sifted over the young fruit two or three times a week for a month.

Among the best varieties of this fruit are the Golden Drop, the Imperial Gage, the Jefferson, Washington, Green Gage, Purple Gage, Lawrence's Favorite, and Smith's Orleans.

SMALL FRUITS IN THE GARDEN.

Large fruits may be cultivated to perfection in the orchard, but small fruits find their appropriate place in the garden. The most important of these are the currant, the strawberry, the raspberry, and the grape.

I have already referred to the healthful influence of fruits on the system depressed by summer heats. The very presence of a dish of fresh and juicy strawberries, currants, or raspberries upon the tea table is refreshing to the sight and stimulating to the languid appetite. Compared with them all other condiments are tame and insipid. As health-imparting medicines no sugar-coated pills or pellets can compete with them.

CURRANTS.

The currant requires a good soil and clean culture. The addition of a little compost in which ashes are mixed will insure a crop every year. In the open sunlight they are less subject to blight, but will yield tolerable crops in the shade. A row of currants on the north side of a tight fence will not ripen so soon by ten days as one upon the south side. In this way the season for enjoying them may be prolonged. There are several varieties in common use. The large kinds are in general the most acid.

The common Dutch red and white currants are hardy, and, perhaps, on the whole, the most valuable. The old and moss-covered wood should be cut out in the spring, and the branches not be allowed to grow too large and spreading.

In trimming cut the wood as low as possible; if buds are left on the stump they will immediately throw out sprouts.

STRAWBERRIES.

There is perhaps no fruit that grows so universally in every part of the world as the strawberry. It is found in the snowy regions of the north and on the sunny plains of the south. It grows in the valley, and creeps to the summit of the hill. It is a universal favorite with all races of men.

On a suitable soil strawberries are immensely prolific; as many bushels of them as of potatoes may be raised on an acre. One hundred and fifty bushels have been taken from an acre in a single season. No strawberry has a higher or richer flavor than the common wild fruit; but by cultivation they have become much larger and more prolific. By raising them from seed many fine and large varieties have been obtained. New kinds are brought forward every year. Berries of an inch in diameter are not uncommon in the market.

Strawberries are fond of a moist, rich loam, and thrive best where they have plenty of water. They may be set in the spring or autumn. I have had the best success with them set in the spring. The soil should be deep and mellow and well filled with fine compost. Set the plants about eighteen inches apart in rows, and give them clean culture. If it is intended to grow them upon the same spot for two or three years, the runners should be cut off as they shoot out, and the ground be kept loose with the hoe. A favorite method with some gardeners is to set the plants in rows two feet apart, and cultivate lettuce, radishes, or early beets in the spaces between them. These are removed about the time the fruit ripens; the runners are allowed to grow, and are directed into the vacant places. After one crop has ripened, the old roots are taken out with the spade, and the new roots made by the runners are cultivated for the next crop. Thus alternate rows are produced. The new roots are thought to give the finest berries. Many believe this to be the easiest and best mode of culture, and the success obtained by it in the vicinity of Boston seems to justify this belief. Some cultivators receive a thousand dollars per acre for the crop.

The land should receive a liberal dressing of stable manure in the autumn, and the plants be covered with leaves, sea weed, or pine boughs. In the spring remove the mulching, and work the ground with the fork, taking care not to disturb the roots. Some gardeners use liquid manure in strawberry culture. Two or three pounds of guano to a barrel of water will make a fertilizer that may be applied with decided advantage. Remarkable effects are sometimes produced by the application of sulphate of ammonia, sulphate of soda, nitrate of soda, or nitrate of potash dissolved in a large quantity of water. This should be applied with the watering pot, about the time the fruit begins to set, and may be continued once a week while the plants are in bearing. An abundant supply of water is the best means of prolonging the bearing season. When irrigation is practicable, streams of water should be led between the rows until the soil is well saturated, and the process repeated once in four or five days. It has been stated that by this means strawberries have been kept in bearing three months. Fortunately different cultivators select different kinds, each according to his taste, and thus many varieties are brought into use.

Almost every section of country has its favorites. Among the good varieties I will mention a few: Hovey's Seedling, Burr's New Pine, Brighton Pine, Scott's Seedling, Wilson's Albany, Bunce's Seedling, Triomphe de Gand, Scarlet Magnate, Diadem, Eclipse, Minerva, Imperial Scarlet, Florence, Prince's, Sirius, Primate, Longworth's Prolific.

RASPBERRIES.

Among the smaller fruits the raspberry holds a high rank. Ripening immediately after the strawberry, when fruit is rather scarce, it usually commands a good price in market. Its pleasant flavor, and cool, refreshing qualities, render it a favorite fruit. Some of the finer kinds are too tender for transportation, but may be cultivated for home use. The plants grow rapidly and require little care except to be kept clean. The best soil for them is a deep, rich, moist, and rather sandy loam. They bear liberal manuring. In the autumn the old canes and the weak new ones should be cut away, and only strong healthy ones left for the next crop. They should be headed in to within about four feet of the ground, and be tied to stakes.

Among the varieties deserving of attention are the Red Antwerp, the New Red Antwerp, Fastolf, Franconia, Catawissa, Brincklé's Orange, Knevett's Giant, and the English. But few persons are aware of the value of this fruit, or of the extent to which it is grown in some places. In the town of Milton, Ulster county, New York, there were, a few years since, one hundred acres devoted to its cultivation. The harvesting continues about six weeks; during this time men, women, and children are engaged plucking the fruit; about five hands are employed on each acre. The work commences as soon as the dew is off the plants in the morning, the berries being picked into small willow baskets, which at evening are packed in boxes and sent by steamboat to New York city. The average daily export through the season is ten thousand boxes, which, at ten cents per basket, amounts to $1,000 a day, or about $42,000 per season. Twenty tons have been sent from this one landing in a day.

GRAPES.

I do not propose here to enter upon the subject of vineyard culture, which has been greatly extended within a few years past, especially in the middle States, and in Ohio and Missouri, as well for supplying the markets with this delicious fruit as for the manufacture of wine. I shall confine my remarks to the culture of the grape in gardens.

Every householder may have a grapevine. It will grow in the corner of the yard or by the side of the porch. It may be trained on the roof of the wood shed, on the side of the barn, on a simple trellis, or on a single stake. The corner of the garden, which would not be convenient for a tree, will afford space and shelter for a vine. Its fruit not only makes a most delightful dessert, but in the sick room nothing can take the place of its cooling and refreshing juices.

The grape thrives best in a good warm soil, not excessively rich, but dark and mellow. Lime, old plaster, ashes, bone dust, scrapings from the road, leaf mould, or any well-rotted vegetable matter, make the best dressings for the grape. Green manures, animal substances, night soil, or other stimulating manures will force out a large growth of wood and foliage, but will add nothing to the quality of the fruit, and retard rather than hasten its maturity. Grapes that mature in season to escape the early autumn frosts are the only ones that merit the attention of cultivators in the northern States. Several new early varieties have been introduced within a few years. Grape-growers are directing their efforts especially towards the production of early sorts, and not without the promise of ultimate success. The Isabella was formerly the finest grape grown in the north; but, except in very favorable circumstances, a crop was not matured oftener than once in three or four years. Some seedlings from the Isabella have made several days' advance upon the parent vine in the season of ripening, with little or no loss in the quality of the fruit. Such sorts as originate in particular sections of the country generally become favorites there, which shows that thorough acclimation is necessary to success in grape culture.

All the finer varieties are liable to be winter-killed in the New England States. Until the vines become too large, the safest course is to lay them down in November and cover them with earth. They may be trained upon walls, trellises, or stakes. After the fruit has set, the buds should be pinched off at two or three leaves beyond the fruit. Cut or pinch the side shoots off as they put out. When they are laid down in November, the new canes, which are to be the bearing wood for the next year, should be headed in, so as to leave but few fruit buds on each one; from two to four are better than more. In the spring fork up the ground thoroughly around the roots, and keep it clean through the season. Soap suds, diluted urine, or weak brine may be applied several times during the summer with benefit.

For a full discussion of the subject of the climatology of the grape, the reader is referred to a valuable article by James S. Lippincott, esq., in the report of the Department of Agriculture for 1862. There are also many interesting questions connected with vineyard culture which, as before stated, I do not propose to touch at this time; but will close my remarks on this topic by naming a few of the hardier varieties adapted to out-door culture in the northern States. No grape can be considered hardy that does not thoroughly mature its wood before the frosts of autumn. Unripened wood will almost invariably be killed by our severe winters.

The hardiest grapes here are the Clinton, King, Logan, and Delaware; next to these come the Concord, Hartford Prolific, and Northern Muscadine; and next to these may be reckoned the Adirondac, Union, and Oporto; and for southern New England and the middle States, the Isabella, Diana, Rebecca, Allen's Hybrid, Lenoir, and Catawba. In this list I refer rather to the hardiness of the vine than to the quality of the fruit.

Every farmer should have at least a dozen grapevines about his house or in his garden; and thus, with little labor, he may secure from one to two hundred pounds of delicious fruit annually for his family and his friends.

RAISING, GATHERING, AND PRESERVING SEEDS FOR THE GARDEN.

I have now spoken briefly of the several leading points relating to a farmer's garden, and as its products are, most of them, not perennial, but require annual planting and care, some suggestions in regard to *raising*, gathering, and *preserving seeds*, seem to be all that is necessary to enable the most inexperienced to establish and manage a garden with entire success. Much inconvenience, loss, and "vexation of spirit" are constantly experienced through a want of *good seed;* and though its careful preservation has been urged for more than a thousand years, most persons are still careless or indifferent about it. Columella, who wrote about the time of our Saviour, in some remarks upon the importance of selecting the best seeds to propagate from, says: "I have this further direction to give, that when the cornes are cut down and brought into the threshing floor, we should even then think of making provision of seed for the future seedtime, for this is what Celsus says: 'Where the corn and crop is but small we must select the best ears, and of them lay up our seed separately by itself.'" The "cornes" here spoken of are probably wheat and other small grains, but the remarks are applicable to all seeds for planting. The farmer raises Indian corn for family use in a green state. No garden would be considered well supplied without it, and its value is increased by its earliness, and specially if it goes to market. Where care is exercised in selecting the soundest and best-formed ears of this grain, and those which are the earliest ripe, and continuing the practice for a succession of years, it is found to be greatly improved as to the time of its maturation. The same remark applies with equal force to other vegetables, roots as well as grains. Let me, then, particularize a little, and first, as to

WHAT SOIL IS BEST FOR THE PRODUCTION OF GOOD SEED.

A very rich soil in most cases develops *foliage* rather than seed. My experience has been that the *best* seed, and often the greatest quantity, is obtained from a soil naturally good, but not excessively enriched. Seed-plants should have more space than is generally allowed, abundance of light and air, and particularly of nourishment at the time of ripening, being essential to development and full perfection. When seeds are extensively grown for the market—for instance, the beet, carrot, parsnip, cabbage, &c.—they are generally grown much too densely, the object of the cultivator being to secure the greatest quantity from a given space of ground. If dry weather occur at the time of ripening—seeds so raised have little else than the form: they lack fulness, are deficient in weight, and a large per cent. will prove abortive.

WHAT TIME TO SET SEED-PLANTS OR SOW SEEDS.

Biennials, particularly cruciferous plants, cabbages, turnips, radishes, &c., should be set early, as soon as the frost is well out of the ground. The cabbage and the turnip, when set for seeding, suffer from the heat and dryness of the summer; but they are generally injured far more by the vermin and mildew to which they are peculiarly liable later in the season. The earlier such seeds can be ripened, I think, the better. As respects the onion, carrot, beet, and most esculent-rooted biennials, the practice should be the same. With me crops of these seeds have been uniformly greater and of better quality when the roots or bulbs have been set early, than when the transplanting has been delayed till the season has somewhat advanced.

It should, however, be remarked, that my soil is loamy, light, and warm, resting on a gravel. On a heavier, that is a more moist, soil, it would probably become necessary to set the plants a little later.

No general rule can be given which will be applicable to all soils.

The cultivator must exercise a sound judgment in the matter.

Annuals vary so much in character that no general directions can be given for the time of sowing. Many of the hardier kinds succeed best if sown in autumn just before the closing up of the ground. Some of the earliest and finest of table beets are raised from autumnal sowings, (classing the beet as it is usually cultivated as an annual,) and the parsnip, onion, and carrot, sown at the same season, are often successfully sown. Tomato plants and many other garden vegetables that spring up self-sown are generally much superior in strength and vigor, in early maturity and productiveness, to plants raised from seed sown in spring in the open ground. The cucurbitaceous plants of the garden—cucumbers, melons, squashes, &c.—are decidedly tropical, and must be classed as tender annuals. They vegetate best where the soil is warm and comparatively dry at the time of planting; but however early planted, or well they vegetate, they rarely make much progress till the occurrence of settled summer weather; and these remarks apply also to the common garden beans, particularly to the running varieties, the latter as a class, being less hardy than the dwarfs.

WHAT PLANTS ARE INJURED BY INTERMIXTURE.

It is to be regretted that a subject so important should be generally so little understood. Take, for instance, the squash and pumpkin. How few there are who either grow the plants properly, or save seed judiciously; and how few have the knowledge and skill to long cultivate and retain a variety of the musk or water melon in its purity! The numerous varieties of squashes and pumpkins cultivated in this country may be divided into three classes, viz:

First. Those with lobed leaves, and clavated or club-shaped furrowed stems, including all of what are known as field pumpkins, the Summer Crookneck, and scolloped squashes, the egg squash, orange squash, and others.

Second. Those with entire leaves and an *irregular fleshy* stem, including the Hubbard, Boston Marrow, Honolulu, Porter, Turban, Mammoth, and others.

Third. Those with entire leaves, and a clavated or a club-shaped stem, as the Winter Crookneck, Canada Crookneck, Striped Crookneck, Cashaw, and a somewhat oblate striped variety, imported from the West Indies, and seen in considerable quantities in our city markets in April, May, and June.

These classes will not *ordinarily* be affected by cultivation in the vicinity of each other, though the individuals composing a class mix with great facility. For instance, the Canada Crookneck may be grown with the common field pumpkin, or with the Hubbard, or Boston Marrow, and will generally retain its purity, neither affecting or being affected by the neighboring plants; and on the other hand, the common field pumpkin, or the common varieties of Mammoth squashes may be grown with the Hubbard, Marrow, or Crookneck with equal security. But the members of each class must be cultivated apart from each other, as the pumpkin mixes readily with all the varieties of summer squashes; the Hubbard with the Marrow and Valparaiso, and *vice versa;* and the Canada Crookneck with the Winter Crookneck, and the variety from the West Indies, &c., &c.

The muskmelon and the watermelon, being botanically quite distinct, are not regarded as being liable to intermixture when grown in close proximity; but so liable are the varieties of the muskmelon to change and degenerate, that of the almost numberless kinds which have from time to time been introduced, scarce a dozen could now be found that in size, form, color, and quality will compare with the original; and the same is true with regard to varieties of the watermelon. The celebrated kinds so recently introduced by the late Dr. Brincklé, of Philadelphia, seem already to be disappearing, either by being gradually absorbed in varieties previously cultivated, or becoming merged in each other. Of the cucumber, every year adds to the long catalogue of sorts. Very recently a hundred and eighteen sub-varieties of what is known as the "London Long Green" have been experimentally cultivated at the Chiswick Gardens, in England, not ten per cent. of which, judging from the past, may be expected to continue long in cultivation, or even to be known in a pure state twenty years to come. The kinds commonly found in the gardens of this country are few in number, and readily intermix when grown near each other. Seedsmen obtain the best seed possible of any genuine sort and cultivate by the acre *for the seed only*, and by this course retain a variety in a tolerable state of purity. In ordinary gardens, where a few are grown for the table, (the early frame, white-spined, and long Turkey cucumbers being perhaps planted promiscuously together,) the seeds, so far as respects the reproduction of the parent stock, must be considered comparatively worthless.

The Lima bean is greatly injured by being grown in close proximity to the Sieva, to which it is botanically allied. The seeds decrease in size, and the plant itself seems to degenerate. Some varieties of the bean seem very permanent in character; for instance, the round yellow six-weeks and the running cranberry, both of which have been common to our gardens for more than a century, and which have slightly, if at all, changed since their introduction; while the horticultural, dwarf horticultural, dwarf red cranberry, and many others, are peculiarly liable to intermix and degenerate. If a farmer or gardener raise his seeds of this vegetable for planting, the best course is to sow the varieties apart from each other; but if he is annually dependent on the seedsman for his supply, the method of cultivation is less important, and the dwarfs or running sorts may be planted about his grounds as taste or convenience may suggest.

Different varieties of the best readily intermix when not near each other for seeding, as do also the different kinds of carrot, cabbage, and turnip. A single umbel of carrot seed sowed last season for the purpose of testing the fact produced roots which varied greatly in color; some were orange and some were pale yellow, with numerous intermediate shades.

WHAT PART OF THE STEM PRODUCES THE BEST SEED.

It is the prevailing opinion that the central shoot or central umbel produces the finest seeds. The side shoots are later in development, slender and weak, and the seeds they produce, if they differ in no other respect, are smaller and generally less perfectly matured. Among umbelliferous plants, as parsnips, celery, carrots, &c., the central head is first put forth, is almost invariably much the largest, blossoms and matures in advance of all others, and the seeds will much outweigh the product of any other single umbel that may afterwards be produced. It is proper to add that as among animals so among plants, "like, in a greater or less degree, produces its like." The practice of allowing the parsnip to remain in the ground during winter, and to be grown for seed where they were sown, is wrong. The better course is to take them up in autumn, and in spring—as is the custom with careful growers of the beet and carrot—select the smoothest and most symmetrical roots for transplanting; as when allowed to seed where they were sown, there can, of course, be no choice of roots, and they must consequently be saved indiscriminately from deformed and branching roots, as well as possibly from the more smooth and regular.

The seeds of the cabbage obtained from decapitated stems are comparatively worthless. For a long period it was almost the universal practice, both in this country and Europe, to cut off the heads from time to time during the fall and winter as they were required for use, or for the market, and to set the stumps in spring for seed. The result of this course was precisely what might have been foreseen—the heads grew small, comparatively loose and open, and, what was soon worse, a large proportion of the plants refused to form any head at all. But when gardeners and seed-growers selected the largest, most solid, and finest-formed heads, preserved them carefully during winter, and set the plants *entire* in spring, the effect was almost immediately apparent, not alone in the increased proportion of the plants producing heads, but also in the larger size, greater solidity, and general superiority of the heads themselves. Compared with the trouble and expense attending the preserving and setting the whole plant—involving, of course, the loss of the head on the one hand, and that of selling the heads and raising the seeds from the headless stems on the other—the difference in cost is necessarily larger; but the real superiority of one kind of seed over the other can hardly be overestimated. The fine heads of lettuce seen in our market late in winter and during spring have been the result of this course of culture—the selection of the finest-formed and most compact heads for seed-plants.

Certain rules observed in the selection of seeds of the bean will make the plant dwarfish or increase their height and size—will make a variety earlier and less productive, or later with increased yield.

Take the horticultural as an example of the running varieties. If the first ripened pods—which are the lowest—are selected for seed, and if this practice is continued for a few years, the variety will become almost as early as the Early China, and, indeed, almost as dwarf. Or, if the green pods are plucked for use during the summer, and the few pods at the extremities of the vines that have escaped being served at table, be resorted to for seed, the plants will be tall, comparatively slender, and the pods will form late in the season and high up the stem. The same is true of the dwarfs. The best course in small gardens, where the grower plants his own seed, is to leave a sufficient number of plants entirely unplucked. There is little difficulty in so cultivating vegetables as to induce *earliness*, but *it is always at the expense of the number and size of fruit, and the health, vigor, and complete development of the plant.*

In the cultivation of the cucumber a gentleman for nearly or quite twenty years saved the first developed fruit nearest the root for seed. At the expiration of this time, few of the plants attained a length of three feet, and the largest of the fruit seldom measured above three inches in length! It is true, they had become *very early*, but the plants were so dwarfish and the yield was so small that the crop did not pay for cultivation.

Few of our garden or field products require more skill in culture and management than the squash and pumpkin. To plant apart from other varieties, and even to raise large *crops* of these vegetables, is not all that is essential to successful propagation and cultivation. To raise large *specimens* is also comparatively easy; but to cultivate a variety for many successive years and retain it in its purity will be found a more difficult matter. Take, for example, the *Canada Crookneck*. In its purity the skin is of an even cream yellow, the flesh salmon red, fine grained, quite saccharine, of pleasant flavor, and the average weight not above four pounds. Now how is the variety lost? Suppose some grower to have a stock of seeds strictly pure, and his crop to correspond with the description just given. During winter and spring they are from time to time used in his family, but two or three happening to be *larger*, and, as he supposes, consequently finer than the rest, they are at once carefully reserved as the most suitable for seed. The next season, and the next, this course is uniformly pursued, until this, the most delicate of its peculiar kind, becomes lost in the huge proportions of the green, yellow, or striped Winter Crooknecks, weighing fifteen, twenty, and perhaps even thirty pounds! Now, if the cultivator would keep in view the normal size of this variety, remembering that much of its superiority over the larger sorts lies in its condensed sweetness, and plant seeds from well-ripened specimens of about three pounds weight, and continue the practice, he would retain his squash in its purity and have a grade of excellence equal, if not superior, to any other variety. Then the *Boston Marrow:* when first introduced, it was symmetrically ovoid in form, with an almost deep red skin, and the weight averaged about six pounds. As now found in our markets, the weight varies from eight to twelve pounds; and the color, instead of the deep red of the original, has passed to a light, cream yellow, almost betraying in its pale exterior how much its saccharine properties have been diluted by this increase of size. If the practice of preserving seed from the largest specimens be long continued, it will most assuredly end this excellent variety in some monstrous nondescripts, good for little else but to be admired at a cattle show, and give variety to the bill of fare for our farm stock. One of the most successful growers of the Marrow squash in the vicinity of Boston saves his seed from the smallest well-ripened fruit he can select, often from those not weighing above three pounds; and he affirms that, under this practice, the vines are more hardy and more abundant bearers, and the fruit is superior in all respects to that obtained by following the old custom of planting from the largest fruit.

There seems to be a strange fascination in size, but it should be remembered that excellence is not always comprehended in magnitude; and though we admire a noble apple, pear, or peach, and though we cultivate our small fruits to their utmost perfection, many of our garden vegetables—our potatoes, beets, turnips, radishes—beyond certain dimensions are actually worthless for the table, and this is measurably true of our squashes. Could we have the Canada Crookneck, Boston Marrow, Hubbard, or any of the best table sorts of the size of the Mammoths sometimes seen at exhibitions, it would hardly be desirable; for what disposition could a family of average size make of the huge mass of flesh within the ribs of such a vegetable monster? It would literally perish in the using.

It has been remarked that American-grown seed-peas succeed much better in this country than imported seed of the same varieties. This is true not alone as respects the pea, for a large majority of our garden vegetables succeed much the best when raised from American-grown seed. Onion seed of English, French, or German growth rarely, if ever, succeed well when sown in this country, even though the variety may have been of American origin.

The influences of climate, of course, are great; but to these there should be less regard on the part of foreign cultivators as to the quality of the bulbs set for seed. The careful American cultivator selects the fairest, best-proportioned, and above all, the best-ripened bulbs for his seed, and there is the most positive evidence that this course, if long continued, will result in the great improvement of the crop in size, quality, and the increased proportion of plants forming large and well-ripened bulbs.

WHEN SHOULD SEEDS BE GATHERED AND HOW PRESERVED?

Seeds should not be gathered until fully ripe. The rule for cutting wheat and other cereals before it is thoroughly ripened will not apply where the grain is to be used for sowing again. After gathering, the seed should be thoroughly dried and stored in cool, dry, and well-ventilated apartments; but, however thoroughly dried, and however cool and airy the locality where they may be stored, they should be divided into small packages, for when stored in masses they are extremely liable to generate heat and lose their vitality.

No complaint of seeds is more common than this, that "sweet corn will not come up." And the remark is a true one; it does not come well, so that thousands are annually disappointed by failing to secure this cheap, wholesome, and delicious garden vegetable. I have no more trouble in bringing it than in the common yellow corn, because I see that my seed is thoroughly ripened, and when gathered hung up in an airy place, and entirely beyond the reach of frost until it is completely dry. Sweet corn is full of juice, and requires a considerable time to become dried through both kernel and cob. The common practice is to gather it, perhaps before it is ripe, throw it upon a floor or hang it in some exposed place, where the frost reaches it before the cob is dry and destroys the vegetative power of the kernel. Then, of course, the seed is worthless for the purpose of planting. So it is with some other fleshy seeds, such as the cucumber, and sometimes even the tomato.

Seeds that were excellent originally, are frequently impaired by being brought on shipboard from foreign countries. It is found almost impossible to prevent a slight dampness, and this, together with the warmth of the place in which they are kept, induces the first stage of germination or mould, either of which is sufficient to destroy the vitality of the seed.

An experienced seedsman informs me that the best way of keeping seeds is to wrap them in substantial paper in small parcels, then enclose them in strong bags and hang them up under the rafters or beams in the attic, tool-house, or some similar place.

Some persons transplant mangolds, parsnips, and beets, but the practice is not a good one with any of the "tap-rooted" or fusiform plants. In testing parsnip seed to ascertain whether it is good, I find that each seed that germinates sends down a root four or five inches long by the time the leaves have attained half an inch in length. If the point of this root be broken off, even though near its extremity, the parsnip will be quite likely to be short and fibrous instead of long and fair. I made some satisfactory experiments in this respect last spring and summer. The best way is to test most seeds in the house. Any old box will answer the purpose. This simple precaution will save delay and disappointment. If the seeds come well in the box, sow some of the same kind in the garden, reserving enough to fill the vacancies that may possibly occur. I would recommend to transplant, however, in preference to leaving vacant places.

TIME THAT SEEDS WILL RETAIN THEIR VITALITY.

There can be no positive data given as to the time that seeds will retain their vitality, because in the nature of the case the circumstances under which they are placed will scarcely be alike in any two instances.

The following table has been handed me by a seedsman of much experience, and is probably as correct and reliable as anything we can get.

Artichoke	5 to 6 years.	Parsley	2 to 3 years.
Asparagus	2 to 3 years.	Parsnip	2 to 3 years.
Beans, all kinds	2 to 3 years.	Pea	5 to 6 years.
Beet	3 to 4 years.	Pumpkin	8 to 10 years.
Brocoli	5 to 6 years.	Rhubarb	3 to 4 years.
Carrot	2 to 3 years.	Squash	8 to 10 years.
Cress	3 to 4 years.	Lettuce	3 to 4 years.
Corn kept on the cob	2 to 3 years.	Melon	8 to 10 years.
Cucumber	8 to 10 years.	Mustard	3 to 4 years.
Egg plant	1 to 2 years.	Okra	3 to 4 years.
Endive	5 to 6 years.	Spinach	3 to 4 years.
Leek	2 to 3 years.	Tomato	2 to 3 years.
Cauliflower	5 to 6 years.	Turnip	5 to 6 years.
Celery	2 to 3 years.	Pepper	2 to 3 years.
Chervil	2 to 3 years.	Radish	4 to 5 years.
Corn salad	2 to 3 years.	Salsafy	2 to 3 years.
Onion	2 to 3 years.		

HERBS.

Anise	3 to 4 years.	Hyssop	3 to 4 years.
Balm	2 to 3 years.	Lavender	2 to 3 years.
Basil	2 to 3 years.	Sweet marjoram	2 to 3 years.
Caraway	2 years.	Summer savory	1 to 2 years.
Coriander	1 year.	Sage	2 to 3 years.
Dill	2 to 3 years.	Thyme	2 to 3 years.
Fennel	2 to 3 years.	Wormwood	2 to 3 years.

An incident mentioned in the "Canada Farmer" is worth noticing. Mr. John Knowlson says, that having some half dozen packages of garden peas of different varieties, and some beans labelled "Agricultural Beans," which had lain in a lumber room as valueless for eleven years, he sowed them as an experiment. Almost every one vegetated and produced an excellent yield.

He adds that they were put up in strong brown paper bags of fine texture, pasted so as to exclude the air.

Were space allowed I might speak of several other topics in connexion with the farmer's garden, such as the gathering and keeping of fruit, the influence of the atmosphere on plants, the diseases of plants, insects, birds, bees, garden implements, and other things.

Increasing intelligence, taste, and wealth have converted many things that once were luxuries into the comforts and even the necessaries of life. Every man who cultivates even a small garden, and who has a taste for beauty, can add ornament to his culture; can mingle with those plants that are sweet to the taste, and which are designed to nourish the body, such as are pleasant to the sight, and as shed an agreeable fragrance around him.

Men of wealth and those who wish to create rapidly a world of beauty around them may employ an artist, but every farmer should be his own artist. Nature has implanted in every man a love of the beautiful, and this, if cultivated, will become to him a source of pleasure and enjoyment. Not every man can paint, but every one can make a picture; and where can a more beautiful picture be found than is presented by a well-arranged, well-cultivated garden?

A cultivator can make a garden anywhere; among the rocks, upon the steep declivity he can form a terrace, by the side of the running brook, around the pond, along the border of the marsh he can make the beautiful flowers spring up. He can form beds of rich vegetables, and borders of roses and pinks and verbenas. He can arrange them in straight lines or in curved lines; he can form them into squares or parallelograms, into circles or ellipses, into triangles or hexagons, into any forms that may best suit the nature of his ground or please his fancy. He may so arrange the vegetable forms that spring from the ground, and which in themselves are beautiful, and so combine their shades and hues, as to increase and brighten the beauty of the whole; and he can set his picture in a beautiful frame. He can surround his garden with trees, evergreens, forest and fruit trees, so arranged as to give shelter to the plants that require it, and to protect all from the chilling winds.

By doing a little at a time, by adding one improvement after another, every farmer may in a few years create around him scenes whose beauty alone would amply reward him for all his labor. A garden thus formed by degrees is much more satisfactory than one produced at once by a large outlay of labor and money. The pleasure of creating it is prolonged, and the expense being but little at the time, is not felt. In this way, also, new flowers, vegetables, and fruits are added from time to time, each giving a fresh pleasure and new beauty.

A garden is one of the most fruitful sources of instruction to the family. The farmer can here bring his children, and speak to them of the wisdom and skill and benevolence of the Creator. He can dissect flowers, plants, and seeds, and show their curious structure, and how wonderfully nature has provided for their preservation. This is one of the fine arts which the farmer can cultivate; and while he is gratifying the love of the beautiful which nature has given him, he is also improving his intellect and his heart. The mere allusion to this subject will suggest a multitude of pleasant thoughts.

The farmer needs recreation, and where will he find it better than in his garden? Time spent there will make him fonder of his home, and keep him from temptation. Many young farmers might have been saved from ruin if they had early commenced the cultivation of a garden. The public need to be urged to give more attention to this subject. Every man of taste and intelligence should seek to interest his neighbors in it, especially the younger portion of them. In this way communities may be influenced, and beauty, which shall increase our attachment, be added to our beloved land. Garden culture will surround our homes with associations of beauty, and with memories of pleasure and joy that will go with us wherever we roam, and never forsake us till we lie down to our final repose in the bosom of the earth.

FLOWERS IN THE GARDEN.

Everybody likes flowers. Thousands of persons who are not farmers will read this volume; many of them intend to be farmers some day, and are earnestly interested in all that pertains to rural employments. They are active business men, with intelligent families partaking largely of their tastes for country life, and, not enjoying that, are beautifying their town or city home with such fruit trees, shrubbery, and climbing plants as their narrow limits will permit. Our suburban towns are annually made more attractive by this taste for the beautiful, and something of it is finding its way into the country, where grim labor has heretofore held undisputed dominion.

The love of flowers and the cultivation of them is an evidence that true and pure sentiments are in the heart; that a love for the beautiful has dawned there, and that the elements of progress are at work. One would scarcely love flowers merely because they look beautiful. He who could go no further than this would hardly have perception to go even as far. But when he breathes their fragrance, and witnesses the manifestations of God's love and wisdom in their structure and growth, then, indeed, are deeper and holier sentiments underlying the love of flowers. The care and culture of them elevate and purify the mind, and give the dusty walks of life many a charm that cannot be found where they are wanting. They have a refining influence on children, tending to soften and polish their manners, and to inspire them with cheerful views of life.

"It is a law of our being that we become attached to those objects upon which we have bestowed labor, and on which we have expended care. We love the trees our own hands have planted, the vines we have cultivated and trained over our doorways, and over the trellis our own hands have constructed."

Cultivated flowers are evidences of high civilization; they are a sort of floral thermometer, indicating in some degree the intelligence and refinement of the people; and their indications are as significant as are the evidences afforded by architecture, painting, poetry, or any of the sciences. The lessons of these gentle teachers are having an influence on the habits and manners of our people. In a recent journey over a broken and unattractive country, I passed many unpretending dwellings graced with a variety of beautiful flowers. Dahlias and phloxes opened their showy blossoms in the sunshine, and made the dooryards bright with their beauty. The modest nasturtiums kept nearer the ground, and spread their flowers of various colors wherever a stream of sunlight could find them. On the gate-posts, in flower pots, and even in rude wooden vessels, trailing plants were growing, hiding blemishes wherever they could, and making the dwellings a thousand times more attractive than they would otherwise have been. Where there were flowers I thought I could see more order about the buildings, an air of tidiness, thrift, and comfort, and better farming generally; and when I entered the dwellings I found the families intelligent, comparatively refined, and not unfrequently imaginative and poetical. Strange as the assertion may sound to some, it is nevertheless true, that if these last two qualities were more generally prevalent and cultivated on the farm they would tend to keep thousands of farmers' sons and daughters from deserting the old homesteads.

"The love of flowers is the love of nature in detail; it is a union of affection and good taste and natural piety." Flowers are the steady, impartial friends of all. They gladden the sick room, and cheer the dusty way of the weary traveller. The bright golden-rod nods over the wall as he passes, and the modest aster or queen daisy peeps from the thicker foliage. The ancients adorned the altars of their gods with flowers. So the curled clematis forms bowers by the wayside, and is called by the country people "Virgin's Bower." It lays hold of the young maples and alders with its clasping tendrils, mounts to the top of the surrounding foliage, and covers it with its gossamer-like blossoms. The French truly call it the "Traveller's Consolation."

The cultivation of flowers and a better knowledge of them will not only have a happy but an enduring influence upon our people. It will affect the character of our farms and homes. Instead of uninclosed dooryards, where stray cattle and gabbling geese are at home, and old wheels and rambling woodpiles skirt the house in dire confusion, while huge dogs, grim as Cerberus, guard the doubtful way to the door, there will be white palings enclosing a spot sacred to "fruits and blossoms that blush in social sweetness on the self-same bough." These will not only attract and please the traveller, but will give the farm an advanced money value through associations of intelligence, refinement, and taste. Children reared in such a home will go forth into the world filled with those sweet affections that soften the harsher aspects of life. Wherever they travel, or trade, or sojourn, they will look back to the old homestead, among whose friendly trees and flowers they passed their early years, as the dearest spot on earth, and one to which every lingering affection will constantly turn.

Our people do not yet fully appreciate the power of garden employments to restore health, to bring back strength and equanimity to a distracted mind, and to wean it from deep sorrows occasioned by bereavement. A lady wrote me several years since, saying that in the autumn she met with a severe domestic affliction. A long, dreary winter passed, and knowing, as she well did, that occupation gives relief to a mind distressed, she resolved to commence the cultivation of flowers. Her husband provided a suitable spot in the midst of a rich vegetable garden, in which she placed a few varieties of pinks, some common roses, and a flowering almond. Everything she placed there grew and throve finely, and the cultivation of this little spot became a source of real comfort. The next autumn she set four tulip bulbs, and in a few years she had more than two thousand tulips in blossom in one season. There were twenty-seven varieties; and, besides these, she had all the bulbous roots that are usually grown in our climate, more than twenty sorts of roses, and an almost endless variety of annuals and perennials. She said the pleasure she derived from tending the garden amply repaid her for all the labor bestowed upon it. I give the closing part of the letter in her own words:

"I am a farmer's wife, and not without an abundance of in-door employment; but my garden is my relaxation from labor. Money would not tempt me to part with it. From the earliest crocuses and snowdrops to the latest autumn flowers, it is one continual pleasure. I will add, that since I commenced gardening there have sprung up about our dwelling trees bearing most delicious plums, cherries, and pears, vines laden with the juicy grape and strawberries and raspberries, too, have each their place in some favorable spot. I would not willingly exchange my home for what it was before we cultivated fruits and flowers, and I believe any one owning even a small amount of land can, without being poorer for it, afford a little spot for ornamental gardening."

The care of flowers will soften the poignancy of grief, and heal sorrows that no medicaments of the apothecary can cure. God's sunlight and pure air, the fragrance of unfolding flowers, the freshness of the soil, and free exercise among growing plants in the garden, may give health and life when all other means fail.

Few dwellings are so circumscribed, and few persons so involved in care, but room and time may be found to set a few climbing plants that will soon change the whole aspect of home. The scarlet trumpet honeysuckle, the yellow trumpet monthly, and the evergreen monthly honeysuckles, are hardy and beautiful climbers for the pillars of piazzas, summer-houses, porches, and trellises. The Chinese twining honeysuckle is another, growing remarkably fast, flowering in June, and very fragrant.

The purple or crimson Boursalt rose is quite a wonder of beauty in the latter part of May, being then literally covered with blossoms, and it is so hardy that scarcely a branch is ever injured by the cold of winter. The Queen of the Prairies is a superb variety, and known by some as the Michigan rose. The flowers are of a deep rose color, with a white stripe in the centre of each petal; it is the most luxuriant grower of its class, and is as hardy as an oak. It blooms after the summer roses are gone. The Baltimore belle is another perfectly hardy rose; the flowers are a pale, waxy blush, almost white, very double, and in large clusters.

The Virginia creeper, or American woodbine, is a hardy, rapid grower, and is exceedingly ornamental. It is a native of our own woods, and climbs rocks and trees to a great height. The flower is of a reddish green color, and is not showy, and is succeeded by clusters of dark blue berries, which are nearly black when mature. At the same period the fruit-stalks and tendrils assume a rich crimson or red color. The leaves are not evergreen like the ivy, yet in the autumn they far surpass that plant in their rich and gorgeous tints. It is the most ornamental plant of its genus. It flowers through July and August.

In speaking of it in his work on the "Trees and Shrubs of Massachusetts," Emerson says:

> "The great variety of rich colors, shades of scarlet, crimson, and purple, which the leaves and stems of this plant assume, and the situations in which we find it, climbing up the trunks and spreading itself along the branches of trees, covering walls and heaps of stones, forming natural festoons from tree to tree, or trained on the piazzas of dwellings, make it one of the most conspicuous ornaments of the autumnal months. Often in October it may be seen mingling its scarlet and orange leaves thirty or forty feet from the ground with the green leaves of the still unchanged tree on which it has climbed."

Nothing surpasses this plant for covering a rustic summer-house, such a one as a farmer and his son could construct in a single day. It is so tenacious of life, too, that a child may tear a root from the ground and carelessly place it in the soil again, when it will grow with surprising vigor. How many gloomy dwellings might be crowned with this beautiful ornament and made bright and cheerful at a trifling cost of care.

These eight hardy and ornamental climbers of which I have spoken would give character to any place, even one of considerable pretensions, and any three or four of them would render our gardens and rural lawns highly attractive. They require no uncommon skill in their cultivation; the soil that would produce a good hill of corn will sustain any of them.

In order that the garden should retain its beauty and attractiveness through the season, there should be a succession of flowers, and a very few, judiciously selected, will afford a pleasing variety. Bulbous flowers must be selected for the earliest bloomers; other herbaceous perennials for their successors, and some particular bulbous plants and annuals for late summer and autumn flowering. The earliest bulbous flowers are the snowdrops, single and double,

> "Who, in habit white and plain,
> Come as the heralds of fair Flora's train."

The crocus, hyacinth, daffodil, or jonquil, and early anemone, all appear almost as soon as the snow is off the ground. These may be followed by the portulacca, adonis, wood anemone, pansies, primroses, and the numerous and brilliant varieties of the tulip, and many others. After these there is a rapid succession of herbaceous perennials, some of the finest of which are the veronicas, phloxes, lupins, the iris of many sorts, columbines, poppies, and the magnificent varieties of the herbaceous peony.

Among the most interesting summer flowering bulbous plants are the "*Gladiolus communis*," or common purple sword lily, which is perfectly hardy; the *Gladiolus floribundus*, or profuse flowering sword lily, remarkable for its beautiful flesh-colored flowers; the *Gladiolus gandivensis*, or Ghent sword lily, with flowers of a rich orange scarlet; and the "tiger flower," remarkable for its showy petals, blooms about the same time; so do the splendid double-flowering hollyhocks. The Japan lilies are more showy and quite hardy. Autumn flowers are obtained largely from the successful culture of annuals. The chrysanthemums flower almost into winter. They are hardy and will grow if planted in open ground with a shelter and full exposure to the sun during the latter part of autumn.

There are many flowering shrubs that are hardy and of great beauty. The pink mezereon blooms before the leaf starts, and sometimes before the snow-drifts have all disappeared. Several of the spireas, the wax plant, Chinese honeysuckle, strawberry tree, lilacs, and viburnums are all beautiful and easily cultivated.

I will only call attention to the great variety of charming wild flowers of our country. They are among nature's most beautiful productions, and by their freshness and fragrance will well repay any care and attention given them.

There are many other flowers which the amateur would introduce into his garden, but I have referred to a few only of the most beautiful merely to show the beginner that his labor will be rewarded, even in the first season, in this delightful work.

In what I have said of fruit and vegetable gardens, as well as of flowers, my aim has been not so much to show how they can be produced as to excite in the mind of the reader a taste, desire, and love for the occupation. When Mr. Colman was abroad on his agricultural tour he wrote:

> "I have said and written a great deal to my countrymen about the cultivation of flowers, ornamental gardening, and rural embellishments, and I would read them a homily on the subject every day of every remaining year of my life if I thought it would induce them to make this a matter of attention and care. When a man asks me what is the use of shrubs and plants, my first impulse is always to look under his hat and see the length of his ears. I am heartily sick of measuring everything by a standard of utility and profit, and heartily do I pity the man who can see no good in life but in pecuniary gain, or in the mere animal indulgences of eating and drinking."

In no other way can so much real beauty be created, so much that will render home healthful and attractive, that will awaken in the mind cheerful emotions, and fix the memories of early life so indelibly upon the heart, as the cultivation of fruits and flowers about our dwellings. Downing says: "The cottage in the country too rarely conveys the ideas of comfort and happiness which we wish to attach to such a habitation, and chiefly because it stands bleak, solitary, and exposed to every ray of our summer sun. How different such edifices, however humble, become when the porch is overhung with climbing plants, when the blushing rosebud peeps in at the window, or the ripe purple clusters of the grape hang down about the eaves. And with very little care or expense all these charms may be added to almost every house in our towns and villages." The little boys and girls of the family may do much to work this change, if the desire exists in their hearts, and to awaken such a desire is the object of this paper.

HOUSE PLANTS.

BY RUTH HALL, OF CHICAGO, ILLINOIS.

"Encourage the beautiful; the useful encourages itself."

The cultivation of house plants has a refining and quieting influence on families where they are grown; they adorn the house as nothing else can, and give to the cheapest furniture an air of elegance which no other ornament can impart. And the influence of flowers is not confined to the house or household where they are cultivated: they are a most graceful form of charity to the poor passer-by who has no means of gratifying his taste for the beautiful. To him blooming flowers, surrounded by their leaves of different shapes and shades, even when only seen at a distance, through a parlor window, give a positive pleasure which those more accustomed to such gratifications can scarcely appreciate. It is impossible to overestimate the effect of youthful association and daily companionship with such exquisite shape and coloring, which foster in the minds of children a taste for simple and natural forms of amusement and recreation.

Henry Ward Beecher declares that he has always found house plants an infallible test in selecting acquaintances, neatness, cleanliness, and innumerable virtues being the usual accompaniments of a love of flowers. Then, what delightful subjects of gossip they furnish; and how many reputations have been spared when house plants were at hand, with their various merits, their growth, and means of culture to be discussed! How they grow into the affections, too, as we watch their green sheaths pierce the rich brown mould, and leaves and blossoms expanding into loveliness! Especially is this the case with early spring flowers, such as the crocus and snowdrop; and still more dear are those in which beauty and fragrance are united, as in the different species of hyacinths, which are raised and petted with tenderest care, every hair-breadth of growth noted, and the unfolding and display of coloring commented upon with pride and exultation.

Fortunately for those, neither rich nor poor, who dearly love flowers, no great outlay is needed for their cultivation; only a little room, and light, and ordinary warmth to fill parlor and dining-room with these lovely guests. It is very easy to have a common pine box fitting the window, and filled with mignonette, timed in sowing so that its perfume may be shed over the feast at Christmas; and the prettiest and most rustic-looking flower-pot, especially for hanging plants, may be made of a flat winter squash, with the seeds scooped out, and the space thus made filled with leaf soil. The *Cyclamens persicum* is a beautiful winter ornament not surpassed by many summer flowers; its waxen petals, stained with a purple spot, seem hovering like insects over the dark green leaves, so that a basket of moss and *cyclamens* is quite a fairy ornament, and the little flowers blossom from November till April, all the care required being a daily moistening with slightly tepid water.

Nothing is much prettier for the roomy parlor of a farm-house, where the surroundings are not too pretentious to harmonize, than a stand of light rustic work covered with thrifty, well-grown plants, fringed with growing moss or fern.

Among house plants there are none which better repay the cultivator than the verbena. It is perfect in itself, is a beautiful contrast with foliage plants, from its endless variety of colors, is admirable for vase or pot culture, and, when properly managed, will bloom profusely from January to May, the very months when the solace of flowers is so ardently desired. Dexter Snow, the most eminent and skilful cultivator of the verbena in this country, says that to grow them successfully, whether in-doors or out, they must be fully exposed to the sun, as they will not thrive without it. When grown as a house plant they should be placed near the glass, where the sun may reach them the greatest part of the time. Give them a good airing each mild, sunny day, by partially opening the window for an hour or so; this is quite indispensable to the health and stocky growth of the plant. The temperature of the room in the vicinity of the flowers should average about 60° in the daytime, and 45° at night. High temperature after dark causes the flower to grow weak and sickly. Water the plants only when actually necessary, and then do it thoroughly, taking care to pour off what falls into the saucer. Shower them occasionally, to keep them clean and free from dust. In all cases use rain-water for house plants. Fumigate with tobacco as often as the green fly appears. This may be done by throwing a handful of tobacco on a dish of coals placed under the plant-stand; or, to avoid the smoke in the sitting room, set the plants in a group on the kitchen floor; place a few chairs around them, over which throw an old quilt or carpet; let it reach the floor, so as to retain the smoke; place the coals and tobacco underneath, but not so near the plants as to scorch them. Ten or fifteen minutes' smoke will destroy all the insects.

As a fertilizer for the verbena the sulphate of ammonia is excellent, giving to the foliage a dark green, luxuriant, and healthy appearance; it is economical, clean, and easily applied. Prepare it in the morning before using, by dissolving an ounce of the ammonia in two gallons of water. It may be applied once a week with safety. A good fertilizer may be made by dissolving one pound of guano in ten gallons of water, letting it stand twenty-four hours before using. Apply once a week. Ladies keeping canaries, and emptying the bath water on these plants, will find it act like magic on their growth.

The crimson passion-flower is the most showy of all its class, and very effective among other plants. It must be placed in a large pot of rich compost, which should be sunk to the rim in an open border early in summer. It will grow ten feet the same season, and bloom profusely by the first of autumn. It is, however, more properly a green-house than a parlor plant, and must be returned to shelter before the frosts set in.

Although it may seem out of place to mention shrubs in an article on house plants, I must be allowed to express my admiration of the double Japan spirea—the leaves are so fine, and the sculptured, massive appearance of the snowy, rose-shaped flower so unique. The plant is hardy, and may be rapidly increased by layering the young, fresh stems early in summer. They will mostly take root the same season, if the soil is kept moist.

A love of house plants is so common to female human nature that there are but few exceptions to the general rule. It is singular what little success attends the endeavors of most people in this direction. "Some fail," says the Country Gentleman, "for want of skill and experience, but more from want of a place to keep plants in." One great difficulty in the way of success is the dryness and high temperature of stove rooms. Plants require a moist atmosphere and a temperature too low for the comfort of human beings. Rooms occupied by the family will not generally answer; for ordinary house plants, therefore, an apartment should be selected which is exposed to the rays of the sun a part of the day, and without a fire, yet so situated as to receive heat from some source when necessary. The temperature should never get below 40°, but be kept as near 50° as possible. Care should be taken at this season not to overwater the plants. Many persons keep the roots soaked all the time. There is less danger in their being too dry than too wet. No definite rules can be laid down as to the frequency of watering or the quantity to be given; but the soil should not be allowed to get so dry as to cause the plants to wilt, nor kept so wet as to have the roots constantly soaked. In sunny weather daily waterings may be given; in dull, cloudy weather perhaps once a week will be sufficient.

Plants that are in a state of rest absorb very little moisture, and, therefore, should be very scantily supplied with water, while those that are in action are constantly absorbing and throwing off moisture, and should have sufficient water to supply the demand. Frequent syringing of the whole foliage is of service; but when this cannot be done conveniently, the washing of the leaves with a sponge will be found beneficial.

When plants are taken up out of the border preparatory to being potted, it is necessary they should be well cut back, or, in plain words, the shoots should be shortened. If this is not done, the plants will have long and spindling shoots instead of vigorous young growth.

First in beauty as a house-plant stands the Camellia japonica, which generally begins to bloom in January. These magnificent floral treasures would not be so rare among amateur gardeners were it not supposed they were so difficult of cultivation. This is a mistake. The writer has never known them to bloom more luxuriantly, with such profuseness, and, withal, so free from stain or blemish on the waxen beauty of the flower as in an ordinary parlor window. This window had an eastern exposure; a common wood-stove was the only means of warming the room, and the precaution of a newspaper at the window at night all the extra care; yet these gorgeous blossoms, varying in hue from pearly white to deep carmine amidst the abundance of glossy green leaves, drew the attention of every passer-by.

This plant is retiring in its habits, and as fond of shade as the violet, a moderate coolness during its period of rest being absolutely necessary to health.

Its worst enemy is the red spider, whose ravages, if not speedily prevented, will prove fatal. If its attacks have reached a great extent the leaves are brownish, having an appearance of decay, or of being scorched by the sun. In taking hold of the leaf it feels soft, and seems to have lost its nutritive substance. When the young foliage expands it becomes covered with dark brown spots, is very much disfigured, and ultimately death ensues. If any of the plants seem thus affected, take a sponge and wash every leaf minutely with soft water, and syringe them three or four times a week, which will keep them clean. All the young foliage will be healthy, and that which has been affected will fall off. However, prevention is better than cure, and if the camellias are properly syringed every evening during summer, and once or twice a week through the winter, they will never be subject to the ravages of that destructive insect. In case of accident, tie up to stakes any of the flowers that have expanded, and in syringing observe not to let any of the water fall on the flowers, as it will cause premature decay and loss of color.

There are about eight distinct species of this plant known in our collections and the varieties of japonica approach one thousand, to which many are added yearly. So rapid has been the increase of varieties in Europe, and even in this country, that in many instances three or four distinct plants have come out under the same name; consequently great confusion has resulted. The collections of this country were kept comparatively pure till within the last few years, or since the anxiety of our cultivators to obtain variety caused them to import from the French and German markets. In this article we cannot do more than glance at the choicest varieties.

C. alba-plêna, common double white, is admired by the most casual observer, and generally considered a very superior flower from the purity of its whiteness and the abundance of its large blossoms, which are closely and regularly set with round petals. The foliage is large; the plant grows freely. We have seen one shoot grow two feet in a summer. The white camellia was imported into Europe from China among the first of the varieties, about eighty years ago, and is magnificent.

Amabile.—This exceedingly perfect flower is regularly imbricated; the extreme petals are bright rose, shading to delicate pink, and in the centre light red. The plant is full foliage, and of excellent habit; flowers about three and a half inches in diameter.

Versicolor.—Perfectly double; color vivid red, with occasional splashes of pure white. The flowers vary, and are often only red; they are of long duration—from six to eight weeks; foliage large, and dark, glossy green.

Lady Hume's Blush, by some called *buff*, is a very double flower, beautifully regular and imbricated, frequently hexangular or star-like. The bottom of the petals is most delicately tinged with blush, and the centre has the appearance of rose-colored vapor. It is a great favorite, and most deservedly so. It flowers and grows freely; foliage rhomboid, elongate; nerves very visible, surface smooth and pale green; distinctly seriate, and grows strong and erect.

Madonna, the last variety I shall enumerate, is a very pure white, delicately striped with bright rose; perfectly imbricated and above medium size; foliage dark shining green.

Monthly roses in all their varieties form an exquisite contrast to the dark, firm foliage and sculptured perfection of the camellia. They seem almost the exact opposite, with their ever new shoots of fragile leaves on their graceful curving stems. In the olden time no collection of plants was considered complete without the rose. Monthly roses are easy of cultivation with a good frontage, moderate warmth, and but little moisture except when flowering freely.

In the garden, of course, roses are indispensable; and in the garden or the house none are more popular than the tea rose. As this species require more care in their cultivation than most others, the most explicit directions from the best authority are given, in order, if possible, to insure success. When out of doors they delight to grow in a rich soil with a dry bottom, in rather an elevated situation, with a southern aspect. After selecting the spot, dig therefrom soil to the depth of eighteen inches; six inches of the bottom may be filled with pieces of brick, stone, or lime-rubbish of any sort; on this, place a layer of compost at least fifteen inches deep, to allow for its settling. The compost may be made of half turf or good garden mould and half well-rotted manure, with about an eighth of sand, all completely mixed together. A few weeks after the bed is thus prepared, say about the first of May, the roses may be planted about two feet apart. During the severity of winter they should be protected by a temporary frame; if covered with glass, so much the better. With this treatment they will bloom in perfection, and will never receive the least injury from the severest seasons. The only pruning they require is merely the removal of any old shoots to give room to those of younger growth, or the shortening of those of extra length. Where there are only solitary plants they will do very well covered with a box or barrel to allow the moisture to evaporate. Those that are grafted or budded will not generally stand the winters of our eastern and middle States, and should be lifted and put in a back shed, except those destined for parlor companionship.

One of the choicest varieties is the Magnolia rose; it is of a yellowish white, with pink centre, very large, always perfect, finely cupped, and delightfully fragrant. "If I were confined to cultivate only twelve roses," said a celebrated florist, "this magnificent variety would be one of the number."

Elisa Sauvage, canary yellow, fading to creamy white; very large, very double.

Yellow Tea, pale straw color, cupped, petals very large, and, though only semi-double, has not a rival of that color. It is a strong grower, but more tender than any tea rose of its habits. A fine plant of this kind on a lady's stand is a rather rare as well as an exquisitely beautiful ornament.

The white musk-scented cluster rose is one of the oldest inhabitants of the rose garden. It is supposed that this is the famous rose of the Persian poets. Although there are several varieties, very few have the peculiar fragrance of the old sort.

There is a very beautiful plant, but seldom seen, which should have a place in every collection. It is known as Maranta Zebrina; is unique in appearance, having large, elongated, ovate leaves, beautifully striped with green and dark purple, and is called by some the Zebra plant. It has light blue flowers in ovate spikes about the size of large pine cones. It is an herbaceous plant, but even in the warmest part of a hot-house retains its splendid foliage. It requires a very liberal supply of water.

Of course the Calla is never wanting in a collection of house plants. The Ethiopian is the most admired for the cool purity of its large white flowers. When repotting, the roots, which are tubers, should be entirely divested of the soil they have grown in, and have all the small offsets broken off; they should be potted wholly in fresh earth. When growing they cannot get too much water; they will flourish in a pond and withstand our severest winters provided the roots are kept at the bottom of the water.

The Cyclamen are all desirable plants. There are eight species and six varieties of this genus, which consists of humble plants with very beautiful flowers. The bulbs are round, flattened, and solid, and are especially adapted for rooms. *C. punctatum*, leaves almost round, flowers light red, in bloom from January to April; *Persicum*, with its four varieties, flower the same length of time, color white, some mixed with purple; the ivy-leaved, color lilac, flowers from September to December; *Neapolitanum*, flowers red, in bloom from July to September. These are all desirable plants. When the foliage begins to decay, withhold the accustomed supply of water, keeping the plants in a half dry state. Even when growing they must not be overwatered, as they are likely to rot from moisture. Keep them in partial shade during the summer months. The best time for potting either of the sorts is when the crown of the bulb begins to protrude. If the roots are becoming large, they may, every alternate year, be cleared from the old soil and put in smaller pots with the crown entirely above the ground.

Most plants are accustomed to cover themselves with leaves, and it is well established now that the plant, properly speaking, consists only of stems and leaves; all other parts, as buds, flowers, and fruit, being only modified forms of the same. Plants, therefore, are mostly green, and the depth of their color is an indication of their healthy action. But there are hundreds of shades, each invariably contrasting with the background against which the plants appear The humble and beautiful moss, in its several feathery varieties, shines with its brilliant emerald green on the dark sides of rocks, whilst mushrooms display their gorgeous scarlet and orange between the sombre, rugged roots of the trees under whose shadows they love to dwell. The glossy ivy looks all the more cheerful from the contrast with the gray, crumbling ruin which it drapes in graceful green.

Most plants are greedy consumers of water, and know how to obtain it by some peculiar, and as yet unknown process. Even in the tropics, where for half the year no cloud darkens the sky, and where not even dew is given, they procure enough to sustain life and vigorous growth.

There are few plants more remarkable than the different species of Cactus. Beauty cannot be claimed for their large, fleshy, uncouth leaves, thrust here and there with the greatest apparent want of order, yet their suggestion of arid deserts and tropical sunshine is not unpleasant in contrast with the flexible foliage and stems of many of our household favorites. The flowers are usually magnificent in coloring and transparent in texture; so, also, there is a never-ending variety of hideousness in the shape of the stems, some dropping downward, snake-like in form and color; others, such as the newly discovered species which returned explorers from Pike's Peak have introduced to notice, resembling an old-fashioned straw bee-hive. This family of succulent plants is remarkably tenacious of life, as is proved by some varieties retaining their vitality for years in a hot, dry atmosphere, without receiving a particle of moisture except what they might absorb from the air. This is owing to their peculiar structure which allows them to exhale damp very slowly, as they have no proper leaves. We know no other plant so peculiarly adapted to growing in rooms, or which repays so abundantly the trifling care required in culture. It is to be regretted that so little attention is paid to this interesting class.

The species and varieties are very numerous, amounting to several hundreds, divided into many genera, some looking like flat, prickly cakes of green wax set on edge and joining each other irregularly. The *Mammillaria*, called the ball cactus, has spines clustered around a small tubercle; the *Cereus* has, for the most part, long, pliant shoots; the *Epiphyllum*, stems resembling leaves. These are all curious; connoisseurs declare many of them beautiful. They cannot endure frost; the slightest tendency to freezing kills them. There are, however, a few hardy species; among them is the Prickly Pear, belonging to the genus *Opuntia;* its flowers are yellow, like most others of this class. Though this plant will grow in nearly pure sand, it does best on good soil. A good compost is made thus: equal parts of rich loam, decomposed manure, and white sand; mix and always keep in a dry place ready for use. One of the main points is to adapt the periods of growth and rest as near as possible to the habits of the plant in its natural condition. When growing, water freely, but give very little when at rest.

For all practical purposes the cacti may be divided into two classes, winter-blooming and summer-blooming. The time of flowering may be somewhat varied by culture, but it is best to follow the natural tendency of the plant. Those who can, had better purchase their specimens while in bloom, unless they are acquainted with the varieties. As soon as the plants have done flowering, take them out of the pots and crumble off half an inch or so of the soil around the ball adhering to the roots; then put them into vessels about one inch larger than those from which they were taken, having plenty of bits of broken bricks in the bottom for drainage. Give them a little water, just enough to settle the soil around the roots, and moisten them not more than once a week thereafter. Place them in a warm situation where they will have plenty of air and light. When they commence to grow, water twice a week, or often enough to keep the soil damp, not wet. Syringe, to keep the stem clean.

In summer the plants may be set out of doors, placing them on boards or flat stones; and if pure sand surrounds the pots, it will be of great service in protecting the roots from the direct rays of the sun. Remove them to the house before a suspicion of frost, giving to those that are not preparing to flower only sufficient water to prevent them from shrivelling; those that show a reddish tint around their buds should have a regular supply. Temperature should be from 60° to 75°, or even warmer, but make no sudden transition from heat to cold, or the buds will blight. When cuttings are taken off they should be placed on a shelf in a dry place, and left there for one or two weeks before potting. This causes them to lose part of their watery substance, and they take root more readily. Put them in soil composed of at least half sand, and give but little water till rooted.

The most common, but not for that the less lovable, of house plants, are geraniums. Leigh Hunt, whose taste was indisputable, said, if one have a solitary plant, let it be a red geranium. They are clustered round with associations. Everybody recollects the horseshoe, the rose, and the fish species from earliest childhood. To many the sight of them brings back the old homestead, where, in a deep, well-sheltered window, these pets of "mother, or sister, or maiden aunt" made perpetual sunshine.

About the first of August geraniums require a complete dressing. Collect them all together, and with a sharp knife cut off the wood of this year to within a few eyes of the wood of last year. Citriodorum and its varieties do not need pruning. Plants grown from cuttings, and that have flowered during the season, may be cut to about three inches from the root. Choose a cloudy day for the operation. Turn the plants out of the pots, reducing the ball of earth so that the same pots may contain them again with from half an inch to two inches of fresh soil around the balls. Carefully press them in with the potting stick, and finish by levelling off neatly with the hand. Give very gentle waterings from a rose-mouthed watering pot for a few weeks, until they begin to grow. The tuberous-rooted and deciduous species must be very moderately supplied. Be careful that the new soil does not become saturated, for, though allowed to dry again, it will not be so pure. When they grow afresh, expose them fully to the sun, turning them regularly every two weeks. Though these shrubs bloom in the green-house the whole winter, their usual time for flowering is in April. "Flower of the Day and Queen of Summer are among the best varieties." The strong kinds will be growing very luxuriantly, and require liberal supplies of water.

The veronica is a very beautiful plant, almost a shrub. Its greatest charm, notwithstanding its spikes of purple flowers, is its glossy foliage. The Andersonia, opening blue and changing to white, is in flower from August to Christmas, requiring only the simplest culture, and growing freely and symmetrically No flower stand can be considered complete without at least one specimen.

A choice collection of the Chinese azaleas should be in every green-house They are easy of culture and bloom freely from February to May. The pots must be well drained and shaded from the sun during summer, while the tops of the plants are fully exposed to its rays. It is found that by such treatment they are every year completely covered with flowers, and grow more stiff in habit than when the whole plant is shaded. They should be repotted as soon as they have done flowering.

The wax plant, scientifically named Hoya, is a curiosity in its way. There are about twenty species, all of them climbers, requiring plenty of heat and little water. The leaves are green and fleshy; the flowers are mellifluous, five-parted, and in pendulous bunches, slightly bearded, and have every appearance of the finest wax; their color a beautiful blush.

The heliotrope, whose fragrance exceeds that of most other flowers, lays no claim to beauty. Of the twelve species all are scented, two of them most remarkably so.

Among the most beautiful of floral ornaments hyacinths rank deservedly high, and few flowers more richly reward the cultivator for the little pains necessary to their successful culture. A very tasteful arrangement of these with the bulbs is common in Germany. Single hyacinths, together with scillas, snowdrops, crocuses, and other small bulbs, are placed in shallow dishes—soup plates if nothing better offers, though, of course, glass dishes are more elegant—arranged in any form to suit the fancy. The roots spread out and intertwine until the flowers rest on a network that keeps them in their places. Having selected the species, place a foundation of charcoal, and on this a layer of damp white sand. Set the bulbs a little distance apart, and remove the dish to a dark room, where they may remain for about three weeks. This treatment encourages the roots to form plentifully before the buds appear. At the end of that time a little water may be given by pouring it down the sides of the dish, and if the roots are pushing the bulbs up out of place, pour dry sand over them till they are covered. When the blossom buds and the leaves have made a little growth they should be brought to the light of a window, and in all respects treated like those in glasses. Dwarf hyacinths are best for this use, the bulbs not being much larger than a walnut.

A London seedsman advertises in his list "miniature hyacinths," which, on good authority, are said to be perfect gems of beauty, especially for winter bouquets, the larger sorts being too stiff to be used for that purpose.

PLANTS PROPER FOR WINDOW CULTURE.

As plants for windows are to be differently situated with regard to place and surroundings from what they are in their natural state, it becomes necessary to select such as are capable of accommodating themselves to circumstances; and as the circumstances unfavorable to plants are want of pure air and light, and uniform temperature, these must be kept in mind in the selection; the latter especially must be considered in regard to those species which are accustomed to long seasons of rest in the winter. Rooms in crowded cities are the most unnatural, and on that account the very worst situations in which plants can be placed; and therefore, if healthy shoots, with abundance of bloom, are sought for, variety must be sacrificed.

Plants which continue healthy for a long time in the confined air of rooms are generally those which have a peculiar surface or texture in the foliage. Such are many of the aloes, cactuses, mesembryanthemums, among what are called succulent plants, and in a higher temperature some of the curious order of Orchidaceæ.

The reason why the succulent and epiphytous plants answer so well for house culture is that their winter is one of drought, not of cold, and the latter especially have little and some of them no mould at their roots in their natural condition. But there has been generally a prejudice against and a want of attention to the culture of succulent plants. This is unwise, for many of them are exceedingly beautiful, highly fragrant, and better adapted to house culture than any others. They are singularly curious and varied in their structure, and, generally speaking, require less light, air, and moisture than other plants.

Next to them, in point of eligibility for the home garden, may be reckoned such as have coriaceous leaves—that is, their leaves firm, and with a smooth and compact epidermis—such as oranges, pittosporums, myrtles, and others of similar texture. These are found to have organs much better adapted to confined air than plants with small leaves of delicate texture. The heaths, and, in fact, the whole race of pinnate-leaved and papilionaceous-flowered plants, are unfit for house culture.

TREATMENT OF HOUSE PLANTS.

Water, heat, air, and light are the four essentials: water, heat, and air to promote growth, and light to render that growth perfect. Three of these requisites man can command at his pleasure by artificial means, but over light there is less control. To be beneficial to plants light must come directly from the sun; therefore it should fall upon them with as little as possible of that refraction and decomposition which it suffers when passing obliquely through glass or any other medium except the air. Plants grown in the open air, and with such free exposure to light as their habits require, develop all their parts in proper form and color. A geranium placed in a dark room becomes first pale, then spotted, and ultimately white. Hence plants in rooms should be placed near a window, which should, if possible, have a southern exposure, and never be shaded with blinds or curtains. If placed at a distance from the window, the position of the plants should be frequently changed.

Air is as necessary as light, but can find its way where light cannot; therefore requires less care from the cultivator. The heat of ordinary dwelling-houses is quite enough for such species as we should recommend for general culture, except in very cold weather, when remove the pots from the window. Spring and autumn are the seasons when most attention is required. More plants are killed by the rapidity of transition from moderate warmth to cold than by the frost itself. When, as will often happen, plants are slightly injured by frost, cold water should be sprinkled on them before the sun shines on them. Continue the application as long as any appearance of frost remains on the foliage.

Water is as essential to the whole plant as it is to the roots. The stems and leaves are liable to collect dust, and thereby be injured. Leaves are the breathing organs of plants as lungs are of animals, and cleanliness is very essential to their health; they should therefore be frequently syringed. The pores are generally large in proportion to the size of the leaves, which is one reason why delicate leaved shrubs are not so well adapted for the house as those of larger and firmer texture.

Carnations are exquisite flowers for those who have sufficient accomodations for the finer sorts. They should always be potted to protect them from heavy rains. Refresh the tops of the pots with new earth in June, and keep the plants free from decayed leaves. Gently stir the soil around each plant occasionally, and as flowers in pots require more water than if placed in the ground, let the carnation be gently moistened about every other day during dry weather. Water them in the morning. No flower will endure drenching during the heat of a summer day. Carnations love salt and sand in equal proportions. Do not allow two buds to grow side by side upon the same stem, for one will weaken the other; pinch off the smallest. They love warmth, therefore give them a sunny aspect, and water them once a week with lime water if they appear drooping; for this is caused by a worm at the root.

Let no one forget the claims of the great family of ferns. Many of the species are evergreen. They give a fresh, verdant appearance to the conservatory when gay summer blooms are past; or if grown under a glass shade or temple they form a beautiful ornament to the dwelling-house at all seasons. The different kinds with which I am acquainted are remarkable for grace and elegance of form. The large leaved brake is a very fine specimen; the leaves are almost entirely bordered by a thickened margin sustaining the organs of fructification.

Adiantum formosum and *acultratum*, two species of maiden hair, have the glossy black stems and delicate leaves so well known in the British maiden hair fern; while the silver brake seems a reminiscence of the sea, with its slender, weed-like foliage.

A hint to mignonette growers will, I hope, be pardoned, even if it savors of repetition, for this modest flower, with its fresh, wholesome fragrance cannot be too largely disseminated. It is sometimes sown in small pots for want of room; but where space is no object, it gives less trouble and succeeds equally well when sown at once in the pots in which it is to flower. Many complain that they lose their mignonette in winter; this is owing to its being kept too damp. It should have little or no water for about three months during the dull season, and care should be taken to keep it from drip, which is sure to kill whatever plant it falls upon. When small pots are used, particular care need not be taken to have the soil very rich, provided it is light; but when sown at once in flowering pots, richer material should be used, draining well, and placing on the top of the crocks, in the bottom of the pots, flaky pieces of decayed manure for the double purpose of affording nourishment to the plant when coming into bloom, and to keep the soil from choking up the drainage. Autumn sown plants shifted into larger pots at Christmas will bloom till May; and another sowing now will succeed them, after which it may be had plentifully; and no amount can be too large in the open ground. Unpromising plants, if topped back about this time, come in nicely for winter boxes in May. Pots of them may be set among stocks, geraniums, or other dwarf plants, the box filled up with rich, light soil, and finished off with a good watering to settle the earth around the roots. Boxes thus arranged are beautiful ornaments for the window-sill; the geraniums or other flowers giving brilliancy and the mignonette fragrance.

In its native country, Barbary, this fragile plant is a shrub and not an annual, as with us. It should always be sown in a light sandy soil, as when sown in a stiff soil it loses its fragrance. To obtain the tree mignonette, a vigorous plant from the common kind sown in April should be chosen, put into a pot by itself, and all summer the blossom buds to be taken off as fast as they appear. In the autumn the lower side shoots must be taken off, so as to form the plant into a miniature tree. It may afterwards be transplanted into a larger pot with soil formed of sand, and turf broken into small pieces. The plant should be kept in a warm room all winter, regularly watered every day, and in the spring the stem will begin to appear woody. The second summer the same treatment should be observed, and the following spring it will have bark on its trunk and be completely a shrub. It may now be suffered to flower, and its blossoms will be delightfully fragrant; they will be produced every summer for many years.

Among the tenants of the plant-stand, a few specimens of foliage plants, or those more dependent on their leaves than flowers for beauty, should find place. First and foremost stands the *Cissus discolor*, whose charms are enhanced by durability, remaining the same all the year round. Some of these rival in the richness of their tints the most gorgeous flowers, and the species above mentioned is one of the most marked. The leaf is heart-shaped, with fine indentations on the edge, and the rich velvet of its upper surface is indescribable. The centre rib and principal veins are marked by various shades of purple and black; between the veins are patches of silvery white, and towards the edge the purple softens into a delicate, subdued green, forming one of the most harmonious arrangements of color with which nature indulges us.

The rich, dark *auricula* is a plant of great beauty for window culture, and is too rarely met with, notwithstanding its claims on account of form and fragrance. Many who possess them fail of success, because they do not give the treatment required in order to make them perfect their bloom. These plants court the shade, and should be watered very sparingly until they begin to grow; never pour or sprinkle water on the foliage, especially before flowering, as moisture destroys that fine meal-like substance found on many of the varieties, which so greatly enhances their beauty. Only one stem should be allowed to each plant; the first one that appears is usually the best. Connoisseurs in the culture of these flowers desire that the pips should be large, flat, and round, with ground color equal on every side of the eye, which should be quite circular, as well as the edge. The tube, a bright lemon yellow, perfectly round, and filled with anthers or thrum; the eye round and large, the body-color black or violet, in green-edged flowers should be a whole one, not a shaded green. The stem long and sufficiently strong to bear the truss above the foliage—the truss to consist of not less than five full-grown pips.

In September these plants should be repotted, to have time to become established before winter, which is the best season to take off slips, for two reasons: they do not want so much nursing through summer, which is the most precarious season of the year for these plants; and they begin to grow and will root afresh sooner.

There is a lovely little flower, seldom noticed, which is, however, worthy of any pains that may be required to bring it to perfection. It is called the *Notylia albida;* is very graceful in stem, deliciously scented, and beautifully formed, although its flowers are no larger than pepper-corns. From a few thin oblong leaves there droops a dense raceme of whitest flowers, perfumed like the lilly of the valley. Their black sepal is long, convex, pale apricot colored, very firm, being in all cases turned to the outside of the inflorescence. The flowers are not unlike fairy shells. The rest of the blossom is transparent white, except one little pale apricot spot at the base of each petal. Words, however, can give but a faint idea of this charming little plant which must be seen to be appreciated.

To have the lilly of the valley in flower about Christmas, the tubers should be taken up in the middle of November, or at latest the third week; they should be at least two years old; if older, all the better. Previous to potting it will be necessary to decide how they are to be disposed of when in flower. They are frequently placed in fancy wire or wicker baskets, and still oftener in ornamental vases. If it is intended to remove the tubers when in flower, our plan is to wrap a bit of moss around each, and then pack them away as closely together as possible in pots, or, what is still better, in mignonette boxes filled with light, porous soil. Insert them deep enough to have the soil cover the crowns. Over all place a good thick layer of moss to assist in keeping them moist; and lastly, pots or boxes of the same dimensions as those in which the tubers are planted are inverted and placed over them, to keep all dark, as darkness is essential to success. Then remove all to a warm pit where they can be supplied with a little bottom heat, which must be gentle at first, but may be gradually increased as the plants show symptons of active growth. In three or four weeks, more or less, according to the treatment they receive, they will be abundantly furnished with their exquisitely scented flowers. They may now be removed and transferred to vases or baskets; the moss in which they are enveloped greatly facilitates this work. If they are intended to remain and flower where planted, the moss may be dispensed with; otherwise the treatment is the same. In this way we yearly produce the Lily of the Valley at Christmas, and keep up a supply of their lovely flowers all through the winter.

Alstroemeria is a genus of tuberous-rooted plants, with beautiful flowers, natives of South America, and capable of being grown to a high degree of perfection in the stove greenhouse, or open air, according to the species. The soil, which suits all the *Alstroemerias*, is a mixture of sandy loam and leaf mould, or well-rotted dung. Of all the stove species, *A. ligtu*, with white and scarlet blossoms, is most difficult to flower; but by giving it abundance of water during summer, and a strong heat in December, it will flower in February, and one plant will scent a whole room with fragrance like that of mignonette. After flowering, the plants ought to be allowed to rest for three months, during which time very little water need be given them. After this they should be repotted and encouraged to grow by giving them plenty of moisture.

The Blue African Lily deserves a notice among house plants, for it retains its leaves all winter. It requires a loamy soil enriched by manure from an old hotbed; this should be loosely shaken down in the pot, but not pressed. The plant wants full exposure to the light, and plenty of water when in a growing state. Shift repeatedly into larger pots, taking the offshoots away every time of repotting, till the flower buds are formed. The plants are always very large before they flower, and, when the buds form, should be so placed as to have plenty of room and moisture; take care not to let water remain in a stagnant state about the roots. Thus treated and kept in a green-house or living-room, or even under a veranda, this plant will frequently send up a flower stalk three feet high crowned with twenty or thirty heads of flowers which will come into blossom in succession. When in flower it may be placed in the open air, and forms a beautiful ornament for the terrace or the lawn. If it is desired to have the Agapanthus flower when of comparatively small size, it should not be shifted often, and when it is in the pots need not be so nearly of a size; the bulbs may be divided and the strongest of the fibrous roots cut off without injuring the plant or preventing its flowering.

The Cape Aster is a pretty and showy plant for stand or window. The whole genus is easy of culture, hybridize freely with each other, and, when it is added that they produce a great abundance of flowers, it is not wonderful that they should be held in such general estimation. They are nearly hardy, but are always grown in pots, as they flower so early that in the open ground the buds would be liable to be nipped by the frost. They are grown in light, rich soil, and only require ordinary care in watering. This plant is propagated by dividing the roots in August by cuttings struck in autumn, or by seeds which they ripen in abundance. The seed should be sown in May on a slight hotbed, and the young plants pricked out into small pots and shifted frequently during the summer. If they are wanted to flower in December, they should be kept in the green-house all the year, and will begin to throw up their flower stalks in October; but if flowers are not wanted before April, the usual time, they may stand in the open air and need not be shifted more than three or four times during the summer; in October they may be put in a cold pit, where they must remain just protected from the frost till March, when they will begin to send up their flower stalks. Nearly all the beautiful purple kinds are varieties of hybrids.

There are two kinds of mesembryanthemum which are called the ice plant; one an annual, the other biennial, and they take their English name from the little globular blisters, which botanists call papulæ, filled with a soft watery matter, which glistens over the whole plant and makes it look as though it were covered with ice. The flowers of these plants are white, but there are others with pink or purple flowers. One of the annuals has clusters of a bright yellow. The seeds of these annuals should be sown in a hotbed and the young plants transferred to the open ground in May; they should always be planted out in the open border, as they never flower well in a pot. The perennial kinds may be grown either in pots or in the open air, but in the latter case should be taken up and carefully protected during the winter, as they are killed by the slightest frost. They grow best in sandy or gravelly soil, which for the larger growing species may be mixed with a little loam; but even of these, the poorer and more sandy the soil, the more brilliant will be the color of the flowers, though the stems and leaves will become small and weak.

All the species should be kept quite dry when in a dormant state, and abundantly supplied with water when about to flower. The perennial kinds are propagated by cuttings, which should be kept dry for several days after they are put into the ground; when they begin to wither, supply them with a little water, and they will directly begin to throw out roots. The pots in which these plants are grown should be well drained with cinders, and if put out in the open air set them on a dry sunny bank.

THE VIOLET.

The genus contains upwards of twenty species; those most esteemed for fragrance being merely varieties of the *Viola odorata*, or sweet violet of botanists, also called the English violet from its being found in that country in its single or natural state as a wild flower. It is most fragrant and delightful when in retired and partially shaded situations. The species best suited for cultivation are quite double, and of many different colors. The most prominent are the *Cœrulea plena*, or double blue, and the Neapolitan; this last is much larger than any of the others, of a beautiful lilac shade, and very finely perfumed. Besides these, are the white and rose-tinted varieties, both single and double. Other kinds which have a tendency to form stems receive the appellation of tree violets. These are comparatively rare, but the true "trees" are exceedingly beautiful and difficult of cultivation.

Many of the varieties will afford flowers at any season of the year if conditions are favorable. They require cool weather, rather shaded, moist situations. They flower in spring and fall, and can easily be retained in bloom from October till the end of May by the simple help of a cold pit well protected in winter. For such purpose they require to be grown in some moist spot during summer and transplanted to the pit in October; all the after treatment necessary being to shelter them from actual frost, and give admission to all the rays of the sun consistent with keeping out the frost; or they may be potted and grown in a green-house, placing them in the coolest part and as near the glass as possible. They may even be made a window plant, but are not prolific bloomers in this situation as the atmosphere is usually too dry for them. The double kinds are propagated by offsets and cuttings; the single ones by seeds or either of the other methods. Except in the case of new kinds in the hands of florists, a simple division of the plant every spring will be sufficient, and give a large quantity, as they multiply rapidly.

Violets form very pretty edgings for parterres where the situation is suitable, moisture and shade being indispensable. They will grow in ordinary garden soil, but a loam or mucky basin will suit best. In pot culture choose loamy soil, with a plentiful admixture of the manure nature provides for them in their own haunts, decayed leaves or vegetable matter. The *Viola odorata* of the woods blossoms only in the spring; the monthly habit has been obtained by cultivation.

MISCELLANEOUS HINTS.

The management of plants in rooms is often found very difficult from the want of proper light and moist air, though this latter may in a measure be obviated by opening the window in front of which the plants stand whenever circumstances will permit. It should never be forgotten that moist air is almost as essential as water.

Another reason for the unhealthiness of window plants is, that they are watered irregularly. The mould should never become so dry as to crumble, but if it happens so by accident, drench it well with water equal in temperature to the air of the room, and as soon as this is done empty the saucer or the water will grow sour and rot the roots. It is best not to overpot the plant.

The proper soil usually is leaf mould or peat, and the pots should always be filled nearly a quarter of their depth with potsherds; large lumps of charcoal mixed with the broken crockery will be beneficial.

Among the natural enemies of flowers may be named the green fly, which infests plants in general, and is to some species particularly destructive. They attack the young, healthy shoots at the point, leaving a dark, filthy appearance on the foliage. Many remedies have been offered by various writers, each confident in his own opinions. Fumigating with tobacco is decidedly the most efficacious.

The red spider is peculiar to a dry atmosphere, and its havoc is generally obvious before it is arrested. With its proboscis it wounds the fine capillary vessels of the leaves, and if allowed to progress causes premature decay. When you notice this appearance turn up the leaf and you will see them running about with incredible swiftness. When very numerous they work thick webs on the under side of the leaf, and frequently all over it, forming a mass of half dead leaves. The most effectual remedy is a thorough syringing, especially under the foliage. This done every evening will effectually banish them.

Thrips, another troublesome visitor, is an insect so minute as scarcely to be perceptible to the naked eye. They usually lurk close to the vein of the plants, and often attack esculents. Viewed through a glass when touched they skip with great agility. They attack the tender shoots or extremities, which become brown, shrivelled, and will rub to dust between the fingers. When leaves or shoots are in this condition the green fly is not observed. Expel the thrips, and remember that to plants, as well as to human beings, cleanliness is necessary to health.

A word may be said to amateur gardeners and others in favor of an insect most of us have in childhood chased and eagerly caught, viz: the crimson lady-bird. How many of us have been surprised and disappointed to find that the meek little beetle had wings when she chose to use them. These beetles creep slowly when in their perfect state, and are often found on the ground. They do no injury to plants either in their larvæ or perfect state, and when found on a shrub they are seeking a spot to deposit their eggs. Instinct teaches them to visit plants most infested with aphides, for it is on these noxious insects that their larvæ feed; consequently their eggs, which are of a bright yellow, are always found on the leaves of shoots, the points of which are covered by the green fly. In France and Holland the lady-bird is considered sacred to the virgin; hence its name. Let all lovers of roses, especially, protect the lady-bird.

A few hints on the arrangement of cut flowers may not be out of place here. Much of the beauty of these floral gems is often lost through want of taste, as when stiffly circled in a hand bouquet, ring after ring, with little intertwining foliage, and no graceful form of tendril, leaf, or bud allowed to break the plate-like circle. To people not accustomed to look closely at causes which, in the mass, form effects, it gives somewhat of a new sensation to observe any leaf, or blossom, or berry that we call one-colored, and see the infinite number of lines and clouds and patchings up of tints that go to make it so. It is not by size, but by expression of color and shade that we have to measure; and thus a group, good and harmonious in itself, may be completely spoiled by being multiplied in number or increased in size—that is, by repeating the same flower in adding to the same group. Delicate shades, if many flowers are used, and those of much deeper tone when the blossoms are few, and when the foliage amidst which they are laid is dark, is a safe general rule, but a great deal depends on the shape and color of the glass and china accessories. The white of Dresden china vases is so intense that the purest flowers would scarcely look their whitest in them. Very light flowers, also, are likely to look darker and less delicate by the striking contrast; or, if very thin and fragile, have their tints too much weakened by the intense white body. A quantity of green is, therefore, the best fringe for such dishes, and ferns the most suitable of any, eac tiny leaflet showing as it droops on the white edge. The whitest flowers very generally have the sweetest perfume. It might almost seem as if in brilliant ones color had taken the place of scent. In all flower arrangements, whether for vases or flat glass dishes, it is better to put in the green first, gradually working up to the required brightness, always remembering that the collection had better lack a flower than have one too many, the object being to make a graceful, refreshing, and suggestive picture.

For winter bouquets of dried flowers and grasses, nothing is more appropriate than a pasteboard vase suspended from an oak branch on which the acorns and brown leaves remain. The vase may be made in any artistic form with outward curved lip, and the exterior may be covered with moss, or pine cones varnished, or a mixture of seaweed, small shells, and imitation branches of coral formed by twigs covered with red or black sealingwax. A little clean sand inside will allow of grouping the flowers to the best advantage.

A very pretty and inexpensive ornament may be made with pine cones and grass seed. Place a large pine cone in the mouth of a tall glass partially filled with water. Open the cone slightly and drop lentil or grass seed into the opening. Water must be sprinkled over the cone as often as twice a day, and in a short time the lentils will send up their small green shoots and cover the cone. The scales are opened by placing them in any moderately warm place for a little while.

Flowers may be preserved perfect in form and color, to be arranged in wreaths or bouquets, and framed and glazed for parlor ornaments, by closely observing the following directions: Take the finest of river or lake sand, wash it so clean that water when flowing from it will be pure as if from a well; heat it very hot, and while in that state mix it thoroughly with stearic acid in the proportion of one pound of the acid to one hundred pounds of sand. Let it cool; take a small common sieve and nail boards under the bottom to prevent the sand running through. Place sand enough in the seive to hold the flowers in position, not covering them; then, with a sheet of paper twisted in the form of a tunnel or cone, carefully pour in the sand between, around, and over the flowers, covering them about half an inch. Set them by the stove, or in some warm place where the sand will be kept at about 70° Fahrenheit. When they have remained long enough remove the boards from the bottom, letting the sand run out, leaving your flowers preserved in perfection.

The greatest difficulty is to know when the process is complete, different flowers requiring different time. Flowers with thick leaves and petals need more than thin light ones. Seven hours are sufficient for some, while others require twelve, or even more. It is best always for a beginner to experiment with a single plant at a time. When the learner has succeeded with a certain variety and noted the time required, others can be tried.

It should be mentioned that flowers for this purpose should be picked when dry, say at midday, after the dew is off. Those most suitable for preservation in this way are flowers of delicate and fragile texture, as they are more readily permeated by the heat than those with thick, heavy petals. The most minute blossoms may be preserved perfect, and are used with good effect in forming the wreaths. Ferns of every variety give the most graceful green, while dark, glossy leaves, such as those of the myrtle or veronica add greatly to the beauty of all, whether arranged in wreaths or bouquets for the frame. Very much, however, depends on the skill and judgment of the manufacturer, and the taste with which colors are contrasted. Sometimes a charm is added by the skilful use of moss in filling the interstices.

Every novelty which brings flowers and leaves nearer to us, domesticates them as it were, is a blessing. Lovers of nature will welcome this charming fancy work of flowers, which, it is to be hoped, will supersede the enormities in worsted monsters, all angles, when curved lines only are the lines of beauty. It affords pleasant means of beguiling leisure hours, and is a source of gratification while in progress, as from it spring many tasteful additions to the parlor ornaments, and graceful and valuable gifts or tokens of affection.

The French, though they do not love their homes, as is the general belief, as well as the English or Americans, are yet very fond of flowers, and indulge their love for them to a degree of which we have no conception. They have balconies and terraces near the roofs of their houses, covered with flowers and foliage, and often furnished with great taste. Some have young trees of lime, maple, and elm, six or seven feet high, with wide-spreading branches, which afford as much shade as is wanted. There is also what is called a *berceau* at one end, neatly trellised over and covered with vines, in which there is a divan. This is a perfect screen when the sitter is in the open air, and as private as within doors. Sometimes a window is left, and a curtain to drop as required. An aviary may occupy one end, uniting the charms of song and fragrance.

To prevent littering the interior of the house by frequent carrying out and in of plants requiring fresh soil, or other attentions, a quantity of soil, with pots, sticks, trowels, and scissors are kept in a cupboard-like box under a seat.

In our large cities where gardens are rare, and, in many instances, impossible, such examples might be followed with a harmonizing influence.

THE MANUFACTURE OF CHEESE

AS A

STAPLE ARTICLE OF EXPORT.

BY S. L. GOODALE, SECRETARY OF MAINE BOARD OF AGRICULTURE.

The importance of the dairy as a branch of rural industry is universally conceded to be very considerable, but it is doubtful if its importance to a grazing hill country like much of New England and of the middle States is yet fully appreciated. Every district which can feed flocks and herds cannot with equal facility and profit convert the same amount of vegetable food into dairy products. Immense ranges, especially in the west, can make beef and mutton and wool cheaper and easier than they can be made in New England or New York; but they have not the green pastures abounding in springs of pure water and covered with sweet, juicy, and continuous herbage: and the cows would have to ramble quite too far to be brought home regularly night and morning to be milked, or to give a generous flow if they were. Taking the United States together, we are compelled to believe that the extent of surface which is well adapted to dairying is very limited compared to that upon which grains, meat, and other staple products can be profitably made. It has been asserted upon high authority that in no other way can so large an amount of animal food be obtained from a given quantity of herbage as by the dairy; and it is believed to be capable of demonstration that a good milch cow furnishes the most economical means known by which to obtain from our pastures the alimentary matters they are capable of yielding.

Concerning the comparative returns from the dairy and from the stall, we have not that definite knowledge which is desirable; nor can it be obtained except by carefully conducted and long continued experiments with many animals, and under a variety of conditions, accompanied with constant use of the scales. Such experiments few have the inclination, the time, the means, and the perseverance to conduct to reliable conclusions, and I am not aware of their having been thoroughly carried out by any one. The inquiry has frequently been made of intelligent and observing farmers, how many pounds of butter can be made from a good milking cow upon the food which would yield a hundred pounds of beef if consumed by a thrifty farrow cow, steer, or ox; and I have never found one who could give an answer apparently satisfactory to his own mind. The first impression seemed to be, perhaps, judging from the usual market rates of each, probably fifty or seventy-five pounds. But the more the question was pondered and observations made in respect to it, the more farmers are inclined to estimate it higher, perhaps fully as many pounds of butter as of beef, or even more. This problem seems to have engaged the attention of the first British board of agriculture, and Sir John Sinclair, its president, probably with reference to the observations or investigations of the board, says: "It is supposed that the same quantity of herbage which would add 224 pounds to the weight of an ox, would produce 900 English gallons of milk." Whether the live or dressed weight be here intended, or whether the measure is that used for wine or ale does not clearly appear. Suppose, therefore, in order to allow the best show possible in favor of meat, that the weight meant is the net dressed weight, and the measure intended is the smallest measure in use. We then find a pound of meat esteemed to be the equivalent of four wine gallons or thirty-three pounds of milk. Milk, on an average, will yield one-tenth of its weight in cheese; consequently, if we assume Sir John's estimate to be correct, we can have three and a third pounds of cheese from the food which will produce one pound of beef. If his estimate only approaches accuracy, it is easy to account for the impression which so generally prevails in dairy districts, to wit, that the dairy affords a very profitable mode of converting vegetable food into money.

The only definite experiment I find bearing on this point is related by M. Durand, of Caen, in the "*Compte Rendus*," July 31, 1848. In the translation given below the French weights are rendered into pounds avoirdupois, and the measure into wine gallons of 23 cubic inches. He says:

"The cow and the ox on which our observations were made were of the Cotentine breed The animals, each about six years old, weighed, respectively, 1,232 and 1,199 pounds. The products of the cow and the ox were only compared from the first of May to the first of August. During this time they had such, and so much, herbage as afforded ample nourishment. Each day the milk was measured, and the ox was weighed from time to time. The milk yielded by the cow during May, June, and July amounted to 470 wine gallons On the first of May the ox weighed 1,199 pounds; on the 5th of June, 1,331 pounds; on the 15th of July, 1,463 pounds; and on the first day of August, 1,494 pounds. He had thus gained in the period of ninety-two days 295 pounds. This ox appears to have been a thrifty animal, seeing it gained three and a quarter pounds per day; and the reported yield of milk is not extravagantly large for a cow of the above weight, being twenty and two-thirds wine quarts, or about seventeen beer quarts per day; yet we find it to be four hundred and seventy wine gallons, weighing three thousand eight hundred and seventy-four pounds, and capable of producing three hundred and eighty-seven pounds of cheese. The gain in the ox was 295 pounds live weight, from which, if we deduct two-fifths for offal, we have a net gain of 177 pounds of meat against 470 wine gallons of milk. If we assume that the two animals consumed equal quantities of food, and were equally capable of converting it advantageously to the several purposes of meat and milk, we find two and one-fifth pounds of cheese to be the equivalent of one pound of meat."

If we attempt a comparison between the returns from rearing veal calves, or of cattle up to the age of one and a half or two and a half years, we meet with the same lack of data by means of which to arrive at definite conclusions. It may do no harm, however, to attempt an approximation. From the most careful observations and experiments which have come to my knowledge, it requires about a gallon of milk for each pound of veal sold from suckled calves from eight to twelve weeks old, and reckoning such carcases to bring five cents per pound, we have a return of five cents for each gallon of milk consumed by them. It is difficult to make a satisfactory comparison between the returns yielded by dairy products and those from the sale of calves of one and a half or two and a half years of age. The estimates of farmers of the cost of rearing them to these ages vary greatly. I suppose much of the difference depends on the way they set about the reckoning. Let one estimate the food and atten tion given them at what they bring when sold in this form, and it would appear that the cost of rearing is not large; by the same light, however, farming is an unprofitable and undesirable business—plenty of hard work and small pay. Let another charge the milk which the calf takes at 1½ or 2 cents a quart, the hay at $10 a ton, the roots or grain and the pasturage and attention at what they can be made to pay by using them for dairy purposes, and the cost runs up to a sum much larger than the probable price which they will command when brought to market.

Judging from the best data we have been able to obtain, the opinion is held that the food which will make one pound of meat will usually make at least twenty pounds of milk, and, where really good dairy cows are kept, probably twenty-five pounds. Assuming, then, only twenty pounds of milk to be the equivalent of one pound of meat, we can have, if we choose, in its place, two pounds of cheese. Although the proportion of cheese to be obtained from milk is variable, depending on the amount of butter and casein which the milk contains, it may be safely set at as much as one pound from ten pounds of milk. In one case, I was credibly informed of its having been made from eight and a half pounds; but nine and a half are usually required with average milk and fair management. So long, therefore, as a pound of cheese commands as much money as a pound of meat, it would seem that we may largely increase the returns from our grazing lands; or, if we take the usual prices of meat as a basis for our estimate, we may conclude that the actual cost of producing a gallon of milk does not exced five cents; and if we can, without too large cost for manufacture, convert it into what will bring eight, ten, twelve, or fifteen cents, it must be a profitable operation. It is not supposed that mere economy will ever induce people to restrict their diet to the single article of cheese, however nutritious it may be, and that thus an unbounded demand for it should be created. But the shrewd farmer ever looks closely to the market value of different products, and changes his crops as circumstances require. It is pertinent, therefore, to inquire what is the market for cheese, and where and what it is likely to be in the future, and how soon it may be so supplied that prices shall fall below remuneration.

The southern half of the United States and the prairie States west make no cheese, never made much, and never will. Formerly a large amount went south. Let us hope that in years to come it may require a much larger amount than heretofore. Great as it was, the loss of that outlet did not permanently nor severely depress prices. Since Sumter fell, cheese has advanced 75 to 100 per cent., and already is the effect of the progress made in subduing the rebellion felt in the demand south. When in the Western Reserve, in August, 1863, I was informed by a large dealer that the call for cheese from Cincinnati, Louisville, and other places, to be sent south, was urgent, and so large as to affect prices to some extent. Considerable quantities also go to the West Indies, to South America, and to California. But the principal market abroad is in England. In Great Britain there are thirty millions of inhabitants. more or less, who consume a great deal more cheese than the same number of Americans, and whom we can supply with manifest advantage to them and to ourselves. The manufacture of cheese has long been pursued there extensively, and the county of Chester has been specially famous for centuries. It is said that not less than 200,000 cows are kept in this county alone for the production of cheese, of which 14,000 tons are annually sold in London alone. The northern counties of England and the neighboring counties of Scotland have also been largely engaged in cheese-making. But the price of land is so high that few, if any, farmers in England can produce a gallon of milk at a less cost than sixpence sterling, equal to twelve cents of our currency when exchange is at par, and considerably more now that gold is at a premium. Of course no dairyman there can sell cheese for less than the cost of the milk and the pay for making it up. It is also a fact that meat sells in Great Britain at much higher price than it does here; and British farmers have their hands full, and more too, to make meat enough for home consumption; large quantities of cured meats, such as beef, pork, and bacon, being annually imported. What reason, then, can be imagined why we may not furnish them all the cheese required with mutual advantage? Our facilities are such that we can make it cheaper than they. There is no difficulty in sending it thither in prime condition, and at a cost of only about one cent per pound, including freight, insurance, commission, and all the charges attending transportation.

It required a long time to create the demand which now exists in England for American cheese, and to Herkimer county, New York, belongs the credit of creating it and securing the trade. It was mainly effected by bringing a high degree of skill to bear upon the manufacture generally, thus producing not only a good article, but uniformly good, or as near uniform as is possible when made in different families. Cheese had been sent abroad in small amounts for many years, but when once by good quality and uniformity it had secured a firm foothold, the amount exported increased with astonishing rapidity. By gradual growth it had come to be nine millions of pounds in 1859; in 1860 it amounted to twenty-three millions; in 1861 to forty millions, and the demand and supply have steadily increased ever since.

That this export demand governs the price of cheese in this country is demonstrated by the fact that in June, 1862, prime cheese was bringing in Herkimer county eight cents per pound, but as soon as specie payments were suspended and gold bore a premium the price of cheese advanced with even step. When gold fell, the price of cheese receded; when it rose again, cheese advanced, and all the while just in proportion to the current rate of exchange, which proves conclusively that to cancel indebtedness, or to pay for goods purchased in England, the cheese was as good as the gold, and answered the same purpose exactly. With a market of such great capacity open to us, it seems as certain as anything in this uncertain world can be, that the manufacture of cheese will increase annually, and I see no reason why all farmers who possess really good grazing land may not share in the profits of the manufacture.

In order to make cheese a staple article of export, it is necessary to be able to manufacture an article which will suit the market to which it is sent, and also that it be of even quality so far as practicable. As this market is chiefly in England, it will be well to inquire what sort is there in greatest demand. The names of Gloucester, Leicester, Wiltshire, Dunlop, Cheshire, and many others are familiar to all, but it may be less generally known that of late years the sort known as the "Cheddar cheese" is rapidly displacing all others, being generally acknowledged superior and bearing the highest price of any made simply from whole milk. Stilton cheese sells at a higher price, but it contains cream from other milk, and its manufacture is not supposed to be especially profitable. The superiority of the Cheddar is due to the fact that a more scientific process is employed, and one by which not only fine quality but uniformity also is more easily attained than by any other method. The name "Cheddar" is from the village in Somersetshire, where it was first made. Improvement has, perhaps, been more marked in this than in almost any other section in either England or Scotland; for we find that a hundred years ago the cheese of Somersetshire was inferior to that of North Wiltshire. Edward Lisle, esq., in his "Observations on Husbandry," says:

"Being with Stephens, about East Lydford, near Somerton, in Somersetshire, and having business with a great many farmers, I found by Stephens, and by the confession of those farmers, that notwithstanding their lands were much richer than those of North Wiltshire, they could not pretend to make such good cheese as was made in North Wiltshire, and that cheese of the same sort would outsell the Somersetshire by three or four shillings on the cwt. It was allowed, also, that the Somersetshire women could not make a cheese with a yellow coat like those of North Wiltshire; wherefore the Somersetshire women, to disguise it, put saunders into their milk to give a yellow color to the coat of their cheese, which, giving a yellow color also to the inside, when people put in the taster they found out the art, and upon discovery they made exceptions, for the inside of the North Wiltshire cheese is white; and it was confessed by all and agreed that down further westward, though the land was better, the cheese was worse than in those parts of Somersetshire which I speak of. They allowed, also, that at Winchester fair, if the fair was dull, the Somersetshire men must stay a day or two longer than the Wiltshire men before they could sell."

Time has changed since Mr. Lisle wrote, for we now find the Cheddar from Somersetshire holding the first rank as an aristocratic cheese, although large quantities of Cheshire, Dunlop, Gloucester, and others are still disposed of. It may perhaps be doubted by some whether there be any acknowledged standard of quality by which to decide whether one cheese is better than another or not. The tastes of people differ very much; one would have cheese new, mild, soft; another wants it old, hard, strong, or perhaps mouldy, and so on; one may even prefer it made of skimmed milk and got up in true white-oak style. We maintain that there must be a standard, and one aside from occasional prejudices; if not a standard for all persons and places, certainly one for the English market taken as a whole, else how should dairymen know what to aim at? How should buyers know what prices to offer or what to select? How should judges at cheese shows decide where to award premiums? What is the standard?

Mr. Willard, the author of several excellent papers on the subject of dairying, says of a Herkimer county cheese forty days old lying on the table ready to be boxed for market:

"It is of a rich, creamy, or golden color, with a firm, smooth, and elastic rind; it is of good proportions, its circumference gently swelling out, giving it an appearance of plumpness and completeness; it is free from cracks, mould, or outward imperfections. Under the hand it has that peculiarly firm, yet soft, velvety texture, which, to the expert, is always satisfactory evidence of its quality; it is neither hard nor too soft, but will feel mellow rather than elastic when pressed by the finger. This cheese, since it came from the press, has never leaked whey; it has never huffed even during the hottest weather, and can, at such time, be safely sent to market. Bore it with your tryer, and you will find it mellow, firm, and solid, with a mild, pleasant flavor, rich, buttery, and melting in the mouth—a cheese which will sell in the market for the highest price."

Now see what our transatlantic cousins say. At the great cheese show in Cheshire, in 1858, one of the judges, Mr. Corderoy, of London, says: "We want cheeses rich, solid, fine-flavored, true colored, that is, of even color throughout, firm, sound, handsome, and that will go on to improve for twelve months, or longer, if required."

Mr. Harding, of Somersetshire, says: "A good cheese is close and firm in texture, yet mellow; in character or quality it is rich, with a tendency to melt in the mouth; the flavor full and fine, apparently that of a hazlenut." Mr. Bate, of Cheshire, says: "The characteristics of a good cheese are mellow and rich in taste and flavor, and firm and full in texture, solid, but not tough." Mr. Patterson, of Edinburgh, says: "A good cheese is rich without being greasy, with a sweet, nutty flavor, clear, equal color throughout, and of a compact, solid texture, without being waxy; firm, and yet melts easily in the mouth, leaving no rough or ill flavor on the palate." It is plain that here is full, or at least substantial agreement regarding the requisite characteristics of such cheese as will best suit the English market; and this market, it being remembered, furnishes by far the largest export demand which exists at the present time, or which may be expected to arise for many years to come.

It is not deemed out of place here to remark that quite a different article, and one which is firmer in texture and less rich in the butyraceous element is demanded for exportation to warmer countries, or to endure with safety long voyages during which tropical regions are traversed. This point, however, will be resumed when treating of the practice of the art by different modes of manufacture.

MILK.

Before proceeding to treat of the theory or practice of the manufacture of cheese, it will be well to devote some attention to the nature and properties of the material from which it is made.

Milk is the liquid secreted by the action of certain glands from the blood of mammiferous animals. It is the provision of nature for the nourishment of their young, and to this end it is most admirably adapted. Like all the secretions of the animal body, milk is a compound substance, and its composition varies a good deal according to the circumstances attending its secretion. Ordinarily, the milk of the cow contains an amount varying from three to five per cent. of each of the following substances: oil, (fatty matter or butter,) casein or curdy matter, and lactose or milk sugar. It also contains a very small proportion of salts, and from eighty-five to ninety per cent. of water.*

To the naked eye milk appears to be an opaque, uniform, white liquid, but such it is not in fact; and under a good microscope it is readily seen to be a transparent liquid, bearing myriads of minute globules diffused through it. These globules are the oil or butter, and give to the liquid its white, opaque appearance. Each of them is enclosed in a little sac or film. After continued agitation, or by the action of heat, these little sacs burst and liberate the fat.

* The proportion of the constituents in milk varies greatly. So far as we can judge, it depends in part upon peculiarities in the constitution and glandular system of the individual cow yielding it, and upon the food and general treatment bestowed.

Below are results of the analysis of various specimens, some of which were examined here, and others are from reliable sources.

Parts in 100.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Water	85.20	85.26	86.55	85.62	48.20	82.9	89.9	90.6	85.86	93.0
Butter	4.90	4.36	4.05	4.68	43.30	7.2	2.4	1.8	4.42	1.8
Casein	3.62	5.69	3.45	4.03	4.12	4.7	2.9	2.9	7.08	3.4
Milk sugar	5.15	4.02	5.16	5.13	3.76	4.7	4.4	4.1	1.79	.8
Salts	1.12	.67	.79	.54	.62	.5	.7	.6	.85	.1
	100	100	100	100	100	100	100	100	100	100

Numbers 1, 2, 3, and 4 are of milk yielded by good cows, at good pasture feed in summer; the milk of four to six cows, mixed together, in each case.

Number 5 is the cream from No. 4.

Number 6 is the mixed milk of three Jersey cows.

Numbers 7 and 8 the milk of two good cows in poor and overstocked pasture.

Numbers 9 and 10 are two reported analyses of milk from distillery fed cows in New York and Brooklyn.

In the above analyses all the nitrogenous constituents are reckoned as casein.

which then readily collects in a mass, and, when duly separated from the other substances, is butter.

When milk is suffered to remain at rest the oily particles slowly separate, and being lighter than the liquid holding them they rise to the surface, and, together with a portion of the cheesy matter, form the unctuous clot or coat on the surface called cream. The fatty matter does not wholly separate, as a portion remains in suspension, and in proportion to the completeness of the separation the liquid assumes more or less of a bluish tint. Being only suspended, the separation of butter from milk is to a considerable extent a mechanical process. Casein, on the contrary, is dissolved in the water of the milk, and not merely suspended in it. Its separation is a chemical process. By what means it is thus held in solution is not known. Casein, under ordinary circumstances, is insoluble in pure water. It will dissolve in water in which a little soda is added. Freshly drawn milk sometimes contains a little free soda, and when this is the case it is slightly alkaline, and nearly all writers on the chemistry of milk teach that it is by virtue of the presence of this free alkali that the cream is held in solution. Thus Dr. Lyon Playfair, says:

"Milk contains about four and a half per cent. of casein. It is held in solution in the milk by means of an alkali. Any acid which removes this alkali converts the cream into an insoluble curd, which, when collected and dried, forms cheese. The acid formed when milk becomes sour also produces the same effect. Prepared rennet is a means of effecting this change."

Professor Johnston says:

"As it comes from the cow, milk contains a quantity of soda not combined with any acid, by which soda the curd is believed to be held in solution. As the milk becomes sour the soda combines with the lactic acid, and thus the curd becoming insoluble separates from the whey, or the milk thickens and curdles. Rennet, when added to the milk, changes the sugar into the acid of milk. The addition of rennet, therefore, is only a more rapid way of making milk sour."

Professor S. W. Johnson, of Yale College, has favored me with the following recent and minute analysis of milk by eminent chemists in Europe:

Cows' milk examined by Boelder and Struckmann.

Ingredients in 1,000 parts.	Morning's milk.	Noon milk.	Evening's milk.
Water	899.7	892.0	866.0
Total solid matters	100.3	108.0	134.0
Casein	22.4	23.6	27.2
Albumen	4.4	3.2	3.1
Butter	21.7	26.3	54.2
Milk sugar	43.0	47.2	41.9
Salts	8.3	6.9	7.8

The butter in evening's milk is here stated to be double that in morning's milk. Professor Johnson remarks that this has been corroborated by other observers in both cows' and goats' milk. I am not aware that this has proved to be the case usually in this country. My own observations have shown only a trifling difference.

Milk from cows of various breeds.

In 1,000 parts.	Swiss.	Tyrolese.	Normandy.	Brittany.	Angus.	Durham.	Holland.	Belgium.	Bohemian.
Water	851.98	817.40	871.80	837.48	803.20	845.60	839.72	857.70	841.80
Total solid matters	148.02	182.60	128.20	162.52	196.80	154.40	162.28	143.20	158.20
Casein	22.56	41.98	42.18	46.50	45.62	32.46	34.87	31.50	28.52
Albumen	3.08	7.60	5.50	7.24	7.90	11.14	7.32	9.10	10.20
Butter	70.88	79.60	32.40	57.04	98.80	64.10	68.46	62.20	63.40
Sugar of milk	45.90	48.42	42.12	45.54	37.26	39.70	43.50	32.92	49.68
Salts	5.60	5.00	6.00	6.20	7.22	6.82	6.14	6.78	6.40

This theory has some plausibility, in view of the fact that when acids are added to milk in sufficient quantity the casein separates—that is, the milk curdles. So it does when by exposure to the air it becomes sour spontaneously, which souring is due to the conversion of the lactose or milk sugar into lactic acid. But the above statements are believed to have been made upon insufficient data, and to be inconsistent with other indubitable facts. Although it is true that freshly drawn milk sometimes exhibits an akaline reaction, it is equally true that it is sometimes neutral, and also that it often exhibits a decidedly acid reaction. I have myself owned cows whose milk, when in perfect health and in pasture, as soon as drawn, would distinctly redden litmus paper, and I have known hundreds of others to do the same, thus showing an appreciable amount of free acid when quite new; nor did this milk curdle or become sensibly sour sooner than other milk.

If we are to accept theories based upon isolated facts, we might in this case as well say that cream is held in solution by free acid, as in the other by free alkali, but another view would account for its solution in a liquid perfectly neutral. Again: if it were true that the casein of milk is held in solution by virtue of a free alkali, it would be precipitated—that is, the milk would curdle just as soon as this alkali was neutralized. If this were the case, newly drawn milk would never present an acid reaction, for before this could be the case the milk would be changed to curd in the udder, and could not be drawn from it. Experience has demonstrated that whether the casein of the milk is separated spontaneously in connexion with the development of lactic acid from the conversion of milk sugar, or by the addition of other acids to the milk, as is practiced in some countries, good cheese is not the result. To this end the action of rennet is indispensable—an action the precise nature of which is not known, although it is probably what is called "catalytic," or an "action of presence," a name given to an action which we know little about beyond the facts. That the action of rennet in curdling milk is not due to the effect of acid may be easily demonstrated by any one who will take the trouble to test the fact as indicated by the experiment alluded to in the next paragraph.

Rennet is an infusion of animal membrane. Various membranes of different animals will serve to curdle milk, but the stomach of the young sucking calf, cleaned and salted, dried, and kept a year or more, is preferred to all others. The infusion as usually prepared is slightly acid, but that it is not the acid in it which effects the coagulation is shown by the fact that it may be made slightly alkaline by the addition of potash or soda, and still be effective. *Milk which is slightly alkaline, I have found, may be curdled by rennet, which has purposely been rendered alkaline, and the whey produced in such case showed an alkaline reaction*, so that in cheese-making we may conclude that the coagulation is not effected by means of acid, as many have taught. Be the explanation of the action of the rennet what it may, we must, until better advised, be content to accept and act upon the facts as demonstrated by experience. The most important of these facts are, first, that rennet curdles milk irrespective of acid; and secondly, that the presence of lactic acid, from the conversion of milk sugar, facilitates coagulation.

In treating of the chemical composition of milk, casein is usually spoken of as its only nitrogenous constituent; but this is not correct, for milk contains at least one, and perhaps two or more, other nitrogenous constituents besides casein. Albumen is one. Its proportion is smaller than that of casein, being usually from one-quarter to one-half of one per cent., but its existence may be easily verified by taking a portion of whey rendered bright and clear by fitering, and elevating its temperature. Before it reaches the boiling point the albumen which was dissolved in it, and which resisted the action of the rennet, is coagulated by the heat applied, and separated in a flocculent mass. Its office as a constituent of milk is not fully understood, but it probably plays an important part. There is reason to believe that albumen passes into a state of decomposition and putridity with greater facility than casein.

The success which attends Borden's patent method of preserving milk so as to keep in any climate and for any length of time depends in no small degree upon the abstraction of the albumen contained in it as an indispensable preliminary. Aside from this, its manufacture consists in taking away the larger portion of the water of the milk by evaporation in vacuo, and by the addition of sugar. But these last would not avail for its preservation without the former.

It is also well known that the Devonshire method of making butter, which involves a heating of the milk and consequent coagulation of the albumen, results in a larger product than any other method, and it is equally well known that such butter cannot be kept for a length of time like butter made in the usual way, doubtless owing to the difficulty or impossibility of separating the coagulated albumen, which at once increases its weight and adds to its liability to become rancid. The usual occurrence of albumen in milk has been denied by some, but with what reason it is not easy to imagine. It has, so far as my knowledge extends, been found in every specimen which has been tested for it.

A late writer on milk, in the Dublin Quarterly Journal of Science, (page 338—1862,) says, "The normal constituents of milk are water, a small quantity of mineral matter, (ash,) casein, sugar, and butter. Albumen is only a constituent in the colostrum or first milkings after parturition."

It seems not improbable, to say the least, that the substance constituting the little sacs which contain the little globules of butter is a nitrogenous material different from either albumen or casein, although this is a matter of conjecture or of inference rather than of proof. If composed of either of these substances, how comes it to exist in the milk in a condition so very unlike all the rest of the same, which is in a state of solution, and not of undissolved films? And again: if these films do not consist of a substance of peculiar properties, why is it that after thumping and banging about in the churn for an hour, more or less, they *nearly all at once, and not in the order in which they are mechanically acted upon,* give up their integrity, break, and liberate the oily particles?

A good many questions might be asked regarding milk and its products which, in the existing state of knowledge, it would puzzle any one to answer, and which seem to require for their solution a more minute acquaintance with its chemical composition. For instance, we know that casein is a nitrogenous substance, and liable to putrefaction; we know that it constitutes from thirty to forty per cent. of cheese; and yet cheese is preserved from decay for months or years by an addition of three per cent. of salt. We know that pure butter or the oily portion of milk is not a nitrogenous substance, and not more liable to putridity than beef tallow; and yet carelessly worked butter, which contains, say, a tenth part as much casein as cheese, cannot be preserved from rancidity by five nor ten per cent. of salt. Why is this? But as such queries do not bear directly upon the manufacture of cheese, we will proceed to notice some peculiarities which are equally obscure, and yet do have a practical bearing upon it.

Aside from the chemical composition of milk and the variations which attend it, milk possesses other properties, which seem to be due to the vital action by which it is secreted. These are variable also, and are of so subtle a character as to defy the scrutiny of ordinary chemistry. What is known as "animal heat" or "animal odor" is of this class. It is a well established fact among practical dairymen that if milk in considerable quantity be shut up closely in a vessel as soon as drawn, it will before long emit an exceedingly offensive odor, and this before anything like decomposition could ordinarily take place. The cause of this phenomenon is not certainly known. It is conjectured that, being a vital secretion, milk holds for awhile some remains of vitality, which gradually pass off as an imperceptible emanation when exposed to the air, and when this wholly passes away the milk becomes an absolutely lifeless substance, subject to the ordinary conditions of dead matter. It is supposed to be analogous to the case of the body of an animal, which, when life departs, does not instantly assume the cadaveric state, but for awhile remains flexible and even sensible to the stimulus of galvanism.

Some of the variations to which milk is subject are evidently the provisions of nature for special purposes. The first milk or biestings, as it is sometimes called, is very unlike that secreted at a later period, both in its chemical composition and in its effects, being purgative. It is especially adapted to the wants of the calf immediately after birth, and should never be withheld from it. The milk secreted by cows during the season of sexual heat is quite unlike that of other times. Persons in robust health may sometimes partake of it without injury, but it should never be given to infants. By a wise provision cows are not subject to this condition while suckling their offspring, and what is dangerous to a calf should be cautiously withheld from a delicate infant or a person in feeble health. Such milk is unfit for dairy purposes as well as for direct use as food. Mr. Willard, in reply to an inquiry on this point, writes as follows:

> "The milk of cows in heat does sometimes play queer pranks with cheese. You will remember I suggested this to be the cause of the trouble in the three cheeses which we saw at Frazer's factory, made from one vat of milk which Mr. F. said could not be properly cooked. I have had it occur in my own dairy when several cows were in heat at the same time, when the weather was hot, and the animals were more than usually excited. In the worst cases I have attributed it not only to the milk of the animals in heat, but aggravated by that of those which became sympathetically excited, and exercised, and feverish in consequence of the cows which were in heat. Milk at such times is feverish and akin to a mass of putridity, and not unfrequently a fetid or very offensive odor is emitted from the whey and curd if used for cheese making Such milk will no more produce solid curd than it would give health and nourishment to a calf when taken into its stomach. When made into cheese there is a tendency to undue fermentation and rapid decomposition, and its character is precisely similar to cheese made with putrid rennet. But such extreme cases are only occasional."

Serious trouble in cheese making has been occasionally experienced by most dairymen from the same cause.

It is well known that milk will often suddenly develop into a state of acidity during thunder-storms, but why it should thus become sour has long been shrouded in mystery. Some have confounded this with the effect of jarrings or joltings, or that produced by vibrating motion of the air, as by beating of drums. It is now well understood to be due to the presence of ozone, which is generated in the air by electrical action. Ozone is simply oxygen gas in a changed or, as it is called, allotropic condition. It possesses some very curious and wonderful properties, and among them intense oxydizing or acidifying powers. The remedy for the trouble just mentioned is to have the ventilation of the milk room so perfectly under control that the outer air at such times may be wholly excluded.

Until within a comparatively brief period the manufacture of cheese has everywhere been almost entirely an empirical process, the mere following of forms which have been handed down from past generations without an understanding of or any reference to those guiding principles which should direct the process. Science has at length stepped in, and in several particulars has rendered valuable aid.

It is a noteworthy fact that systematic attempts to improve the manufacture of cheese began to be made both in Somersetshire, England, and in Herkimer county, New York, about the same time; and also, that with no knowledge on the part of either of the progress made by the other, after lengthened experiments, both should have adopted substantially the same method; for it is a fact that the Cheddar and Herkimer methods so closely resemble each other that the only differences of any consequence are such as necessarily grow out of the difference of climate. Their process differs from most methods mainly in two particulars: first, in employing milk which has attained a proximate degree of acidity, although never enough to be sensible to the taste, instead of such as is quite new; and secondly, in the separation of the whey from the curd by means of the chemical effect of heat applied to the curd in the whey, thereby causing its contraction and precipitation, instead of depending mainly on mechanical means. The improvements thus introduced within a comparatively recent period have resulted in several important advantages. First, a material reduction of labor; secondly, the production of a larger amount and a better quality of cheese from a given quantity of milk; and lastly, the cheese made by this method requires less time for the ripening process, and thus is sooner ready for the market.

How these results have been attained, and can be made available to all, will be most fully comprehended by a statement of so much of the theory of the manufacture as has been demonstrated by experience to be correct; and next, by a relation of the details of practice. It may not be easy nor desirable to keep theory and practice wholly apart, but we will proceed to mention

THE IMPORTANT POINTS OF CHEESE MAKING.

1st. The first to be noticed is *cleanliness*, and this, it may be observed, is quite as important in the butter as in the cheese dairy.

2d. That the milk be rid of animal odor, and be in the proper state both as to temperature and proximate acidity.

3d. That the rennet be properly prepared, and a suitable quantity, and no more, be added.

4th. That the whey be completely separated from the curd.

5th. The maintenance of a suitable and even temperature in ripening.

First, cleanliness, absolute cleanliness; and by this is meant a great deal more than exemption from visible dirtiness. The inferior character of a considerable portion of the dairy products manufactured anywhere and everywhere, and especially the bad flavor which, although not perceptible when new, develops in an unmistakable manner with age in both butter and cheese, is chiefly owing to lack of proper care and cleanliness in the full sense of the latter term. To understand this better, let me say that cream or the curdy portion of milk is a nitrogenous body, and, like all nitrogenous animal substances, is inclined to run into putrefaction. This liability to putrefy is developed with greatest rapidity when under the influence of other substances in which decay has already begun. For instance, a piece of fresh meat placed in a perfectly clean vessel, and the air about it pure also, may keep good many days, some weeks perhaps; while if it be placed in one apparently clean, but which has had tainted meat in it previously, it will begin to putrefy in a short time. The exciting cause, although in this case invisible, is as really operative as a visible amount of filth would be. Its action is that of a ferment, not unlike that of yeast, a little leaven leavening the whole lump. Any decaying emanations, whether from spilled milk, or from any other source, communicates a tendency to the same decay, and, the change once begun, it is very difficult to arrest it. Its effects may not be apparent at once, but the leaven is working. Butter possessing the tendency may not, while fresh, offend the most delicate taste, but it will most surely develop so as to be plainly perceptible after being kept. Ferments are destroyed at the heat of boiling water, 212°. Boiling water will readily cleanse vessels in which milk has been kept if they be of tin or other metal. Possibly a slightly lower temperature may suffice for metallic vessels, but certainly not for wood; and it is safer in all cases not only to have the kettle "sing," but the water "dance." Wood is porous, and absorbs more or less milk, and be it ever so little which finds a lodgement in it, there is no security against the propagation of the peculiar ferment. In a note from a friend is related his experience on this point thus:

"The following fact shows not only the importance of having vessels for holding milk perfectly clean, but made of material easily kept so. We purchased a new wooden pail, unpainted inside, for a milk pail. The usual care was taken to wash, scald, and dry it every time it was used. It was found after some time that if the milk was allowed to remain in it, say, from a quarter to half an hour before being strained, particles of loppered milk could be found gathered in the crease or angle formed at the junction of the bottom and sides, and no amount of scalding or scrubbing could prevent it. It became advisable to throw it aside, and use a tin one in its place, when the trouble ceased. Was it not that particles of milk at some time had become absorbed, and lodged so deeply in the pores of the wood as to be out of the reach of scalding water, (wood being a poor conductor of heat,) where it had 'turned,' and thus formed a *nidus* for loppered particles, which acted upon the new milk and changed it in so short a time."

The danger that the ferment may find a lodgment permanently in wooden vessels, together with the great amount of labor which their use involves, should cause their banishment from the cheese dairy in all cases where metallic vessels can be substituted with advantage. If wooden vessels must be used, great caution should be had not to employ any which have been recently painted. On this point Mr. Willard remarks:

"Sometimes, when the dairyman has been using newly-painted pails and tubs, he will find black specks and spots on the rinds of many of his cheeses, and should he cut them, the same peculiarity is found throughout the cheese. This is *poison cheese*, more or less dangerous to the consumer, and justly feared and avoided in the market; for though much of it may possibly be eaten in small quantities without producing any serious effect or sickness yet the chances are that some of the cheese is very poisonous. Now the dairyman is often, and perhaps generally, ignorant of the cause, and innocent of any intent to poison, and he learns with amazement that his cheese has been thrown out of market, or sent back to him, or that some family has been poisoned by eating it; but such is the fact, and the result has been brought about by carelessly using newly-painted utensils. The milk and whey have extracted poison from the lead and deposited it in the cheese. The fact has been well substantiated in numerous cases where the matter has been fully traced out. When utensils are to be newly painted, it should be done at a time when they will not be needed for three months; and before being painted they should be thoroughly scrubbed with strong lye, in order that all the old flaky paint be removed, and a good clean surface be presented for the new paint."

The cleanliness referred to should include not only the utensils, but every part of the premises. Milk absorbs odors of any kind with such facility that much caution needs to be exercised lest it suffer injury by exposure to offensive effluvia. Let milk be ever so rich, it may be spoiled before as well as after rennet is added.

Having secured cleanliness in all the appurtenances belonging to the dairy, having before us pure milk in clean vessels, we come to the second point, to wit, that the milk be rid of animal odor, and be in the proper state both as to proximate acidity and temperature. That peculiar aura or effluvium which milk holds when freshly drawn has already been referred to, and it is only needful here to say that the milk should be freely exposed to the air until this has wholly passed off.

The proper condition of the material in regard to acidity is a point of much consequence, and is one to which hitherto but little attention has been paid by the great mass of dairymen in this country. When milk is drawn from the cow it is sometimes alkaline, sometimes neutral, and sometimes acid; oftentimes acid in summer, indeed, if my own observations afford a fair criterion. The milk of cows at pasture during the summer months in this country is usually acid, for in no instance has it been found alkaline, and very rarely neutral until very late in the autumn. It is never acid so as to taste sour, but sufficiently so to exhibit an acid reaction to a delicate test.*

As soon as exposed to the air, there commences a spontaneous conversion of the sugar (of which milk usually contains from four to five per cent.) into lactic

*Litmus paper is used for this purpose. It is colored blue by a vegetable infusion. A very slight degree of free acid in any liquid is detected by the reddening of the paper, and when thus reddened a very little alkali suffices to restore the blue.

acid. The chemical composition of these two substances, as determined by analysis, is the same, or very nearly the same, yet they are very different substances to our senses of sight and taste; and the difference is supposed to be due to the transposition of the elementary atoms of the sugar. Some have held that cheese is best made from new milk. It is true that when too much changed only a hard, sour cheese can be made of it; it is also true that those cheeses which bear the highest reputation and command the highest prices, both in this country and in Europe, are not made wholly from new milk, but from evening and morning's milk mixed. From all the evidence presented, no doubt can be entertained that the latter is the better practice; or, in other words, that it is desirable that the conversion of the sugar of milk into lactic acid should have made some progress. The precise degree of acidity which is best is not definitely known, nor have we at present any easy method of measuring it with precision; but practically it is found in family dairies that if milk is kept for twelve hours at a temperature of about 65°, and the morning's milk be then added, and the whole properly warmed, the best results will follow, and the due separation of whey is more easily effected. As this point is deemed one of much practical importance, we quote from the best authorities in proof of the position here assumed.

Mr. Robert McAdam, of Gorsly Hill, a successful teacher of the Cheddar method in various parts of England and Scotland, says:

"When acid is not present in a sufficient quantity the curd will require longer stirring among the hot whey, and too long stirring has the effect of hardening the curd and of making the cheese stiff to cut and deficient in richness. When acid is deficient the curd will seem excellent and taste sweet, but the cheese produced will be soft to the touch, have a tendency to heave and bulge out in the sides, will be longer in being fit for the market, and when cut will not have that close, solid, compact body, nor yet that richness of quality and sweetness of flavor which are so desirable. We are convinced that attention to what we have stated is the first and most essential principle of cheese making, and that the difference between fine and middling quality is caused by inattention to or ignorance of these particulars. When the temperature of the cold milk is 64° or upwards no sour whey ought to be used; the acid then present is a sufficient degree without it. When the temperature is 65° or upwards every operation of the process must be accelerated until the curd is taken out of the cheese tub and cooled and salted, for when too great a quantity of acid is present it affects the curd so as to render the cheese hard and give it a sour taste. On the other hand, when the temperature of the evening's milk is 58° or under, it is beneficial to put the sour whey into the cheese tub, before milking, along with the cold milk, as this allows the acid to begin the change, and promote the degree of acidity necessary. In large dairies less sour whey is needed, in proportion to the quantity of milk, than in smaller ones."

X. A. Willard, esq., of Little Falls, says:

"The requisite degree of acidity in milk for producing the best results in cheese manufacture is very imperfectly understood by most dairymen.

"Experienced cheese-makers have observed the fact that milk which has been cooled down to a low temperature and kept very sweet requires more rennet to form the curd, and when coagulated is longer in cooking, and often will not work down firm, but will be soft and spongy, forming what is termed a 'honeycomb cheese.' Many times a superabundance of whey is retained, and cannot be pressed out. This soon becomes sour and putrid, the cheese does not cure evenly, but goes on depreciating in quality until it reaches a high state of decomposition, giving off an offensive odor, and not unfrequently requiring immediate removal from the shelves to the pigpen. When cheeses swell and puff up the whey oozes out, carrying a portion of the butyraceous matter changed to oil, and are saved with difficulty, and when saved cannot be marketed at half the ordinary price of good cheese.

"The principal features of this character of cheese are given that it may be identified, and because large quantities are annually made during spring and fall, many dairymen not knowing where the trouble lies, or how to obviate the difficulty.

"Now this results from manufacturing from milk that is *too sweet*, and which should have been treated with sour whey. The use of sour whey in cheese making, when the temperature of the evening's milk has been kept low, we deem of imperative necessity, if uniform, firm cheese of fine quality be desired. It may be observed that milk should never have acquired sensible acidity before setting with rennet, but should nevertheless be well on its way towards that point. By sensible acidity we mean acidity that can be detected by the taste or smell. Some milk is more acid than other soon after being drawn from the cow, and often, when freshly drawn, will redden litmus paper, yet to the taste is perfectly sweet. The milk from cows at pasture and fed with whey or slops is more acid than that from those which get nothing but grass on sweet upland pastures. But if by chance or accident the milk is sensibly changed when about to be made into cheese, it should be set at a low temperature, and all the subsequent operations hastened as far as practicable. Could there be some simple instrument devised for determining the acidity of milk, it might be used with much advantage in cheese making. The most practicable method, and one which we now employ, is by testing the evening's milk in the morning by the thermometer. This, with experience and close observation, will serve as a guide for conducting operations.

"Our remarks on the use of sour whey, it may be observed, are more applicable to family cheese making than to factory manufacture, since there are various causes to hasten acidity in factory milk, and it is impossible to watch the milk as thoroughly as where it is under the immediate eye of the manufacturer from the moment it is drawn from the cow until it is turned into cheese.

"When the evening's milk stands in the morning at or below 62° the morning's milk may be added to it, and at the time of putting in the rennet a quantity of sour whey should be added and stirred into the mass in proportion of two quarts of whey for every sixty or seventy gallons of milk. If the night's milk stands below 60°, a larger quantity of whey may be used, and the quantity of whey always graduated according to the degree of sweetness of the milk. If the evening's milk stands at or above 65° in the morning no sour whey need be used, as the milk is on its way towards a change, or has acquired sufficient acidity to render the use of the whey not only unnecessary, but a damage from an excess of acid.

"When milk has not been treated with sour whey at the time of adding the rennet, and there is difficulty in cooking the curd, it will be better to add to the mass, while cooking, a sufficient quantity of sour whey to harden up the curd; but it is always better, when practicable, to use the whey at the time of setting the cheese, as by that means the coagulation is rendered more perfect, while more of the butyraceous matter is retained, and the cheese consequently richer and of finer texture and flavor.

"When acid is used in this way to assist the rennet in its work of coagulation, it passes off in whey and in pressing and in the cheese-room, leaving the cheese sweet, mild, firm, rich, and of finest texture. It has none of the characteristics of cheese made from milk sensibly sour, as in that case it will be hard, and retain an acid taste.

"In hot weather there will be no occasion to use the whey, unless the milk is cooled down with running water and ice at a low temperature, and so held through the night. We may remark here that it is presumed the milk-room, dairy utensils, &c., are to be kept sweet and clean, for if otherwise it will be useless to attempt to have uniformity of manufacture, for no degree of skill in manufacture will be able to counteract all the damage done when the milk is constantly absorbing sour or putrid emanations, or when taints are received from unclean dairy utensils.

"The whey should be distinctly acid, about like that coming from a sweet curd in summer weather, and standing twenty-four hours. If the weather be cool, the whey must be kept in a warm temperature, in order to acquire the requisite acidity.

"Milk treated as above with sour whey will produce curd that will be all that can be desired, which will work down evenly and without trouble, the cheese coming with a firm, compact texture, retaining more of the butyraceous matter, and having that mild, rich, pleasant flavor peculiar to first-class cheese, while at the same time it will add in quantity, and save that which would otherwise go off in the whey and be lost."

The temperature of the milk when the rennet is added is next to be attended to, and is a point of much importance. It has been found by experiment that milk coagulates soonest when at a temperature of about 115°. I detect but little difference in the time from 110° to 120°, but above or below this point the time required was longer, and a degree of heat equal to 160° or upwards seemed entirely to destroy the coagulating power of the rennet. When curdled at so high a temperature as 115° the product is much injured. The proper temperature, as determined by experience, is usually from 85° to 88°, and the whole range admissible, under the varying conditions which sometimes occur, is not more than 10°—namely, from 80° to 90°. If set below 80° the curd is long in coming, (unless an excess of rennet is added, which is highly objectionable,) is too tender, and the separation of the whey is attended with great labor, and unless extreme care is used, with loss also. If it be set at a temperature above 90° the curd assumes a toughness which is objectionable, and the cheese made from it is hard and of inferior quality.

How shall the proper temperature be determined? Our reply is, by the use of the thermometer, and in no other way. The answer given by the practice of a majority of dairywomen is, by the feeling, by judgment, by the verdict of the practical hand; and doubtless they honestly believe these to be sufficient, and may ridicule the use of scientific instruments to determine so simple a matter. But the truth is, that feelings, though very useful in their place, are not to be depended on to determine temperature. Our bodies are constantly affected by too many disturbing causes to afford a reliable index to slight differences. Tell a man when suffering from fever and ague that he is no warmer now, when seeming to be on fire, than he was a little while ago when shivering under a heap of blankets, and, unless he is assured of the fact by other evidences than his own sensations, he will believe you to be laboring under an egregious mistake. He may very likely take you for a fool, and perhaps exclaim, "Don't I know when I am burning and when I am freezing?" and yet the fact is as you stated to him, and easily demonstrable by the introduction of the bulb of a thermometer beneath the tongue or under the armpit. A very simple experiment will satisfy any one that the sensation of cold or heat is not always, even when in perfect health, in consonance with the fact. Take two basins partly filled with water, one as hot as you can comfortably bear, and the other as cold. Plunge a hand in each, and after a little while pour one into the other, and put both hands in it; one hand says the mixture is cold, and the other says it is warm. No; if you desire a good product uniformly, and not merely occasionally, there is no other way but to use the proper means, to wit, the employment of an instrument acting by expansion and contraction in accordance with a fixed law, undisturbed by any of the many causes which affect living bodies.

How shall the desired temperature be attained? By heating, of course. But the way of doing this may affect the product. Milk should not be heated by the direct action of fire upon the vessel containing it. If a tub is used, the common method has been by warming the milk in a tin pail or other vessel set into a larger one of water to which heat has been applied. If this method is adopted the whole milk should be warmed, as if only a portion is heated, and that sufficiently to warm the rest to a proper degree, there is some danger that some of the buttery portion will rise as oil and escape with the whey. If a tub must be used, the better way is to introduce a tin pail of hot water into the milk in the tub and gently move it about. By a similar method, namely, by using a pail of ice-water, the evening's milk may be cooled when to be kept over night in a wooden cheese tub in warm weather. In this way a proper temperature may be attained, and none of the milk heated too much. But the best way by far is to use the improved apparatus consisting of a double vat, the inner one of tin containing the milk and the outer one water, which is warmed by a fire of a few chips in the heater below. There are quite a number of these, differing somewhat in construction, several of them being well adapted to the purpose for which they are designed.

Third. We come now to the means of effecting coagulation, or the precipitation of the curd; and our first point is, *that the rennet be properly prepared, sweet and good, and that a sufficient quantity, and no more, be added to the milk.* This point is of such practical moment that it is not extravagant to say that scarcely one dairyman in a hundred, even in old dairying districts, realizes to the full its importance. Milk can be curdled in various ways, but to make good cheese rennet is indispensable. This is a preparation made of the stomach of a sucking calf. It is better that the calf should be not less than four nor more than ten days old. A healthy stomach when taken from the calf has a clear, clean, whitish appearance; if discolored, or marked with dark spots, or of a reddish cast, showing inflammation, it ought not to be used. The stomach is to be emptied of its contents and cleaned without washing or scraping; plentifully salted and stretched on a stick in the form of a bow. When it is hung up to dry it is well to put in a little salt, but not to fill it; and care should be taken not to hang it in too warm a situation. In some instances the entire stock of rennets of a dairy have been rendered worthless by being dried too near the stove-pipe. They should be hung in a dry atmosphere in a room moderately warm. It is a curious and unexplained fact that freezing and thawing when the skins are green, in the spring, increases their efficacy. They are stronger, also, at a year old than when new, and the dairyman will do well to keep a good stock on hand. It is important that just enough, and no more, be added to the milk to effect coagulation in about fifty minutes.

To accomplish this the liquid rennet must be prepared with care, and its strength ascertained by previous trials. The practice of the best cheese makers is to take four or six skins and soak them in milk-warm water—a pint or a quart to each skin—with occasional rubbing during two or three hours, adding salt enough *fully to saturate* the liquor. Repeat this process three times, so that there shall be altogether half a gallon or a gallon of liquid to each skin; mix these infusions and strain through several thicknesses of flannel, add more salt, and, if you please, a few lemons sliced, or a little spice, *and keep in a glass demijohn or stone jar.* Do not fail to have an excess of salt, so that some will remain undissolved, and keep the vessel containing it in a cool place. If a smaller quantity be wanted, take a half or a fourth of several skins and prepare in the same way, as by this method subsequent parcels can be made of nearly or exactly the same strength, while if a whole one be used at one time and another the next, the strength of the liquid may be very unequal. If good skins are used, and a gallon of liquid be made from each, the probability is that a pint of it will suffice to curdle fifty or sixty gallons of milk in forty or fifty minutes, which is the proper time to be occupied in the coagulation. After a few trials the amount necessary can be determined very accurately. Too much caution cannot be exercised to have the rennet pure, clean, and good. Properly prepared, the liquid is bright, clear, and effective; perfectly free from any disagreeable smell or taste, and, with suitable care, may be kept some weeks in good order. I have known it sometimes safely kept through the entire season. But if rennet is faulty in any respect, the cheese will suffer accordingly.

Mr. Willard very justly remarks:

"Tainted rennet is the source of infinite mischief to the dairy, even when the taint is so slight as to be unsuspected. It produces ills well known to the dairyman as huffing, rapid decomposition, nauseous stenches, the breeding of mites, and often the entire loss of the cheese."

An instance in illustration of Mr. Willard's remark may here be cited. An old dairyman, in Herkimer county, a few years ago, lost a large quantity of cheese, and neither he nor his neighbors for a long time suspected the cause of the trouble. The cheese seemed perfect when made, but the fermentation soon became violent, and the cheese would turn itself completely out of the bandage. One after another they were thrown to the hogs. He changed his rennet, buying new skins of his neighbors, but the liquid was put in the same wooden tub formerly used, and which, without his being aware of the fact, had become tainted. At length, on the suggestion of a critical friend, who examined the dairy, he threw the tub away, with its contents, substituted a stone jar, procured good skins, and the trouble was at an end.

Be the rennet ever so faultless, it is well to add no more than just enough to accomplish the desired end. It is often supposed that if more be added the only effect is to hasten the curdling, and that the excess passes off in the whey; but there is a liability incurred of a disagreeable "rennety" flavor, and of disturbed and irregular ripening. Besides this, when too much rennet is used, the curd forms too rapidly, and the cheese in this case is too hard, and often rather sour also. On the other hand, if the milk be not coagulated within an hour, the curd will be too tender, and cannot be easily separated from the whey without loss of butter and consequent deterioration of quality to the cheese. No better rule can be given than to add rennet enough to bring the curd of a firmness fit to cut in from forty-five to fifty minutes. To judge when this is obtained, introduce the finger, and if the curd breaks with a clean fracture as it is lifted, it will answer. If it has a pasty appearance, let it stand a while longer.

SEPARATION OF THE WHEY FROM THE CURD.

Fourth. It is well understood by all cheese makers that unless the whey be properly separated from the curd the product will be imperfect. If much whey remains within it is liable to leak, and the lactose or milk sugar being converted into lactic acid, a sour taste is early induced. It is liable also to undue fermentation, especially in warm weather, during which fermentation gases are engendered, rendering the cheese porous. If in a warm place it swells, and when the gas escapes it emits an offensive smell. As the fermentation subsides, the cheese is liable to careen and become unshapely. The flavor is injured; a sharp, pungent, ammoniacal taste being acquired, and the putrefactive decomposition thus having begun, the cheese ere long spoils and becomes utterly worthless.

Numerous methods have been employed to effect a due separation of the whey, most of which depend for their efficacy upon mechanical manipulation, and involve considerable and protracted labor. It is in this part of the manufacture that the greatest improvements of modern times have been made. It has been found that heat, gently and properly applied, has the effect to contract the curd and expel the whey. In its proper application lies much of the art of manufacture, for it is as capable of producing injury as good. What is technically called "scalding the curd" is common to several methods, but what is done under this name differs very much. In some the curd, when solid enough, is sliced or cut up in a curd mill, and warm water or whey is poured over it to remain a short time. This is doubtless beneficial so far as it goes, but it is ineffectual to accomplish the ends which may be secured by a proper cooking of the curd in the whey, an attempt to describe which will be made when we come to speak of practice. For the present our statement is simply this: that by a suitable application of heat to the curd while yet in the whey, the latter may be so thoroughly separated from the former that it will nearly all drain off, so nearly that scarcely anything remains for the press to accomplish except to expel the whey which remains upon the surface of the particles of curd to cause them to adhere to each other in a solid mass, and to shape the mass into the desired form.

Fifth. The last point of importance in the manufacture of cheese is the maintenance of a suitable and even temperature in ripening.

The lump of curd as it comes from the press is not yet a cheese. It is fit neither for the table nor for market until it has undergone the process of curing or ripening, a more important item in the manufacture of cheese than many suppose it to be. The chief feature of this ripening process is a sort of fermentation, somewhat analogous to what takes place in the ripening of a pear after it is plucked from the tree, by means of which are developed the good or bad qualities, particularly flavor and odor, which the materials and the process employed are calculated to produce. What the precise nature of the changes which take place during this fermentation may be is but imperfectly understood by the best chemists. There seems reason, however, to believe that the fatty elements react upon the moist casein, which reaction causes a change from its original *curdy* state to a different one which may distinctively be called *cheesy*. It is also believed that while this change is going on certain flavoring principles are generated from the glycerine which is present in the buttery portion, and which impart, accordingly as the process is skilfully or badly managed, an agreeable or disagreeable taste, and the characteristic odor of cheese.

What we do know beyond a peradventure is, that for the production of a choice article a moderately warm and even temperature is desirable, nay, is indispensable. The desirable degree of uniformity may not always be attainable in practice; but if steadily aimed at with an intelligent conviction of how much depends upon it, an approximation to it will be reached greatly preferable to ordinary practice.

Ventilation of the curing-room is only less important than a proper temperature, for during the process, and especially in its earlier stages, there are emanations of moisture and gaseous substances from the cheese which should have free opportunity to escape, because if retained in the room it is rendered damp and offensive, and the cheese becomes liable to mould and injury. Like other forms of fermentation, the ripening of cheese may be accelerated or retarded by a higher or lower degree of temperature. The temperature to be maintained in the curing-room may depend somewhat upon the object sought. If an early market is desired, and the aim is to have the cheese ripe in thirty to forty days, as is customary in Herkimer county, the temperature should be near 75°; but it may be doubted if a temperature ten degrees lower, while it would require a longer time, would not on the whole be preferable. It is believed by many good judges that a temperature of 65° is warm enough, and more likely than a higher one to result in superiority of flavor. Careful experiments, on a sufficiently extended scale, are wanting to determine more nearly than is indicated above, but experience is not wanting to prove that evenness of temperature within the range mentioned is of prime importance.

In the construction of the curing-room the endeavor should be to fulfil the conditions above named. A sufficient current of air may be induced by openings which will not cause a direct draught upon the cheese, and which should be arranged so as to be under control, and by a ventilation at the top. Light is desirable, but the sun must not be allowed to shine upon the cheese. Warmth may be secured by stoves, but a better mode would be by hot water-pipes passing around the room. Mr. Willard, who has the best curing-room I have seen, in a note, says:

"In order to cure cheese properly, so that flavor and texture be perfect, an even temperature is all-important. Under our practice of sending cheese to market at thirty to forty days old a temperature of 70° to 80°, in my opinion, is about right. It needs air and light; but if air be admitted through windows so as to strike the cheese, the exposed surface will crack and check, disfiguring the rind, rendering it liable to be lost from mites, and always injuring its sale. When the sun's rays strike directly, it will be unevenly heated, and the rind sometimes almost melted. If the room is damp the cheese moulds under the bandage, presenting an unsightly appearance, and on this account, perhaps, an upper room is most desirable. In our best dairies cheeses are not always of uniform good flavor, on account of curing as the weather varies. This has long been understood, both by buyer and manufacturer, and though losses are annually sustained, little attention is given to curing-rooms, dairymen not generally understanding how to obviate the difficulty.

"My cheese is cured in an upper room. The cheese-house is so located in respect to other buildings that a draught of air is induced around it. Light is admitted at the north and south ends only, so as to prevent the sun's rays striking the cheese directly. Several trees are near the building, shading the north and east sides. The windows for admitting light are never opened to let in air. The centre of the building is a large ventilator terminating in a cupola, the openings provided with wickets for closing draught or regulating as desirable. In the sides of the building, and even with the floors, are six ventilators or openings, twelve by twenty inches, communicating with the open air, three on each side, and provided with wickets to regulate draught as desired. In this way a draught is secured which does not injure the cheese. In the original plan I proposed to have a refrigerator or ice-box in the room, to be used in case of need for cooling the atmosphere, but thus far have had no use for it, the thermometer at no time quite coming up to 80°. The room is lathed and plastered, and provided with a stove, so that in cool or damp weather the temperature is kept up by artificial heat. The room operates perfectly in curing cheese."

APPARATUS.

Very much of the ease and facility with which the manufacture of cheese may be conducted, and something also regarding the amount of product to be realized, depends on the apparatus employed.

American ingenuity has not been idle in this department, but has devised implements as much superior to the old cheese-tub formerly used, or even to those now in use in the best European dairies, as the best American plough of to-day is superior to the clumsy wooden one of a century ago, or, for our use at least, to the long, heavy, costly English or Scotch ploughs now highly esteemed abroad.

First in importance is the cheese vat, in which all the operations may be performed up to the time when the curd is ready to go to press. Patent cheese vats of various forms and degrees of merit have more or less extensively been introduced into different sections. Of those now manufactured and sold, I observed "Roe's Western Reserve Vat" in frequent use in northeastern Ohio, and not often elsewhere. In New York the more popular ones are the "Empire Dairyman" of O'Neil, and the "Oneida Vat" of William Ralph & Co., Utica, New York. Both are used to considerable extent, are ingeniously devised, convenient and eminently labor-saving. If called upon to express an opinion of their relative merits, or a preference for one over the other, I would remark that from as critical an examination as I could bestow, and from diligent inquiry and observation of their practical working and results, the preference would be given to Ralph's Oneida Vat, as most perfectly combining strength and durability of construction and simplicity of arrangement, with evenness of heating, perfect control of temperature, and economy of fuel. This vat was commended in high terms by all whom I consulted who had used it, or had known of its being used. It took the first premium at the New York State exhibition, and at others also. The necessary length of this paper is our excuse for omitting illustrations and a more extended description of this vat. Any one, however, desirous to learn its details can procure a descriptive circular by addressing William Ralph & Co., Utica, New York.

The Oneida vat was formerly used chiefly in private dairies, but latterly it has been introduced into factories in place of double vats of somewhat similar construction, but heated by steam, which was supposed to be a cheaper method. A manufacturer of both choice butter and cheese for the southern market from the same milk, and which will be treated of further on, says in a note recently received:

"At first we used steam to heat the milk, but gave that up and adopted Ralph's vats, which we find far superior to steam in safety, economy, and uniformity of the heat, and they are coming into general use in this region. I have already received and forwarded orders to Mr. Ralph for vats for six or seven new factories which have sprung up on our success."

Cheese-presses are almost numberless, and greatly varied in construction. In factories where some one is in constant attendance the common screw is much used; but in private dairies it is needful to have a press which will follow up its work without such attention. The best which has fallen under my observation is Oyston's "Herkimer county cheese-press," invented and sold by Charles Oyston, of Little Falls, New York, embracing the application of the toggle-jointed lever. In no other I have seen is the power so easily increased just when it is most needed. As the resistance to compression rapidly increases with the reduction in the size of the object pressed, it is important that the multiplication of the power should increase in about the same proportion, and this is admirably effected by the toggle joint.

PRACTICAL OPERATIONS.

We will now attempt to describe the method of manufacturing, in private dairies, whole milk into cheese, after the Cheddar, or, which is substantially the same, Herkimer county method, in the way which will produce an article bearing the highest price in the London market.

The evening milk, drawn about 5 o'clock p. m., is turned into the vat and stirred until its temperature is reduced to 65° Fahrenheit. Cooling is effected by the introduction of cold water into the outer vat, or by placing in it tin coolers filled with ice and water. The temperature should not be allowed to go much below 60°, as the product would be diminished by too great cold. Stirring the milk during the cooling process serves to prevent the rise of cream to the surface during the night. If kept at this temperature, viz., 65°, it will be in the best condition for use the next morning without the addition of sour whey. About twelve hours later the morning's milk is added. If any cream has risen, it is carefully incorporated with the mass of milk. If the milk has been kept below 62° during the night, sour whey of the day before is added in the proportion of three to six quarts to the hundred gallons, according to the sweetness of the milk. If kept at 64° or above, none is required, and its addition would do harm rather than good. A fire is then started in the heater by means of a few chips. With a well-constructed apparatus like the Oneida vat but little fuel is required, and the whole mass of milk is thus uniformly elevated in temperature until it reaches 88°. Rennet is then added and thoroughly mixed in. The vat being graduated on the inner side, the number of gallons is readily observed. The strength of the rennet having been ascertained by previous trials, just enough is incorporated into the milk to curdle it in forty to fifty minutes. Herkimer county dairymen prefer to have the curd properly formed in forty to forty-five minutes. Somersetshire dairymen, in England, prefer to have a whole hour occupied in the coagulation.

If set at too low a temperature, the flavor of the product is injuriously affected, the process of coagulation is slower, the curd is too soft, and the whey is separated with more difficulty, and apt to be turbid, involving a loss of both butter and casein, and reducing the product in both quantity and quality. If the milk be too warm, coagulation is too rapid and adhesive, and the product rendered tough and hard. With the rennet is also added a very small quantity of a preparation of annatto, made by dissolving the best quality which can be obtained in a weak solution of potash. The English liquid annatto, which is prepared by Nichols, and also by Clements, and sold in large cities, is much preferable to the crude article usually sold in shops, but is more costly, the retail price being five shillings sterling per quart bottle. The expense is not great, however, as four or five cents' worth is sufficient for a hundred pounds of cheese. Enough only should be added to produce a light straw or cream color. The rennet and coloring having been well incorporated, the vat is covered with a cloth, and left undisturbed until the curd is formed. If the process be properly conducted, therefore, the curd will be found in about three-quarters of an hour to be sufficiently firm to cut, not tough, but splitting apart readily when a portion is lifted on the finger. It is now to be cut, in order to allow the whey to subside and collect by itself clear and free from the butter and curd. The coagulum, when first formed, is an exceedingly tender and delicate substance, and the butter is held with the curd by a very frail tenure. It is the casein alone which is affected by the action of the rennet, the latter having no effect on the oily globules which are at this stage merely imbedded mechanically in the curd. If it be roughly or carelessly crushed, there is sure to be a loss of more or less of the oily or buttery portion, and of the curd also, escaping as "white whey." Many contrivances for cutting have been employed, among which are wooden knives; wire sieves, with coarse meshes; cutters made of thin strips of metal crossing each other at right angles, to be thrust downwards; shovel breakers; revolving breakers, &c. The best instrument I have seen is known as "Young's dairy knife," consisting of a gang of four or more very thin, smooth, two-edged steel blades about fifteen inches long, thus having ten or fifteen feet of cutting edge to each knife. By passing this knife through the curd, first lengthwise and then crosswise of the vat, it is very smoothly cut into perpendicular columns, without any tearing, crushing, or squeezing, and the whey escapes clearer and more free from both curd or oil than by any other mode. Some dairymen are confident that a saving of two or three pounds in the hundred are effected by its use over any former mode, and the saving being chiefly of butter, the richesss of the product is correspondingly increased. In Herkimer county it has nearly displaced all former contrivances. One with four blades only is commonly used in private dairies.

After standing for ten or fifteen minutes, the curd is to be again cut still smaller, both to facilitate the escape of the whey, and in order that the cooking now to commence may be uniform. As soon as the whey forms rapidly and the curd sinks, a gentle heat is to be applied, and the whole mass slowly warmed. If the vat is inconveniently full, a portion of the whey may be first dipped out. The thermometer must be frequently used to determine the temperature, which must not exceed 100° Fahrenheit in any case. A heat of 98° is amply sufficient, and better than a higher degree. While the mass of milk is being slowly elevated to this point, it is gently worked with the cutting knife, both to secure even cooking, and to cut the curd into fine particles. When these are of the size of wheat kernels, or of wheat and peas mixed, they are left to steep in the whey; a cloth is laid over the vat, and the hand or a dipper occasionally introduced to stir it enough to secure uniform cooking.

It is believed that one effect of this protracted steeping in the warm whey is to impart the sweet, nutty flavor so highly prized in the Cheddar cheese.

The time required for cooking the curd varies considerably by reason of many attendant circumstances, such as the degree of acidity of the milk, the temperature of the atmosphere, the quickness with which the curd came, &c. If the curd come quick, it will cook quick; if the degree of acidity be considerable, it will cook quicker than if neutral or alkaline. Something also seems to depend upon unobserved peculiarities of the soil of the district, or of the herbage from which the milk is produced. The time required is rarely less than an hour; it is not often beyond two hours, although occasionally protracted to three, or even four hours. Under ordinary circumstances, with a temperature not exceeding 98°, an hour and a half or two hours may be considered an average of what is necessary.

To determine when the cooking process has been carried to exactly the right point requires practical skill, which cannot be obtained from any mere directions. The instructions of a competent teacher and careful observation on the part of the learner are needful. Close attention and experience are also demanded; for the precise degree which is best on one farm or in one locality has been sometimes found too much upon another and too little upon a third. In one case the product may be too soft and wheyey, and in another hard and overdone, with precisely the same treatment which in a third case is attended with the most perfect results. This arises doubtless from variations in the material employed, and variations they are which are not cognizable upon inspection or even careful examination. Were milk always the same in all its constituents and properties, cheese making might be conducted with mathematical exactness; but such is not the case, and with all the aids of science there will always be ample room for the exercise of judgment and practical skill.

As the cooking progresses the curd becomes firmer in texture; it loses its glossy look; it holds the buttery portion in closer combination with itself, so that rough usage will disengage less of it than before; and its color deepens somewhat; the milky look it had is changed to a creamy one. To determine whether it is cooked sufficiently, some take out one of the larger particles of curd, cut it open, and note if the change of color extends through it, or if the interior has a milky look; some put a bit between the teeth to see if it will "squeak." In Herkimer the dairy maid usually judges by a certain granular feel, and by the general appearance and elasticity of the curd when a handful is taken and squeezed. If the particles fall apart readily when the hand opens, it is considered done; if they adhere together, the heat is continued. But in some other sections to continue the heat until the particles thus readily fall apart would be to overcook the curd and get too hard a cheese. When the curd has very nearly reached the desired condition, the strainer is inserted at the corner of the vat, the cork withdrawn, and the whey rapidly runs off, and may be conducted by a pipe beneath the floor to the whey tub in another building. The vat is then tipped up a little, the curd drawn to the higher end, and when sufficiently drained the salt is added and evenly worked through the whole mass. The proportion of salt used varies somewhat. In making Cheddar cheese in England it is usually one pound to fifty-six of curd. In Herkimer county it is usually from two and a half to two and three-quarters to every hundred pounds of curd. The more salt is used the slower will be the ripening, and the longer the cheese will keep. Care should be given to use only the purest and best salt to be obtained.

Another method of salting, introduced by Mr. De Angelis, of Holland Patent, New York, deserves mention. It is by dissolving the salt in the whey before being drawn off, or rather when only partially drawn off, so that the salt may penetrate the particles of curd without friction. This tends to secure a more even distribution of the salt, and also a richer product, by saving more or less butter and curd, which, being crushed and liberated by contact with the sharp-edged particles of salt in the ordinary method of mixing, escape with the latter portion of the whey as it passes off. It has the disadvantage of requiring more salt than is taken up by the curd, a considerable portion being left in the whey, and also of uncertainty in the amount taken up by the curd. If the latter objection can be successfully obviated in practice, its advantages would probably more than compensate for the additional salt required. The curd, when salted, is to be dipped into the hoop, in which a cloth is first laid, and put to press. Its temperature when it goes into the hoop may be from 60° to 65°. An error of some dairymen is to cool the curd by means of cold water or whey, which impoverishes the cheese by washing out some of its richness. A far better method is by stirring and exposure to the air, which, while it cools, imparts a fine color also. It is not as well known as it should be, that exposure to the air heightens the color of cooked curd, and by continued exposure before, during, and after salting, before putting to press, a light golden or rich cream color, which is really the most desirable shade, may be obtained without the addition of any foreign substance. When put to press it is well that the pressure be gentle at first, but in a few minutes it may be very considerably increased—say to half a ton or more if it be a large cheese; for curd properly cooked is not only already rid of much of the whey which by other methods of manufacture must be worked out, pressed out, or dried out, but the curd and butter are so thoroughly combined and compacted together that comparatively little danger exists of loss by reason of the escape of either with the whey. The separation of the whey in well-cooked curd is so complete that little remains for the press to accomplish beyond the removal of the moisture which adheres to the outside of the particles, and to compact them together into the form desired for the cheese. So complete is the separation that frequently not more than two quarts of whey can be obtained under the press from a cheese of a hundred and twenty pounds.

Thus treated, the curd retains all its natural richness, and the cheese has a sweet, nutty, new-milk flavor peculiar to this process. The cooking seems also to be equivalent to a portion of the curing process needful when made by other methods; for we find, when made from curd properly cooked, cheese will ripen with greater facility than by the modes formerly in use. After remaining in press two or three hours the cheese may be removed, the edges pared smoothly, and a bandage of the proper length and width, first sewed together at the ends, applied. The top and bottom of the bandage are most neatly drawn together, and kept in place by a string run in the edges which lap an inch or two over the sides. The cheese is then to be returned to the press, where it remains under heavy pressure until the curd of the next day is ready to take its place in the cheese hoop. It is then taken out and removed to the curing-room, where it is rubbed over with hot whey butter, usually colored with annatto, its weight and date marked on it, and for thirty days or more turned and rubbed daily, and oiled as often as necessary. The rubbing should be carefully and thoroughly done, so as to brush off and destroy any nits that may have been deposited by the cheese fly; for if neglected, especially in warm weather, skippers will work their way into the cheese and under the bandage and cause serious trouble.

If it be desired to practice this mode of separating the whey by cooking the curd without the use of a vat, it can be done after a fashion in the ordinary cheese tub, but involves greater labor and less certainty of a thoroughly well-made product. In such case, as the whey subsides, dip out a portion of it into a tin vessel to be set in another of hot water, and when warmed—say to between 130° and 140°—let one pour it slowly into the tub containing the rest of the whey and curd, while another stirs it briskly but gently, so that no part gets overheated; the effect of which is to separate some of the butter which then escapes, and to overcook the outside of the particles of curd. Too much heat will cause curd to run in the whey like toasted cheese, and a coating of this tough substance acts like a water-proof wrapper, and effectually shuts up whatever whey remains outside the particles. This would result in an imperfect product, of course, liable to leak and puff, and to be porous and rank flavored. In using a tub it is necessary to heat successive portions of whey, all of which must be added with the same caution. Except for the differences necessitated by the employment of inconvenient vessels, the process is to be the same as when a properly constructed vat is used.

MANUFACTURE OF CHEESE BY ASSOCIATED DAIRIES.

Reduction of labor and increase of product have been greatly assisted by the introduction into families of improved apparatus in place of the old-fashioned cheese tub and other utensils. But the great and radical change which has still more recently passed upon cheese manufacture has been by the adoption of the principles of association. The advantages of association in the conduct of various branches of art and manufactures are well understood and appreciated; but the farmer has hitherto considered himself excluded from participation in them by reason of his occupation. To a considerable extent he is undoubtedly excluded; but his case admits of some exceptions, and here is a notable one, not only in theory, but abundantly proved so by facts. In the manufacture of cheese a considerable time must necessarily elapse after the rennet is added before the curd goes to press. One of the most prolific sources of inferiority when made in families is the temptation or supposed necessity to hurry the process. This may require only three or four hours, and perhaps it may need seven or eight. Whatever the length of time required, the process cannot be hastened without serious injury. During this time there is little or nothing to do but to note the progress which is making; and with proper facilities it is scarcely more work to make up the milk of fifty cows than the milk of five or ten, and so it is comparatively little more to make up that of five hundred than fifty.

About ten years ago Mr. Jesse Williams, living near Rome, Oneida county, New York, conceived the idea of turning the above fact to practical advantage by making up the milk of his neighbors into cheese, together with his own Although this idea of associated action was doubtless original with Mr. Williams it had been previously adopted to a considerable extent in Switzerland, especially in those cantons where the famous Gruyere cheese is made. Miss Johnson, in her work on "The Cottages of the Alps," tells us that in 1859 there were several hundred cheese societies in the canton of Vaud alone.

With Mr. Williams the plan worked well, and before long he increased his facilities so as to make up the milk of four hundred cows or more. Farmers are usually cautious, and slow in changing long-established customs and practices; but the advantages of this new notion were so evident and indisputable that gradually similar establishments were set up, and when I was there a year ago it was said there were over ten of these cheese factories within a circle of about ten miles. During a visit the present year (1863) the number was found to be largely increased, and so recently had many of them been established that it was not easy to ascertain with certainty how many were in actual operation. From various sources, however, a list was obtained of more than thirty of these cheese factories in Oneida county alone, besides five in the adjoining county of Herkimer, and of several in other sections; and they would average nearly five hundred cows to each.

Some twelve or fifteen years ago the experiment was tried on the Western Reserve, Ohio, of buying up curds made in family dairies, to be scalded, salted, pressed, and cured at several establishments started for that purpose, but after some years of trial they all failed.

The advantages which it is generally conceded attach to the mode of association now in successful operation, over that by private families, are superior quality and uniformity of product, by reason of which a higher price is commanded; also a saving by buying at wholesale such materials as salt, bandages, boxes, annatto, &c.; and more than all, in relieving the farmer and his family of the labor and care of manufacture and of ripening. The higher price obtained has in all cases been found, so far as my own observation extends, to be equal to the cost of manufacture, and in not a few instances has resulted in a positiv gain of as much more. This is no more than should reasonably be expected. When a high degree of skill and undivided attention are bestowed on any branch of industry, we look with confidence for beneficial results, and the prospect is in no way damaged if ways and means are found whereby five are enabled to accomplish as much as thirty or fifty used to do by former methods.

These establishments, in all cases where I have known them, partake to a greater or less degree of a mutual character. Sometimes they are erected and owned by an association of a dozen or more, who intend to bring their milk to it to be manufactured, and who appoint a superintendent and an executive committee to have charge of its entire management. In such cases it is customary to deduct from the proceeds the salary of the superintendent, wages of operators, and all other expenses, together with a certain per-centage, usually fifteen or twenty, supposed to be sufficient to compensate for interest on capital employed, and for depreciation of buildings and machinery, and then to divide the remainder in proportion to the amount of milk contributed by each.

The buildings are erected and the apparatus furnished by one or two, who first make an agreement with the neighboring farmers to supply the milk of a certain number of cows for a certain number of years, and in return receive each their proportionate amount of the proceeds of the sale of the cheese, first deducting a fixed sum, usually one cent per pound, for manufacturing, and also their proportionate share of the cost of salt, bandages, boxes, and other smal items of incidental expense. When operated in this method, it is supposed that the milk of not less than four to five hundred cows is needful to make it a paying business on the usual terms, and that profit rapidly increases in proportion as the number of cows is greater.

In selecting a location for a cheese factory two requisites are sought: First, that it be central and easy of access; and next, that it be furnished with an unfailing supply of pure cold spring water. It should be abundant, also, and its temperature should not be above 50° Fahrenheit, unless the supply is very plentiful, in which case a temperature a trifle warmer may serve a tolerable purpose. At one factory which I visited on the Western Reserve, in Ohio, the spring had failed; consequently, not having cold water to reduce the temperature of the evening's milk, it was made up both night and morning, thus involving night work, double labor, and even more, for it required longer cooking; and not being acquainted with the use of sour whey in milk too sweet, the result was an inferior product.

The necessary buildings comprise a room for manufacturing, containing the vats, sink, and a press-room adjoining, and a curing-house which is at a short distance from the others, both to be safer from fire and to avoid dampness. The dimensions, where the milk of six hundred cows is used, are usually about twenty-six feet square for the manufacturing-room, and a story and a half high; press-room thirteen by forty feet, and the curing-house twenty-six by one hundred feet, and two stories high; all this cheaply built. The cost, with apparatus and fixtures, is usually about $2,500 or $3,000. The milk is brought to the factories by the contributors in tin cans of circular form holding from thirty to eighty gallons; the covers have a rim or flange six or seven inches wide, closely fitting the inside of the can, with an aperture in the top to allow the escape of air as the cover is pushed down to near the surface of the milk, when it is closed with a cork. This effectually confines the milk, and prevents agitation and splashing in the carrying. The cans have a faucet at the bottom, through which, when arrived at the factory, the milk passes into the weighing can set upon a platform balance, from which, when weighed and credited to the producer, it runs through a tube into the vats below.

In most cheese factories steam is used for warming the milk and cooking the curd. In some there is merely a steam boiler set in brick work and provided with pipes, while in others there is an engine also, usually from four to eight horse power. The milk as received is conducted into vats of from four hundred to six hundred gallons capacity each. These vats are made double, and usually of cheaper construction in proportion to their size than those used in private dairies. The inner one is of tin, and the outer one of wood, with a space between of about two inches. This space is for the reception of water, and is provided with pipes conducting from the boiler, and so arranged that when steam is let on it may be distributed through the water as evenly as possible.

It is generally supposed to be cheaper thus to use steam than to employ such an apparatus as is most suitable for family use, and very possibly it may be cheaper at the outset, but if Ralph's Oneida vat and heater are employed, the daily expense of fuel would be much less, all risk of explosions or other accidents from steam wholly avoided, as well as the loud and very disagreeable noise caused by the steam as it is driven into the water of the outer vats.

The factory of Mr. Allen, near Rome, New York, is supplied with Ralph's vats. There were three of them which I saw in operation when there the past summer. Their capacities were severally six hundred gallons, five hundred and forty gallons, and four hundred gallons, which served to make up the milk of four hundred and ninety-six cows. Only one of these vats had the hot-water tank attachment, which was found to suffice for all three. My observation of the working of these vats led me to coincide with the opinion expressed by Mr. Allen of their superiority over the vats heated by steam.

The presses commonly in use are of the simplest character, being merely stout iron screws with the necessary wood work. These are found to answer a better purpose here, some one being always at hand to attend to them, than in families, where a press is wanted which will follow up the work without close attention. The sink where the curd is drained and settled is placed convenient to the vats, and is movable, being on rollers and placed on a track leading to the press-room. Tables and racks of convenient height for handling the cheese are arranged in the curing-house. On these the cheese is placed as it comes from the press, and here it remains during the process of curing. Each cheese, when placed on the table, receives a record of its weight and date neatly marked on its bandage. The wood best adapted for the table is hemlock. It should be well seasoned and made smooth and level. Pine is sometimes used, but being more or less resinous is liable to impart some of its flavor to the cheese; the cheese also adheres to it more closely than to hemlock. Wood like basswood is objectionable and should not be used, for the cheese adheres to it so closely as not to be readily loosened, marring the rind, and often taking out considerable portions of the cheese itself.

The cheese-rack is a recent invention and a great improvement upon the table. It consists of four by five inch scantling with the corners bevelled or cut so as to be five-sided. These are framed the proper distance apart at the ends and set on legs of the desired height, forming a skeleton table. Round covers of inch hemlock or pine, bound with stout elm rims three or four inches wide, set upon the racks and hold the cheese. When a cheese is to be turned, a spare cover is placed on top and the cheese and cover turned over. The cover now on top is removed, rubbed with a cloth, and is ready to be applied to the next cheese. The rims of the covers protect the edges of the cheese in the process of turning, and a part of the cheese swinging down in the open space between the timbers, and the rims resting on the bevelled edges or sides, renders the operation easy and insures safety to the cheese. A large cheese can be turned with as much ease on a properly constructed rack as the loosening of a smaller one on a table preparatory to its being turned. Large cheeses are difficult to handle on a table, and are liable to have their edges broken or otherwise marred in turning.

The windows of the curing-house are provided with curtains or shades to prevent too much heat and the direct shining in of the sun. Sufficient ventilation is also provided for. In all the establishments recently erected there are labor-saving arrangements too numerous to be here mentioned in detail, which add materially to the ease, economy, and expedition with which the various processes are conducted.

The process of manufacture at these establishments is substantially the same as that described as practiced in the best private dairies. Several deviations and modifications are, however, introduced, most of which are necessitated by a difference in the condition of the material employed, or by the larger quantity operated upon, or grow out of the fact that time enough can be given without neglecting other duties. In the first place, greater labor has to be bestowed upon the cooling of the evening's milk than would be had it been carried only a few rods into the house, in order to reduce its temperature sufficiently to insure the absence of too great acidity in the morning. For the same reason there is rarely, perhaps never in summer, any need of increasing its acidity by the use of sour whey. For several reasons, one of which is that five or six hundred gallons of milk in a mass will not lose its heat so quickly as a small amount, it is set (that is, the rennet is added) at a lower temperature in these dairies, say 82° instead of 88°, as in family manufacture. Late in the summer and autumn, when the milk has diminished in bulk more than in proportion to the solid constituents contained in it, cold water is sometimes added to the evening's milk, which serves the double purpose of cooling it and reducing its density to that of milk during the juicy flush of feed earlier in the season and nearer the calving of the cows. Next, the amount of rennet added is a trifle less, so that sufficient coagulation is rarely effected in less than an hour; and inasmuch as during this time there is a tendency of the cream to rise, the practice has been adopted in some factories to stir the milk, or rather to keep the surface of it gently in motion until the action of the rennet is perceptible.

The moment the least thickening is perceived, however, the vat is covered and left perfectly at rest until thick enough to cut. In the cutting it is customary to use knives with more than four blades. I have seen some with as many as thirteen blades used for the first cutting, and for subsequent use it is common to have one with six blades. As already remarked, the making of cheese at the factories is proceeded with more leisurely than is usual in families. It is their work for all day, and no inducements exist to hurry through the processes.

The heat used in cooking the curd is raised very gradually, say at first only to 86°, and half or three-quarters of an hour later to 90°, and afterwards to 94°, and is never allowed to go beyond 98°. The cooking process usually occupies not less than two hours, and much oftener three or four hours. When too much acidity is present, and the manufacturer has only to choose between a hurriedly cooked curd and a sour one, he chooses the least evil of the two, and hastens the process. Throughout the cooking the curd is handled with extreme care, thus saving the loss of the butter from it which would be liberated with rougher usage. The lack of hurry and its attendant evils must be considered one of the advantages of factory work over private dairying, since in the latter there is always a very natural and almost an irrepressible desire not to expend more time on the process than can be afforded or conveniently spared from the pressing calls of other household labors.

SIZE AND FORM.

In a commercial point of view it is a matter of some consequence not only to produce a good article, but to confer upon it a satisfactory external appearance, and so the size and form of cheeses are of importance in connexion with the demand of the market where they are to be disposed of. The recognized style of Cheddar cheese in the London market is about twelve and a half inches thick by fifteen and a half wide. If made smaller, the same proportions are observed. The rule adopted in Herkimer county, namely, to have the depth equal to half the breadth is probably as good and convenient as any. A thick cheese is more easily turned than a thin one; it presents less surface to be oiled and rubbed, or to lie in contact with the shelf, and when shipped to market is more easily handled. The most popular size for factory cheese for exportation during the past year has been from one hundred and ten to one hundred and forty pounds. Most factories decide on the weight and form, and have all conform to it as nearly as possible. The range is mostly from nine by twenty to ten by twenty-two inches. At some a few show cheeses are occasionally made, weighing from eight hundred to one thousand pounds, or even more. Cheeses made for shipping south should be much smaller. Those weighing from thirty to forty pounds usually give best satisfaction.

FOR SOUTHERN MARKETS AND LONG VOYAGES.

In order to produce an article which will keep in tropical climates, the requisites are, in brief, a smaller proportion of butter and a firmer texture. The article known in New York market as English dairy or Goshen cheese, which is largely manufactured in private dairies in Litchfield county, Connecticut, is of this character, and has been principally sold to go to the southern States, to the West Indies, and to California, and commands a good price. The method of its manufacture, as I witnessed it at the farm of Messrs. S. W. & T. S. Gold, on Cream Hill, West Cornwall, was as follows: The evening's milk of about forty cows is strained into a vat two and a half feet wide, five feet long, and holding three barrels, and cooled by pouring cold water into a cast-iron water vat enclosing the inner one, which is of tin. In the morning the cream is taken off and the milk heated to about 90°. The morning's milk is added, and annatto sufficient to give it an orange tint, (one pound, of good quality, suffices for a ton of cheese,) and rennet to curdle it in half an hour, are then put in and well stirred. The first cutting of the curd was done by pushing downwards through the mass a square tin frame, dividing into columns of about an inch. The warm water in the outer vat was then drawn off and cold water put in its place. The curd was next further broken by hand, and as it settled a portion of the whey was dipped out and heated to scald the curd of the preceding day. The curd and whey then remaining were dipped into a cloth strainer laid into a wooden frame and sink, from which the whey is carried by a pipe to the whey tub in another building. When tolerably firm, the curd was cut in slices with a knife, the cloth drawn closely about it, and a heavy stone placed upon it. Here it remains for several hours, when it is put away in a large wooden bowl until next day. While the curd of to-day was making, that of yesterday was first cut in slices and then run through the curd mill in order to divide it finely. This mill consists of a framework holding two cylinders one above the other, both of which, as well as the sides near them, are studded with numerous small, sharp, steel blades, those in the lower cylinder being much closer than in the upper one. The curd thus finely cut was then put into a large tin tub, and the whey, dipped off for the purpose, having been heated as hot as the hand can bear, was poured over it, and the whole thoroughly stirred with the hands. In about ten minutes the warm whey is removed and cold water poured upon it. As soon as cool, the water is poured off and the curd salted; thirty-two pounds are then put into a hoop eleven and a half inches in diameter, and moderately pressed for two or three hours. It is then turned, the cloth changed, and again pressed till evening. The cloth is then removed, the edges of the cheese pared, and a cloth and bandage cap of thin unbleached cotton, made for the purpose, covering the whole cheese, put on, when it is returned to receive a heavy pressure for thirty-six hours longer. This makes a cheese seven to eight inches thick and about twelve inches broad Curing requires two or three months, and they are generally sold in the autumn. It would doubtless be improved, and the labor of manufacture greatly lessened, by the substitution of the improved vat, and by cooking the curd in the whey, as in the Herkimer method, in place of the labors of the second day, as above described, carrying the process, however, a trifle further than would be needful to make an article to suit the London market.

The manufacture of an article less rich than the Litchfield cheese was commenced during the present year in Orange county, New York, by the factory system, making, at the same time, a considerable quantity of cheese butter. For this purpose the location and buildings are similar to others, except, in addition, there is required a cool cellar and a larger supply of ice. The milk comes from within a moderate distance, not exceeding two and a half miles, and on arrival is poured into tin coolers twenty inches deep and seven wide, which are set in a tank of cold water. The morning's and evening's milk of one day, except in the hottest weather, stand thus until the next morning, when the cream is taken off and churned and the skimmed milk made into cheese. Whenever practicable, the cream is churned sweet and the buttermilk added to the skimmed milk, which increases the quantity and improves the quality of the product. Ralph's vats are used, and the process of manufacture is in many respects similar to the Herkimer method. The chief differences are, that the skimmed milk is first warmed to about 90°, the buttermilk is then added, which somewhat reduces the temperature, and next the coloring and rennet. In cooking, the heat is raised to 98°, but the length of time required is shorter than with whole milk; longer, however, when buttermilk is used than when it is not. Usually the curd steeps in the whey only about thirty minutes, as otherwise the product would be too tough and hard. The amount of salt used is one-fourth less than for whole milk cheese, and the curd is salted in the vat instead of being removed to a sink for the purpose. The form and size given to these cheeses are quite in contrast to those made for the English market, being pressed in a sixteen-inch hoop, four and a half inches deep, and weighing only thirty to thirty-two pounds—this size being found preferable to larger ones for shipment to southern ports.

The success attending this style of manufacture has been so encouraging that already six or seven other factories are projected or under way on the same plan. Some of the results of the past season, from April 1 to November 1, seven months, show an average product of butter per cow 95 pounds, and of cheese 195 pounds; and it is proper to state that about a fourth of the cows had been used for three or four years past for the production of winter butter for the New York market, and so the yield was considerably smaller than it would otherwise have been. The butter is sent semi-weekly to New York in returnable pails or tubs, and the cheese sent weekly when thirty to forty days old. The average net return for the season, after deducting all expenses of transportation and commissions, was twenty-four cents and six mills per pound for the butter, and eleven cents and two mills for the cheese. Some single days operations were as follows:

"*April* 27.—1,746 wine quarts of milk; the cream churned sweet gave 115 pounds of butter and 239 pounds of cheese.

"*May* 26.—3,300 quarts of milk; cream churned sweet gave 210 pounds of butter and 550 pounds of cheese.

"*October* 19.—1,700 quarts of milk; cream churned sour gave 120 pounds of butter and 280 pounds of cheese. This butter brought 24 cents per pound and the cheese 13 cents per pound in New York.

"*October* 20.—1,776 quarts of milk; cream churned sweet gave 115 pounds of butter and 336 pounds of cheese."

BREEDS FOR THE DAIRY.

The selection of cows for the dairy is a matter of the first importance. A good cow is a better investment at $100 than a poor one at $10. Few persons make the difference in price, either when they buy or sell, which actually exists in value. The difference in value between good cows and poor ones was forcibly stated by Mr. Arnold, a dairy farmer of Herkimer county, before the Farmers' Club at Little Falls, as follows:

"The difference in the product of cows in different dairies, and often of those in the same dairy, is notoriously very great, even where the food is abundant and alike good. If examined carefully, it will be found to be the chief cause of difference in the profits of dairying. To illustrate, let us suppose a case. It often happens that one cow will produce three times as much cheese as another. The cows being of equal weight, and fed with the same kind of food, one may produce two hundred pounds, and the other six hundred pounds. Instances of this difference are not uncommon. It is evident that the one giving the greater quantity will require a greater amount of food; but the food and milk will not be in the same ratio. To make this plain, suppose it costs $15 to supply each cow with food sufficient to support the body and maintain animal heat for a year, and for each hundred pounds of cheese it costs $2 50 worth of food in addition. The first cow will require five dollars' worth of food extra to produce two hundred pounds of cheese, and the second fifteen dollars' worth to produce six hundred pounds. Let us compare these items:

"Cost of keeping first cow, $20; product, 200 pounds; cost per pound, 10 cents.

"Cost of keeping second cow, $30; product, 600 pounds; cost per pound, 5 cents.

"But the food which will support three cows like the first will only support two like the second, and consequently where thirty like the first could be kept, only twenty like the latter one could be maintained. Let us now set these two dairies and their products side by side and see how they compare, remembering that the cost of maintaining each is the same:

"First dairy, 30 cows; product, 6,000 pounds.

"Second dairy, 20 cows; product, 12,000 pounds.

"In the first only a quarter of the food is converted into milk; in the second one-half. Suppose cheese to sell for eight cents per pound, the larger dairy will work a constant loss to the owner, while the other will yield a handsome profit. Whether the exact cost of keeping or of the extra amount of food to produce a hundred pounds of cheese is accurately represented here or not, the principle is not invalidated. It remains perpetually the same in every imaginable case."

Another dairyman gives the following statistics of the facts regarding the five best and five poorest cows in his dairy in 1857:

Five best credit by an average of 554 gallons of milk each, which realized, in butter and cheese sold, 11½ cents per gallon		$63 71
Dr. to 2½ tons of hay, at $8 per ton	$20 00	
Thirty weeks' pasturing	7 50	
Two hundred weight of ground feed in spring	3 00	
Ten per cent. interest on each cow, say $45	4 50	
		35 00
Net profit of each cow		28 71
Five poorest cows credit by an average of 243 gallons of milk, which realized, as above, 11½ cents per gallon		$27 95
Dr. to cost of keeping as above		35 00
Loss on each cow		7 05

Five cows paid him a profit of $143 55, and five others involved a loss of $35 25 during the season. His dairy of forty-three cows averaged 450 pounds of cheese each.

The object of the butter dairy is best subserved by cows which give rich milk. The difference in this regard is very great. Some which give only a moderate quantity will produce more butter than some others giving twice as much. The object of the cheese dairy is best attained by cows yielding plentifully of milk of fair quality. The proportion of butter varies in milk all the way from two to eight per cent. The proportion of casein in milk is more uniform, being usually from three to four per cent. Consequently, as a general rule, the more milk a cow gives, the greater the product of cheese; and if it contain three per cent. of butter, cheese of very good quality can be made from it, provided no loss is incurred in the manufacture. Yet it must be remembered that every one per cent. additional of butter which the milk contains adds ten per cent., more or less, to the amount of cheese which may be produced from it, and is a much greater gain on the richness of the product.

To illustrate this, let us suppose milk to contain three per cent. of butter, and four per cent. of casein. This would be seven pounds of solid matter to one hundred pounds of milk. This, with the water, &c., held with it, would make about ten or eleven pounds of cheese, and an addition of one per cent. to the solid matter contained in the milk would add a tenth, or from a tenth up to a seventh more, to the amount of cheese.

Good milkers are not confined to any one breed; yet some breeds furnish a much greater proportion of good milking cows than others. The excellencies and defects of our common or miscalled "native" stock are too well known to require much remark. This stock includes some excellent milking cows, as good as can be had of any other sort; and it includes a great many more which never pay for their keeping, and which eat the food and receive the attention that would have brought a handsome profit if bestowed on better ones. The only serious trouble with the good ones is, that they are not sure to transmit their better qualities, but are ever and anon "breeding back," and their calves often exhibit the traits of inferior ancestors. If such bulls be used as sires we can anticipate nothing in regard to their progeny but uncertainty and disappointment. Now, in such a case, what should be done? I answer without hesitation, let every such bull be utterly discarded at once; let every unprofitable cow go to the butcher or drover as soon as may be, and let the good ones be bred to a male of some fixed breed, possessing so firmly the desired properties, form, and characteristics that he is sure to transmit them to his progeny. A very simple rule this, and easy to put in practice. Its universal adoption would, before many years, result in a gain to be counted by millions of dollars.

The Jersey race of cows excels all others in richness of milk, and although the yield is not usually abundant, they deserve very favorable consideration for the butter dairy. A few Jersey cows in a herd, or a strain of this blood infused through it, leave their mark very distinctly in the richer color and more delicate flavor of the butter produced. Wherever known, Jersey butter commands the highest price in market. I have not known of any instances where these cows have been proved in the cheese dairy, and should not feel warranted in recommending them for that purpose.

For richness of milk the Devons probably rank next to the Jerseys, and, like them, do not yield abundantly; the efforts of most Devon breeders having been diverted away from milk, and towards the production of beef. Of late, efforts have been made by some to breed towards milk, and there exist families of this race possessing highly respectable milking qualities. When a bull of such a family is crossed with deep-milking cows of the common, mixed sort, the progeny usually manifest a good degree of adaptation for the dairy, in connexion with the activity, hardiness, and other good qualities for which the Devons are noted.

In years past the improved short-horns, often called Durhams, were generally possessed of excellent milking qualities, and some families in a remarkable degree. These, like the Devons, have, by most breeders, been directed towards the production of meat, and often at the expense of milk; but they have not all suffered alike in this respect, and some families continue to be highly esteemed for dairy qualities. In this respect, however, success chiefly follows their being crossed upon deep milkers of the common sort. The progeny in this case possess greater size and weight than grade Devons, or than grades of almost any other breed; they need better pasture and winter food, and when these are allowed them the returns are generally satisfactory.

The Herefords are an excellent breed for work and for beef. There may be good milkers among those of pure blood, but if so it has never fallen to my lot to see any of them. Some of the grades, when from good milking dams, produce pretty well, but as a general, and, so far as I am advised, a universal rule, milking properties deteriorate in proportion as this blood prevails.

The Kerry breed has been too recently introduced into this country for us to speak with confidence of its merits; but, judging from what is known of it in Ireland, it may probably prove valuable in sections where larger ones will not thrive. They are quite small, very hardy, easily kept, and for their size yield largely of very rich milk. In 1858 Mr. Sanford Howard visited Ireland, and purchased in Kerry county five heifers and a bull for A. W. Austin, esq., of West Roxbury, Massachusetts. These I saw at his residence, with their progeny, and was greatly interested in examining them. They had increased very much in size upon the better food given them, being nearly as large as common cows; very symmetrical and handsome, and were represented as giving a large yield of very rich milk. Mr. Austin indulges the hope that they will prove a most valuable accession to the stock of the country, particularly for severe climates, and scant, hilly pastures. In some points they excel any cattle I had previously seen.

The Ayrshires originated in Scotland, in a section of moderate natural fertility, and similar in some other regards to considerable portions of New England, northern New York, and northeastern Ohio, where dairying is extensively carried on. They have been brought to be what they are mainly by means of continued selection for many years past, especially with reference to dairy qualities. Easily and cheaply kept, and very hardy, they yield abundantly milk of good quality; more in proportion to the food consumed than any other. The Ayrshire breed presents us to-day with a cow in most essential respects similar to what might be reasonably expected as the result of fifty years' judicious, systematic, persevering attempts to improve our so-called "native" cows, by a continuous selection of the best-formed and deepest milkers among them to breed from, in order that dairy properties might become fixed so surely as to be transmitted with regularity and certainty. From what observation and experience I have had, the opinion is substantiated that in most cheese-dairy sections the Ayrshire would prove more desirable than any other; but it would not pay to introduce pure bred cows simply for their milk, nor is it necessary. Successful crosses and high grades are often fully equal to pure bloods for all purposes except for breeding. The males of crosses should never be kept for bulls, unless merely in place of worse stock; for, though not to be depended upon to transmit their virtues, they do so sometimes, and so are preferable to scrubs. There is, however, no real economy in employing anything short of pure bred males for propagation.

For a milk or cheese dairy I would prefer Ayrshires to any other; but for a butter dairy I would be loth to dispense wholly with the Jerseys.

MANAGEMENT OF COWS.

Without attempting to describe the details of feeding and treating dairy stock, I will notice briefly some of the points to be kept in view. No matter how good cows are, stingy feeding and shiftless management will soon run down the stock and dissipate all hopes of profit. "What is worth doing, is worth doing well"; and what is worth having, is worth taking care of. There is no worse economy than neglect of and indifference to the comfort and health of animals from which we expect profitable produce. Care and attention may secure all we desire, while neglect will surely nullify all advantages the best facilities can give. Let us suppose the dairyman provided with a stock of good cows; the next point is to bestow proper treatment, and to feed them well. No dairyman can afford to do otherwise. Look at it. A cow is wanted to give milk, and good milk. She cannot make it out of nothing. The more milk we want, the more material must be supplied to make it of. The reasoning adopted by Mr. Arnold, before quoted, with a slight modification, will meet this case. Be your cows ever so good, they must be supported; their own system must be maintained, waste must be repaired, respiration sustained, and, in a word, the machine kept in working order; and it is only what the cow can be induced to eat and to digest, over and above what is required for the maintenance of the animal, which goes to make milk.

Milk is a secretion—that is, it is secreted or separated by the action of a gland, and mainly or wholly from the blood which passes to it. We know very little of the nature of secretion or of the forces at play in it; but we know the fact that certain glands have the power of appropriating parts of the organism or of the food, in order to produce certain fluids. As these secretions come from the blood, this fluid must be supplied with the necessary materials; for the mammary gland of a cow can no more make or separate something from nothing than any other apparatus or machine can do it. Milk is variable in composition, depending partly on the peculiarities of the cow, or of her glandular system, but largely also on the quantity and quality of food supplied. If the food contain much fatty and starchy matter, the milk will be richer and better than if these qualities be lacking or scanty. If the food be rich in vegetable albumen, or other nitrogenous substances, the milk will be richer in casein. This last rule, however, holds only up to a certain point—say about five per cent.—beyond which albuminous as well as oily foods only increase the proportion of butter in the milk.

Milk is liable to other changes than those produced by food or by any outside agencies subsequently to being drawn. In women we find that anything which tends to irritate or annoy her, or to produce an exhibition of anger, produces at the same time serious changes in or partial destruction of her milk

We can observe this with more distinctness in her case; but similar causes produce like results in the lower animals, and consequently every means should be used to insure tranquillity in our milch cows. Everybody knows that when a cow is driven rapidly on her way home to be milked, the milk is lessened in quantity, becomes hot, and is more liable to sour. That portion of food which supports respiration and animal heat is precisely the same which, if not so used up, goes to form butter; and every cause which increases the rapidity of breathing diminishes the amount of butter the cow might otherwise yield. Cows should be driven as leisurely as they will walk, never harassed, annoyed, or irritated by man, boy, or dog. Harsh treatment of any and every sort has a very injurious effect on the milk, by reason of both mental and physical causes.

The operation of milking should be governed by the same general rule; use only kindness, and let the animal understand that she is approached with none but friendly intentions. In ninety, and perhaps ninety-nine cases out of a hundred, kicking and all other vicious tricks originate in disregard of this rule. Milking should be done at regular intervals; as soon as the proper time comes, if the cow is not milked she becomes restless. Let the udder be cleaned thoroughly, and, beginning slowly, let the process soon be as rapid as is consistent with gentleness, and make it complete. The "strippings" are from five to fifteen times as rich in butter as the milk earlier drawn. We cannot afford to lose this; and, what is of more consequence, leaving some in the udder tends to decrease the secretion. Poor milkers dry up cows.

To provide against the effect of the almost certain deterioration of pasture during the dry weather of July and August, there should be a good supply of succulent food in reserve, to be cut as required. Clover and oats furnish excellent green food; but the cheapest, and, on the whole, the best is green corn fodder. Southern or sweet corn sown closely in drills or broadcast on land in good condition makes good food; allow an acre to every eight or ten cows. If not all required during summer and autumn, it furnishes an excellent winter fodder. Productive cows, if not fully supplied in the hot season, are liable to run down; and it will be found both easier and cheaper to maintain condition than to restore it after being lost. Besides, if allowed to shrink much in their flow of milk at this season, generous feeding subsequently, especially if the cow is with calf, will tend rather to lay on flesh than to restore the secretion of milk.

It will be found good economy to lay in a large store of roots for winter feeding. For this purpose the carrot and mangold offer many advantages. The first is the more nutritious, and on soils adapted to it, and with clean and rich culture, is easily grown. It is good from autumn to spring. The mangold succeeds better on clayey land and within reach of sea breezes; or if in the interior, the land should have a dressing of salt some weeks before sowing the seed. These roots keep late, and are best during winter and spring. If used earlier they are liable to produce scouring. With good management and in a fair season, the equivalent of from six to ten tons of hay can be grown on an acre. Turnips give more or less flavor to milk, but to cows not in milk they may be fed with profit. If much rough or coarse fodder is to be used, roots are indispensable; and they are of great assistance even with good hay. In quantities not exceeding a peck per day per head, they are of considerably greater value than the mere amount of nutriment they contain, inasmuch as they assist the digestive process, and enable the animals to obtain more nourishment from the other fodder consumed than they otherwise would. When fed out more freely we must expect benefit only in proportion to their nutritious matter, but this alone is sufficient to warrant extensive cultivation; and when their great efficacy in preserving the health and condition of animals is considered, the neglect to supply them seems almost inexcusable. If condition be lost during winter, little or no profit will be realized in the best part of the succeeding season.

In early spring, as the cows come in milk, they should have liberal feeding—plenty of good, early cut, well-cured hay, with carrots or mangolds, and perhaps a feed of shorts or other grain or meal once a day. Oats and peas ground together or barley and buckwheat meal will give a better flow of milk and conduce more to the health of a cow giving milk than Indian corn, which seems to be of too heating a nature. One fact regarding pasture should not be omitted—which is, that dairy cows make heavier draughts upon them for phosphates in the soil than any other farm stock. The amount taken up by one cow, supposing her to bear a calf and to yield seven hundred gallons of milk per summer, has been stated by Professor Way to be as much as can be replaced by forty or fifty pounds of bone dust; and it may well be believed that a demand such as this would be seriously felt in the course of years.

In Cheshire, England, it is customary to use bone dust on pastures to supply the drain made by the dairy cows, and in some cases it has been found necessary here also. I am not aware that suffering from "bone disease" is common in this country, but it has been a pretty serious evil in some sections. It is due to the absence of a sufficiency of the bone-forming material in the food; and when the food does not furnish a supply the bones of the animal suffer; earthy matter is absorbed from them, they become soft and yielding, and the poor creature is with great difficulty able to sustain its own weight. Instinctively such animals crave bones, and if one be found it is gnawed and chewed as a sweet morsel preferable to any other food. A temporary remedy is found in feeding out bone meal, but a far better one, and a permanent, is a sufficient dressing of crushed bones to the land. Of all manurial applications to pasture, none equal crushed bones, either for efficiency or permanency. They can be coarsely crushed by pounding, or they can first be softened by the action of wet ashes or hot manure, and be more easily crushed afterwards. Ashes are next to bones in value, as they contain potash and the phosphates also.

VALUE OF WHEY.

In the manufacture of cheese from milk there is a large remainder of whey, concerning the value of which some difference of opinion exists among practical dairy men. In private dairies there is little difficulty in feeding it out to the farm stock in a way to realize a fair value for its nutritious constituents. Sweet whey is good for young calves. Mr. Willard says:

"When a pint or more of buckwheat flour is added to sixteen or eighteen quarts of sweet whey it forms a nutritious food, on which calves will thrive almost as well as on milk; at least after one week's feeding on milk they can be reared on whey, as above, without detriment."

In Herkimer county the practice of feeding whey to cows instead of to swine seems to be gaining ground. On this point Mr. Willard says:

"Whey is also fed to cows giving milk, and with such good results that many prefer to dispose of it in this way, believing it to be the most profitable method. Cows soon become fond of it, and the increased quantity of milk pays better than feeding it to swine."

When fed to swine, the whey should always be given in connexion with other food, as alone it is insufficient to give profitable results, and incapable of producing wholesome meat. It is generally supposed to be more safely fed when partially soured. Its principal solid constituent is milk sugar. This is very valuable as food, but is unfit for an exclusive diet, as it does not contain all the elements indispensable to a healthy growth.

Swine, in a state of domestication, and as usually kept in confined and filthy quarters, are very liable to many forms of disease. It is difficult enough to grow wholesome pork with good and sufficient food, but when hogs are kept for months together on whey alone, as is sometimes done in cheese districts, the meat may be depended upon as particularly unwholesome, and is especially to be avoided. Fed, however, in connexion with bran or shorts, Indian meal or buckwheat meal, whey serves an excellent purpose for swine, and adds considerably to the dairyman's income.

But when the milk of a neighborhood is carried to a common centre within a circle the radius of which is three or four miles, the question how to dispose of the whey profitably assumes a different aspect. When cheese factories were first started great anticipations of profit from pork to be made of whey were indulged in. These anticipations have not been realized. Sometimes the owner of a factory purchased and kept hogs on his own account; sometimes he took them in to board for a York shilling per week; but rarely have the results given much satisfaction. In either case the large piggery near by was a nuisance from its exhalation of odors so readily absorbed by milk and so ill adapted to improve the flavor of cheese. If the pigs throve well without much extra feed, those who brought milk to be made up were apprehensive that too much butter and curd escaped with the whey and was lost to the weight of the finished product. If meal or other food was given in sufficient quantity to keep them in healthy condition, the cost materially reduced the amount received for the pork. In some cases, where clear whey has been fed without much other food, the swine have died off by scores, the owners supposing this result due to some new disease of doubtful origin, when, in fact, it was merely from starvation, or what is equivalent to it, namely, food abundant in supply, but deficient in those nutritious properties which, from the nature of the case, are indispensable. Whole milk is probably nearer than any other known substance to a perfect food, but when its oil and its casein have been removed it is a very different article, and a very imperfect food.

In order to understand better the problem of utilizing the whey of cheese factories, let us inquire more particularly what whey is.

When rennet is added to milk its casein is coagulated and a curd formed This curd holds the oil globules or butter of milk with it mechanically. If the subsequent operations are conducted with care, the whey contains just what the milk did, minus the butter and casein, or nearly all of it, and the whey is bright and clear, but usually more or less of both butter and casein escape into the whey, which is thus rendered turbid. With the average management in what are deemed good dairies I suppose a tenth of the butter and casein of milk are lost in the whey, and there are dairies where a much larger proportion escapes.

One reason why the whey of factories has been no more satisfactory as a feeding material may be that it contains less cheese. Whey contains the soluble salts of milk, that which appears as ash when milk is dried and burned. This amounts usually to from six to eight tenths of one per cent., about half of which is phosphate of lime. A careful analysis of five samples of whey, resulting from a careful manufacture of cheese, gave an average result as follows:

Water	93.12
Butter	.35
Casein	.47
Albumen	.38
Milk sugar	4.54
Lactic acid	.45
Ash	.69
	100 00

Can whey be utilized, or at least the milk sugar which it contains? Suppose only thirty factories to have been in operation during the past year;

that each had an average of four hundred cows, each yielding four thousand pounds of milk, enough for about four hundred pounds of cheese, the yield of all would be forty-eight millions of pounds, and the usual per-centage of sugar found in milk would amount to upwards of two million pounds, or say ten thousand barrels. In a factory employing the milk of one thousand cows, supposing them to yield twenty pounds each, and the milk to yield four per cent. of milk sugar, the daily product would be eight hundred pounds. To separate the albumen from the whey it would only be necessary to raise its temperature to near the boiling point, when the albumen, together with about all the butter remaining in it, would separate and leave the liquid clear, and this, when evaporated to the proper point, would yield prismatic crystals of lactose. Which the better method of evaporating the liquid might be, so as not to convert it into lactic acid, whether with an apparatus similar to that used for the juice of sorghum, or by the use of the vacuum pan, such as sugar refiners use, or by other modes, is a matter to be tested by trial. The albumen and curd first separated would be very desirable food for swine, at least, and might likely enough be used for other purposes.

Lactose, or milk sugar, is less sweet to the taste than cane sugar. Its principal use at present is as a vehicle for homœopathic remedies. It is less soluble than cane sugar, requiring five or six parts of cold water, but dissolving more readily in boiling water. It is less susceptible of alcoholic fermentation, but by boiling in dilute acid it may be converted into fermentable sugar. With the presence of an albuminous ferment its solution rapidly passes into lactic acid, as when whey sours spontaneously. Its chemical composition is C. 12, H. 12, O. 12, and varies but slightly from cane sugar, which is C. 12, H. 11, O. 11.

What might be the market value of milk sugar, to what extent it may be substituted for cane sugar, and what other uses it might serve, are at present merely matters of speculation. It has been manufactured to some extent in Switzerland, where it is an article of commerce.

AGRICULTURAL MACHINERY.

BY HON. M. L. DUNLAP, OF CHAMPAIGN, ILL.

The increase of population, the deterioration of the soil by constant cropping, and the demands for labor in other departments, have made a necessity for improved modes of culture, and for the saving of manual labor. This can only be met by improved machines and implements, by which the work can be both better and more rapidly executed.

Aside from these considerations, the farmer must be relieved from the old drudgery of hard and continual muscular exertion, such as mowing by hand, and cutting the grain with the sickle and cradle; otherwise his sons will betake themselves to the mechanic arts, where steam does all the heavy work, such as sawing, boring, turning, &c. The contrast between the labor of the field and that of the shop, without a corresponding advance in the mechanic arts applied to the former, would become so great that no laborers could be obtained without greatly increased wages, and the agriculturist would soon find himself among the pariahs in the social scale.

Although we cannot claim that farm implements and machines have kept even pace in improvement with other departments of mechanics, yet such progress has been made within the last forty years as to place farming high in the world's art, and has given it a position of influence and respectability second to no other. Much of this is due to the common school, that great utilitarian institution that rubs the rust from dormant genius, and enables the lowest in oosition by birth to make himself useful, and so carve out his own fortune, or lace his name high on the rolls of his country's fame.

Until within the last fifty years the culture of the soil made little progress, and farming wore its ancient garb of weary industry, and wiped the sweat from the sun-browned brow of labor with hands made hard by constant toil. Our first lessons in farming were with the old wooden mould-board plough, the hand sickle, the cradle, and the hand flail. The memory of the latter is still vivid, as with weary blows we shelled out the rattling grain.

With the axe we helped to carve out a home in the deep forest, and in later days have broken up the matted sod of the wide prairies of the teeming west with the plough. This we began with the old strap plough; cut our hay from the prairie sloughs with the hand scythe; harvested our grain with the cradle and the hand rake; threshed it with an open cylinder, and hauled it to market with the wagon, over roads whose sloughs and streams were unbridged. Since that beginning (a quarter of a century ago) the improvements in farming on the prairie, whether in extent, in new modes of culture, or in new implements, has no counterpart in the world's history.

It is not our purpose to follow these improvements through all their stages of progress, but to give some idea of the machines and implements now used in the culture of prairie farms, with some suggestions of what we yet need.

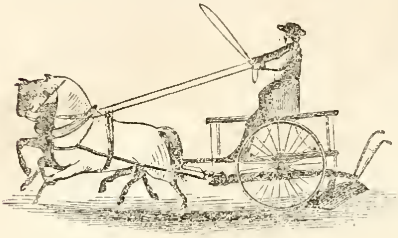
MACHINES FOR PREPARING THE SOIL.

Under this head we shall treat of the common cast-steel plough, the gang plough, the steam plough, or rather steam applied to ploughing, the rotary spader, the plough cultivator, the roller, and the harrow.

THE STEEL CLIPPER PLOUGH.

These are now made with cast-steel mould-boards, with German steel shares, though cast-steel shares, cast in iron molds, are being tried, but not sufficiently to give an opinion of their value. Instead of being sold at a cheaper rate, the price has been increased, thus putting them out of competition with the steel clipper, which is now made with the wearing parts much thicker than heretofore, rendering them very durable. No other than a highly polished steel mould-board plough can be used to advantage on the prairies, and a cast-iron plough, although polished, is not of much value. The steel clipper plough, as now made, may be considered perfect, so far as turning of the soil is concerned; but in its details there is yet room for improvement.

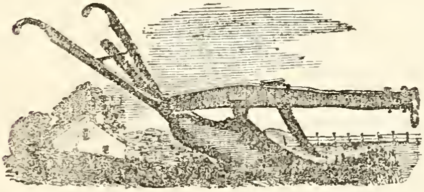
A large amount of ploughing is done by farmers' sons of the age of fourteen years and upwards. To follow the team in the furrow, day after day, is very tiresome work, and has the effect of giving the boy a heavy, awkward gait, by stiffening the lower limbs—a condition from which he seldom, if ever, recovers. To remedy this, the plough should be made to run on wheels, giving the driver a sulky seat upon which to ride. This can be done without extra power to move it, as the wheels will relieve an amount of friction equal to the increased weight of the driver and the extra gearing. We then have the increased cost of the implement to offset against the improved mode of handling it. A plough thus rigged can be run by a class of persons who cannot manage the common plough, either from being lame, or from want of muscular ability to stand the hard labor of travel over the rough ground, and the handling of the plough and team.

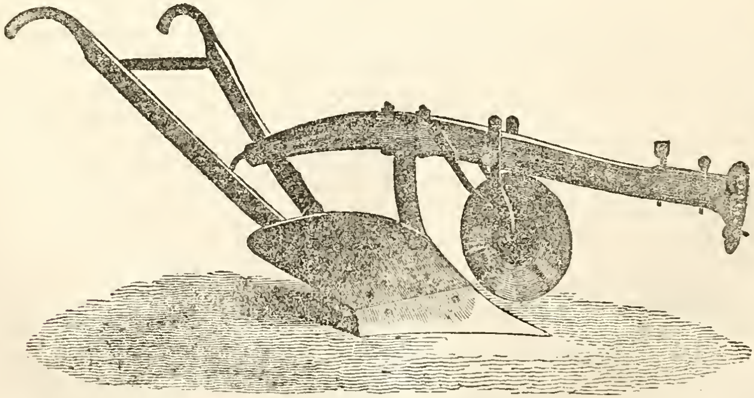


That a plough on wheels can be made to do better work we have no doubt. Several patents have been issued for sulky ploughs, but, thus far, none have proved practicable. Several devices or sizes of wheels have been more or less used, or applied to the plough itself, to relieve it of friction, but none of them have come into general use. The next progress in plough-making must be to give the driver a sulky seat.

GANG PLOUGHS.

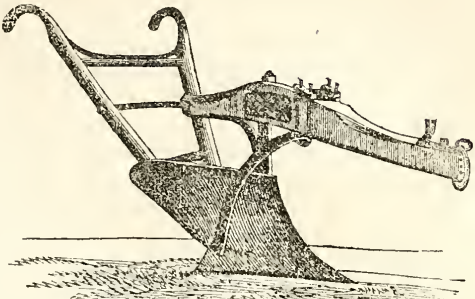
Thus far these have not answered the expectations of farmers. They are heavy, liable to clog, and, though run on wheels, nothing appears to have been gained. A plough on wheels that can be drawn by two or three horses, and of any width of cut from twelve to sixteen inches, would appear more desirable. The gang plough, cutting twenty to twenty-five inches in the aggregate, requires four horses, and as one of these must walk on the ploughed land, it is hard work. We observe some improvement of late in their construction that may tend to make them useful. This mode of ploughing, by using the gang plough, to be followed with a trench or subsoil plough, will doubtless prove useful. Another year's experience is required to arrive at the merits of this mode of ploughing.





The old standing coulter has been thrown aside, and the rolling or wheel coulter substituted in its place. This coulter is very useful in all kinds of ploughing, cutting through turf at little expense of power, and making a smooth, clean furrow. Another implement of value is the weed-hook, as shown in the annexed cut. In the south part of the State it can be made highly useful in ploughing under weeds.

The hook is made of a bar of iron, two inches by three-eighths of an inch, and bent. It is fastened with stirrups, as shown. The outer end is so placed that it runs in the open furrow, and draws all the weeds and cornstalks into it, so that they are covered by the upturning furrows. For the turning under of a crop of clover, Hungarian grass, or buckwheat, it is valuable. The largest green weeds can be buried out of sight with its use. It will clog up with dead or loose rubbish. The plants to be turned must have one end fast in the soil.


DUNLAP'S WEED HOOK.

The winter wheat is cut about the 1st of June, and the stubble is soon filled with weeds, which grow from four to six feet high before the seeding in September. With this weed-hook these weeds can be placed in the bottom of the furrow out of sight, where they will soon furnish food for the young wheat plant, instead of being harrowed to the surface, as in the usual mode of ploughing. Sometimes a log-chain is placed on the plough-beam, so as to drag down the weeds; but this is a very imperfect process. We have used this hook with great advantage in turning under cornstalks, especially when partially fed off during the winter. In a fallow of dead weeds it will clog up and is useless.

The double Michigan plough has not come into general use in the west from the fact that it requires an enormous power to move it. No plough so thoroughly pulverizes the soil as this; but so few of our farmers use ox teams, of which from four to six yoke are required to run it, that the more practicable mode of using two ploughs for trench ploughing is preferred. We have used this plough to good advantage in breaking prairie, by setting the upper within two and a half inches of the lower one, and cutting the turf about one and a half to two inches thick, when it is rolled up like the half of a stove-pipe or scroll over which the lower furrow is thrown; thus making an air space under the turf, which has the effect to kill the grass and aerate the inverted soil. The ploughing can be done early in the spring, or open spells during the winter, when the ground is saturated with water. At such times three horses will break two acres a day; but if the ground is dry, as at the usual time of breaking, the three horses cannot move it at all. We have never had turf so well and quickly rotted as with the above-mentioned winter breaking. In this case we need not wait for the frost to be out of the ground more than to the depth of the ploughing, as it matters not if the plough runs on the frozen ground, and only turns over the thawed stratum of three or four inches. In this way prairie can be broken at a time of comparative leisure, with less team, and in all respects with better results than is done during the hot days of July.

The principal value that we find in this plough is for the above purpose. In preparing land for grape-vines and other deep tillage, we use three teams; the first runs a common cast-steel clipper eight inches deep; the second, a deep tiller four inches; and the third, a Mapes' lifting subsoil plough four inches, breaking and stirring the soil sixteen inches deep. This makes a bed of loose soil of nearly twenty inches, sufficient for all purposes. The furrow slice is cut eight inches wide, and the three teams will thus prepare an acre to an acre and a half per day.

THE STEAM PLOUGH.

Fawkes' steam plough has attracted the most attention at the west, and as it contains the idea of a traction engine to draw the ploughs after it, may be considered as a fair exponent of this kind of ploughing. This implement was first tested at Centralia, at the State fair of Illinois, September 17, 1858, more than five years ago. The place of trial was on level land, baked hard by the summer drought; of course, just the condition to succeed with the traction engine. To this six ploughs were attached, cutting a foot each. The success was complete under such favorable conditions, and the crowd of people in attendance greeted it with rounds of applause.

The next public trial was at Decatur, Illinois, in the month of November. There the conditions were less favorable. The ground was moist and the sloughs soft. The failure there was as signal as the success at Centralia had been two months previous. The difference between the level, sun-baked surface of Egypt and that of the friable clay loam of central Illinois was a wide one; and the people in attendance went home disappointed.

The next trial was made at Freeport, at the State fair of 1859, with a new engine and such improvements as would seem required to overcome the difficulties found in the yielding loam of the northern prairie, but another disappointment followed. It may be well to mention that the committees appointed to examine it reported warmly in its favor, and many of the newspapers pronounced it a success, but the practical farmers began to have doubts of its final success. The next week it was tried at the United States fair at Chicago in competition with Waters' steam plough. Neither of them met the expectations of the people, and the laurels gained at Freeport by the premature judgment of the scientific committee were nearly lost.

The Illinois Central Railroad Company had offered a premium of $3,000 for a successful steam plough. The plough was to be tried at three different points. The first point was on the writer's farm. The ground on which it was tried was slightly undulating, uncultivated prairie, in all its native wildness, being part of an enclosed field on which no stock had been permitted to graze. In getting to the field a soft, low piece of ground had to be passed over, but this land was not so soft but that a team could easily haul a ton over it; yet the weight of the engine sunk the drum so deeply into the soft soil that it could not be passed over by the aid of steam. This was the first serious failure in that trial, demonstrating that the machine could not pass over low prairie, even when the turf was unbroken, for the drum, so soon as steam was applied to it, would bury itself too deep for extrication, though the same machine might be hauled over with other power with safety; thus showing that the traction engine can never be run over soft ground, whether from moisture or cultivation.

The amount of prairie broken in the course of some two weeks of trial was about four and a half acres. The first attempt was made with eight ploughs, cutting a foot each, but four of these had to be taken off, and the machine, without coal or water to run on the hard prairie over half a mile, (the length of the field,) was put to its utmost to do the work. The field had a gentle slope to the east, in the direction of the ploughing, with a grade, in no place more than forty feet to the mile. So well satisfied was the inventor of the failure of the trial that no further effort was made as contemplated in cultivated land and at other points. Hundreds of farmers and mechanics visited the machine when on trial, but all went away disappointed. The inventor, on further consideration, concluded that he could yet remedy the defect so as to meet all objections, and another machine was made in one of the largest shops of the Union, and under the hands of superior workmen, but with no better success.

Waters, of Detroit, brought out the second machine, with which we learn, on good authority, he broke up nearly a hundred acres of prairie and abandoned the enterprise An inventor at Indianopolis, also, made an attempt with skavering knives* instead of ploughs, but met the fate of the others.

We may well come to the conclusion that ploughing with a steam traction engine is out of the question, for the following reasons:

1. This machine cannot pass over soft land, whether wet or cultivated, as the soil yields to the motion of the drum or driving wheels, and instead of carrying the machine forward, excavates a hole into which it sinks beyond its own power of rescue.

2. When loaded with a half day's supply of water and fuel it is incapable of drawing the ploughs.

3. It cannot rise the ordinary grades of the rolling prairie with the plough at work.

4. On level land it cannot do the work as cheaply, under the most favorable conditions of water and fuel, as animal power.

In England, steam ploughs appear to be gaining in popularity, and if we are to believe some accounts, are soon to supersede, to a large extent, animal power. Reasoning from analogy, many of our rural population, as well as mechanics, are inclined to the opinion that the same result will follow here. But there are several reasons why this will not be the case. The condition of the soil, climate, comparative cost of labor, of fuel, and of subsistence, are too great to follow in the same path. The English soil is a stiff clay that requires, usually, three to four horses to turn a furrow, and that must be a narrow though a deep one. The dampness of the climate, the tenacity of the soil, and its retention of moisture, make it imperative to have perfect drainage and thorough aeration to produce good crops. With us the soil is less tenacious, being mostly a clay loam, is easily moved with a plough, and as the climate is warm and dry, it is naturally well aerated; consequently, deep ploughing and under draining are not so essential. After the soil is once broken up it retains the benefits for a long time, and shallow ploughing answers well for a series of years. The result of this difference is that, in ploughing with us, less than one-half the power is required to plough the same depth, or to have it thoroughly aerated to the same depth for a series of years.

The engines used in England are stationary, or movable along a headland, and draw the plough back and forth over the field with the use of wire ropes. This is, of course, a slow process, considering the expense and power applied; but, as labor is cheap and fuel abundant, while the cost of animals and their subsistence is very high, the difference appears to be in favor of steam. Another difference claimed is that the work is done better, which is doubtless true. We have already shown that to stir our soil sixteen inches deep requires three teams, of two horses each, and a man to each team. This expense can be somewhat lessened with the use of a subsoil plough. But let us count the cost with the three ploughs, so as to compare it with steam power on the principle of the English steam plough: Three (3) men and teams one (1) day, cutting a furrow-slice eight inches wide, and ploughing one and one-fourth acre sixteen inches deep, at $2 50 each per day, $7 50, or at a cost of six dollars per acre. All orchards, vineyards, and garden lands ought to be thus prepared, and there can be no doubt that such preparation will pay for all farm crops. But one such ploughing in our soil will answer for a long time, and the cost of subsequent ploughings will be half a day's team work, worth about one dollar and twenty-five cents ($1 25) to the acre. Theoretically there is no reason why steam cannot be applied to this kind of deep tillage on the English plan. where the cost is not less than six dollars ($6) per acre. But in all cases where the work can be done with a single team at the rate of two acres a day, which is the usual day's work, we see no prospect of its ever coming into use. But

* Scooping and slicing the earth in horizontal layers in a peculiar manner.

we see other and more serious obstacles in the way of the use of steam ploughing. The first one is in the laws of descent, which divides and subdivides estates, and has a constant tendency to crumble down accumulation of capital that might otherwise become permanently invested in expensive and enduring fixtures and machinery. Under this law farms, as a general thing, will be small, and to a great extent worked by the owner and his sons. A farm of the size that would require three teams could, in a few years, be deep tilled at intervals of comparative leisure, scarcely feeling the cost. The only extra outlay would be for a deep tiller plough, and a subsoil lifting plough, costing for both thirty dollars, ($30) which, if well made, would answer for a farm of two hundred acres, at least twenty years for the purpose named, or at a cost of a cent and a half an acre. The real cost in the case for deep tillage would not be over three dollars an acre, and its repetition once in ten years would be ample. A farm of two hundred acres would not, therefore, invest in a steam plough costing $3,500—the lowest estimate for such an implement. The interest on this, at six per cent., would be $210—a sum sufficient of itself to pay the deep tillage of thirty-five acres a year, at the rate of six dollars an acre, or seventy, at the figure intimated above.

We will now consider the small farmer, who keeps but one team, and works sixty acres. Three of them can unite their teams, and thus, in a few years, deep till the three farms in turn. We do not believe that, with the present cost of animals and of subsistence, any farmer will find it profitable to employ steam for even deep tillage. The cost of the machine, the expense of an engineer, of fuel, of water, of repairs, (the last being enhanced by the distance from the foundry,) and the throwing out of work the hands thus employed during the time of delay, make almost if not insurmountable bars to the profitable employment of the steam plough. It might be argued that parties accustomed to this kind of work would find it profitable to do job ploughing by the acre. But here, again, we are met with the difficulty of the shortness of time that they could find employment, as the land for a portion of the year is not in a condition to plough, and at others is covered with crops. We might put down a hundred days that such a machine might find work, which, at five acres a day, would amount to five hundred acres a year, which, at six dollars an acre, would be three thousand dollars. But as this is the highest cost per acre to do the work with animal power, it is not likely that jobs would be let at that rate, and from four to five dollars would be nearer the true figure. At four dollars the gross earnings would be only two thousand dollars—a sum that would leave a small profit over the interest, wear and tear of the machine, the cost of the fuel, of water, and of labor.

Take any view we choose of ploughing by steam, its bright side soon vanishes when we apply figures and facts to it. That steam can be applied to ploughing has been demonstrated, but of its economy there are many grave doubts; even in England we have not seen any figures that show a flattering result. One plan we have seen proposed is to use a traction engine that is capable of running the ploughs on level ground; but in steep grades, to go ahead, cast anchor, and draw up the ploughs by a windlass. We have said sufficient on this head to show that this plan, which parties propose to put in operation, will prove futile. The land in the basin of southern Illinois approximates more nearly to that of England, and as the surface is more level, will be found the best adapted for the experiment of steam ploughing.

THE ROTARY SPADER.

Last autumn we gave one of these (Comstock's) a partial trial, though so late in the season that we could form no definite opinion of its value, but were highly impressed in its favor. Where used, the crop was much better than on that alongside, but this might have been the same by the use of the plough. Four horses will spade the soil to the depth of eight inches and three feet wide, or at the rate of five or six acres a day. In this it promises to be a labor saving machine, but its great cost (two hundred dollars) is against it for the small farmers. The idea that the soil must be inverted with the plough is fast losing ground, as it is found, in practice, that a thorough stirring or forking up is equally as valuable, if not more so, without the objection of having a hard, compact bed under the plough. It is well known that the potash in the soil becomes fixed when below the influence of the air, and in turning deep furrows the free or aerated potash becomes buried, and is in turn fixed, while the crop must await the slow process of the atmosphere in aerating a new supply. In spading, the free and fixed potash becomes mixed, hence the plant has a good supply at the start, with more in process for assimilation. Another objection to spading is the bringing of the seed of weeds to the surface to be ready to start with the seed sown. This, at first sight, might look like a serious objection, and, to some extent, is true.. In old lands the seed of weeds becomes pretty thoroughly mixed with the soil, and however one may plough or spade, a good supply will be found near the surface to fill the whole space. In the case of a very weedy piece of land the plough will be found desirable to place the seeds of the weeds so deep that they cannot sprout up with the cultivated crop. We may then safely consider in practice, in all well cultivated land, that it is immaterial whether we stir up the soil or reverse it, as far as the weeds are concerned, while, as a mode of culture, the stirring is most decidedly the best.

Should steam be applied to the tilling of the soil, we predict it will be by the use of the rotary spader rather than the plough. The experiment thus far is to spade to the depth of eight inches. How the implement will work to the depth of sixteen or twenty inches we cannot say, but at this depth it is not probable it will be found capable of so thoroughly comminuting the soil. In ploughing it is sometimes difficult to make the plough scour, but in the spader in question no such objection appeared in the way.

Should this new mode of stirring the soil ultimately come into popular use it will be by slow degrees, as has been the history of all new and valuable labor-saving implements. Nothing short of the most decided testimony will induce farmers to change an implement costing ten to fifteen dollars for one costing two hundred, with which to do the same work. The advantage must be largely in its favor to accomplish this.

TRIAL OF IMPLEMENTS.

Here is a point at which we can urge Congress to institute experimental grounds for the Department of Agriculture. Their value would be great, if for no other reason than to try all newly invented implements, and to carefully compare them with the old. This would save farmers a vast expense, and be the means of rapidly disseminating the really valuable implements throughout the country. This of itself would largely occupy the attention of practical men. Let us look at this a little further. Take, for instance, the steam plough, which has, up to this time, cost individually more than two hundred thousand dollars in the various attempts to make a traction engine do ploughing; nor do we believe the idea fully abandoned, for, unless the various implements and failures are published, the disease will break out in a new place, or, in other words, the same failures will be reproduced.

On such a farm the gang plough and rotary spader could have a thorough trial, and their respective merits be fully ascertained. But now we must await the slow process of individual experiment, or be at the mercy of interested parties, who send forth fancy sketches of imperfect trials to deceive us into the idea of purchasing their implements. Such an institution would be a great benefit to inventors; for, if successful, it would establish at once a reputation, and, if unsuccessful, it would save further money and effort. But we have another object, which would be to give a detailed description and statement of the trial of the unsuccessful implements, so as to point out to future inventors the ground that had been so unsuccessfully passed over. We now see, every year, old discarded ideas reclothed and presented to the public as new. Several of these have come up within the past year.

THE PLOUGH, OR TWO-HORSE CULTIVATOR.

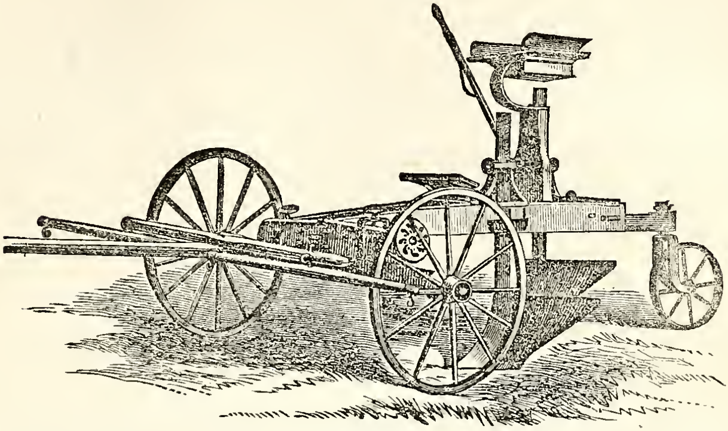
No implement has so rapidly come into general use on the prairie as this, nor is there one more deserving enthusiasm in its favor. It has already, to a great extent, revolutionized the old system of marking off and check-row planting of corn. It has lessened the cost of this crop by a large per-centage, and when applied to the cotton fields of the south, will reduce the cost of culture more than one-half, and, at the same time, largely increase the crop. It has doubled the number of acres that one man could cultivate with the double-shovel plough, to say nothing of the ability to dispense with the hoe. It certainly cannot fail, in the cotton fields, to be of priceless value. With its use hand-labor, except in the thinning of cotton, can be dispensed with almost entirely, and the crop must be improved by its use, as it will give the plant a much earlier culture than could be given with any of the old implements. With it the scraping and hilling is done with two horses or mules, at a brisk walk, finishing a row at each turn through. We have given it a trial on three-fourths of an acre of cotton with the most complete success. The same implements that succeed well in cultivating corn on our prairies will be alike valuable in the cotton fields of the south.

These cultivators are valuable for other purposes than the culture of corn and cotton. Among them is a great variety of patterns, and, while all of them do good work in the corn-field, all are not so applicable to other purposes. During the past season we have used four different patterns. One of these, which we have selected for next season's use, excels in its adaptability to more purposes than the other, and, at the same time, is less liable to get out of repair, or to have the cultivator standards broken, this last being one of the most fruitful causes of complaint against this class of implements.

Last autumn, having occasion to plant several bushels of peach and plum pits, it occurred to us that this cultivator could be used for the purpose. Driving it across the field, we soon found that it would make miniature furrows for the seed, which was dropped along them at the usual distance apart, when the implement was put astride the rows, and by passing twice over each row the proper depth of fine, well pulverized earth was put over them. With one boy to drive, and one to drop the seed, we accomplish in half a day what, before, had been several days' work for an industrious gardener. This has suggested to us that, with it, the potato fields can be marked out, and the seed covered in the best and most expeditious manner. We made the further experiment of ridging up for sweet potatoes, which was done, with the exception that the loose earth between the rows should be hauled to the top with a steel rake. The labor saved in these processes is not only large, but the work is, in all respects, better done. In the corn districts of this State this implement has nearly made good the loss of laborers who have gone to the army.

Nearly all of these two-horse cultivators have seats for the driver, and those that have not are becoming unpopular. A boy who can drive a team, yet is too slender to handle the shovel plough on foot; a lame person, who cannot walk to advantage; an invalid, partially recovered from sickness; or a young lady fond of driving, and who wishes to assist her father or brother, can do a full day's work with this new and valuable implement. When we come to speak of the harrow we shall have more to say of this implement.

THE DOUBLE SHOVEL PLOUGH.



The double shovel plough is an implement only known at the west, and is of recent date, say a dozen years. With its use corn culture dated as from a new era. It will always prove a valuable aid on rough ground, among high weeds, for small fields, and for small farmers, who keep but one horse, it cannot be set aside. With us it has thrown out the old cultivators and one-horse ploughs, which now lie idle in the tool-house. In the culture of small plants a shield, something like those on two-horse cultivators, is used. This costs but a trifle, and is valuable to protect the young plants from clods, or from being covered up with loose earth. This shield is so made and arranged that the most delicate plants are cultivated with this implement. The shovel can be run close to the plant, and thereby save a large amount of hand-weeding. As soon as the plants are strong enough the loose earth can be so disturbed along the row as to cover up and smother out the young weeds, thus entirely dispensing with hand-weeding, which at all times is both laborious and expensive. The double shovel plough came of the old shovel plough, usually made of the blank share of the old bull plough, and only used in new lands among roots and stumps. It was remodelled for the prairie of cast steel. The one became a pair on the same beam, but smaller in size. This was considered a great stride in the field of progress, but was soon eclipsed with a pair of double shovels on wheels, surmounted with a driver's seat.

THE ROLLER AND THE HARROW.

The harrow, as a pulverizer and coverer of the cereals when sown, is of ancient date, and has held out stoutly against innovation, but its days of usefulness have culminated, and it must hereafter take a less prominent place in the farm economy. The grain drill in English husbandry has been its strongest competitor on the other side of the water, but the clean turnip fields or stubble of the smaller grains give place here to cornstalks, small stones, stumps, and other obstructions, rendering the grain drill of little value, and the harrow has mainly had its own way.

In the clay loams of the prairie autumn ploughing has been of great value for almost if not all crops. Without fall ploughing spring wheat cannot be grown.

This is a crop of great importance in the north part of the State, where this process is always resorted to. In the central and southern parts of the State, where fall ploughing has not as yet obtained to any great extent, little spring wheat is grown, and in case of a wet spring the corn planting is much delayed.

We now propose to show another advantage of the two-horse cultivator, and how it will dispense with the harrow in connexion with the roller.

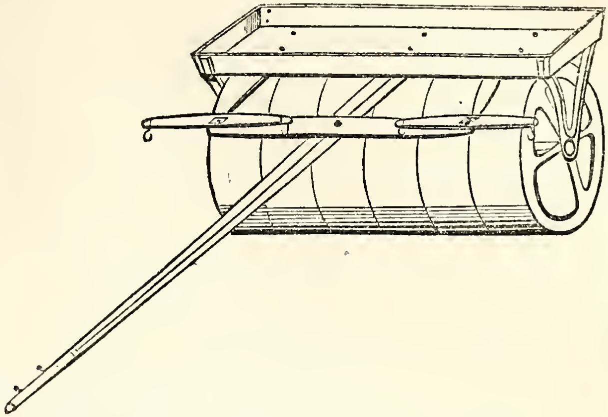
In the first place, we will suppose a rotation of crops: say wheat on a clover sod turned over in August, to be sown in September with winter wheat, or in February or March with spring wheat. As soon as the crop is off the stubble is to be turned over with the plough, or stirred up with the rotary spade, say to the depth of seven or eight inches. This can be worked over with a six-shovel two-horse wheel cultivator, at the rate of eight acres a day, to the depth of four inches. This will pulverize and level the surface, and nicely prepare it for the seed, which can now be sown with a hand seed-sower at the rate of twenty-five or thirty acres a day. Sow to oats, barley, or other crops. Pass the harrow over this once, which will cover the seed, and roll; or if the land is in good order, the seed can be sown and cultivated, dispensing with the harrow. The roller will pulverize the small clods and press the soil on the seed so that it is sure to germinate. The seed will come up even and make more rapid growth, thus largely increasing the crop over the old process.

We always have a few days of good weather early in the spring, and if the land is ploughed the seed can be sown, but if neglected the ground becomes too wet to plough, and the crop is sown so late that a light crop is the result. *We must have the benefit of the spring rains to insure a good crop of the cereals;* and with the use of the two-horse cultivator and roller we can have it if we will but plough in the fall. The stubble of this crop is again ploughed in autumn, and the ground cultivated as before for corn. Of course, this enables the farmer to get in his crops early, by which he insures a good crop under almost every subsequent contingency. In this crop we use no harrow. In the fall the corn is cut close to the ground, or the stalks are cut during the winter at the surface with a hoe, raked up, and burned. We should never feed stalks in the field and have our land poached up with cattle. The six-shovel cultivator, by adding two extra shovels to the one before mentioned, is now all that is required to prepare the corn stubble for spring wheat or barley, which is cultivated in at the rate of six to eight acres a day with the use of two horses, nearly double the amount that can be done with the harrow, and in a much superior manner. This is followed with the roller to level down the loosened corn hills and to closely pack the soil on the seed. Clover and herds grass can be sown with this crop to be mown or pastured two years, when it is to be broken up at the close of the second year. This completes a rotation of two years in wheat and one in oats, one in corn and one or two in clover, making a five or six years' rotation, and without using the harrow more than once in the whole time, and even that can be dispensed with. The advantage of the fall ploughing and use of the cultivator in stirring up the surface that may have become packed by the winter's rain in all cloggy soils can be appreciated in all locations north of 42°, where the springs are comparatively short, and south of that point where it is an object to take advantage of the spring rains, so as to have the crop advanced before the usual summer drought that too often makes the failure of the crops a rule rather than the exception.

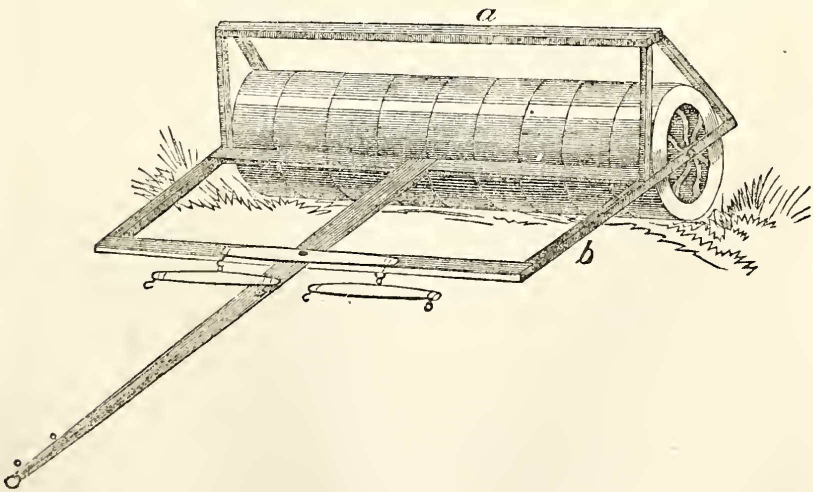
It will be seen that the two-horse cultivator can be made to play an important part in the culture of small grains, not only in the saving of labor, but in the increased yield.

THE IRON ROLLER.

The iron roller, as sometimes made, is an implement of torture to the team instead of use. The mode of applying the team is the most unscientific possible. The draught should be from the centre of motion instead of from the top. A plain board seat, the entire length of the roller, should be placed above the roller, by the use of bent irons attached to the end-pieces of the frame, so that the driver can sit on either end or in the middle. This will enable him to drive to a line, which will be necessary where a corn-planter is used in combination, so as to



plant and roll the cornfields at one operation, which can be done at the rate of fifteen acres a day. The value of the roller has been too long overlooked, partly from the mode in which it has been constructed. The best are now made of cast sections of a foot wide and twenty-two inches diameter, weighing, including frame, about one thousand pounds, and costing some fifty dollars. On our prairie soils these are of great value, and in corn-planting they finely comminute the surface, and by packing the earth on the seed, allow shallower planting, which, in case of a wet, cold spell, will prevent the



seed from rotting, and in case of drought keeps this shallow-planted corn from drying, in either case insuring a good stand. In the culture of the small grains it is of equal value, encouraging a good stand and pulverizing the small clods on the surface, giving the young rootlets an opportunity to make a vigorous growth. While clods reflect the sun, a smooth, thoroughly comminuted surface absorbs its rays, and thus heats up the soil so as to force the plants. We cannot too warmly commend the use of the roller on all prairie soils.

We have purposely omitted the common and hill cultivators, one-horse ploughs, clod-crushers, (not rollers,) horse hoes, &c., as no longer of much value on the prairies.

BROAD-CAST SEED SOWERS AND DRILLS.

Grain drills, except in clean, well-pulverized prairie soils, are of little value. Of their value on sandy and gravelly land we know nothing personally. For winter wheat and rye grain drills may have some value, but of this we have doubts. For spring-sown grain we have serious objections to the use of the drill. The seed is buried too deep, and the surface is left too uneven; in addition, the weeds spring up between the rows, and thus crowd out the grain instead of having the grain crowd out the weeds. Until it will pay to hand-weed the grain crops we should never think of using a grain drill. At one time it was supposed the use of the drill would insure a crop of winter wheat, and that its use was indispensable, but this theory has given way, and now the grain drill is little used in prairie farming.

Another advantage of the drill was the saving of labor in sowing by hand and in the economy of seed. This has now given place to a new invention for sowing by horse-power and by hand. With a good hand machine a man will sow from twenty-five to thirty acres a day, as much as can be done with the best two-horse broad-cast sower. Seed drills and cultivators are combined, but these succeed only in clean, level lands, and are too expensive and liable to get out of order to be profitable. They are only used for a few days in a year, and the interest and deterioration amount to more than the cost of a hand sower and the labor of sowing a hundred acres; hence they cannot, if successful, prove profitable on small farms. In our soil the seed need have but a slight covering if the land can, as it should, be rolled. With a hand seed-sower the work is done better than that by hand, and equal to the best broad-cast sowers, and, on the whole, it will be found the most economical. The popular demand is for the horse-power seed-sower, but farmers will gradually make a change. The hand sowers are generally sold at ten dollars each, but if kept for sale in stores a good profit can be made on them at five dollars, as the shop cost is less than three dollars each.

MACHINES FOR THE MEADOW.

We have never, as yet, seen a good combined reaper and mower, and would never recommend them thus made. If a farmer can afford but one, let him have either a reaper or a mower, and hire the use of the other. Our harvests are very short at the west, generally only two weeks; as the heat of the season hastens the late sown grain, making the crop lighter, of course, but bringing it forward nearly at the same time with the early sown; neither can we cut grain in the dough state, as in the more northern and eastern districts. The same is true of the hay crop, which is usually so far advanced as to make immediate cutting necessary, lest its rapid maturing injure it for food. A common reaper will cut ten to twelve acres a day of twelve hours, the usual time of harvest work, and a mower will cut eight to ten acres in the same time. To cut grass the motion of the sickle must be greater than to cut grain. If this is applied in the same machine to the long sickle and heavy gearing of a six-foot reaper, the strain on the machine is very great, and it soon gives out; whereas, in mowing, the gearing is much lighter, as the sickle, which is but a trifle over four feet, can be easily drawn by two horses, and is much more durable. The six feet combined reapers and mowers require four horses, and are much heavier, and will do but little more work in a day, at best, as there are always more or less detentions with them. There can be no economy in thus combining the two machines, and if the farmer will look at the state of facts as they exist he will never be induced to purchase them.

The tendency of the farmer is to run after expensive implements, but he does not always count their cost and the value they are to him. Two hundred acres of grass may be said to be a fair estimate for the use of a mower in one season. The cost of a mower is, say, $80. The interest, repairs, and deterioration will be about twenty-five dollars a year, or about ten cents an acre, assuming the machine to last ten years. We know one farmer who cut twelve hundred acres of meadow with four mowers the past season. These were drawn by two horses each, and driven by boys of fourteen to sixteen years of age. To have cut this amount of grass with combined machines would have required four additional span of horses and expert drivers in place of the four boys. We do not think a combined machine would stand more than two seasons' work at this rate, when the account would be as follows:

Use of mower, at 10 cents per acre	$120 00
Four teams, 30 days each, 120 days	120 00
Four boys, 30 days each, 120 days	120 00
	360 00

Or, thirty cents an acre.

Four combined machines, $120 each	$480 00	
Half charged to reaping	240 00	
		$240 00
Half their value for one year		120 00
		120 00
Repairs and interest		20 00
		140 00

Or, say twelve and a half cents an acre; but the difference does not stop here:

Cost of machine	$140 00
Eight span of horses, 30 days each, 240 days	240 00
Four men, 30 days each, 120 days	240 00
	620 00

Or a total cost of fifty-one and a half cents an acre—nearly double that of the single mower. We think no one can cavil at the above comparisons. We say the above deliberately, after nearly twenty years' experience with the reaper and fifteen of the combined machine and single mower. It has been too much the practice with small farmers to own a combined machine, and as these are seldom housed the loss is a large one. Last season the cost of machines was much above the figures given; but as the patents expire they must be cheapened, even below the above figures. It is not so material that the exact price in making the comparison should be given so long as the relative difference remains the same. We are glad to see a growing demand for reapers and mowers independent of each other, and we trust that it will not stop until the last combined reaper and mower is thrown aside as a dead weight on the operations of the farmer.

HAY RAKES.

The hand rake is now little used for any purpose, and not at all in gathering the crops of hay. Revolving rakes are yet largely used for their cheap ness, and on small farms will continue to hold a place for some time. On large farms the sulky wire-tooth rake is fast replacing all others. With it a boy and horse will rake and bunch twenty acres a day. The *bunching* is a great saving of hand labor, as with it the windrow is thrown into heaps or bunches of eighty to one hundred pounds, ready to be placed in cocks or loaded. The latter mode is now employed, as with this kind of rake the hay is very much compressed, and can be pitched nearly as well as from the cocks that have stood one or two days to settle. The sulky rakes cost thirty-five to forty dollars. The difference between the amount of work that can be done with this kind of rake and the old hand rake is but another index to the progress of the age.

The hay fork, or patent pitching fork, is now largely used, both in the barn and by a temporary frame or gin to unload at the stack. By the use of this fork barns can be built higher than formerly, and stacks are made larger and higher, receiving the hay in much better condition.

BALING AND SHIPPING.

A large part of the hay now used in cities is baled on the farms or at the depots near the place of growth. Before the war large quantities were sent south to the cotton States, and now the supplies for the army are also large, requiring all the surplus grown. By the use of an improved press eight to ten tons of baled hay can be put into a common box-car. As the baling costs less than a dollar a ton, and the rate of transportation by the car load is low, the hay trade has assumed important dimensions, and has become a prominent item in rural economy. The cotton and the sugar States cannot grow the tame grasses to advantage, and for all time to come must draw a large portion of their winter forage from the north.

HARVESTING GRAIN.

The cutting of grain with reapers became common in the west about eighteen years ago. A few years previous the old strap plough had given place to the steel clipper; and this, with the reaper, stimulated the productions of the cereals to a wonderful extent. Railroads soon came to the aid of marketing the crop, thus giving the farmer most of his time to grow and prepare it. The average distance to the depots may be assumed at eight miles, or an average of sixty bushels of wheat per day for one team to deliver at the place of shipment. The harvesting of grain has not been so much cheapened as it has been facilitated by these substitutes for animal labor and capital. In absence of animal labor to the extent demanded, this has been important; for, without it, much smaller amounts would have been grown.

The first attempt to harvest with machinery was to draw the heads within a cylinder filled with teeth, so as to thresh it as the machine moved forward into the solid array of spikelets; but this was found to waste the grain, nor would it answer except on fully ripened grain that stood up well; hence it was abandoned, and the reaper and header both entered the field at nearly the same time. While the former has made great progress, and is found in all grain-growing districts, the latter has made little progress. Self-rakers have been added to the reapers, and binders are beginning to be used to some extent; but for want of skill in their use, or for some defect of manufacture, they have not given as good satisfaction as we had hoped. That they will yet succeed we have no doubt.

Some years since, Messrs. Sylla & Adams, of Elgin, in this State, made several reapers with platforms so constructed that three binders and the raker could ride. About eight acres a day could be cut and shocked by this mode. The bundles were placed on a false platform as fast as bound, and when sufficient had accumulated for a check, a spring was drawn back, and the whole was slid off, the weight of the platform bringing it back to its place. We used one of these for several years, and regretted that the manufacture was suspended. Attempts are now being made in one direction to combine the automatic rake and binders so that the former will deliver the gavels to the latter; and, by the aid of the driver and one hand, a six-foot swath can be cut and bound at one operation. As this will cut twelve acres a day, the cost of cutting and binding would be greatly reduced. One of the drawbacks to this mode is the cost of wire, amounting in heavy grain to about twenty-five cents an acre.

The heading machines have their friends, and, on large farms, have in many instances given good satisfaction; but as the great majority of farmers grow less than a hundred acres of the same grain a year, the large outlay for these machines is so great that they can never become popular with that class of farmers. It has also been found in practice that if the grain is not fully ripe when the heads are cut off, the grain will shrivel up, and, when placed in stacks, is liable to mould. To remedy this to some extent, the heads have been cut off with straw attached from twenty inches to two feet long. This, of course, is adding seriously to the bulk, and to the labor of threshing. In these headers an endless apron is so arranged as to carry the cut grain to a wagon that is drawn alongside. It is now proposed to lower the cutting bar, and so arrange the apron that the cut grain shall be carried by this endless apron and deposited on a form on the platform, where two men alternately bind these bundles as they come to hand. The great labor of binding is in the walking from one gavel to another, and in stooping down to take it from the ground. In this case there is no stooping, and as the gavel is on an open form, it is easily clasped and bound. It can be thrown on to a false platform, as before mentioned, thus saving a large amount of labor in shocking up.

This plan we think practicable, and it must prove a great saving of labor. Four horses will cut twenty acres a day, requiring one driver, two binders, and two more to shock up. Thus we have:

Two span of horses per day	$2 00
Five men, at $1 50	7 50
Oil and grease	50
Use of machine	8 00
Total	18 00

Or a net cost of ninety cents an acre. As now harvested with self-raking reapers we have for twenty acres:

Two span of horses, two days	$4 00
One driver, two days, at $1 50	3 00
Ten days' binding and shocking	15 00
Oil and grease	25
Use of machine	5 00
Total	27 25

Or, at the rate of one dollar and thirty-six cents an acre, a difference of nearly half a dollar an acre. This to a farmer growing a hundred acres is of no little importance, and in the aggregate amounts to a large sum.

BINDING WITH WIRE TWENTY ACRES.

One span of horses, two days	$4 00
One driver, two days	3 00
One binder, two days	3 00
Shocking up, four days	6 00
Wire, at 25 cents per acre	5 00
Oil	25
Use of machine	6 00
Total	27 25

Here, again, is the same result. With a hand-raking reaper the cost is increased some three dollars on the twenty acres. It is probable that with a ten-foot header, to carry the sheaves for a shock, it may require an extra team, which will, of course, add to the cost, which may be set down at one dollar an acre.

TO HARVEST BY HAND TWENTY ACRES.

One cradler, eight days	$16 00
One binder, eight days	16 00
Four days' shocking up	6 00
Total	38 00

Or one dollar and ninety cents an acre. With a hand-wheel rake four dollars can be saved on the above estimate.

Should the contemplated improvements succeed, the labor and expense of harvesting will be greatly reduced. In the use of horses and mules we have charged their use at a dollar a span per day. Were it not for this work, they would be nearly idle, while now we make them largely assist in the harvest field.

The cost of reapers is much too great, and the time cannot be distant when it will be greatly reduced both from competition and in the expiration of patents, the fees of which now amount to over twenty dollars on every reaper and mower made.

THRESHING AND CLEANING.

We now come to the last branch of our subject. When a boy we threshed with a hand flail, and have winnowed many a week's work with the hand-fan. If labor had been worth the same then as now, it would have cost over twenty-five cents a bushel to thresh and clean our wheat. The horse-power thresher is of English origin, and at the time of its first appearance created no small stir among the laboring population as infringing upon their rights. It was supposed to be a death-blow to the laborer who depended upon his winter work to support his family. Yet this English machine was but a sorry thing beside one of our improved ones. That was, however, one step out of the old beaten track—almost the first attempt of genius to aid in the labor of the field. Since then what glorious achievements has she not secured, and yet what a field is yet open to her investigation!

It was a long time before separators and winnowers were attached to the thresher; but when once put into operation, they soon became general, and now all machines have one or the other. In time straw-carriers and bagging apparatus were attached, leaving most of the labor to the team. At first farmers owned their own threshers; but now they mostly belong to jobbers, who go about threshing and cleaning grain at a certain price per bushel, say, for wheat and rye, five cents; barley, three cents; oats, two cents. The grain thus threshed is ready for market, thus saving to the farmer the cost of a farm fanning mill and the labor of recleaning and screening, as was the case until within the last few years.

The stacking of the straw was an important item, so as to save it for winter feed. This is now done by straw-carriers attached to the cleaning apparatus, which deposits the straw on the stack. In feeding these stacks of straw the stock are allowed to help themselves, making their beds on the lee side of the stacks in cold weather. We have wintered our stock at such stacks of straw for several winters, and have never had them do better, without any other feed but the straw, even when we have wintered them on shock corn without husking.

As the great mass of farmers on the prairies have no barns, this system of threshing has great advantages. The farmer is at no outlay of capital for machines; all he has to do is to furnish half the team, which is two span of horses; a hand to throw the bundles from the stack; one to cut the bands and place them on the thresher-table; one to look after the chaff and straw, and one to haul off the grain to the bin. The owner of the machine furnishes the driver, feeder, and one man to attend to the bagging and measuring.

Farmers who have large barns generally own a different style of machine. These are called railway or tread powers, and are adapted to one, two or three horses. Some of these have only separators attached, so as to separate the straw from the chaff and grain. In this case the threshing progresses according to the demand of the stock for the straw and chaff. Usually the machine is run a fourth or half a day at a time, according to the capacity of the floor to hold the straw. This mode of threshing, taking into view the value of the straw and chaff for feed, is, perhaps, one of the most economical that we have. The machine is cheap, and being always housed, will last a long time. We know of one that has been in use fifteen years, and which has cost little more than an occasional set of wooden treads or "lags," as they are called. and to all appearance is not half worn out. Two hands will do very good work with such a machine; but to work it to its full capacity requires four hands. In addition, the grain must be cleaned with a hand fanning mill. With this there are two or three advantages: the work is done at a leisure time of the year, and the stock have the full benefit of the straw and chaff; the aggregate cost of threshing is below every other mode.

To these horse-powers and threshers a winnower and straw-carrier is sometimes attached, to do field or out-door work; and some large farmers use them for barn work. The farmer of two hundred acres, half of which he has in small grain, and who has a barn, will find this kind of thresher very profitable. The objection that formerly applied to these powers, in regard to the danger of injuring the team when the band runs off the driving pulley, is now obviated by the use of a patent brake that instantly stops the machine in such an event. The machines are portable, and can be taken out to the wood-shed or any part of the farm, and are the most commonly used to saw wood for railroads and for domestic use. They are also used for running hay or straw cutters, for threshing and cleaning clover seed, grinding corn, and other farm uses. They are among the most valuable and durable of farm machines; but let no man own one unless he has a barn or other convenient place to house it. This remark also holds good for *all* farm machines and implements. The annual loss on farm wagons, machines, and implements by exposure to the weather, would nearly pay the whole tax levied on the farms, both personal and real, in the State. Three hundred dollar threshing machines, one hundred and fifty dollar reapers, and ploughs innumerable, stand out to the sun, wind, and rain. As the wood of most of these is of ash and pine, the deterioration is rapid. To these add sleighs, wagons, and other farm implements, and the list will be found enormous. In most cases the damage by rust and rotting is much greater than by use.

THE THRESHING OF CLOVER.

The labor of threshing and cleaning clover is no small part of the cost of this now indispensable seed. In the first place, the heads are threshed from the straw generally by treading with horses or oxen, and then are put through a clover-huller to clean the seed from the chaff. So tenacious is the chaff that seven to ten bushels of clean seed a day is good work. This requires two horses and one man. Machines are now being used to thresh and clean the seed at one operation, similar to that of other grain, by which about one-half the cost is saved. These machines cost about three hundred dollars. It is probable that the same result will follow their introduction that has followed the eight-horse power grain threshers, by placing them in the hands of jobbers, who will thresh and clean the farmers' clover seed at a fixed rate per bushel. Anything that will tend to cheapen this seed will be hailed with delight, and must have a beneficial effect on the soil. Clover is the great renovater of worn-out soil, and nothing but the high price of seed prevents its more general use.

Clover seed is saved from the second cutting of the crop, the first being used for hay. This crop yields three to five, and sometimes seven, bushels of seed to the acre. The straw has some value for feed, and the residue makes most excellent manure; but the cost of threshing, and the want of barns, has been the great drawback to a more extended growth for this purpose. Pennsylvania, with her immense barns, leads off in this product, followed by Ohio, leaving Illinois the lowest in the list—not from any intrinsic want in the soil, but from lack of barns and machines to thresh the seed.

The prairies are best adapted to this seed; for it can be grown in them pure, as the ground can be made clear, or is so already, of Canada thistles, charlock, daisies, &c. It is to be hoped that the new clover threshers and hullers may have a good effect on the crops at the west. The crop of 1862 is set down at a little over a million of bushels, worth probably, at wholesale, four and a half millions of dollars, of which the farmers of Pennsylvania received a million and a half, and those of Illinois but a hundred and twenty thousand dollars. The time is not distant when this will be changed, and the prairie States be the great producers of this seed.

DRAINING

This is an important topic for the west, and one that is beginning to attract considerable attention.

MOLE DRAINS.

These drains are made by a broad coulter, armed with a shoe that presses the earth on either side, except the bottom, and forces the clay up into the cut made by the coulter, closing it for several inches above the mole. The water filtering through the mole, gradually drains the land. It is chiefly used in low, wet, clay land; in fact it is of no value in a sandy or gravelly soil. In the prairie sloughs it is valuable for its cheapness, and to procure water for stock, making artificial springs that do not freeze over in the coldest weather. We have one of them now, nearly four years old, which appears as good as when first made, furnishing throughout the whole winter an ample supply of water, where we formerly had to use a pump for the greater portion of the winter. The supply of water failed for the first time during the drought of last season.

There are but few farms in the central and northern parts of the State but could have these artificial springs. In the basin of "Egypt," (that part of Illinois lying between the Big Muddy river and the Terre Haute and Alton railroad,) this would not be the case, as the soil is of such nature that the water does not freely percolate through it.

We have used this drain to some extent in upland, or rather in the upland depressions, with very good results. As a drain for orchards and garden ground, it would probably be of little value, while in all clay meadow land it is doubtless valuable. Should the drain fail once in ten years, yet it will prove the cheapest drain that can be made. The prairie soil is very easily drained—that is, all that portion having a dark colored clay loam. One drain in four rods would be ample in most cases, requiring forty rods to the acre. This, with the mole drain plough, would cost, say fifteen cents a rod, or six dollars an acre; while a tile drain would cost over twenty dollars at present prices.

Tile draining has not been introduced to any great extent at the west, as the demand for tile has not induced their manufacture, and until the tile are made here little will be done. If we had the tile, a large amount would be used in draining cellars and house grounds, and ultimately it would extend to the garden, the orchard, and the lowest parts of the farm. In our friable soil, so destitute of stone, one would suppose that the drains for tile could be nearly completed with animal power. Several machines for this purpose have been made, but thus far none of them have been fully approved, or have had sufficient trial to demonstrate their value. We think such a machine will yet be produced which will enable us to use tile drains at a small cost for the excavation of the trenches.

In the making of open drains, we have machines for doing it at a cost of ten to fifteen cents a rod, making a ditch three feet wide at the top, one at the bottom, and twenty-two inches deep. The power is applied to a capstan by two horses, which cut some forty rods at one setting of the capstan. The soil is thrown on one side of the ditch. This could be improved, so that a double ditch, or one of, say, five feet wide, could be cut. One team and two men cut from eighty to a hundred and sixty rods a day with this machine. The cost of the machine, with the necessary chains and rods, is two hundred dollars. The cost per rod is the jobber's price for the work, or ten to twelve and a half cents, including board and feed of team. These machines can only be used in slough land, in a wet condition, so that water will follow the ditch. Without this, the machine will not scour or run free, and the soil must be soft, so that the knives that cut the sides and bottom of the ditch can be easily drawn through it. We do not suppose it would work well in cultivated land even when wet, as it needs the thick, leathery, matted turf of the slough to hold the soil so that it could be carried by the mould board away from the ditch.

FARM MILLS.

The cheapness of corn, which is the principal feed for animals, both for work and fattening, has generally been so low, and labor, on the other hand, so high, that little effort has been made in this direction. Most of the mills used for this purpose are of cast iron, and are run by the use of a sweep. These, of course, only bruise the grain, and do not grind it so as to rupture the cells. There can be no doubt that there is economy in grinding corn and other grains for feed, when it can be done at a reasonable cost. To haul corn ten or fifteen miles and pay one-fifth for toll, is doubtful policy; and yet, to pay sixty dollars for a mill that will crush only thirty to forty bushels of corn in ten hours, with two span of horses, has no great promise of gain. If we could have a cheap mill to run with a railway two-horse power that would grind five bushels an hour, and at the same time not require a set of new grinders every other day, we might find it an advantage; but of the hundreds of farm mills that we have seen, not one of them comes within our idea of what such a mill ought and can be made to do. A durable mill of this kind would be cheap at a hundred dollars, and find a ready sale at the west.

SORGHUM MILLS.

These are now made strong and durable. Some of them have feed aprons and carriers to deposit the bagasse out of the way, when it can be hauled off for mulching or put in the manure pile. As a general thing farmers will do better to haul their sorghum to the steam works, rather than to work it up themselves; for, as a rule, farmers should not become manufacturers, as it will be found more profitable to give all such work into the hands of mechanics and skilled workmen than to attend to it themselves. The business of the farmer is to produce and deliver the raw material into the hands of the manufacturing process.

To a great extent the progress of agricultural improvement is due to the mechanical genius of the age. The drain of laborers from the farm to the army during the past three years has been nearly made good by the ingenuity of our workmen, who have given us wooden forms with sinews of steel.

MAIZE-PAPER AND MAIZE-CLOTH.

BY J. R. DODGE, DEPARTMENT OF AGRICULTURE

In the search through the vegetable kingdom for textile fibres, who thought of looking in the cornfields? Yet coarse textures of good quality, made from the husks (or "shucks," as often called) of Indian corn, can be seen at the Department of Agriculture.

And paper-making, an art very ancient, has levied upon the grasses, reeds, bamboos, the tender inner bark of trees, asbestos, flax, cotton, and to fill the cavernous maw of the insatiable printing-press has even stripped the beggar of his rags. But rags are getting dear; people, in these war-times, who were formerly covered with them, have not one to their backs, and the paper-maker is compelled to seek a substitute. Straw, a product of our fields, its stacks so profusely studding the area of every farmstead with an effect so picturesque and golden, yet so generally and contemptuously cast under foot of cattle as worthy only of speedy disorganization and subsequent food for living plants, was also sought as a material for paper; and the experiment has only met with partial success.

The amount of paper consumed is constantly and rapidly increasing in quantity and widening in its range of uses, which are now so numerous as almost to defy enumeration. For printing, writing, drawing, architectural decoration, cigarette-making, parcel wrapping, and box and basket making, among other uses, it has long been valuable; and now it is invading the domain of cloth, ranging from the delicate counterfeiting of a linen collar for the neck of man or woman to the seemly substitute for a seamless bag. With so much inflation of paper issues, in so many forms, it is not amazing that the attention of paper-makers should be turned to maize.

Nor is this use of corn fibre altogether original; there is a record of two maize-paper establishments existing in Italy in the eighteenth century. The quality of this paper is not stated. Recently one Moritz Diamant, a Bohemian, suggested to Baron Bruck, Austrian minister of finances, a process for making paper from maize. The imperial paper-mill at Schlögelmuhl, near Gloggnitz, undertook the manufacture, under Diamant's direction; the product was not quite satisfactory either in quality or cost of manufacture. His first application for government aid was in 1856. After the unsuccessful experiment, followed by ineffectual efforts to induce private individuals to continue the work, he made a second request of the minister of finance, fortified with recommendations from judicious, practical men; and the experiments were continued, but were not yet fully successful. To reduce the cost, a "half-stuff factory" was erected in a maize district, designed to cut off the heavy expense of transportation of the crude material. The product was so inferior that Diamant became disheartened, absented himself, and was released from his position, leaving the question unsolved. The cost of this experiment was about $13,000, which had been advanced by the imperial paper-mill.

The direction of the Schlögelmuhl paper-mill, not disposed to discontinue the effort to make a good and cheap paper, continued the experiments, aiming first to reduce the cost of production; and secondly, to investigate the cost of using only the finest husks enclosing the ear, rather than the leaves of the stalk entire.

The result was, if not a material for paper cheap as rags, the discovery of a new fibre capable of being spun and woven, and furnishing, in its waste, a cheap paper.

The endeavor to procure paper from unworn plant fibre was always met by its great expense; and the fact that cotton, hemp, and flax were first woven and worn, and afterwards converted into paper, suggested the possible conversion of the new material into textures first, and paper afterwards, and led to the production of coarse cloth from the husks of maize. Thus the first process became last, and the manufacture is yet in a crude and imperfect state, having been experimented upon for only two years. It is not expected to compete with fine linen, but is designed as a substitute for common flax and hemp linen, for oil-cloth, tar-cloth, &c. Specimens of crash are on exhibition at the Department of Agriculture, and oil-cloth which seems a perfect *fac simile* of the best oil-cloth of commerce. These specimens look well; their durability will be tested by use.

Three components are developed by the result of the process: fibres, flour-dough, and gluten. The fibres are spun and woven; the "flour-dough," or nutritive element, has a pleasant taste, (improving poor qualities of flour by an admixture,) is wholesome, and has the peculiarity of resisting putrefaction for months; and the waste, consisting of gluten and broken fibres, is used for making paper. Thus our Indian corn furnishes the ear, and this maize extract, for the food of man, fibres for his clothing, and beautiful paper from the shorter fibre and gluten; and when the textures are worn, they are reduced to rags and converted into paper. The lower part of the stalks furnish fuel for the steam-boiler used in reducing the raw material to its separate elements.

The progress made in perfecting the manufacture of paper has of late been very satisfactory. Evidence of this is abundantly afforded in the specimens recently received at the department from Dr. Chevalier Auer de Welsbach, director of the imperial printing establishment at Vienna, and superintendent of the imperial paper-mills at Schlögelmuhl, who has been unremitting in his efforts, which have been crowned with a large measure of success. Among these papers are found parchment and document papers of great strength and durability; tracing paper of superior tenacity and transparency—an effect of the natural gluten of the husks, rendering unnecessary the present expensive process of its manufacture, and supplying draughtsmen with the cheapest material known; letter paper in various styles and in several colors, with a smooth and polished, but soft surface, which takes the ink kindly; "chancery papers" of great variety—in size, very heavy and durable; beautiful silk paper of several colors, of wonderful delicacy in structure and finish; paper for the manufacture of artificial flowers, in lilac, rose, blue, green, and brown, gossamer-like, yet strong, weighing but six pounds to the ream; and cigarette paper, but little heavier, weighing but seven pounds to the ream. Of most varieties, both machine and hand papers are produced.

A peculiarity of this paper, due to the large proportion of gluten it contains, is worthy of mention. Placed with common paper in water, and left to soak until the latter will fall to pieces by its own weight, the maize-paper, on trial, seems nearly or quite as tenacious as ever.

The price may be judged by the following specimens, reduced to our currency:

"Royal chancery, 32 pounds, 20 by 26 inches, \$4 16 per ream.

"Letter paper of different kinds, from 22 to 32 cents per pound. A medium specimen, weighing 12 pounds to the ream, 17½ by 22½ inches, is valued at \$2 40 per ream.

"Flower paper, weighing 6 pounds, \$2 88 per ream.

"Cigarette paper, 7 pounds to the ream, 19½ by 28½ inches, brown, \$2 24; white, \$2.

"Silk paper, 4 pounds to the ream, 14½ by 17½ inches, white, \$1 60: yellow, \$2 20 per ream.

"Drawing paper, 16 pounds to the ream, 13 by 16 inches, \$4 80 per ream."

The measures are Austrian, the pound being 1.2352 English pounds. Therefore a deduction of nearly twenty per cent. from the price per pound would be necessary in calculating the price by the English pound.

The extreme cheapness of the drawing papers is due to the great amount of gluten contained in the material. It has a natural preparation for such uses.

The process of manufacture is claimed to be simple; the humblest laborer can readily understand it with little instruction, and practice it with success.

The cost of the husks (and it seems that leaves are, to some extent, included) is from 32 to 56 cents per 125 English pounds, (per centner,) or $9 per ton at the higher price, which represents more the labor of gathering than the value of the material. This is, of course, in the locality of their production.

The cost of extracting the fibre from 100,000 centners (6,250 tons) is estimated: for coal and other material, $15,705; labor, $6,400; interest and loss, $4,296; raw material, including local freight, $80,000; total, $106,401. To this add for laborers and repairs to swell the total to $109,496.

The product is 10 per cent. of spinning fibre, 19 per cent. of paper stuff, and 11 per cent. of feed stuff, or 40 per cent. in all, leaving a loss of 60 per cent. The spinning stuff is worth $64,000; paper material, $72,200; feed stuff, $15,400; total, $151,600. Deducting the expenses of manufacturing, a profit of $42,104 is shown.

The interest included in the expenses is five per cent. upon capital invested, which includes $6,400 for land, $12,000 for the building, and the remainder for steam boilers, washing and bleaching vats, steam-engine, pumps, pipe, &c.

This is a brief record of a persevering and highly successful series of experiments in perfecting corn-paper manufacture. The process has been patented in this country, as well as in Austria and other European states; and an ample reward will doubtless be realized to its ingenious originators.

But it should not be understood, in this acknowledgment of the labors and inventive genius of Austrians, that this country, the native habitat of "Indian corn," has utterly ignored the value of this abundant fibre. On the contrary, maize-paper was made in this country a full half century before the date of its manufacture in Austria. If the discovery was not advanced to ultimate perfection, it was because other paper material was cheap and abundant, and other enterprises of too urgent and immediate importance to warrant sufficient present remuneration. An American enterprise must pay *to-day*, as well as in the future.

In 1802 a patent was issued by the United States to Burgess Allison and John Harkins, of New Jersey, for making paper of corn husks. Another patent was issued in 1838, for preparing corn husks for making paper, to Homer Holland, of Westfield, Massachusetts. Others have since been issued—one in 1860 for making paper pulp of corncobs alone, or cobs and husks together.

Whatever is hereafter accomplished, in maize-cloth or maize-paper, this country must have a large interest in it. Not only do we grow some six hundred millions of bushels of corn, but it is believed, from the inspection of samples received from Austria, that our husks are of finer texture, and better adapted to the manufacture of superior goods, either of cloth or paper.

THE ICE TRADE.

BY LEANDER WETHERELL, OF BOSTON, MASS.

It has been often said of Massachusetts that among her chief productions for export are ice and granite; and it is true that those engaged in the ice and granite trade of Massachusetts have given employment to many seeking labor, have grown rich themselves, and, besides, have in no way impoverished the State.

In 1805–'06 the ice trade was begun* in Boston by Frederic Tudor, then a young man. He has recently deceased at the age of more than 80 years, and was at the time of his death still engaged in the business entered upon when he was but 22 years of age, as he recently informed the writer. In 1805 Mr. Tudor made his plans to engage in this trade. He first sent agents to the West Indies to procure information, but finding no one willing to ship so strange an article, he was compelled, in 1806, to purchase a vessel, the brig Favorite, of 130 tons, which he loaded with ice from a pond in that part of Lynn, now Saugus, near Boston, belonging then to his father, and sent to St. Pierre, Martinique.

This first cargo of ice from Boston was loaded at Gray's wharf, in Charlestown, where the shipment of ice has centred ever since, it having extended both ways to other wharves. The first shipment of 130 tons was followed, in 1807, by another of 240 tons, by the brig Trident, to Havana. The first shipment was attended with a loss of about $4,500, and subsequent ones resulted in heavy losses. When the embargo and the war put an end to foreign trade, the ice trade had yielded no profit to its projector.

In 1815, after the close of the war, Mr. Tudor resumed the ice trade under a contract with the government of Cuba, which granted certain privileges and a monopoly, enabling him to pursue the trade without loss. In 1817 he introduced the ice trade into Charleston, South Carolina, where he continued it until interrupted by the rebellion. In 1818 he extended it to Savannah, Georgia, and in 1820 to New Orleans, where, also, it was continued until interrupted by secession. Meanwhile it had been tried again by other parties sending to Martinique and St. Thomas, but it failed. It was also tried by Mr. Tudor at St. Jago de Cuba, where, after a trial of three years, it failed.

The first shipment of ice to the East Indies was made by Mr. Tudor in May, 1833, in the ship Tuscany, for Calcutta, and since then Mr. Tudor has extended his business to Madras and Bombay. Previous to this the ice trade was chiefly confined to the originator of the business, though it had been engaged in to some extent by other parties, but it was abandoned as an unprofitable operation. In 1832 the whole amount exported was 4,352 tons taken from Fresh Pond, in Cambridge, by Mr. Tudor, and shipped by him. Down to that time ship-owners objected to taking ice as freight lest it should injure their vessels

*Isaac Sturdevant, late of Portland, Maine, stated frequently to a large dealer of ice in Boston that he was cabin-boy of the schooner Favorite that sailed from Portland in the winter of 1798–'99 freighted with wood for New York, and after arriving in port and discharging her freight, a gentleman from Charleston, South Carolina, chartered the ship Favorite, in the month of February, 1799, to take a cargo of ice, cut from a pond in New York, near Broadway and Canal street, to the city of Charleston, seven years before Mr. Frederic Tudor sent out the brig Favorite, loaded with ice, to Martinique. Admitting this to be true, it does not, however, derogate from nor invalidate the claim of Mr. Tudor as the originator and successful founder of the ice trade in the United States. To him does the honor justly belong, and to him is it most cheerfully awarded.

and endanger the safety of voyagers. The mode of constructing ice-houses, necessary at home and abroad, was not then well understood. The same was true of preparing ships to receive cargoes of ice. The implements and machinery for cutting, transporting, hoisting into ice-houses, for storing, discharging, and lowering into the holds of vessels, &c., were to be invented. Since 1832 great progress has been made in all these particulars. In 1836 other parties engaged in the ice trade, and in other places, out of Boston, but without success. "The facilities for cheap supplies of ice and low freights," said Mr. Tudor, in a report to the Boston Board of Trade in 1857, "keeps the trade where it began, and at the same spot for shipments, and this having been the case for about fifty years, it is probable the century will close without its removal, and the demand for ice meanwhile will constantly increase."

The ice trade has doubtless preserved the Calcutta trade almost exclusively to Boston, and would do so for China were that country in a quiet condition, added Mr. Tudor, whose freights paid to India for ice down to 1857 amounted to from ten to fifteen per cent. of the earnings of the whole run of the ships out and home again, and it is earned without cost or deduction to the charterer or ship-owners. So it is with vessels bound to the Gulf of Mexico, taking from 50,000 to 60,000 tons of ice annually, from which the owners derived, on an average, $120,000 freight money, the shippers paying the expense of loading and discharging the cargoes.

The following table will show the beginning and progress of the ice trade as near, says Mr. Tudor, as can be ascertained, dropping fractions, exclusive of the home trade of consumption:

1806, 1 cargo	130 tons.
1816, 6 cargoes	1,200 tons.
1826, 15 cargoes	4,000 tons.
1836, 45 cargoes	12,000 tons.
1846, 175 cargoes	65,000 tons.
1856, 363 cargoes	146,000 tons.

The exports of 1856 were made to Philadelphia and nearly every port in the United States south of that; to South America, the East and West Indies, to the English settlements in India, to Canton, Mauritius, and Australia. Since this statement, made by Mr. Tudor in 1857, the trade has increased and extended to other places. The mention of these ports will serve to give the reader some idea of the extent of the ice trade of Boston.

In 1847 the shipments of ice coastwise from Boston were 51,887 tons, and were to nearly thirty places from Philadelphia to Galveston, Texas. These shipments were made in 49 ships, 39 barks, 45 brigs, 125 schooners, making in all 258 vessels. In the same year, 1847, the ice shipped to foreign ports amounted to 22,591 tons, and was sent to the following places: Cuba and the West Indies, South America, Calcutta, China and the East Indies, and to Liverpool. These shipments were made in 21 ships, 24 barks, 38 brigs, and 12 schooners, making in all 95 vessels, which, with the 258 vessels engaged in the coastwise trade, make an aggregate of 353 vessels engaged in the ice trade, or partially so, in 1847.

The freights during this year, 1847, averaged, it is said, as high as $2 50 per ton, which would amount, on the 74,478 tons shipped coastwise and abroad, to $186,195. The cost of securing ice and storing it varies according to the season, and the expense of shipping varies also as the expenses of fittings vary required for different voyages. Taking all the contingencies into the account, the cost of ice on board a ship is estimated to average $2 a ton, which would give for the above quantity shipped $148,956. In 1847 upwards of 29 cargoes of provisions, fruits, and vegetables were shipped in ice to ports where otherwise they could not have been sent, as, for example, to the West

Indies and Calcutta, the invoiced cost of which averaged about $2,500 each, making an aggregate of $72,500. To these items may be added the profits of the trade to those engaged in it, stated to be $100,000, making a total return of $507,651.

Thus has the ice trade had a tendency to increase the commercial marine of the United States. Formerly a large portion of the vessels engaged in the freighting trade from Boston sailed in ballast, depending for remuneration on freights of cotton, rice, tobacco, sugar, and other tropical productions, and often having to compete with vessels of other nations, which were freighted out and home. Ice has furnished outward freight from Boston to those places where freighting vessels ordinarily obtain cargoes. Accordingly the ice trade has generally been an unsuccessful business to places where profitable return freights cannot be obtained, because in such places the charge on ice is so high. So, also, at ports even where it is demanded as a luxury, it can hardly be afforded when those ports have nothing to export, so as to refreight the vessels discharging cargoes of ice.

In preparing vessels for the ice trade formerly their holds were closed up on all sides with boards nailed to the joist or ribs, with double bulkheads fore and aft, the spaces thus formed being filled with spent tan, rice hulls, swamp hay, straw, wood shavings, or like materials. These spaces thus filled were greater or less according to the season, length of the voyage, &c. The surface of the ice was covered with like material except tan. Sawdust is now used for long voyages. It is placed immediately between the ice and the sides of the hold of the ship. This material is obtained from Maine, where it was once valueless, but now has a commercial value. In 1847 4,600 cords of it were brought to Boston at an average price of $2 50 a cord when delivered.

The returns of the ice trade, including freight, are almost clear gain to our country. But for this trade the labor expended on ice, the material for its preservation, and the means for its transportation would not be needed. Thus has a business been created, a coastwise and foreign trade grown up, founded on an article of no value prior to 1806, now exceeding, probably, a million of dollars a year, as it had nearly reached that in 1857, as stated by Mr. Tudor.

He said then that $25,000 dollars were annually expended by several companies engaged in shipping ice for shavings, sawdust and rice chaff. Planing-mills and saw-mills now find ready sale for shavings and sawdust.

In 1856 Mr. Tudor said in his last report that the average of freights paid for ice shipped at Boston was $2 50 per ton clear to ship-owners. Therefore, said Mr. Tudor, they received from this trade in 1856 $365,000, and probably a profit unequalled in any other department of their business. Besides, railways and wagons were paid $100,000; laborers, $160,000; towns for taxes of ice privileges and ice in store, $1,500; and wharves, $20,000 to $25,000.

Then there were 93 wagons and 150 horses employed in distributing ice in Boston and vicinity; 60,000 tons being thus retailed to 18,000 families, hotels, stores, saloons, and factories. We have no more of winter-strained oil, it now being better strained in summer by the use of ice. The coast fishermen use it to great advantage in preserving their fish in the very best condition till they come into port. Ice has become almost as important an article of consumption in families as salt. Once regarded as a luxury, it has now come to be held as indispensably necessary to the promotion of health and comfort.

In 1847 ice was sold in Havana for 6¼ cents a pound, and the demand had not increased from 1832, when 1,112 tons were shipped thither. In New Orleans it sold for half a cent to three cents a pound, and had increased from 2,310 tons to nearly 30,000 tons. At Calcutta, where ice was introduced in 1833, with a shipment that year of 201 tons, the price had never been above 6 cents a pound, and in 1847 sold for 2½ cents. The export meanwhile had increased 3,000 tons, 50 per cent. of which is ordinarily melted before the cargoes can be discharged.

The consumption of ice in Boston and neighborhood in 1847 was 27,000 tons, which cost $54,765. It retailed at an average price of about 13½ cents per 100 pounds, making 27,000 tons to sell for $72,900, leaving a profit of $18,135 to be divided then among the seven principal ice dealers.

As ice is used and shipped at all seasons, large ice-houses are required to store and preserve it. Exclusive of the ice-houses at Charlestown, in which ice is kept for short periods, there had been erected in 1847 and previous thereto—

At Fresh pond, in Cambridge, ice-houses capable of holding	86,732 tons.
At Spy pond, in West Cambridge	28,000 tons.
At Little pond, West Cambridge	2,400 tons.
At Wenham pond	13,000 tons.
At Medford pond	4,000 tons.
At Eel pond, in Malden	2,000 tons.
At Horn pond, in Woburn	4,000 tons.
At Summer's pond	1,200 tons.
Total	141,332 tons.

In 1864 Mr. Addison Gage, of Boston, who has long been engaged in the ice trade, furnished the writer with the following estimates of the quantity of ice cut at the following-named ponds:

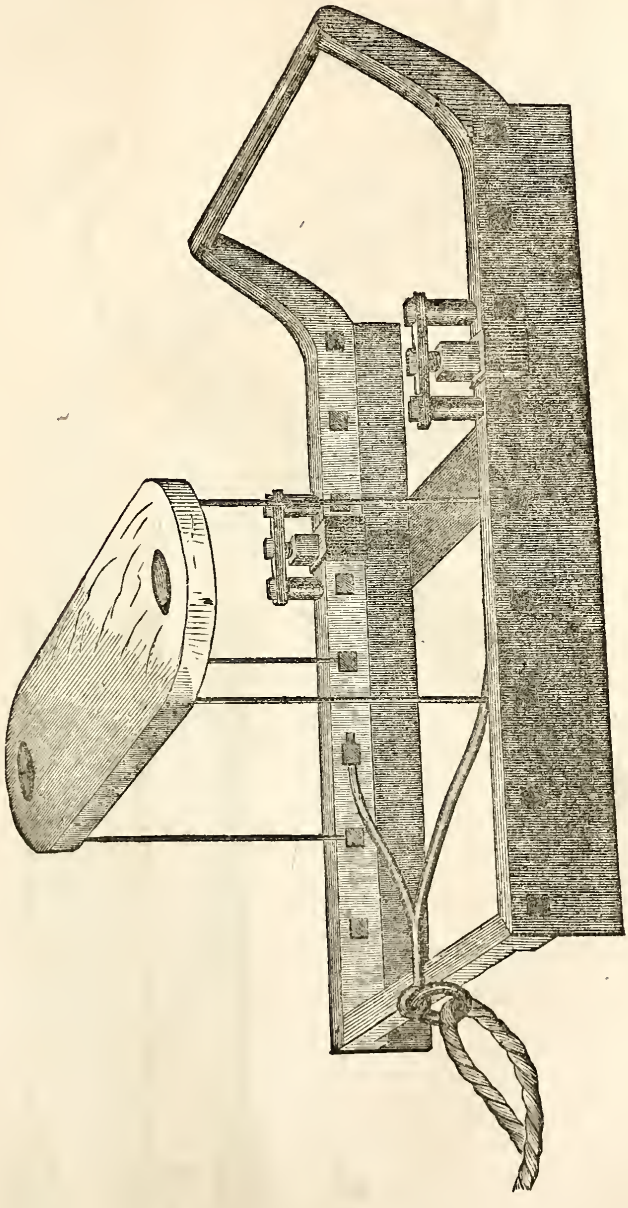
At Fresh pond, in Cambridge	95,000 tons.
At Spy pond, West Cambridge	75,000 tons.
At Little pond, West Cambridge	12,000 tons.
At Wenham pond	30,000 tons.
At Eel pond, in Malden	3,000 tons.
At Horn pond, in Woburn	15,000 tons.
At Smith's pond, in South Reading	10,000 tons.
At Quanapowitt pond, in South Reading	15,000 tons.
At Lynnfield pond, in Lynnfield	15,000 tons.
At Hackett's pond, in Andover	10,000 tons.
At Leach's pond, in North Chelmsford	15,000 tons.
At Sandy pond, in Groton	15,000 tons.
At Charles river, Waltham	5,000 tons.
At Hammond's pond, Newton	3,000 tons.
At Jamaica pond, West Roxbury	10,000 tons.
At Assabett pond, Assabett	15,000 tons.
Total	343,000 tons.

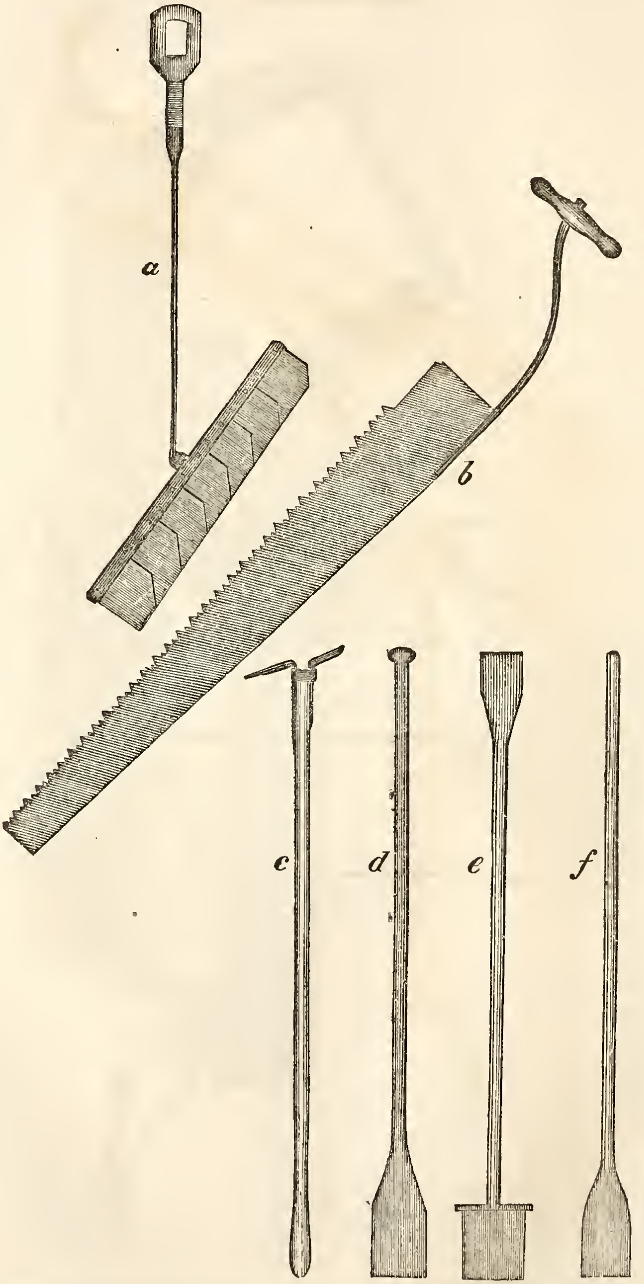
In the winter of 1847 $650 were daily paid for laborers and $230 for horses. It was stated that on an average there are not generally more than twenty days in a season favorable for cutting and securing ice. Wages one dollar a day at that time.

At the beginning of ice cutting and storing only farm implements were used. The business, however, soon developed the necessity for implements and machines for doing the work, which were supplied.

In 1847 more ice was secured in a day than would have been requisite to supply the trade in 1832. Ordinarily, before ice is formed of sufficient thickness, snow falls, which, if the ice be four or more inches thick, is removed by a "snow-scraper," in case the snow is not of sufficient weight to bring the water above the ice, but if it does, after being frozen, the snow ice is removed by an "ice plane," which cuts about two inches deep and twenty-two inches in width. This machine is drawn by two horses, and is directed by inserting its guides into grooves before made by the ice-marker. The chips are removed in the same manner as dry snow. This is often attended with great expense, and if the weather is warm immediately after, is a total loss; yet if this be

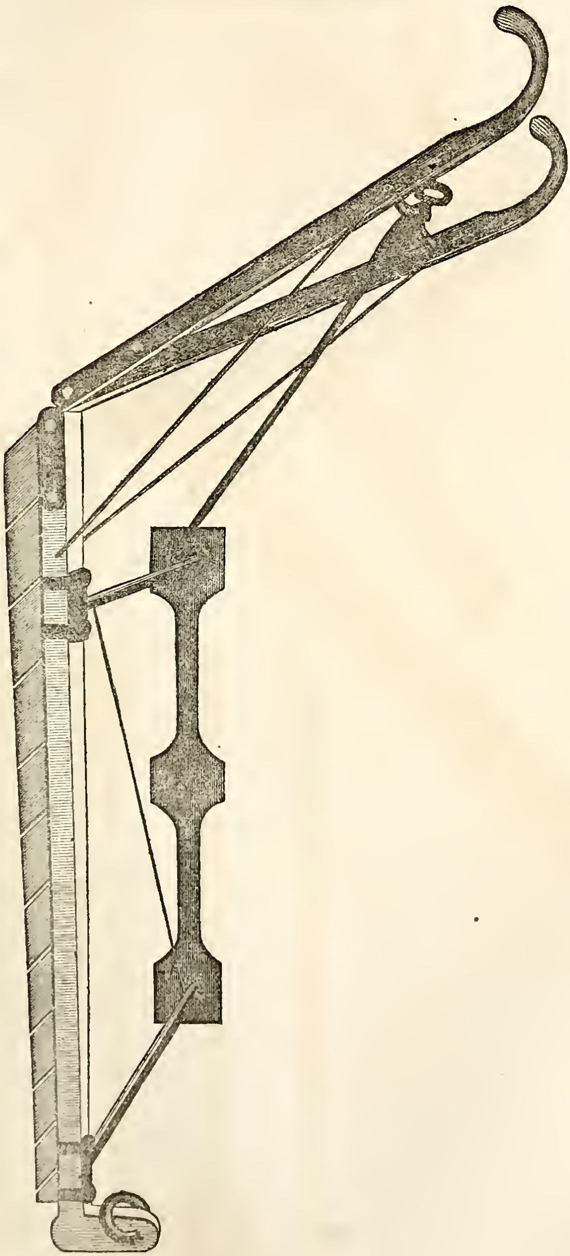
SNOW PLANE.



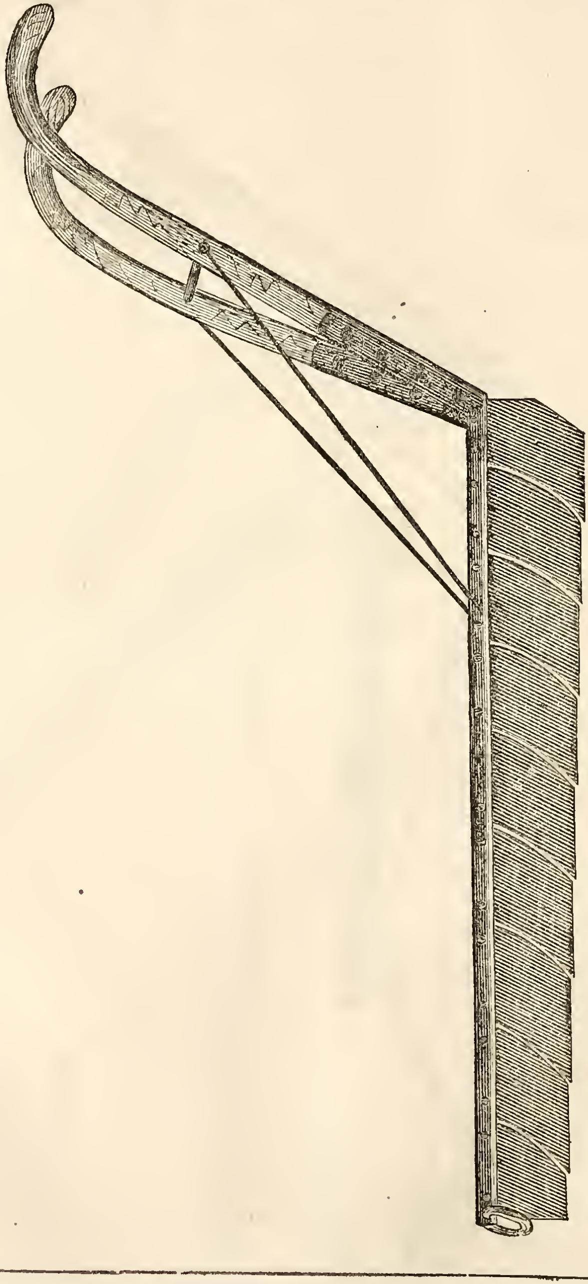


(a.) **HAND GROOVE.** (b.) **SAW.** (c.) **ICE HOOK.** (d.) **CALKING BAR.**
(e.) **POND BAR.** (f.) **CHISEL BAR.**

SWING-GUIDE MARKER.



EIGHT-INCH CUTTER.



not done, and the cold continues, there will be little or no increase of thickness of ice. One firm lately expended $8,000 in cleaning the ice for cutting. Ice being of sufficient thickness, and the snow and snow ice removed, first a straight line is made with a hand groove with a straight-edged board for a ruler; then the swing-guide-marker is used, making parallel grooves twenty-two inches apart. When the ice is thick enough to cut, it is marked by parallel lines twenty-two inches apart, crossing the former marking at right angles. Then in every second line each way the six and eight-inch cutters are drawn, cutting two-thirds through the ice; also the ten and twelve-inch cutters are employed when necessary. Then the lines where they intersect are calked with the calking-bar, where the ice is to be cut off, to prevent the water from running through the seams and freezing. Strips are sawn from twenty-five to fifty feet in length, two, four, or six deep lines in width, as convenient for floating, when the strips or sections, thus separated, are floated near the elevator, where they are split with pond-bars; each cake of ice, usually 44 inches square, is then passed on to the elevator or inclined plane with endless chain, over which it is passed under a plane, reducing it to a gauged thickness, leaving two projections or ribs on the top above the surface in order to prevent too close contact in packing—a consideration which greatly facilitates discharging ice for removal. It then passes under brooms which sweep away all loose particles from the surface of the ice, thus leaving it in the best possible condition for packing use. When the ice-house or vault is filled, the ice is covered with shavings or swamp hay. When taken out, every block is hand-grooved and split into four lesser blocks of twenty inches square for transportation, whether by ships, cars, or wagons. Some pack their ice in blocks twenty-two inches square, instead of forty-four inches square, deeming the former better economy. The modes of cutting, storing, and discharging ice vary somewhat and probably ever will. A block of ice twenty-two inches square and ten inches thick weighs 150 pounds, as stated by an ice dealer. Steam power is employed by some of the ice-cutters in lifting the ice from the ponds and putting it into the ice-houses.

Ice-houses are now built above ground and on the borders of ponds where ice is cut. There are about thirty-five ice-houses or vaults around Fresh pond, in Cambridge. They are ordinarily built contiguous to the pond where the ice is cut and stored, sometimes of bricks, but more commonly of wood. When of wood, the walls are double, formed by two ranges of boarding, the space between the boardings outside and inside being filled with refuse tan wet from the yard. In tropical climes ice-houses are built with two spaces to be thus filled with tan or other suitable material. One ice-house was built at Fresh pond covering 36,000 feet, with vaults 40 feet in depth, with brick walls four feet thick, including two sets of air spaces. What has now been stated in regard to building these ice-houses is sufficient to suggest to farmers and others, who may desire to build for private purposes, the best way of constructing them. For this vicinity but one air space or filling is deemed necessary.

In New Orleans, before the rebellion, substantial brick ice-houses had been erected at a cost of $200,000. Similar outlays had been made in Mobile, Charleston, and other southern cities.

The consumption of ice in Boston and vicinity in 1857, as set down by Addison, Gage & Co., was about 70,000 tons; in 1858, 74,000 tons; in 1859, 79,000 tons; in 1860, 85,000 tons; in 1861, 92,000 tons; in 1862, 105,000 tons; and in 1863, 97,000 tons. The ice crop of the winter of 1862–'63, was very light, most of the ice used having been cut in March, 1863.

The freights for ice shipped coastwise in 1857 was $2 a ton; in 1858, $1 75; in 1859, $2; in 1860, $3; in 1861, $3 50; in 1862, $1 and in 1863, $2 50.

Foreign shipments for 1857, \$6 per ton; in 1858, \$5 50; in 1859, \$5 50; in 1860, \$6; in 1861, \$6; in 1862, \$7; and in 1863, \$7.

These are about the average cost per ton for both coastwise and foreign shipments of ice for the years named above, as furnished by one of the largest ice companies in Boston. It has been as low as 50 cents a ton for coastwise trade; and it has been as high as \$10 per ton for foreign trade.

Ice has been exported from Boston to New York city. It was done in 1863, by Addison, Gage & Co., for \$11 a ton. The quantity of ice used in New York in 1855 was estimated at 305,000 tons. Rockland lake furnishes 120,000 tons; Highland lake, 30,000 tons; New Rochelle, 10,000 tons; Athens, 15,000 tons; Rhinebeck, 18,000 tons; Kingston creek, 60,000 tons; Catskill, 20,000 tons; Barrytown, 12,000 tons. The Knickerbocker Company store 113,000 tons of this quantity; the remainder being chiefly stored by four other firms. Albany, Hudson, Newburg, Poughkeepsie, and Troy, severally store annually from 10,000 to 30,000 tons. Syracuse began to store ice in 1844, and the quantity there used now is nearly 20,000 tons, mostly from Onondaga lake. Rochester and other cities in western and central New York have followed the example of Syracuse. The average price is 25 cents a hundred. Cincinnati and Chicago are chiefly supplied from the lakes, the former city receiving her supply from Cleveland. Places along the Mississippi are supplied from the neighborhood of Peru, Illinois. Farmers are building ice-houses over the country, and thus storing what ice they need for home consumption. Once they regarded ice as a luxury, but now they deem it a necessity.

In Newport, Rhode Island, about 10,000 tons of ice are cut and stored yearly. Mr. Daniel Cook, of that city, states that the ice business was begun there about fifteen years ago, at Lily pond. Mr. Cook puts up about 5,000 to 5,500 tons a year. No ice is exported, and ordinarily none imported, though last season was an exception, as Mr. Cook was obliged to ship some from Bath, Maine, and paid \$15 a ton, weighed where it was shipped. He cuts blocks four feet square, elevates them over an inclined way by steam at the rate of thirty tons an hour. The pond from which the ice is taken is good water, as it is fed with springs.

Considerable quantities of ice are cut and stored in Maine; yet it is true, as said by an English writer, the ice trade is chiefly carried on by Boston and Norway; the latter country supplying the English market with ice at lower rates than can be done by Boston exports. Nearly \$2,000,000 are invested in the ice trade of Boston and vicinity, employing about 550 ships, and giving employment to about 4,000 persons.

Though it is more than half a century since the ice trade was introduced by Mr. Frederic Tudor, yet millions in civilized society pine for the want of it in hot weather. It is almost a necessary of life, and we hope the time is not distant when farmers will gather their ice crop as regularly as their farm crops.

Mr. Everett, on one occasion spoke of the foreign ice trade as follows:

"When I had the honor to represent the country at London, I was struck one day, at the royal drawing-room, to see the president of the Board of Control, (the board charged with the supervision of the government of India,) approaching me with a stranger, then much talked of in London, the Baou Dwarkananth Sagore, a Hindoo of great wealth, liberality, and intelligence. He was dressed with oriental magnificence, having on his head as turban a rich cashmere shawl, held together by a large diamond brooch, with another cashmere around his body; his countenance and manners were those of a highly intelligent and remarkable person, as he was. After the ceremony of introduction, he said that he wished to make his acknowledgments to me, as the American minister, for the benefits my countrymen had conferred on his countrymen. At first I did not know to what he referred. I thought he might have had in view the mission schools, knowing, as I did, that he himself had done a great deal for education. He immediately said, however, that he referred to the cargoes of ice sent from America to India, conducing not only to comfort, but health; adding that numerous lives are annually saved by applying lumps of American ice to the heads of patients in cases of high fever."

The ice exported from Boston is acknowledged to be of superior quality to that from other localities. It is not as porous as most of the ice obtained elsewhere, and, besides, it is taken from clean, clear ponds of soft water, a consideration too little regarded.

The antiseptic property of ice creates a large demand for this commodity in northern as well as in southern cities and towns.

Dealers in fresh meats and fish would not know now how to carry on their business in the warm season without ice. Hence there is a large demand now for ice for such purposes; also for keeping butter and other perishable articles of diet. Vessels are no longer under the necessity of shipping live animals for the sake of having fresh meat at sea. By means of an ice vault supplies can be preserved for a long voyage. As a medical agent in tropical regions, as seen from the report from India, it is deemed of the highest value, especially in cases of fever. Its introduction there is deemed by the inhabitants a great blessing.

Machines for producing artificial ice have been invented, but it does not come within the province of this article to describe them.

Since 1860, owing to the rebellion, the southern ports, formerly the ice dealers' best markets, have mostly been closed to the ice trade.

In 1860 New Orleans alone consumed nearly 60,000 tons of Boston ice. Meanwhile the home or local trade has largely increased, the consumption of ice being not less than 100,000 tons in Boston and its immediate vicinity.

ICE SHIPPED.

The following statements show the custom-house clearances, with the estimates of the coastwise shipments, in 1858, as arranged from the Boston Board of Trade reports for 1858–'59–'60–'61 and '62:

In 1858, to the East Indies and China	12,693 tons.
Cuba, South America, and other southern ports	24,262 tons.
Coastwise, United States ports	55,640 tons.
In 1859, to the East Indies	14,031 tons.
Cuba, South America, and other southern ports	26,886 tons.
Coastwise, United States ports	88,486 tons.
In 1860, to the East Indies	14,803 tons.
Ceylon	1,407 tons.
Cuba, South America, and other southern ports	29,042 tons.
Coastwise, United States ports	97,211 tons.
In 1861, to the East Indies, Ceylon, and China	17,308 tons.
Cuba, South America, and other southern ports	25,517 tons.
Coastwise, United States ports	56,948 tons.
In 1862, to the East Indies and Ceylon	17,416 tons.
Cuba, South America, and other southern ports	25,814 tons.
Coastwise, United States ports	34,872 tons.

The total exports of ice from 1848 to 1857 were as follows:

In 1848	57,507 tons.	In 1856	125,814 tons.
In 1849	66,308 tons.	In 1857	112,972 tons.
In 1850	69,623 tons.	In 1858	92,595 tons.
In 1851	99,578 tons.	In 1859	129,403 tons.
In 1852	96,482 tons.	In 1860	142,463 tons.
In 1853	82,572 tons.	In 1861	99,773 tons.
In 1854	115,315 tons.	In 1862	78,102 tons.
In 1855	98,080 tons.	In 1863	133,000 tons.

A heavy dealer in ice, both coastwise and foreign, says the coastwise estimates are greatly below the actual accounts thus shipped. The trade with southern ports not being required to obtain custom-house clearances, the amount of ice thus shipped is left to be estimated, which estimates must, as in all similar cases, vary somewhat, leading only to the approximation of facts. With the trade at foreign ports the case is different, as stated.

DOGS AND DOG LAWS.

"Beware of dogs."—ST. PAUL.

OF all the family of the *Sanguinaria*, the genus *Canis familiaris* is universally known and generally tolerated by man, while *C. lupus* and *C. aureus*, the northern wolf and Asiatic jackal, the congeners, and, indeed, the original progenitors of the dog, are universally execrated. From so detestable an origin the dog has won the affections of the human race by many instances of fidelity and gratitude, creating a sympathy no doubt intensified by contrast of such qualities with the meanness of his origin.

The dog, in the Bible, is synonymous with things unclean and disreputable and mean. Job, when derided, reminded his self-appointed tormentors that their fathers were men whom he would have disdained to place with the dogs of his flock. David, in the depth of his humiliation, when complaining that he had been brought to the "dust of death," and that his bones looked out and stared at him, exclaimed bitterly, "Dogs have encompassed me." And St. John, in his revelations, by way of antithesis to the blessedness of those entitled to "enter in through the gates into the city," adds: "For without are *dogs*, and sorcerers, and whoremongers, and murderers, and idolators, and whosoever believeth and maketh a lie." The only scriptural mention of a benefit received from a dog is in the memorable case of Lazarus.

Dogs have been of great service to man, and few, if any, would favor their extermination. Poets have sung their praises not alone in doggerel, but in exalted numbers; and women have petted them from the earliest historic periods. Children have fondled them, abused them with more or less impunity, and cherished for them an affection worthy of a higher object.

A few dogs, well trained and good-tempered, might be tolerated. But when they swarm over the land, making night dismal with their howlings, and banishing sleep from the invalid's eyes, when sheep are slaughtered mysteriously, and cattle are mangled, and when every month renews the horrible, ghastly sufferings of the victims of hydrophobia, it is time that sentimentalism and feminine tenderness for a half savage brute should measurably vanish from a dog-cursed community.

When such a period has arrived, the usual and effective expedient to limit and restrain the evil has been taxation. England has long had a dog tax of twelve shillings sterling upon everything of the dog kind except the shepherd dog. Scotland and Canada have taxed them. Indeed, dog taxation in some form has been resorted to in every civilized country. Many curious police and sanitary regulations have existed. In Munich, Austria, each quarter is obliged to send all its dogs to the police on a certain day, twice every year. If found in health, the dog receives a ticket which he wears round his neck; if old or unsound, he is condemned to death. Any dog without a ticket is liable to suffer death. In this country there is an annual slaughter of the dogs in every city, in default of muzzling in obedience to municipal regulations. Such regulations are imperative, and would be made in self-preservation, even if a dog were a sacred animal, or surrounded by all the safeguards of special laws or constitutions. Despite all caution, every year adds many new cases of hydrophobia, in all sections of the land, to the list of that fatal, most dreaded, and dreadful of all diseases. One human life thus sacrificed could not be atoned for by the lives of all the dogs in the land.

WHAT IT COSTS TO KEEP DOGS.

Did the reader ever count the cost of the dogs in the country?—the cost of their keeping, the value of the sheep and other animals killed and worried, and the quarrels and lawsuits occasioned by them? Is it possible to estimate the cost of hydrophobia in a single human subject? To the extent of their exceptional usefulness dogs should be credited; but what figures shall we place in the long account against them?

It must be settled first how many there are. Did not our municipal authorities in cities, and the *magistri domi* of the country, sensible disciples of Malthus as they are, restrain production, there would be *litter*-ally inundations of canines overwhelming the land every quarter, and they would represent every imaginable grade of canine miscegenation—gaunt, lank-faced, and straight-tailed, like their northern progenitors, the wolf; voracious, mean-spirited, and unsightly as the jackals from which some species have descended; and every imaginable shade of intermixture between the two types, and between the myriad sub species which were produced first by the modifications of climate and condi tion, and then permanently fixed by breeding.

It is an inexorable necessity, then, that this prolific and promiscuous race should be curtailed of its excessive multiplications. How many do we tolerate? Enumerations by assessors or other officials can show but a portion. Were there no total omissions or partial neglects in towns—in towns here and there—the census would only bring to light a portion of this wandering race. People will evade this premonition of a tax by judicious silence, by equivocations, and not a few of the owners of the lower class of curs (or the lower class owners of curs) by downright lying. Let these statistics be examined:

In Ohio the official enumeration of 1862 foots up 174,405 animals; that of 1863, 183,167; intelligent members of the recent wool convention estimated the real numbers at 500,000. This would be one to every family, or one to every five inhabitants; the official census makes one to every thirteen. It is plain that Ohio exceeds the estimate, often made by men capable of judging correctly, of at least one dog to every ten of the human population throughout the country.

Massachusetts had about 100,000 dogs in 1859; fully one to every twelve of the human population—thirteen to every square mile—a very large proportion for a State made up of cities and villages, full of practical and sensible people, most of them having no more use for a dog than for a real wolf or a veritable jackal.

Little Rhode Island has had 6,845 dogs upon its tax list—a fact which furnishes a very safe guarantee of a proportion fully as large as that of Massachusetts.

In western and frontier States the proportion is greatly in excess of that of Ohio. In so old and thickly settled a State as New York it is also large. A census of dogs in Cayuga county exhibits among a human population of 55,000 no less than 13,000 dogs, almost one to four, fully equal to the half million estimate of Ohio, which, as a central State of medium population, may fairly be taken as a basis for a national estimate. Now, Ohio has not exceeding one-tenth of the population of the States actually under federal authority. Upon the highest estimate for that State, the dogs of the loyal States would therefore number five millions. But to make a moderate estimate, which cannot be gainsaid, and which is probably less than the actual number, let us fix it at three millions. What is the board of these three millions of dogs worth? In Washington, sportsmen's dogs, which are of medium size, and fairly representative of the medium feeding capacity, are boarded at two dollars per week. In other places the price is less. Throughout the country, taking the range of city and country, seaboard and frontier, the price of boarding varies from fifty cents to two dollars. If we acknowledge the possibility of profit in such boarding, and accept the lowest price named—if we go further and make allowanee for farmers who feed their dogs on meat produced by themselves, and call it twenty-five cents per week, or the paltry doling out of a microscopic cent's worth at each meal, the average cost of a dog's keeping for a year will be thirteen dollars.

The assertion of a farmer that his dog's keeping costs him nothing will not bear examination. Farmers who buy little, yet live well, do not know what their living really costs. Their surplus products find a ready market; everything they eat represents the price for which it might be sold; not the city price, but the home value. There is no need of waste in a family sufficient to keep a pack of dogs, or even a single dog; they will not eat vegetables, except, perhaps, potatoes saturated with grease, to prevent starvation; and meat is now an expensive commodity. Besides, this waste, of whatever kind, is all available and valuable for the pigs. Of so much cheaper material is the feed of a pig than that of a dog, that comparison is scarcely fair; yet S. Edwards Todd, a well-known agricultural writer in New York, has estimated the cost to the farmer of keeping a dog one year as equivalent to the eost of giving the weight of one hundred pounds to a pig. At present prices of pork, such a pig would be worth $10 at least.

Then, in view of the price paid for boarding dogs, the eost of keeping large numbers of them in cities, their exclusive eonsumption of meat, and even of a comparison with the value of "waste" fed to hogs, let the estimate of twenty-five cents per week be reduced nearly twenty-five per cent., and let dog rations be commuted at less than a cent per meal, and call the general average throughout the land $10 per year; then the keeping of three millions of dogs of the loyal States would be $30,000,000.

The loss of sheep by dogs may be closely approximated. For a series of years, in Ohio, the average of ascertained damages was $111,548 per year, when sheep were very low in price. In 1863 the ascertained loss was $144,658. The secretary of the New York State Agricultural Society estimates the loss in Nev York in 1862 at 50,000 sheep, worth $175,000. This is a larger loss than tha of Ohio with a less number of sheep. Higher proportional estimates than that of Ohio have also been made for Maine. These are eastern States; the western States are still more exposed to the ravages of dogs. Then it is a moderate assumption to take Ohio as a basis for the country. As Ohio had 4,448,229 sheep in 1862, the loyal States 23,000,000 in round numbers, and the average loss of that State was 40,764, the entire loss would be 229,102 in killed; and a similar calculation upon the basis of 25,483 injured in Ohio would show a total of 143,219 maimed. At the present prices of sheep, an average for the entire country cannot reasonably be placed at less than $5, which would make the total loss in killed $1,145,510. The damage to the remainder has generally averaged in Ohio about three-fifths of the value of the animal. This would make the total loss of sheep injured $429,657; total loss of killed and injured, $1,575,167. No addition is made for increase of sheep since 1862, (at least 30,000,000, instead of 25,000,000;) let the growing watchfulness of their interests and the increasing restraint upon dogs be allowed to counterbalance such increase.

The account against dogs, thus far made out, stands as follows:

Keeping 3,000,000 dogs	$30, 000, 000
Sheep killed	1, 145, 510
Sheep injured	429, 657
	31, 575, 167

It is not considered unreasonable to make nearly as large an estimate for cost of litigation occasioned, for cattle bitten, hogs worried, fowls killed, eggs eaten, gardens injured, and other losses, as for damages done to sheep; and it may be a much larger item. The entire cost of dogs to the loyal States may safely be put down at $33,000,000.

This sum of $33,000,000 may seem a small matter, yet it would pay nearly half the present interest on the national debt; it would buy 165,000 farms, at government price for land, each year; it would support 165,000 farmers' daughters in boarding schools; it would purchase 132,000 neighborhood libraries of 200 volumes each.

HOW DOGS DISCOURAGE SHEEP HUSBANDRY.

"We should keep more sheep about here but for the dogs." A statement like this should have silenced the wondering inquiry, "Why don't you keep more sheep?" in any portion of this country within the last twenty years. We have allowed the herbage of millions of acres to decay, and imported many millions of pounds of wool yearly, because we chose to spend our substance in feeding worthless dogs with mutton, in deference to the lazy habits and silly prejudices of a class who dote upon the companionship of a dog. A southern agricultural editor, disgusted with the popular partiality for a half-domesticated, predatory animal, once lamented that civilization was not there sufficiently advanced to secure for sheep the favor extended to dogs; and his dislike of dogs was not lessened by seeing on many plantations more dogs in the pack than there were sheep in the herd, nor by receiving letters from subscribers saying they had "lost upwards of one hundred sheep by the depredations of sheep-killing curs."

Perhaps some sauntering hunter, stopping his accustomed pursuit of small birds, of sweet carols and insectivorous habits, for more ambitious forays, his fowling-piece instead of a Springfield musket on his shoulder, and a lank pointer at his side, affects to doubt the reality of these damages. If his unimproving pursuit has not destroyed his capacity for primary mathematics, let him note a few of the facts and figures which swell the tide of testimony against the curs.

Massachusetts had 378,226 sheep in 1840, 188,651 in 1850, 145,215 in 1855, and 113,111 in 1860, and about 100,000 dogs. The wool crop depreciated nearly half a million dollars in ten years—a tax of fifty cents per annum upon each dog in the State, *paid by wool-growers.* The State Agricultural Society gives the key to this depreciation: "The returns which this society have received unanimously ascribe as a reason why no more are kept, the injuries inflicted by dogs." In 1860 the dog law realized $35,894 upon 32,707 dogs licensed, while as many more were killed to avoid the tax, and an equal number escaped by the connivance of negligent or dog-sympathizing officials. In 1861 there were but 16,905 licenses. The dogs are now reduced one-half, and the sheep, in consequence, bid fair soon to be doubled. But the evil still exists; a young man of this State who recently bought seventeen sheep, worth $10 each, lost thirteen of them in a single night.

In Ohio, during five years ending in 1862, there were records of 203,824 sheep killed by dogs, and 127,418 injured, involving a loss of $558,733, or $111,548 per year, when the average price of sheep was scarcely two dollars per head. Of course there were damages which were never collected, materially swelling this aggregate. In twenty-two counties in Ohio a decrease of more than 300,000 sheep, in consequence of the ravages of dogs, between the years 1846 and 1856, has been chronicled in the Ohio reports. Such items as this from the Springfield Republic are constantly exhibited in Ohio papers: "Twenty-five superior sheep belonging to E. B. Cassidy were killed by dogs a few nights ago."

A partial canvass of twenty-five counties in New York, which were not the principal wool-growing counties, showed that 6,000 sheep had been killed in 1862. From such data B. P. Johnson, secretary of the New York State Agricultural Society, one of the best authorities on agricultural matters in the United States, estimated the entire loss in the State at 50,000 sheep, worth at least $175,000.

Hon. J. B. Grinnell, of Iowa, informs the writer that he has frequently lost $100 worth by dogs in a single night, and as this paragraph is penned the following item appears in an Iowa paper:

"We will refer to the case of John Scott, of Story county, who, a few weeks since, had 116 head of sheep killed by a gang of six or eight dogs in one night. We are informed by a gentleman who saw the sheep the morning after they were killed, that they were worth $8 per head, a loss of $928. Since this loss Mr. Scott has met with another, though not so great."

A dog in New Jersey—a mad dog—bit and caused the death of $1,600 worth of cattle, exclusive of sheep.

An editor of an agricultural paper, limping from dog bites in early youth, after losing twenty-seven sheep of his first flock, shot a dog found feeding on the carcases of twelve lambs, and was fined therefor the price of six sheep.

Instances innumerable are offering themselves for quotation. They are not needed. If more than 200,000 sheep have been killed in Ohio in five years more than 2,000,000 have been destroyed in the country, depriving our manufacturing industry of 6,000,000 pounds of wool by actual loss, and of untold quantities by discouraging production. Thus are farmers discouraged, manufacturers thrown into foreign markets, the country drained of gold, worthless dogs multiplied, and the national industry crippled.

But there springs up a necessity for more wool, and immediately the preliminary necessity for fewer dogs calls loudly for dog laws. But the wool-grower, impatient of the "law's delay" in coming, seizes his trusty gun, waits and watches the advent of the sneaking cur across the borders of his own domain, and executes justice speedily, diminishes the evil, and increases thenceforth the number of sheep. So it has proved. Dogs are yet numerous, but with the revival of sheep husbandry the decline of dogs inevitably commences. Let the good work go on. All hail to the municipal dog-killer!

No fact in our agriculture is clearer, or more readily acknowledged, than the serious effect of dog depredations upon the flocks of the country. It has almost driven sheep from the east; it has diminished their numbers in the central regions, and the same cry is echoed from the prairies. Even the herding of sheep upon those distant plains, under the care of shepherds, is affected by it, and the word comes thence, "Dogs are the greatest drawback to the full-range system."

WHY THEY SHOULD BE TAXED.

In these days of taxes it may seem absurd to attempt to tell why. It ought to be unnecessary. Horses are taxed, cattle, sheep; carriages are taxed, and the ladies' pianos, plate, watches, &c.; bank checks, mortgages, foreign passage tickets, receipts, and policies of life insurance—every imaginable species of property, and almost every occupation or privilege of trade. Yet the owner of this property in domesticated animals, imitating the habit of his proteges, absolutely whines over a tax upon his dog, wags a vituperative tongue at the makers and executors of the law, and growls on the compulsion of its payment.

Dogs are property, and therefore taxable. The doubt of this fact, which some dog owners entertain, is only proof of the general uselessness of most of them. If a dog proves to be of the least utility, his owner finds no difficulty, in case of his maltreatment or canicide, in getting damages for his property in the animal.

A bear or a wolf may be kept, and also becomes property, and the owner or showman who keeps them is taxed; and if allowed to trespass upon the grounds or property of others, the proprietor is liable for damages.

While the dog is property, the utility of such property is limited, and its excessive distribution gives scope to the wild or predatory element of the race, and it becomes a nuisance, a constant trespass upon the rights of citizens to be abated, and if the necessity of the case demands it, exterminated.

The dog may, then, either be taxed as simple property, or his keeping be licensed as a matter to be regulated and restrained by law. Nor does a State constitution, like that of Ohio, which requires the levying of taxes according to value of property, prevent such licensing and restraint upon an animal which is half domestic and half predatory.

The silly objections to the principle of taxing dogs shows the poverty of arguments against it. One man assumes it to be taxing one person to pay the losses of another, for which he is in nowise responsible. But a man who owns a dog, which may go unrestrained upon the premises of others, *is* responsible for damages he may occasion; and when, from the multiplied numbers of the race, and its habit of nocturnal wandering, it becomes an unmitigated nuisance, almost impossible of detection in its depredations, the community has a natural and legal right to impose whatever restrictions may, in the judgment of the law-makers, be necessary to abate the nuisance, although such restraints may reach good and bad alike, and affect the poodle that cannot harm a kitten, as well as the wolf-hound that lurks in the path of the traveller. But one person is not taxed specifically to pay the losses of another. The man who owns a dog should be taxed just as the owner of a sheep or lamb is taxed. Again, the dog may be taxed as a police regulation and restraint upon production. And then it is not only poetical, but exact, equal justice, that the money that comes from taxes of dogs should be used in part to pay the damage occasioned by dogs.

It is common for whiners over the dog tax to ask why the community should not be taxed to pay for the ravages of the weevil, the fly, the aphis, mice, &c. These absurd suggestions are acknowledgments of the rightful outlawry of dogs. If these pests should be taken up by man, petted, and propagated to prey upon the community, not only would the propagators, individually and as a class, be liable for damages, but they would deserve and possibly be assigned a situation in the penitentiary. It is common to hear laudations of the local laws which require cattle and other farm stock to be restricted to the premises of their owners, and, from the same lips, condemnation of the law which requires the same thing of an active animal of carnivorous habits and bloodthirsty temperament, which does its mischief in secrecy and in darkness, removes the marks of blood with cunning care, and reaches home by a circuitous route to greet the family at dawn of day with a look of innocency and a wag of the tail, unconscious even of the existence of wrong-doing.

The sportsman goes into the country for a month's enjoyment. He sallies forth with his dog and gun, and everything that ministers to his amusement or his comfort is made to contribute to the wants of the government through the revenue tax. He puffs a cigar for the public good, tips a flask of whiskey to strengthen the government, and burns gunpowder in aid of the rebellion's suppression; then he takes a sail in a taxed yacht propelled by taxed sails, fishes with a taxed line, solaces himself in the shade in a taxed tent upon the shore, and eats a chowder in which the very salt is taxed; and when, on a summer evening, he seeks amusement in a country circus or menagerie, the trick-mules and learned monkeys are taught to withdraw from the general circulation a substantial tribute to the nation. And yet the dog, the constant companion in all this round of pleasurable and taxable enjoyment, is exempt. No tax has more of the elements of justice and wise expediency than the dog tax.

WHY THEY ARE NOT TAXED.

The right of taxation is thus placed beyond a reasonable question. Why are they not in all States fully and effectively taxed? The reason is humiliating to American statesmanship. Man is nominally a vertebrate animal, although American politicians have been claimed as exceptional specimens, an assumption in some degree unwarranted and unjust, except in the matter of legislation in restraint of dogs. In this regard the spinal columns of law-makers are affected to a lamentable degree with weakness or paralysis.

The man who has a dog has also a vote, and it is singular how a conjunction of such a possession with such a franchise affects the law-maker, be he delegate, assemblyman, national representative, or even invested with the dignity of an American senator. With what delicacy he approaches a dog law. How he shrinks from doing a simple act of national protection when it affects an interest which ignores reason and justice, and acts from prejudice and impulse. He acknowledges the right and inherent propriety of taxation, but shrinks from it neither wisely nor bravely. He invents excuses, but urges them feebly, and finally acknowledges their impotency. "It wouldn't be a popular measure." Such admission is honest as it is cowardly. "It is a subject with which personal feelings and home affections have to do." So it may be; but the cold hand of the revenue law is laid upon the snugly ensconced lady's watch, however deftly hidden, and a tax extracted; and the soft tone of the piano is burdened with the wail of a tax. No! such excuses avail nothing; they are worthless and unworthy of their source.

One who has done and suffered in this cause in a State that made indecent haste to repeal a wise and efficient dog law writes:

> "Has any man political aspirations? Before the people will support him he must declare a dead and damned dog law unconstitutional, and must, at the sacrifice of his manhood, honor, and integrity, swear that he will never favor the smallest interference with the multiplication of hordes of dogs. A candidate must, in answer to the inquiry, 'What do you think of the dog law?' instead of disposing of it with a wave of the hand and the declaration that it is dead and buried, enter into a lengthy disquisition upon its constitutionality, and over its tendency to utterly subvert the rights of the American citizen. Nay, more; he must heartily abuse every man who had aught to do, directly or indirectly, with its passage."

But our legislators are becoming, it is hoped and believed, not only more practical and patriotic, but more independent and free from time-serving. They are already manifesting not only a willingness, but a determination to do their duty in this matter, and the people do cheerfully and will heartily sustain them.

The following letter, written by Governor Randall, of Wisconsin, shows a politician with a sound head, a kind heart, and a stout backbone:

> "EXECUTIVE OFFICE, *Madison, July* 6, 1860.
>
> "DEAR SIR: Your letter in regard to the 'dog law' is received. The bill was properly signed, and is the law of this State, and that law will not be repealed with my approbation while I remain in office. No good citizen will object to it or refuse to obey it. A man who is able to own a dog, which costs as much as to keep a cow, is able to get a collar for him. No good citizen will refuse to make the sacrifice of obedience to that law when he must know that if it is enforced it will save the farmers and stock-growers of this State from $40,000 to $60,000 every year, and increase the number of wool-growers very largely. Every human life lost by the bite of a dog is worth more than all the dogs in the country. A man who is not willing to sacrifice one dollar for his privilege, where so great a benefit may accrue to the State by compliance with the provisions of the act, ought to be kicked out of it.
>
> "Very truly, yours,
>
> "ALEX. W. RANDALL."

DIGEST OF OUR DOG LAWS.

In the general desire for enactment of judicious dog laws recently revived throughout the land, and consequent action of legislative bodies, the latest changes in such laws may not have been received, and therefore the following synopsis of the laws of several of the States may not be without imperfections. It exhibits a great variety, some nearly impracticable and of little efficiency, and others, of later origin, very efficient and indicative of wholesome progress.

MAINE.

A law taxing persons owning or harboring dogs one dollar for each dog was enacted in 1862 with a saving clause as follows: "*Provided*, That towns or cities shall so vote."

By its provisions dogs inflicting damage subject their owners to fines of double the amount of the damage done, to be recovered by an action of trespass.

Any person may lawfully kill a dog that assaults himself or other person while walking or riding peaceably, or is found worrying, wounding, or killing any domestic animal.

Any person finding a dog strolling out of the enclosure of his owner may, within forty-eight hours, make oath before a magistrate that he suspects such dog to be dangerous or mischievous, and notify the owner by giving him a copy of the oath; and if the dog shall be found again at large, he may be lawfully killed; and if he shall thereafter wound a person or kill a domestic animal, the owner shall be liable to treble damages and costs.

The report of the Maine Board of Agriculture attests the pertinacity with which the farmers of that State have sought legislative protection to sheep husbandry, and says:

"Those canine causes still continue, like 'war risks,' to eat up the profits. The essence of legislative interference has been too much like British neutrality. * * * The assumption has been unimpeachably established beyond denial, by the farmers of the State, that the losses from wild animals, disease, and accident are not equivalent to the losses from the depredations of dogs. Facts and figures, multiplied to an almost unlimited extent, testify to the truth of the assertion. Supplications, remonstrances, and petitions have failed to induce the legislature to abate the grievance or remove the transgressors."

The law is mainly inoperative, as might be expected if it was not so intended. If a man is assaulted by a human assailant he may kill such assailant with impunity under the common law; but if he shall be attacked by a dog, he may not kill the brute under this State law, but is allowed, after binding up his wounds and making oath that they exist, to cool his blood for forty-eight hours in waiting for a legal opportunity to lie in wait for the ruffianly animal, after his owner has been advised officially of the propriety of tying him up. Instead of protection to sheep, this looks more like protection to sheep-killing dogs. And so worthless a law as this may exist in one township and not in the adjoining, which may be full of sheep-killing curs.

NEW HAMPSHIRE.

In 1862 the legislature levied a tax of one dollar on male and two dollars on female dogs. Prior to this the common law was the only protection enjoyed by owners of flocks.

In 1863 a law was enacted forfeiting double the amount of damage done by dogs, recoverable from the owner by an action of debt; or a complaint may be made to the selectmen of towns, who are required, upon proof made within thirty days, to draw an order upon the treasury, which is registered and made payable, in whole or in part, from the fund accruing from the dog tax, on the second Tuesday of March annually.

VERMONT.

The following is the law of 1862:

SECTION 1. The listers in the several towns of this State shall in each year set all dogs in their respective towns in the grand lists to the owner or keeper of the same at the sum of one dollar each; and no person shall be entitled to have the amount so assessed deducted from their lists in consequence of any debts owing.

SEC. 2. Every owner or keeper of a dog shall, when called upon by the listers for their lists, notify them of the dogs by him owned or kept; and every owner or keeper of a dog who shall neglect or refuse to notify the listers as aforesaid, shall forfeit and pay to the town in which he resides the sum of two dollars, to be recovered in an action on the case in the name of the treasurer of such town, before any court competent to try the same, with full costs.

SEC. 3. It is hereby made the duty of the owner or keeper of a dog, whether set in the lists or not, to cause a collar, with the name of the owner or keeper plainly written thereon, to be worn on the neck of each dog by him owned or kept; and it shall be lawful for any person to kill any dog running at large off the premises of the owner or keeper not having on such collar; and the owner or keeper of such dog shall recover no damage for such killing.

By another law, owners of dogs that have worried or wounded sheep are made liable for double damages and double costs; and they can sustain no action for damages against persons who have killed dogs assaulting them off the premises of their owners, or chasing or worrying sheep.

MASSACHUSETTS.

In Massachusetts, where sheep husbandry of a high order is on the increase, stringent and effective laws have been passed. The following is a synopsis of the last law:

AN ACT concerning dogs and for the protection of sheep and other domestic animals.

Be it enacted, &c., as follows:

SECTION 1. Every owner or keeper of a dog shall annually, on or before the thirtieth day of April, cause it to be registered, numbered, described, and licensed for one year from the first day of the ensuing May, in the office of the clerk of the city or town wherein he resides, and shall cause it to wear around its neck a collar distinctly marked with its owner's name, and the registered number, and shall pay for such license two dollars for a male dog and five dollars for a female dog.

Sections second, third, and fourth provide for licensing and the payment of money into the treasuries:

SEC. 5. Whoever keeps a dog contrary to the provisions of this act shall forfeit fifteen dollars, to be recovered by complaint, and the money shall be paid to the treasurer of the county in which the dog is kept, &c.

SEC. 6. The assessors of the cities and towns shall annually take a list of all dogs owned or kept in their respective cities or towns on the first day of May, with the owners' or keepers' names, and return the same to the city or town clerk on or before the tenth day of July. Any owner or keeper of a dog who shall refuse to give just and true answers to the assessors relative to the ownership thereof shall be punished by a fine of not less than ten dollars.

SEC. 7. Mayors of cities and the chairman of the selectmen of towns shall annually, within ten days from the first day of July, issue a warrant to one or more police officers or constables, directing them to proceed forthwith either to kill or cause to be killed all dogs within their respective cities or towns not licensed and collared according to the provisions of this act; and any person may, and every police officer and constable shall, kill, or cause to be killed, all such dogs, whenever and wherever found. Such officers, other than those employed under regular pay, shall receive one dollar for each dog so destroyed from the treasurers of their respective counties, &c.

SEC. 8. The mayors of cities and the chairman of the selectmen of towns shall, after issuing their warrant to police officers or constables, as specified in the preceding section, forthwith certify the fact under oath to the district attorneys of their respective districts, whose duty it shall be to prosecute all such officers as fail to comply with this requirement.

SEC. 9. Whoever suffers loss by the worrying, maiming, or killing of his sheep, lambs, or other domestic animals by dogs, may inform the mayor of the city, or the chairman of the selectmen of the town wherein the damage was done, who shall appoint two disinterested persons, who, with the mayor or chairman of the selectmen, shall proceed to the premises where the damage was done, and determine whether the damage was inflicted by dogs, and if so, appraise said damage. The amount of said damage shall be certified by the board of appraisers, and, except in the county of Suffolk, be transmitted to the county commissioners, who shall during the month of December examine all such bills, and, when any doubt exists, may summon the appraisers, and make such examination as they may think proper, and shall issue an order upon the treasurer of the county in which the damage was done for all or any part thereof, as justice and equity may require.

The treasurer shall annually, on the first day of January, pay all such orders in full, if the gross amount received by him under the provisions of this act, and not previously paid out, is sufficient therefor; otherwise, he shall divide such amount *pro rata* among such orders in full discharge thereof.

The board of appraisers shall receive from the county, or in the county of Suffolk from the city or town treasurer, out of the moneys received under the provisions of this act, the sum of one dollar each for every examination made by them as prescribed in this section.

SEC. 10. Any town, city, or county officer refusing or neglecting to perform the duties herein imposed upon him, shall be punished by a fine not exceeding one hundred dollars, to be paid, except in the county of Suffolk, into the county treasury.

SEC. 11. The treasurer of any county may, in an action of tort against the owner or keeper of any dog concerned in doing damage to sheep, lambs, or other domestic animals in said county, which damage has been ordered to be paid by the county commissioners, recover the full amount thereof to the use of said county. If the amount so recovered exceeds the amount so received by the owner of the sheep or other animals, under the provisions of section nine, the excess shall be paid by the county treasurer to such owner. All fines and penalties provided in this act may be recovered on complaint before any police court or trial justice in the county where the offence is committed. Moneys received by the treasurer of any county, city, or town, under the provisions of this act, and not expended in accordance with its provisions, may be applied to the payment of any county, city, or town expenses.

RHODE ISLAND.

In this State, by the law of 1860, a dog might be killed with impunity if found without a collar bearing his owner's initials, or worrying or wounding sheep or other stock out of the enclosure of his owner. Any person might make oath to any case of injury, or to the special ill-fame of any particular whelp, and if the allegation was sustained, the dog must be confined, or the life of the animal was forfeited.

A distinguished correspondent suggests that the private history of that law would be instructive and amusing. The substitution of the recent and more stringent law for the old one was suggested to the legislature by the Society for the Encouragement of Domestic Industry. The former law allowed the several town councils to make ordinances taxing dogs, and providing for injuries inflicted upon sheep. A general State law also provided for recovery of damages of the owner of dogs, and double damages and the killing of the dog for a second offence. The agricultural committee of the society, to whom the matter was referred, reported that these municipal regulations were discordant, and were not enforced. The substitute proposed they describe as less stringent than those of Massachusetts and Connecticut, and quite too tame, but still as severe as they dared to recommend. It was discussed in the legislature of 1860 for several days, and the present enactment was finally hatched from a new incubation of anxious politicians, fearing the retributions of voting dog owners.

An additional law has just been passed, which requires dogs to be collared, registered, numbered, described, and licensed, with the payment of $1 15 for each male and $5 15 for each female dog, before the last day of April, and one dollar additional for each dog after that date, and previous to the first of June. It provides for the appointment of suitable persons to make a list of the owners or keepers of dogs, to be returned to the clerk previous to the first of May, who is required to furnish to such persons a list of all dogs licensed for the current year, and to make another list of those not licensed, with the name of the owner or keeper, to be suitably posted or advertised. Any one keeping a dog contrary to these provisions is liable to a fine of ten dollars; and persons appointed to make the lists are required to make complaint and prosecute delinquents prior to the first of July. Such persons and constables and police officers are required to kill and bury all unlicensed dogs, and any person may lawfully do so, and for such service the sum of one dollar shall be paid. Removal of a collar is punishable by fine not exceeding fifty dollars. Damages to sheep are recoverable upon proof made within thirty days from the town or city treasury on the first day of June, or a *pro rata* proportion of them if the tax fund is insufficient for payment in full; and the city or town may then recover from the owner of the dog doing the mischief.

CONNECTICUT.

By the latest law for the protection of sheep—that of July, 1863—the tax upon male dogs is one dollar each, females two dollars. The selectmen are authorized to collect of negligent collectors the taxes unpaid, as in the case of other arrearages due from collectors; and they are not empowered to abate such tax unless upon satisfactory proof that the dog is dead. The selectmen are also empowered to institute suit against the owners of dogs for the amount of damage for sheep maimed or killed; and if the owner resides in another town, the suit may be brought against that town.

The provisions of the former law, yet partially in force, require the registry of all dogs over three months old, and sanction the killing of all not registered, and persons neglecting or refusing to register are liable to a fine of three dollars each. Dogs of known bad character shall be killed, although registered; and it is lawful to kill any dog taken in the act of worrying sheep.

NEW YORK.

The laws of this State upon this subject, as amended by that of 1862, impose a tax of fifty cents for the first dog, $2 for each additional; $3 for the first female dog, and $5 for each additional. The assessors are required to annex to the assessment roll the names of persons liable, and supervisors must return them, when, if failure in paying the tax occurs, it becomes the duty of the collector, and the privilege of any other man, to kill the dog. The collector has a commission of ten per cent. on fines, and one dollar for each dog killed. The previous enactment provided that the owner of dogs killing sheep should be liable for injuries perpetrated; and in case the owner should not be found, the loss should be paid out of the fund arising from the dog tax.

NEW JERSEY.

By the laws of New Jersey dogs are taxed from fifty cents to one dollar each. Persons may lawfully kill a dog found worrying or wounding sheep; damages sustained by such depredations are collectable from the township committee, if the fund arising from such tax is sufficient. If the owner of a dog committing depredations shall neglect for twenty-four hours after notification to kill the animal, he shall forfeit ten dollars and costs to any person suing, and triple damages to the owner of the stock injured or killed. A provision is made for the assessment of damages sustained, to be certified by two disinterested freeholders, the amount not to exceed five dollars for each sheep or lamb killed. Some counties have had special enactments allowing full damages to be paid.

William M. Force, secretary of the State Agricultural Society, says that a recent act has been secured "by the provisions of which actual damages sustained by any person were estimated by appraisement by two disinterested freeholders, the oath of the owner being also required as to real cost and value, the township where the injury was committed paying the owner, and the amount annually ascertained being laid upon the owners of dogs as a dog tax."

PENNSYLVANIA.

No effective law is in existence in this State for the protection of sheep. The owner of a dog, knowing that he has worried or killed sheep, and failing to kill him after such knowledge, is liable for all damages done by him *thereafter.* A dog may destroy a flock of sheep, without danger to himself or loss to his master, until he has offended a second time. If he kills a second flock, and his owner conveniently ignores the fact of the former offence, he may await, with the wool yet in his teeth, for an opportunity to return once more to his mutton.

DELAWARE.

Legislation relative to protection of sheep was initiated early in this State. A law of 1811 made the owners of dogs liable to the value of all sheep killed by them; that of 1820 forfeited the lives of dogs at large without collars on their necks. By the law of 1811 the tax was from 25 to 50 cents for the support of the poor; by that of 1817 it was from 50 cents to $3 for a fund to pay for sheep killed by dogs; by that of 1839 from 50 cents to $1 for county purposes; by that of 1843 one dog was exempt, others $1 each for county purposes; by that of 1853 from $1 to $2 for a fund to pay for sheep killed by dogs. These are repealed, their principal provisions being incorporated in the following laws:

"The owner or possessor of a dog which shall kill, wound, or worry a sheep or lamb shall be liable to pay the owner of such sheep or lamb the full value thereof, and it shall be lawful for any person to kill such dog. It shall be lawful for any person to kill any dog running at large in Newcastle county, beyond the owner's premises, without a collar upon his neck with the owner's name upon it."

The law of 1862 requires an assessment list of persons owning dogs to be returned to the levy court. The tax is placed at 50 cents for each male and $1 for each additional dog, and $2 for each female dog, which shall procure the fund from which damages shall be paid, not to exceed $3 for each lamb and $5 for each sheep injured or killed, the remainder, if any, to go into the school fund. A dog not on the assessment list, which may be wandering or caught worrying sheep, may be killed. Persons paying taxes upon dogs are deemed to have property therein, and may recover damages for theft of or injury to such dogs.

MARYLAND.

In this State the owner of a dog proved guilty of killing or injuring sheep is required, upon complaint and exhibition of proof, to kill such dog, in default of which the owner of the sheep may kill him off the premises of his owner, or require a constable to do so, wherever found. If the dog shall be killed immediately by his owner, the owner of the sheep injured can have no cause of action; if not thus killed, his owner is liable for double damages, with costs, recoverable by an action of debt.

OHIO.

Several laws have been enacted to restrain dogs, none of which have been very stringent or effective, or generally executed. The latest was passed by the general assembly in 1863, declaring it unlawful for any dog to run at large off the premises of the owner in the night season, between the hours of seven o'clock in the evening and six o'clock in the morning, unless accompanied by the person owning or harboring the animal; and the owner or keeper is required to keep the dog upon his premises between those hours. It is of so negative and incomplete a character as to be practically worthless. The only real protection of an Ohio flock is a well-loaded gun in the hands of its owner.

INDIANA.

A license is required, at fifty cents for the first male dog, one dollar for each additional dog, and one dollar in every case for a female dog. All unlicensed dogs are declared nuisances that may lawfully be killed. Accruing funds are set apart for the payment of damages suffered from injuries to sheep in the several townships. The sufferer has his option of the following remedies: Within ten days after having knowledge of such depredations he may substantiate it to the satisfaction of the township trustee, and draw the amount at the end of the current year, or a *pro rata* proportion if the fund is deficient; or he may recover by suit full damages from the owner of the dog. A fine of from five to fifty dollars and liability to damages, recoverable by the owner, are the penalties for killing licensed dogs that maintain a fair canine character.

The Secretary of the Board of Agriculture reports that the law is so defective that it virtually amounts to nothing.

MICHIGAN.

A law approved March 29, 1850, authorizes the destruction of dogs attacking any kind of domestic animals except on the premises of the owner of the dog, and such owner is liable for double the amount of damages done by the dog. When notified of such damage, neglect of the owner to kill the dog is punishable by a fine of \$3, and \$1 50 additional for every forty-eight hours thereafter until such dog shall be killed. Supervisors, upon complaint of a citizen, verified by his oath, are required to prosecute and recover the fines imposed by this act.

An act was passed March 20, 1863, requiring township assessors to ascertain the number of dogs liable to be taxed and the names of their owners; and if such owners refuse for ten days after demand to pay the taxes assessed, it becomes lawful to kill the dogs so taxed.

WISCONSIN.

By the law of 1860 dogs are required to be numbered, collared, registered, and licensed on payment of one dollar for males and three dollars for females; and police officers, constables, and marshals are required to kill and bury all unregistered dogs, and to receive twenty-five cents for such service. A person may be fined fifty dollars for removing a collar. Persons suffering loss from dogs are paid full damages at the first of April if the tax fund is sufficient; if not, *pro rata;* and the owner of the dog is liable to the town for the full amount The fine for keeping unregistered dogs is five dollars. Officers neglecting or refusing to obey the law are fined \$20 for every twenty-four hours of such neglect. Towns may increase the license not more than one dollar, and the penalty not more than ten.

MINNESOTA.

The following is an epitome of the law of March, 1863, which repeals previous enactments on the subject:

Every owner or keeper of a dog shall cause such dog to be registered, numbered, described, and licensed, paying one dollar for each male and two dollars for each female. The township or city clerk shall conspicuously post a list of all licensed dogs, and furnish one to constables and chief of police. Failure to license shall make one liable to a penalty of ten dollars. Stealing or poisoning a dog is punishable by fine not exceeding fifty dollars, and killing subjects to liability for damages double the value of the dog. Constables and police officers shall, and any person may, kill any unlicensed dog; any one may also kill a dog assaulting him, or worrying sheep out of the enclosure of his owner. Within thirty days after suffering injury or loss of sheep by dogs, proof of damage may be presented to the county auditor, who may draw an order upon the treasurer, payable from the fund accruing from taxes of dogs, when the city or town may sue and recover full damages from the owner of the dog. It is made the duty of the mayor and aldermen of cities, and the supervisors of towns, to require the destruction of unlicensed dogs, and officers refusing or neglecting to perform these duties are liable to a fine of twenty-five dollars for the benefit of schools. All of these penalties may be recovered, on complaint by any householder, before any justice of the peace of the county. Money remaining after the yearly payments from the tax fund is turned over to the school fund.

IOWA.

A law was passed in 1862 by the Iowa legislature for the protection of sheep against the ravages of dogs. At the following session, called with reference to legislation in the interest of the soldiers, the law was repealed in utter disregard of the interests of volunteers dependent on their flocks for the clothing of their families.

MISSOURI.

Extensive injuries have been sustained by dogs in Missouri, yet the legislature has resisted the effort to procure legal protection. Instances, not unfrequent, are reported of large flocks driven into the rivers by packs of hounds and drowned. A correspondent of the department is constrained to believe that some of his neighbors think more of their dogs than they do of their children.

TENNESSEE.

The secretary of state for the State of Tennessee writes that no laws for the protection of sheep exist in that State, notwithstanding the persistent efforts of farmers for many years to secure such an enactment. Damages have been very serious here, affecting very materially the business of wool-growing.

CONCLUDING SUGGESTIONS.

It has been shown to the satisfaction of the reasonable reader that a large portion of the dogs in the country are utterly useless; that the cost of their keeping, and the damages directly occasioned to farm stock. amount to an annual tax of at least thirty-three millions of dollars; that they discourage sheep husbandry, and consequently woollen manufacturing, to the extent of many millions more, which would otherwise be added to our productive industry; that they are property, and therefore taxable, and in their excessive multiplication a nuisance to be regulated or abated; and that, unfortunately, a weak hesitancy about inaugurating taxation, not indicative of the true dignity and proper independence of statesmen, has too often existed among legislators.

The laws of the several States indicate a transition period between pioneer life, with its inevitable dog companionship, and a state of permanent settlement and superior civilization. The silly prejudice that allows dogs to trespass upon a neighbor's grounds and destroy his sheep, while enacting laws to restrain sheep from wandering from their owner's pasture, is rapidly giving way to a common sense that would make restraint equal and just.

In most of the States are certain provisions of a just law upon the subject, but a lack of completeness, or want of penalty attached to neglect in enforcement, render them partly inoperative, or wholly inefficient. In Pennsylvania there is, practically, only a threat held over the heads of the dogs, for which they seem to care very little; in Maine, each separate township has the option to ratify or nullify the general law—a non-committalism that is far worse than no law; in Ohio, dogs are instructed that it is unlawful for them to run at large at night, but their owners are held to no proper responsibility for their effective restraint; and in most other States some radical defect exists. Massachusetts has the best law. It taxes dogs from two to five dollars each; owners are made responsible, under heavy penalty, for their registry and taxation; assessors must make accurate lists, and evasions of the listing are heavily fined; refusal or neglect of officers to execute the law incurs a penalty of one hundred dollars; and untaxed dogs are killed without mercy, and district attorneys are requried to prosecute officers who neglect to destroy them.

Such a law, or one more guarded and efficient still, should be on the statute book of every State.

GEOGRAPHY OF PLANTS.

OUTLINE SKETCH OF THE GEOGRAPHY OF PLANTS AND OF THE METHODS PROPOSED FOR DETERMINING THE AMOUNT OF HEAT REQUIRED BY THE VINE AND THE WHEAT PLANT; WITH REMARKS ON THE PRODUCTION OF NEW VARIETIES OF WHEAT, AND ON THE ACCLIMATION OF PLANTS, AND OBSERVATIONS ON THE NECESSITY OF A MORE ENLIGHTENED AGRICULTURE.

BY JAMES S. LIPPINCOTT, HADDONFIELD, NEW JERSEY.

THE most superficial observer has doubtless sometimes noticed a method in the arrangement of natural objects, and believes that they have not been distributed by chance, or left without the superintendence of a directing agency. He perceives, if his view becomes more extended, that they have not been scattered at random over the surface of the globe. He who is better informed has learned that living beings (animals and plants) are regulated in their distribution by especial laws, and that their arrangement gives to each country a peculiar aspect.

The physical conditions which seem to regulate this distribution of living beings are diversified, and are mostly included under the idea of climate. Among the agencies which are understood to influence the life, health, development, and extension of the range of animals and plants, the more important are the distribution of heat throughout the year, its periodic increase and diminution, the conditions of humidity or dryness of the air and of the soil, the amount of light, the electric conditions, and in some instances the pressure of the atmosphere, and the varying degrees of actinic power or force of the chemical rays of the sun.

There are other very important considerations affecting the distribution of plants, which are not properly included under our idea of climate. Among these may be enumerated the composition and chemical character of the soil, which are influenced by the rock whence it was derived; the mechanical conditions of the soil, whether friable or coherent, readily decomposed, or resisting decomposition in a state of fine comminution, or in coarse grains or gravel; permeable readily by heat, rain, or moisture, or otherwise; and, finally, on the amount of vegetable matter therein, the color of the soil, and its inclination and exposure to the rays of the sun. The art of the agriculturist enables him to modify all these latter-named circumstances, and to adapt the soil to his various needs; but the vicissitudes of the climate he cannot control—over the weather he has not been made master.

The most important climatic influence is temperature, which, indeed, in this association may be termed the dominant power. It is beneath the ardent rays of a tropical sun that the noblest forms of vegetation are developed, while in the circumpolar zones neither trees nor shrubs can exist, and extensive districts are entirely destitute of plants, or in favored spots alone are found a few lichens and diminutive herbs, which the short summer of these regions calls forth from the partially thawed surface of the deeply frozen ground. Between these noble products of the torrid zone and the almost barren desolation of the Arctic regions there exists every variety of vegetable form, growing gradually less diversified and generally more dwarfish as we approach the limits of existence on the north and south, and exhibiting a correspondence between the modifications of temperature observed successively in our progress from the equator to the poles, and the geographical distribution of vegetable and, generally also, of animal life on the earth.

The geographical distribution of plants is a subject of vast extent and importance. The nature of the vegetation covering the earth varies, as we have remarked, according to the climate and locality; and plants are fitted for different kinds of soils, as well as for different amounts of temperature, light, and moisture. From the poles to the equator this constant variation in the nature of the flora is a shifting scene, passing from the lichens and mosses (the lowest vegetable forms in the Arctic and Antarctic regions) to the noble palms, bananas, and orchids of the tropics by a series of regulated changes through all the multiform aspects of the vegetable kingdom. The same progress and graduated fitness is observed in the vegetation of lofty mountains under the equator, when descending from the summit to the base. From the scanty vegetation of Greenland, where the only woody plants are the Arctic willows, trees scarcely a finger length in height, we may trace the expansion of vegetation as we move southward over the lichens and mosses to the saxifrages and cruciferous plants, or those which resemble the cabbage and the turnip in their mode of flowering; then to grassy pastures, and by coniferous or fir-like trees, and amentaceous or birch and alder-like trees, to the northern borders of the United States. Extending our glance further southward, we shall perceive that we enter the region of oaks, hickory, and ash, of tulip-poplar, buttonwood, walnut, red and white cedars, sugar and other maples, sassafras, sumac, laurel, and many other trees and shrubs characteristic of the temperate regions of North America. In the districts further south we find an increase both of species and of genera, and more tropical forms show themselves, such as magnolia, Osage orange, honey locust, cypress, holly bay, wax myrtle, the cotton plant, rice, the live oak, and enter the borders of the regions of the palmetto and the orange; thence to those of the sugar-cane and pineapple, the coffee plant and cocoa-nut, and the luxuriant vegetation of the equator and torrid heats. "In this progress," as Humboldt, the father of geographical botany, remarks, "we find organic life and vigor gradually augmenting with the increase of temperature. The number of species continues to increase as we approach the equator, and each zone presents its own peculiar features; the tropics their variety and grandeur of vegetable forms; the north its meadows and green pastures, its evergreen firs and pines, and the periodical awakening of nature in the spring time of the year."

Many causes intimately connected with the aspects of our globe have an influence in modifying the conditions of climate, and thus affecting the distribution of animals and plants on its surface. The geographical forms of contour, the relief or elevation and depression of the terrestrial surface, the relations of size, extent, and position, each exert a very marked effect upon the climatic peculiarities of a district. The bearing or direction of the shores of a continent, the elevation of a mountain in one place rather than in another, the subdivision of a continent into islands or peninsulas, and other minor differences, have very important bearings upon the climate of a district. The depression of a few hundred feet over some wide areas would reduce some regions to the level of the sea, or sink them beneath its waves, or so modify the climate of the higher portions left above the waters as to render them no longer tenable by the life that once enjoyed a congenial clime. This is shown by the observation that some low islands scattered in clusters are covered with a vegetation entirely different from that of extensive plains, though lying in the same latitude. A change in the bearing of the shores would modify the currents of the ocean, which would react upon vegetation. Mountain chains have oftentimes an influence upon the prevailing winds, and their height, or the plateaus from which they arise, modify the climate, and render it temperate or arctic under the fervent heats of the torrid zone. A mountain chain extending from east to west may form a barrier between the colder regions on the north and the warmer on the south, and thus protect the northern plains from the warmer winds of more temperate regions, and increase the heat on the southern slope. This is exemplified by the Alps of Switzerland, which reduce the temperature of Germany below the mean that would otherwise prevail but for their cooling influence. Under some of the high towers of this mountain barrier against the assaults of winter, the palm, the pomegranate, the orange and the olive grow in the open air, while a few miles to the eastward, in valleys, open to the north, through which the hurricane blasts of the Borra rush with terrific force and severity of cold, often sweeping vessels from anchorage, these more tender plants cannot exist.

A few thousand feet in elevation, which is insignificant compared with the mass of the earth, changes entirely the aspect and the character of a country. For evidence of this assertion we may compare the burning region of Vera Cruz—its tropical productions and its fatal fevers—with the lofty plains of Mexico, their temperate growths and perennial spring, or the immense forests of the Amazon, where vegetation puts forth all its splendors, and where animal life is abundantly prolific, with the desolate paramos or Alpine regions of the summits of the Andes, "rude, ungenial and misty." Or imagine the interior plains of the United States, east of the Rocky mountains, to be slightly inclined towards the north, and the Mississippi river to empty into the Frozen sea or Arctic ocean, or into Hudson's bay, and the new relations of warmth and moisture incident upon this simple change of direction of the current of this river would effect the most important modifications in the conditions of the vegetable and animal world, would exert a still greater influence upon the welfare of the inhabitants, and, through them, upon the destinies of society yet to be, and, perhaps, upon the entire human race.

The climate that would result from latitude alone is greatly modified by the presence or absence of extended sheets of water; and the distribution of heat through the year, for any place whatever, depends essentially on its proximity to, or distance from, the ocean or large lakes, and the relative frequency of the winds that blow over them. The equalizing influence of large bodies of water, the temperature of which is less liable to sudden changes than the atmospheric air, is quite apparent. While in Ireland and the southwestern part of England the myrtle grows in the open air, as in Portugal, fearless of the cold of winter, the summer sun of these so genial isles does not succeed in perfectly ripening the plums and pears which grow and ripen well in the same latitude on the continent. On the coast of Cornwall shrubs as delicate as the camellia and orange are green throughout the year in the gardens, though in a latitude at which, in the interior of the continent of Europe, trees the most hardy can alone brave the winter cold. The mild climate of England cannot ripen the grape almost under the same parallel where are grown the wines of the Rhine, nor will our Indian corn ever mature or attain there, even the size it will reach on our most northern border or in Canada.

In our own country the influence of the ocean is very favorable, and is more apparent in the northern sections, where it attempers the heats of summer on the land by the sea-breezes which prevail during part of the day along the coast. Nor is this genial influence of water upon the temperature of the neighboring land limited to very extensive bodies. The inland lakes of North America certainly ameliorate the otherwise severe climate of the district in which they are located, and even the minor lakes of western New York soften the extremes of cold, and, in connexion with their larger congeners, protect the incipient vegetation of spring, and prolong the growing season by preventing the recurrence of early autumn frosts.

Under the influence of the physical agencies of heat, moisture, &c., vegetation exhibits a regular progression, whether we ascend from the equator towards the poles, or from the base of a high mountain, under the equator, towards its summit to the regions of perpetual snow. In both these directions there is a striking general agreement in the order of the succession of the phenomena, so that the natural productions of any given latitude may be properly compared with those prevailing at any given height above the level of the sea. The elevation at which any variety of plant will grow spontaneously will, of course, vary with the latitude of the mountain on which it exists. There may then be said to exist a corresponding similarity of climate and vegetation between the successive degrees of latitude and the successive heights above the sea.

There is a class of plants which a slight advance beyond the freezing point calls forth from their winter sleep, which have a peculiar stamp, and constitute a peculiar flora, termed Alpine. We find this Alpine flora in regions where snow covers the earth, where the lakes are frozen most of the year, as in northern Lapland, northern Siberia, Arctic North America, on the Alps, the Pyrenees, the Carpathians, the Caucasus, in the mountains of Norway, on Scotch and Icelandic summits, in the Himalayas, the Sierra Nevada, and on our own Mount Washington. On the latter, Alpine plants identical with those of Lapland in latitude 67° north, where they grow at a height of three thousand feet and less above the level of the sea, are found at a height of not less than six thousand feet in latitude 44° north, while below this limit, in the wooded valleys of New Hampshire, there is not one species which occurs also about North Cape. The Alpine flora appears almost ubiquitous wherever a temperature sufficiently reduced, and yet adequate to sustain life, is found. Scandinavian genera and even species reappear everywhere from Lapland and Iceland to the tops of the Alps of Van Dieman's Land, in rapidly diminishing numbers, it is true, but in vigorous development throughout. They abound on the Alps and Pyrenees, pass on to the Caucasus and Himalaya, thence extend to those of the peninsula of India, to Ceylon and the Malayan Archipelago, (Java and Borneo,) and reappear on the Alps of the New South Wales, Victoria, and Tasmania, and beyond these again on those of New Zealand and the Antarctic islands, many of the species remaining unchanged throughout. It matters not what may be the vegetation of the bases and flanks of these mountains, the northern species may be associated with Alpine forms of Germanic, Siberian, Oriental, Chinese, American, Malayan or Australian, and Antarctic types, which are all more or less local assemblages; the Scandinavian, from Sweden, Lapland, and Norway, asserts its prerogative of ubiquity from Iceland, beyond its antipodes, to its Antarctic congener of high southern latitudes.*

The correspondence between the ascending vegetation on mountain sides and the distribution of trees, especially over the whole extent of the temperate zones, is so close that it may be considered a universal law. On lofty mountains climates seem arranged, as it were, in strata, one above another, with a regularity that has strongly impressed the attentive observer. He has noticed that the trees resembling the chestnut and the walnut, or most of those that flower in aments or catkins, occur in the lower latitudes under the influence of a genial clime, but disappear entirely before he reaches a latitude or an elevation where agriculture ceases. Further north he finds a variety of poplars, willows, oaks, maples, and other deciduous trees interspersed with pines, which begin to form continuous forests until they become an almost uniform pine and birch forest, covering in unbroken continuity the more northern districts as far as trees extend. So likewise, in ascending higher and higher on

* J. D. Hooker, Flora of Tasmania.—Silliman's Journal of Science, XXIX, pp. 323, 324.

the slopes of mountains, he observes the same order of succession of poplar, oaks, maples, &c., followed by forests of pines and birch to the limit of wooded growth. Beyond this, both towards the polar regions, and higher on the mountain side, the Alpine vegetation, before referred to, succeeds. A detailed comparison of northern and Alpine vegetation would show that they agree in almost every respect, and that in general corresponding species exist under similar circumstances in different parts of the Old and New World, following each other in the same succession from south to north, as well as from the plains to the mountain summits.

Illustrations drawn from observations made in our own country are always more interesting, and, perhaps, more convincing than those brought from distant regions. Many of our readers may have had the opportunity of witnessing to the truth of the following detailed description of changes in the conditions of vegetation by increase of height and consequent increase of cold, as observed on the sides of Mount Washington and in the district at its base.

The traveller who has visited the White Mountains of New Hampshire, from the south, will observe, on ascending from the lower districts towards the head-waters of the Connecticut river, that the forest vegetation begins to assume a character differing from that lower down the main valley or that nearer the ocean. At Windsor, three hundred feet above the level of the sea, the chestnut has already disappeared. Between Windsor and Littleton the hemlock spruce, the white pine, arborvitæ, larch, the buttonwood, the beech, the white, the black, the yellow, and canoe birches, the white, the red, and swamp white oaks, the elm, white ash, aspen poplar, the linden or basswood, sugar maple, and a few other species of maples and less important trees may be seen. At Littleton the buttonwood and hog walnut or pig nut disappear, the oaks are fewer and smaller, and the mountain maple, which is not found below here, makes its appearance. From Littleton, eight hundred and seventeen feet above the sea level, to Fabyan's, which is fifteen hundred and eighty-three feet above the sea, he will notice the white spruce, balsam spruce, hemlock spruce, white pine, larch, linden, white ash, sugar maple, mountain maple, elm, the birches above-named, and some others. The cup-bearing trees, or the oaks, the chestnut and the birch have disappeared, and the pitch pine is no longer observed. This vegetation continues from Fabyan's to a level of two thousand and eighty feet, where the pines are the prevailing features of the forest. From this level the slope becomes much steeper, and the variety of trees is much reduced. Above this, to the height of four thousand two hundred and fifty feet, the vegetation consists almost entirely of white and balsam spruce,* the lofty or yellow birch and the canoe birch, which become gradually more and more stunted till at the height above named, the species which form tall and splendid trees one or two thousand feet lower, appear here as mere shrubs or low bushes with crooked branches so interwoven as almost entirely to hedge up the way, excepting in places where a bridle-path has been cut through. Above this level, which is almost as elevated as the summit of Mount Clinton, and higher than Eagle Head, near Eagle pond, of the Franconia mountains, the mountain is destitute of forest trees. Many minor plants, however, appear which remind the well-informed and philosophic botanist of the flora of Greenland, and many of which have been found growing on the sub-arctic northern shores of Lake Superior.

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* Most of the high mountain tops in western North Carolina and East Tennessee are covered with Abies nigra and Abies Fraseri, the former the black spruce, the latter the balsam fir. The black spruce grows at a lower elevation than the balsam, but neither of them are often met with beneath a height of 4,000 feet. Eight degrees of lower latitude causes them to ascend to a greater height.—S. B. Buckley, Silliman's Journal, XXVII, pp. 286–294.

The summit of Mount Washington,* six thousand two hundred and eighty-eight feet high, produces several plants which have no representatives south of Labrador. These, it may be interesting to some readers to be informed, are Andromeda hypnoides, Saxifraga rivularis, Rhododendron lapponicum, and Diapensia lapponica.

We are all as well aware that the mean annual temperature in this country decreases as we proceed towards the north, as we are that we shall encounter increase of cold on ascending a high mountain. All are not equally well acquainted with the rate of variation either on the plain or on the mountain slope. In central Europe the change in mean annual temperature takes place at about the rate of one degree of Fahrenheit for each degree of latitude, or for about every seventy miles; while in the interior of the United States, in the Mississippi valley, the rate of decrease is about one degree of Fahrenheit for every forty miles; or, in other words, as we travel north or south we reach successively localities the mean annual temperatures of which are one degree of Fahrenheit's thermometer lower or higher as we pass over seventy miles in central Europe, or forty miles in the valley of the Mississippi. In the Alps of Switzerland, in ascending or descending, the same change of one degree in mean annual temperature is experienced for about every three hundred feet of vertical height, so that we can pass, within the narrow limits of between six or seven thousand feet, from the vine-clad shores of the lakes of northern Italy to the icy fields or snow-capped mountains, whose summits are never adorned by vegetation, a journey that may be made in a single day; while to descend to the level in our own land and latitude, which corresponds in mean annual temperature to that experienced at the foot of the Alps, and travel northward, we shall find in the valley of the Mississippi a diminution of one degree of temperature for every forty miles; so that to find the region where the mean annual temperature is reduced to the freezing point, we should travel over about twelve degrees of latitude. This would conduct us to districts beyond the northern borders of Lake Superior before we could pass over the same range of climatic changes as we would encounter in one day upon the slopes of the Alps.

The mean annual temperature of 32° Fahrenheit does not imply a total absence of vegetation on the plains, or in the northern districts of North America, nor the presence of eternal frost. The heats of summer extend far beyond the limits above referred to, and even Indian corn may be ripened beyond the line of mean annual frost, or of a mean annual temperature of 32° Fahrenheit in districts northwest of Lake Superior, where, in the valley of the Red river, in latitude 50° north, about sixty days of clear tropical summer occur, which are sufficient, for reasons to be hereafter cited, to ripen some varieties of this most valuable of cereal grains.

Though the correspondence between the forest vegetation on mountain sides and the distribution of trees is thus marked, there exist many circumstances which show that climatic influences alone, or as at present existing, however extensive, will not fully account for the geographical distribution of plants and animals. Their various limits do not agree precisely with the outlines indicating the intensity of physical agencies upon the surface of the earth. The limit of forest vegetation does not, as before remarked, coincide with the isotherm or line of the mean annual temperature of 32° Fahrenheit; nor is the limit of vegetation in altitude on mountain sides strictly in accordance with the mean temperature; nor are the plants and animals distributed under the different zones of climate the same in their respective zones in the northern and

* The above-cited heights are taken from Guyot's "Appalachian Mountain System," a very full detail of recent accurate measurements of most of the more elevated portions of the mountains of the Atlantic border of the United States.—See Silliman's Journal, (1861,) XXXI, pp. 158 to 187.

southern hemispheres, nor even in the same zone in the Old and in the New World, certain classes of plants being exclusively circumscribed within certain regions, such as the magnolia and cactus in America, and certain animals, as the kangaroos in Australia, and the elephant, rhinoceros, and hippopotamus in Asia and Africa, which are limited to their respective districts.

Although there exists an intimate correlation between climate and vegetation, the temperature and other influences which constitute climate do not reveal all the causes which are operating or have produced these differences as they are repeated under the isothermal lines, or lines of equal heat, between the eastern and western shores of the Old World in the same order as along the eastern and western shores of North America. The similarity of the climates of eastern North America and eastern Asia, and of western North America and western Europe, originating in similarity of position as respects latitude, exposure to ocean currents, protection by mountain barriers, &c., does not excite surprise; but that there should exist in Japan many genera and species of plants unknown except to the eastward of the Rocky mountains in North America—that the district of the lower Amoor river, on the shore of the Pacific, should produce several species identical with peculiarly eastern North American kinds, and many others nearly allied, if not identical therewith, which are not found in northwestern America nor elsewhere on the globe, is more worthy of remark; and when on further inquiry we learn that the Canary islands and Azores possess American genera not found in Europe nor in Africa, and that the lofty mountains of Borneo contain Tasmanian (Van Dieman's Land) and Himalayan representatives, that the Himalayas contain Andean, Rocky mountain, and Japanese genera and species, and the Alps of Victoria (a district of Australia) and Tasmania, assemblages of New Zealand, Fuegian, Andean, and European genera and species, the interest becomes greatly enhanced, and the query arises, How shall all these seeming anomalies of a similarity of product, under similarity of climate, yet wide disseverance of species identical with each other, over districts between which there seems to exist no possible means of communication, be satisfactorily explained? Causes now in operation cannot be made to account for a large assemblage of flowering plants characteristic of the Indian peninsula, being also inhabitants of tropical Australia, while not one characteristic Australian genus has ever been found in the peninsula of India. Still less will these causes account for the presence of Antarctic and European species in the Alps of Tasmania and Victoria, or for the reappearance of Tasmanian genera on an isolated lofty mountain in Borneo.*

The above-cited and a multitude of analogous facts have led to the study of the agencies which may be reasonably supposed to have had an influence in determining the distribution of plants. Among these agencies may be named supposed changes of climate, which geological research seems to exhibit, arising either from direct cooling of the entire mass of the earth, or from new positions and elevations of the surface, which we cannot doubt have occurred at various epochs of the history of the progress of the earth. We shall not pause to dwell upon these most interesting problems which are tasking the learning and acumen of the most profound and acute philosophers, and which have not yet found a satisfactory solution, nor enlarge upon the nature of the facts and reasoning brought up from the study of extinct plants and animals, whose remains, entombed in the solid rock, bear witness of their former life, and of the conditions demanded for its support, but will pass to more practical applications of the general law of distribution under the regularly recurring changes of temperature now influencing the life of the globe.

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* Dr. J. D. Hooker, Tasmanian Flora in Silliman's Journal of Science, vol. XXIX, pp. 19, 21.

THE DEFINITE AMOUNTS OF HEAT REQUIRED BY PLANTS.

When considering the coincidences existing between the distribution of plants, according to their respective zones of climate on plains and on zones of elevation on mountain sides, we have had especial reference to the mean annual temperatures prevailing in the respective regions observed. These, it has been remarked, are in general correct as regards the distribution of forest trees, which brave the extreme cold of winter, and require but a few months of moderate heat for foliation and for maturing their fruit. The discrepancies found to exist between the isotherms in latitude and isotherms in elevation are more especially noted when we come to consider the arrangement of annual plants under these respective relations. Originally the mean annual temperature was alone observed, and the polar limits of plants, it was presumed, could be thereby determined. But opinions on the subject of polar limits, or isothermals, bounding on the north in the northern hemisphere the extension of certain species of plants, have changed with the progress of physical geography. More recently it was taught that the mean temperature of seasons is of more importance than that of the year, and that in general two similar climates may be distributed in fractions very dissimilar, which may neutralize one another in the estimate of their mean annual temperatures. Thus it has been observed that countries in which the summers are short but very warm, and the winters very long and cold, have a vegetation different from that of those which enjoy seasons more equable, and where the march of temperature from month to month is more gradual, or the changes less sudden and violent, although the mean annual temperature of both may be the same. It is, therefore, believed that to the relative distribution of heat over the seasons rather than to the absolute amount received through the year that we are to attribute the fitness or unfitness of a region for the growth of certain kinds of vegetation. In other words, that in a knowledge of the mean temperature of seasons, or of monthly temperatures, we may find an explanation of the causes that have influenced certain species of plants in their choice of home. Also that they have advanced from their original centre over a continent to a certain line which passes through points having an equal temperature during some period of the year, which may vary with various plants, and have occupied all the region to the border thus indicated, unless their extension has been arrested by a climate too dry or too humid, or by the impassable ocean.

In the progress of knowledge, it has become apparent that these lines of equal temperature or isotherms for certain seasons do not answer all the requirements of each case; that they do not limit even the extension of annuals, though their vegetation is confined wholly or mostly to the three months of summer.

It appears that the conditions which define the limits of a plant require that we should know the degree of temperature at which its vegetation begins and ends; that at which it will flower and will mature its seeds or fruit; and also the sum of the mean daily temperatures during these periods respectively. The hypothesis that a definite amount of heat is required in order to develop each plant in its progress from one stage of growth to another was first advanced by Reaumur, better known in America from the thermometer which bears his name than through the scientific labors which added largely to the wealth of his native France. This philosopher proposed to calculate the amount of heat demanded by a plant, by multiplying the number of days required to pass through its growth by the mean temperature of the period.

To Michael Adanson, a French naturalist of comprehensive mind, great acuteness and perfect independence of thought, but too far in advance of his contemporaries to be rightly appreciated, we are indebted for the hypothesis that, by adding together the mean temperatures of each day from the commencement of the year, it will be found that when the sum shall have reached a certain figure the same phenomena of vegetation will be exhibited, such as foliation, blooming, and maturation of the fruit.

Boussingault, that "prince of agronomical chemists," in whom combine the successful farmer and the profound philosopher, whose "Rural Economy" should be studied by every farmer, and whose new "Agronomie" promises yet more brightly to illumine his name, and the path of the scientific seeker for "light—more light," revived the hypothesis of Reaumur and enlarged its application. Many years' residence in South America, engaged in scientific observation and research, where vegetation upon mountain sides appears under almost every aspect and condition, combined with experience in the pursuits of agriculture on his farm at Brechelbronn, in Alsace, had taught him that if we multiply the number of days—the length of time a summer plant endures—by the mean temperature of this period, the product will be the same in all countries and in all years.

Baron Quetelet, of Brussels, styled by his countrymen "the Belgian Arago," has experimented upon the amount of heat required by plants, and proposes that it should be measured not by the simple product of the temperature of the several days by the number of days required, but that the squares of the mean temperatures should be employed in lieu of the daily mean. The younger De Candolle has, however, sought in vain in the researches of Quetelet and others for any positive facts showing the direct advantages of the variations of heat over continuous even temperatures, or for the evidence fully determining that one day having a mean of 20° centigrade, is of equal value with four days having each a mean of 10° centigrade, as is assumed by Quetelet in the Bulletin de l'Academie Royale de Bruxelles, v. XIX, pt. I, p. 543.

Babinet, a distinguished physicist, has proposed a method for determining the heat required by plants for the performance of certain functions. He compares the action of temperature to that of a force, such as weight, which produces effects proportioned to the intensity of the cause and the square of th time. He has not, however, made experience the basis of his hypothesis, and it is rejected by Quetelet as unsound. According to the latter philosopher, by the hypothesis of Babinet, if one day at 20° centigrade produces a certain effect, two days having a mean of 10° centigrade should produce four times 10° or the effect of 40° centigrade, and four days at 5° centigrade should exert an influence equal to sixteen times 5° or 80° centigrade—results which the general experience of horticulturists will not permit us to accept as true.

Count Adrien de Gasparin, a minister of Agriculture and Commerce, and Peer of France, who, by his numerous memoirs addressed to the societies of the departments as well as to the Academy of Sciences, attained an honorable place among contemporary agronomes, or scientific agriculturists, has also given much attention to the question of the amount of heat demanded by plants.* In his excellent Cours d'Agriculture, or Course of Agriculture, he suggests that the mean heat of the day should be derived in part from the direct heat of the sun, and not alone from that of the air, as is in general measured by meteorologists, because the motive power which induces the circulation of the sap is the heat derived from the atmosphere and the soil in conjunction with the direct rays of the sun. The rate of decomposition of the carbonic acid absorbed from the air must be measured by the activity of the chemical rays of the sun, and the growth of the plant is accelerated, we are aware, by exposure to its full measure of sunshine. This method cannot, however, be readily verified in

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* Count Adrien de Gasparin was father of Count Agenor de Gasparin, whose virtues and generous appreciation of the importance of the struggle that now racks our nation have been so fully exemplified in his enlightened labors in our behalf among his fellow-countrymen in Europe.

the actual state of meteorological knowledge. This distinguished observer followed the vegetation of one variety of vine growing near Orange, in France, from foliation to maturity, noted the minima of heat for each day in the shade, and the maxima shown by the thermometer in the sunshine, but protected by a slight covering of earth. The mean between these minima and maxima give, according to Gasparin, a more satisfactory number than that derived from other processes; and when multiplied by the number of days during which vegetation is influenced by this particular mean, results in a sum total of heat which varies but little from year to year at the locality where the observations were made. So nearly do these sums agree that the presumption is strengthened that the process may be the correct one, and deserving of much more attention than has been awarded to it. The result of de Gasparin's experiments in 1844 was a sum of 4195°; in 1845, 4203°; in 1846, 4057°; and in 1847, 4100° centigrade.

Among the contributions of these inquirers into the mystery of heat as adapted to the wants of plants, none have hitherto elicited more interest than those of Boussingault. His method, proposed by Reaumur, appears to be logical and precise, giving results sufficiently satisfactory for determining the heat necessary for maturing annual plants, particularly the cereals in spring. He has been very happy in determining the conditions of a good vintage in his district of Alsace, and has shown that certain mean temperatures are necessary during certain eras of vegetation, and especially that a definite amount of heat is needed to insure the elaboration of a due proportion of sugar in the grape.

The principle that we must combine the values of temperature and time in our inquiries into this subject cannot be controverted, for all must perceive that heat acts proportionally as regards its duration and its force. Boussingault, therefore, asserts that if a plant has required twenty days to ripen its seed, numbering from the period of flowering, and the mean temperature during those twenty days has been fifty degrees, it will be found that the plant will have received one thousand degrees of heat. The same number of degrees of heat might have influenced the plant during a lesser number of days had the mean temperature been proportionally higher. This is well illustrated by the rapidity with which some annual plants germinate in Arctic regions on the return of midsummer heats. In these northern regions, where for a short time plants are subjected to an intense heat, often as high as 109° Fahrenheit in the shade, and which enjoy a longer continuance of the sun above the horizon than in more southern latitudes, the growth of some vegetables is said to be so rapid under assiduous culture and in genial situations that their progress may be traced from hour to hour. In Norway, in latitude 70° north, peas grow at the rate of three and a half inches in twenty-four hours for many days in summer, and some of the cereals, probably barley and oats, grow as much as two and a half inches in the same time. Not only is the rapidity of growth affected by the constant presence of the sun's heat and light, but those vegetable secretions which owe their existence to the influence of the actinic force on the leaves are all produced in far greater abundance than in more southern climes; hence the coloring matter is found in greater quantity, the tints of the colored parts of vegetables are deeper, the flavoring and odoriferous matters are more intense, though in saccharine properties the plants of Norway are not equal to those of the south.

The successful cultivation in northern countries, by artificial means, of plants naturally demanding the high temperature and long seasons of more southern latitudes do but combine the duration and degree of heat. Nor need it excite our surprise that so well defined are the laws regulating the temperatures necessarily accorded to each variety of plant undergoing these artificial climatic conditions, and so accurately determined are they by practiced gardeners, that they have become experts to that degree that they succeed in producing the flower or the matured fruit on a given day.

While there can be no doubt that different plants require different amounts of heat from the time of sprouting to full maturity, though the time through which this may be furnished may be different in different instances, and that a great heat may produce the same effect on plants which is produced by a lower degree operating during a longer term, another principle of much importance must be observed in order to the successful cultivation of plants under natural or artificial circumstances.

This second principle is that each species requires for each one of its physiological functions a certain minimum of temperature, or, as has been well said, each species of vegetable is a kind of thermometer which has its own zero or lowest degree at which it will vegetate. A temperature above a certain minimum of heat is found necessary for germination, another for one chemical modification, and a third for flowering, a fourth for the ripening of seeds, a fifth for the elaboration of the saccharine juices, and a sixth for the development of aroma or bouquet. A certain intensity of light is also demanded to render green the tissues, and a due supply of humidity in the air and in the soil to furnish a vehicle for the materials of growth and prevent undue desiccation. A plant is thus not only under all the influences which affect the thermometer, but is likewise acted upon as is a hygrometer by humidity and dryness.

From the study of special examples among plants, under the combined influences of temperature, light, and moisture, a later inquirer believes he has reached most interesting results regarding the limiting effects of these causes towards the north, and on mountain sides. From the point of view taken by this later investigator botanical geography ceases to be a simple accumulation of facts, takes a place among the sciences, and assumes to explain by the study of the distribution of living plants the actual conditions of climate, as well as those that prevailed in former ages. It is to Alphonse de Candolle, who, in his Geographie Botanique Raisonnée, has presented to the scientific public one of the most important works that has of late appeared, and one of the most generally interesting, both on account of the subjects it treats of and the signal ability and thoroughness with which most of them are handled, that we are indebted for a clearer insight into the obscurity which has shrouded the subject of the geography of plants. "This work," which, in the language of Dr. Asa Gray, "is one that addresses and will greatly interest a much broader circle of scientific readers than any modern production of a botanical author, and which will probably long be esteemed the standard treatise upon a wide class of questions highly and almost equally interesting to the botanist, the zoologist, the geologist, the ethnologist, and the student of general terrestrial physics," is not to be found in our bookstores, and appears upon the shelves of only one library in Philadelphia, the magnificent natural history collection of the Academy of Natural Sciences. "Truly we are an enlightened people!" A. de Candolle has proved himself a son worthy to bear the name and continue the renown of his father, Pyramus de Candolle, who was the only botanist since Linnæus that embraced all branches of the study with an equal genius, and whose works mark a new era in the progress of his science. The limits which we have assigned to this paper forbid an extended notice of this work, and we will confine our remarks to a few illustrations of the results arrived at, and refer the inquiring reader to Dr. Asa Gray's notice, in Silliman's Journal of Science, vol. XXII, pp. 429, 432, and to Hooker's Journal of Botany, spring and summer of 1856, for a more extended critique.

ON THE RANGE OF CERTAIN ANNUAL PLANTS.

It has been the custom to attribute the disagreement between the limits of plants and the lines of equal temperature to errors of observation on the locality of species, to uncertainty respecting the thermometric mean, or to varying degrees of dryness and humidity. But certain facts and calculations upon the heat requisite for culture in different countries have awakened doubts of the truth of these explanations, and have led to more minute investigations.

As each species of plant can bear a definite range of temperature, indeed, requires a certain amount during a given period of time to enable it to perform all its functions properly, the only true indication of climatic adaptation is, that the plant, under the conditions assumed, perfect its seed and produce its various secretions; and more recent research has demonstrated that neither the annual mean, nor that of the summer season, accurately indicate the northern limits of the extension of the range of our *annual* plants. An extended series of comparisons of the range of many European plants, with the tables of monthly temperatures and seasons over the districts where these plants naturally appear, has shown that in no case does the limit of a species exactly coincide with a line of equal temperature for any one period of the year. Also, which will appear more worthy of remark, that the limits of annual plants in the plains of Europe cross one another with considerable frequency, and that the limits of perennial and ligneous species also cross each other in different directions, and both are far from being parallel when they do not thus cross.

The lines of mean temperature are derived from a consideration of fixed periods whether of a month or of a season, while the vegetation of annuals lasts during periods which are variable, the vegetation of the plant having its commencement and completion at different epochs of the year dependent upon the condition of greater or less excess of heat when compared with the mean of the growing season. There can obviously be but small agreement between these two classes of facts which have no necessary connexion or relation.

A. de Candolle has taught that if we would estimate the heat really useful to a plant we must consider in our calculation those values only which are above a certain degree of temperature, which degree varies with the species. This he adds is a field hitherto unexplored, and proceeds to explain the application of the above principles in combination in European climates, by which are brought about similitudes or dissimilitudes to which the means ordinarily employed furnish no key.

London and Odessa are certainly not under the same lines of temperature. The mean summer heat at London is 61° Fahrenheit, at Odessa 70° Fahrenheit; while in winter the difference is rather greater. In the monthly means these two climates have but imperfect analogy. The monthly means at London and Odessa appear to be as follows, in degrees of Fahrenheit:

	January.	February.	March	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
London	37.2	40.1	42.5	46.9	53.5	58.7	62.4	62.1	57.5	50.7	44.0	40.4
Odessa	25.2	27.6	33.1	46.4	57.6	66.2	73.3	70.8	59.7	52.3	40.0	29.4

For greater convenience we will convert the above into degrees of centigrade, or the French mode of dividing thermometers, which shows but 100 degrees between the freezing point and the boiling point of water, a graduation it is greatly to be regretted not yet of universal acceptance with our countrymen.*

Thirty-two degrees of Fahrenheit becomes their zero, and as the degrees below this point or that of freezing are of no account to us in this consideration, we may very properly note those only above freezing or the zero of the centigrade. We have accordingly reduced the above Fahrenheit degrees to those of centigrade, and the series of temperatures for the respective months read as follows:

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
London	2.83	4.50	5.83	8.28	11.94	14.83	16.89	16.72	14.17	10.39	6.67	4.67
Odessa	—3.78	—2.44	0.61	8.00	14.22	19.00	22.94	21.56	15.39	11.28	4.44	—1.44

Now, if we consider the time at which the temperature of 4.5° centigrade or 40° Fahrenheit commences and terminates in each of these cities, and the sum of the mean heat between these two limits, as shown in the above table, we shall find nearly the same result. At London the mean of 4.5° centigrade (40° Fahrenheit) commences on the 17th of February and terminates on the 15th of December. Between these two periods, we find by taking the monthly means and fractions for the parts of the months named—that is, 5° centigrade for the thirteen days of February, and 5° centigrade for the fifteen days of December, which may be considered allowable since the heat of the latter part of February and earlier part of December exceed the remaining portions, we find an aggregate for London of 115.50° centigrade. At Odessa the temperature of 4.5° centigrade (40° Fahrenheit) commences later, from 2d to 3d of April, and terminates sooner, from the 17th to the 18th of November; but as it is warmer during summer, the amount of heat determined as above is about equal to that of London, being 116.39° centigrade. Hence it is apparent that a plant which would require 4.5° centigrade to commence vegetating with a certain activity, and in order to reach a certain stage or condition would require in all an amount of heat of 115° centigrade, rated upon the monthly means, might advance in a northwest direction to London, and in a northeast to Odessa. If a plant should require more or less than 4.5° centigrade as a minimum, or more or less than 115° centigrade in the whole as above calculated, the climates would no longer correspond, and the limit of species would be otherwise established. Our author has made use of the daily means in his calculation, and discovered that a plant commencing its growth at 4.5° centigrade, or 40° Fahrenheit, and requiring a season extending to the return of the same temperature in autumn, would demand at London 3,431° of centigrade heat, and at Odessa would receive between the same minima 3,423° centigrade. The above is a much more accurate method of comparison; but as we have not records of daily means for these places at command, we have used the monthly means, which, in this case, appear to approximate pretty nearly to the same result. It thus appears how two climates which differ, when considered as regards their respective mean monthly temperature, may yet be identical under certain combinations of the two causes which affect the life of the species existing therein.

* The centigrade scale offers many facilities to calculation, and may be readily understood. To convert Fahrenheit degrees, the common graduation, into centigrade, observe the following formula: x° Fahrenheit $= (x^\circ - 32^\circ)\ \frac{5}{9}$ centigrade, which means that to convert Fahrenheit into centigrade, deduct thirty-two degrees therefrom, divide the remainder by nine, and multiply the quotient by five. for the amount in centigrade degrees.

For the purpose of discovering these correspondences of climates De Candolle calculated the days on which the temperature 1°, 2°, 3°, &c., up to 8° centigrade commence and end at certain European localities; these all being above the freezing point, and correspond, respectively, to 33.8°, 35.6°, 37.4°, &c., up to 46.4° Fahrenheit. At the lowest of these temperatures some forms of vegetable life are called forth from their winter sleep. By associating with each locality noted, the product indicating the heat received in excess of each of these degrees, and applying these figures to the facts of vegetation, highly satisfactory results are obtained. One instance we may adduce in illustration of this method.

The *Alyssum calycinum*, an annual plant, grows on the eastern coast of Britain, as high as Perth. It is not found on the western coast of England, nor in Ireland, in Jersey, in Guernsey, nor in Brittany, which may be attributed to the constant humidity of those regions, for this plant loves a dry atmosphere, and a plant that grows in Scotland cannot be said to find the heat of Brittany insufficient for its existence. On the continent, the *Alyssum calycinum* spreads to the northwest as far as Holstein and the Baltic sea, but not into Scandinavia, and on the northeast as far as Moscow, but is not found in Kazan in about the same latitude, though further east, and reappears in the governments of Pensa and Simbrinsk, but little south of Kazan, and again in the Steppes between the Volga and the Ural. The limits where its extension may be thought to be determined solely by temperature stretches, therefore, from near Perth, in Scotland, under the parallel of 56½ degrees of north latitude, passes along the 54th degree in Holstein, and thence oscillates in Russia between the 55th and 56th degrees. This line varies widely from any line founded on equality of temperature for any season or month of the year. On examining a table of daily temperatures, it appears that at or near Perth, in Scotland, the temperature of 7° centigrade, about 45° Fahrenheit, or upwards, continues from the 18th of April to the 31st of October, and that, during this time, the product of the days by the mean temperature amounts to 2,281° centigrade. At Kœnigsberg, on the Baltic, the temperature of 7° centigrade and upwards is of shorter continuance, but the summer being hotter, the product amounts to 2,308°. As the limit of the species is about sixty miles to the north of Kœnigsberg, this figure must be reduced, and thus more nearly resembles that found for Perth, in Scotland. At Moscow the mean of 7° centigrade commences on the 22d of April, and terminates on the 5th of October, the product in consequence of the heat of summer rises to 2,473°. This is more than is necessary for the *Alyssum* which probably flourishes more than one hundred miles north of Moscow. At Kazan the figures fall to 2,196°, so that it is not surprising that the *Alyssum calycinum* has disappeared. Thus the hypothesis of 7° centigrade for an initial temperature or minimum at which this plant commences to vegetate, and 2,280° to 2,300° for the quantity of heat demanded, accord completely with the facts.

Another instance may be adduced of conformity of facts with figures derived from temperature. The *Euonymus Europæus*, or European spindle-tree, nearly related to the burning-bush of our gardens, has for its northern limit the north of Ireland, Edinburgh, in Scotland, the north of Denmark, the south of Sweden, the isle of Aland in the Gulf of Bothnia, latitude 60° north, Moscow, southeast to Penza, in Russia, in latitude 53°, through a latitude of seven degrees. The mean annual and mean summer temperatures vary several degrees at these places when they are respectively compared, nor do the monthly temperatures agree much more nearly. The *Euonymus* requires a temperature of 2,480° centigrade, the sum of the daily temperatures between the two epochs of the year when the curve of mean temperature ascends above 6° centigrade. At Edinburgh this is found to be 2,482°. At Stockholm, beyond the limit, the sum is but 2,268°. At St. Petersburg, likewise beyond it, it is too small. At Aland there may exist a more elevated temperature due to the surrounding water. At Moscow, where the plant appears, the sum exceeds the supposed condition, and the *Euonymus* doubtless extends here further north. Finally, at Kazan this figure is reduced to 2,250°, and here the plant does not appear. The values thus found along the limit in its neighborhood, and beyond it, accord as nearly as could be desired with the double hypothesis of a minimum of 6° centigrade, and an aggregate temperature for the growth and maturation of *Euonymus Europæus* of about 2,480° centigrade.

De Candolle considers himself justified, by the results derived from the investigation of the limits of the northern extension of nearly forty species of plants, to enunciate the law of nature that "every species having its polar limit in central or northern Europe advances as far as it finds a certain fixed amount of heat, calculated from the day when a certain mean temperature commences to the day when that mean terminates." The apparent exceptions to this rule may be explained by two circumstances which restrict its application. The eastern and western limits of a species may be determined by the humidity or dryness of portions of the region over which it would otherwise extend, or perennial and woody plants are sometimes arrested in their extension towards the north by the absolute minima of temperature. In tracing a limit of a species from east to west, if the law as stated ceases to be applicable, the species may be supposed to have encountered the excluding influence of severe cold or excessive drought or humidity, and it is often difficult to decide which of these causes operates as an obstacle.

THE TEMPERATURE AFFECTING THE VINE.

There are few crops that are so much at the mercy of the atmosphere and its varying conditions as that derived from the vine. Even in vineyards that are most favorably situated, it is rare that wines of equal quality and flavor are produced in two consecutive years; and in districts upon the verge of the productive limits of the vine under extreme climates, where it exists only in virtue of hot summers, its produce is still more variable, more inconstant.

The limits to the culture of the vine in Europe are generally fixed where the mean annual temperature is from 50° to 52°. Under a colder climate in Europe no potable wine is produced. To this meteorological datum must be added the fact that the mean heat of the cycle of vegetation of the vine must be at least 59° Fahrenheit, and that of the summer from 65° to 66° Fahrenheit. Any country which has not these climatic conditions cannot have other than indifferent vineyards, even when its mean annual temperature exceeds that above indicated. It is impossible, for instance, to cultivate the vine upon the temperate table lands of South America, where they nevertheless enjoy a mean of from 62.6° to 66.2° Fahrenheit, because these climates are characterized by constancy of temperature, never rising to the higher heats necessary to the process of sugar-forming, and the vine grows, flourishes, but the grapes never become thoroughly ripe. Even in Europe, where the climate partakes of a regularity that to us is remarkable, the varying temperature of the summer mean from year to year produces a corresponding variation in the quality of the wine. This quality may, in good measure, be tested by the amount of alcohol contained therein, as this is directly as the amount of sugar elaborated by the heat of the summer months, or by the epoch of its growth, during which the sugar-forming process takes place.

A series of observations, from 1833 to 1837, inclusive, made in Flanders, shows the following results, which may be better understood if placed in a tabular form :

	MEAN TEMPERATURES.			PRODUCTS.	
	Temperature of cycle of growth of vines.	Temperature of summer.	Temperature of beginning of autumn.	Wine, per acre, in gallons.	Percentage of pure alcohol.
	°	°	°		
1833	58.46 Fahr.	63.14 Fahr.	52.52 Fahr.	311	5.0
1834	63.14	68.54	62.60	314	11.2
1835	60.44	67.10	54.14	621	8.1
1836	60.44	70.70	53.96	544	7.1
1837	59.40	65.66	53.42	184	7.7

We here perceive that the mean temperature of the period, during which the growth and maturation of the grapes take place, exercises a very remarkable influence. The temperatures of the summer and autumn of 1834, and consequently that of the entire growing season, were decidedly greater than that of any others noted above, and in the same year the strongest wine was produced. The temperature of the beginning of autumn—September, of 1835—is next in order, as higher than that of the remaining years, and though the summer of 1836 was warmer, we find the wine of 1835 superior to that of 1836. This clearly indicates that a summer heat, prolonged into the autumn, is of more value than high summer heats, with a lower temperature, later in the season. The value of the wines produced in the remaining years is nearly in accordance with the temperature of the beginning of autumn, or the month of September, and that for 1833, when the growing season was the lowest, and that for September reduced to a minimum, the wine, it is said, was scarcely drinkable. The mean temperature, therefore, of the summer is not a safe criterion for judging of the adaptation of a district to vine culture. A mild autumn must be regarded as one of the essential conditions, and, consequently, the mean for the entire period of growth where the higher heat is near the termination of that cycle, becomes a better evidence of fitness of any region for producing wine of the highest quality. This truth is strongly indorsed by the observations made in 1811, so remarkable over Europe for the quantity and excellence of its wines. This year, known as the "comet year," was distinguished by the high temperature of the early autumn. Though the summer mean was lower than several of the years above tabulated, and about an average, the months of September and October were maintained at 59° Fahrenheit, while the usual temperature of these months had not been higher than 52.7° Fahrenheit, or nearly seven degrees lower. Boussingault, to whom we are indebted for much of the data on the meteorological conditions necessary to the production of wine of the best quality, has expressed his conclusions in the following terms:

"That in addition to a summer and an autumn sufficiently hot, it is indispensable that at a given period—that which follows the appearance of the seeds—there should be a month the mean temperature of which does not fall below 66.2° Fahrenheit."

The following table illustrates the cultivation of the vine in Europe, and also the depreciation of its produce according to climatic relations. Cherbourg in Normandy, in northwestern France, Dublin, and London, show, in a remarkable manner, how, with annual mean temperatures about the same, or higher than those of several places in the interior of the continent, and a winter temperature much milder, yet the summer heat falling several degrees below, and the temperature of the hottest month differing more widely, the grape cannot be cultivated in Ireland, Britain, or Normandy. The more general prevalence of a clouded sky at the above-named places may in a measure account for the lower temperature for the summer months as observed in the shade, and strengthen the credibility of the results of the observations of Dr. Daubeny, who appears to have proved that the ripening of fruits depends more on the illuminating rays than on the calorific and chemical rays of the sun.

A table illustrating the temperatures required for the production of wine of good and excellent quality at certain celebrated localities in Europe.

Locality.	Annual mean.	Summer mean.	Autumn mean.	Mean of hot month.	Hot months.	Remarks.
	°	°	°	°		
Dublin	50.0	59.6	53.0	61.0	July and August	Vine not cultivated.
London	50.0	62.0	51.0	63.2	July	Do.
Cherbourg	52.0	62.0	54.4	63.2		Do.
Kœnigsberg	43.2	60.6	44.4	62.6		Never ripens thoroughly.
Berlin	48.1	64.5	49.2	65.8	July	Wine, very poor.
Paris	51.3	64.5	52.2	65.6	July and August	Wine, not good.
Frankfort	50.3	65.0	50.0	66.0	July	Acid wines.
Würzburg	50.2	65.7	49.4	(?)	do	Leistenberg wine, fine.
Vienna	51.0	69.4	51.2	70.0	do	Better than Rhine wines.
Toulouse	55.2	69.1	56.5	71.5	August	Strong wines.
Dijon	53.0	69.6	53.3	72.5	do	Fine Burgundy.
Bordeaux	57.0	71.0	57.9	73.1	July and August	Very good clarets.
Lisbon	61.4	70.0	62.5	72.0	do	Very good.
Cadiz	62.0	70.4	65.3	72.8	August	Do.
Madeira	65.5	70.0	67.7	72.1	do	Excellent.
Marseilles	58.3	73.0	59.2	76.0	July and August	Very strong wines.
Naples	60.3	74.4	61.4	76.3	do.	Super-excellent.

In the plains near the Baltic, in northern Germany, a wine is produced which is very acid and scarcely potable. The summer mean between 61° and 64.5° Fahrenheit, being too low, and even the temperature of the hottest month falling below the limit of 66.2° Fahrenheit.

The mean summer temperature of Würzburg, in Franconia, is 65.7°, but one degree above that of Berlin, while its hottest month cannot be more than two degrees higher than the hottest in the latter district; and when the different qualities of the wines produced in Franconia, and in the countries around the Baltic, are compared with the mean summer and autumn temperatures, respectively, we are almost surprised to find a difference of only about two degrees.

While the wines of Berlin are very inferior, and indeed unworthy of the name, those of Franconia, whose chief city is Würzburg, are held in high esteem. The Leistenwein, one of the kinds here produced, is esteemed with justice the second finest wine of the south of Germany, and the whole produce of the small space on which it is grown is secured for the table of the King of Bavaria, and is scarcely known, and can seldom be purchased. Doubtless there are local influences affecting the quality of the product, or which elevate the temperature above that of the surrounding region and assimilate it more closely to more southern districts, where wines stronger in alcohol are made. It is, however, acknowledged that the choicest variety of grape is grown, and the utmost care exercised in the selection of the most perfect berries, and that it is only by managing both the culture of the vine and the manufacture of its juice in the most skilful manner, and preserving the result until it shall have acquired the highest degree of perfection it can attain by age, and selling as the product of this celebrated vineyard only such vintages as are calculated to acquire or maintain its celebrity that a reputation has been obtained and preserved.

Even in the land of the vine all seasons are not alike propitious. An examination of a tabular view of the vintages of four of the most diverse and celebrated wine countries, extending from almost the western to the most eastern points, where famous wines are produced in Europe, exhibits the uncertainty attending the production of a good or fine vintage even in the favored land of the vine. This table extends from 1775 to 1842, and by it we find that for the sixty-eight years noted, that there were of the following varieties, viz:

Port.	Claret.	Rhenish.	Tokay. (1783 to 1831.)
23 years, very fine, fine, or good.	9 years, first-rate, very good, and good.	16 years, very good, or good.	12 years, good, &c.
27 years, middling.	59 years, either middling, bad, or none produced.	13 years, middling.	20 years, middling.
18 years, inferior, bad, or very bad.		39 years, inferior, or bad.	17 years, bad.

Seldom did three good or middling good years occur consecutively, while in the Rhenish provinces three, four, or five bad years have thus occurred. The expression "good" refers to quality only.

A reference to the Wine Chronicle for 432 years, from 1420 to 1852, exhibits the remarkable facts, that out of this long series of more than four centuries there were but eleven (11) years that were eminently distinguished for the superior quality of the wine produced; twenty-eight (28) very good years; one hundred and eighteen (118) pretty good ones, producing a good wine; seventy-six (76) that showed a middling quality of wine; and one hundred and ninety-nine (199) inferior. These four centuries and a third exhibit one hundred and fourteen (114) years of ample yield; eighteen (18) of middling product; ninety-nine (99) of poorer, and two hundred and one (201) failures, that did not pay the expenses of labor, &c. Thus the crop was seriously injured three years out of four. Think of this, ye complaining vignerons in the eastern sections of the United States, who are discouraged if but a few leaves drop from mildew; who talk of "rot," and "shrivel," and insects, as if they only were not the favored ones, and they only endured a climate where grape-growing cannot be made profitable. Here are wide districts of country whose staple crop and main dependence is the vine, which fails one-half of the time, and for three years out of four is seriously injured. How will the assertion that our country is not adapted to the growth of the vine be sustained, when we know that we have districts east of the Mississippi where it has not for eighteen years, probably the entire period since it was planted, failed to mature a good crop of grapes, and a wider district in California where no report of a season of failure has reached us, even by the mouth of tradition.

On a further examination of the preceding table of annual, summer, and other means, we observe that as we proceed towards the south, other circumstances being favorable, the temperature of the hottest month increases, and with it the quality of the wines. The wines produced in the region around Vienna, in Austria, are better in general than those of the Rhine; those of Burgundy have long been famous. These districts enjoy a month having a temperature of 70° and 72° Fahrenheit, respectively.

The vineyards near Bordeaux, which produce the highly prized clarets, enjoy a high summer mean of 71°, and two hot months of 73.1°, July and August, and a September of 67° Fahrenheit. The mean of June is above the minimum of 66.2°, being nearly 70°. These are circumstances very favorable to the production of superior wine.

The wines of Languedoc, Provence, and Roussillon, in the southeastern part of France, are remarkable for fulness of body, but they want the fine odor or bouquet of the wines of the Rhine. Their summer temperature is the highest enjoyed by any districts of France—that at Marseilles exhibiting a summer mean of 73°, while July reaches nearly to 76°, and August to 72°.

Lisbon, Cadiz, Madeira, and Naples enjoy a very high measure of summer heat and a hot August, the most favorable for the development of saccharine matter, and the wines of the adjoining districts are celebrated the world over.

In the most northern point of the district where the grape is grown, as at Kœnigsberg, it ripens only in warm summers, and is deficient in sugar, containing only a glutinous muco-saccharine matter; while in the southern regions the sugar is actually crystallized, and the grape is devoid of those acids which are requisite in order that the wine may possess flavor and those other qualities which distinguish wine from a mixture of syrup and alcohol. These extreme limits of the wine region thus offer extreme conditions of the product dependent almost solely upon the relative degrees of summer heat or the temperature of July or August.

THE SELECTION OF VARIETIES AND THEIR ADAPTATION TO THEIR RESPECTIVE DISTRICTS.

In the wine countries of Europe the utmost regard is paid to the proper selection of varieties adapted to the respective districts, yet with all their art and long experience the years of failure outnumber those of success. On the Rhine, the Little Riessling *(Der Kleine Riessling) Vitis vinifera pusilla*, of Babo and Metzger, is generally cultivated. This variety produces the famous Johannisberger, as well as many kinds of wine much inferior. The vineyard of Prince Metternich, to whom the Johannisberg belongs, is protected by the castle wall and a stone wall ten feet high, which occupied ten years in building. This greatly promotes the steady progress towards maturity by securing a quiescent state of the air, which is known to be extremely beneficial. The wine of Lugisland and the Liebfrauenmilch owe their superiority over that of the neighboring vineyard to the protection afforded by the town wall of Worms. The advantages of protection against agitation of the air are well understood in the Rheingau, or the "Rhine country," a valley of Nassau, celebrated for its rich vineyards, and the belts of vineyards which clothe the height of Hockheim produce very different wines, according to their position. One morgen, about one acre, close to the bed of the river Main, brings in the market two thousand florins; a higher morgen brings one thousand florins, and one at the summit only five hundred. The difference between Leistenwein and Steinwein, both the produce of the banks of the Main, is explained by the fact that different kinds of grapes are grown in the two vineyards; but why these two wines should differ from all others in the district has not been satisfactorily ascertained.

While we would not advise a close imitation of many practices common in Germany and France, such as laborious and expensive terracing the precipitous heights of rocky steeps and planting vines in baskets holding the earth upon ledges among the rocks, as we have seen in many instances along the Rhine, nor loading the backs of women with baskets of manure with which to climb the hills called the Coté d'or, in Burgundy, as has been our painful lot to witness a common practice, we may yet learn much from the centuries of experience gathered by the observant and laborious vine-dressers of Germanland.

Among other points worthy of attention, let us not fail to remark that the selection of varieties of the vine is always made with special reference to the locality. Those that will bear a lower degree of heat and ripen are selected for the more northern latitudes and exposures; and as we progress towards the south, towards warmer summers and longer continued heats of early autumn, more tender varieties are grown. We have said that the Kleine Riessling is cultivated on the Rhine, and that from this the finest wines are made. There are other varieties in this section of nearly equal merit, as the Traminer *(Vitis vinifera Tyrolensis)* and the Elbling grape, *(Vitis vinifera albuelis;)* the white Traminer, called Franken, by some Gutedel, *(Vitis vinifera aminea;)* and, finally, the Hermitage, brought from France. Vineyards planted with the first two varieties are generally superior to those which contain the Guetdel and Elbling. Rulænder, Black Clævner, and Sylvaner are grown either in inferior localities or for their early ripening and productiveness.

In the Burgundy district, on the Coté d'or, or Golden Hills, which extend upwards of eighty miles from N. NE. to S. SW., and are about 200 to 300 feet high, the variety of grape grown is the "Pineau," small and black, with a small bunch and a light product per vine, and from 8 to 12 barrels per acre. They also grow the "Gamai" grape, which much resembles the "Pineau," but the bunches and berries are larger and the product three times as much as that of the "Pineau," but a much inferior wine.

The wines of the Medoc, the clarets of St. Julien, Margaux, Lafitte, &c., are made from the grape called "Cabernet" principally.

The sweet wines from the south of France termed Frontignac, Lunel, and Riversaltes, are from the muscat grape, which on the Rhine will ripen only just sufficiently to furnish a grape for the dessert. Further south in France, as we approach the shores of the Mediterranean, we find the vine flourishing and displaying its choicest fruits under circumstances which it would not endure in the departments of the north. Instead of a methodical arrangement of stakes and the close-cut appearance of a plantation of hops on poles shortened to half their usual height, which the vineyards of the north most nearly resemble, we find in the south the long branches of the vine ranging over the dusky green olive trees, or on high espaliers, or intertwining its shoots with the almond or the elm.

The wines of Spain and Italy possess qualities derived from the increased heat of their more southern latitude. In Spain the "Pedro Ximenes" is the most commonly esteemed. The wines of Spain are mostly rich and sweet, at least those preferred by the people, such as Malaga and Alicant; while they export those which contain more alcohol to foreign consumers. Among the the latter is Sherry, which is made in Andalusia, near Cadiz, on the west coast of Spain, on the hot and chalky hillsides of this district.

Finally, the principal wine grown near Naples is the "Lacrimæ Christi," a luscious wine which holds a place in the foremost rank of the first class produced by any country; and truly can we indorse the opinion, if a judgment formed by thirsty climbers up the jagged cinders of the cone of Vesuvius, upon whose summit we have imbibed draughts of this peerless vintage grown on the warm volcanic ashes of the mountain side, can be deemed sufficiently disinterested.

We have seen from the foregoing notices of the popular varieties of European wine grapes, that certain kinds are adapted to certain districts of the wine climate or zone in Europe, where Riessling, Traminer and Rulænder, Pineau and Gamai, Cabernet, &c., may be the representatives of our Delaware, Diana, Clinton, Concord, our Norton's Virginia, and Catawba, and many others, each of which finds its appropriate location in a district whose warmest month occurs at the period of growth best fitted to develop the sugar, and whose autumn is sufficiently long for the perfection of the fruit. We have seen that by the table of comparative temperatures for summer, and the hottest month, that those places in the wine regions on the north, having a mean in July below 66° Fahrenheit, produce no good wine; that as the temperature for July rises, and the highest heat occurs in August, as we proceed south, the wines, as those of Burgundy and Lisbon, improve in quality until we reach the highest temperature in July and August near Naples, and with it the highest excellence.

This hasty sketch of the chief varieties of grapes grown for the production of the best wines of Germany, France, Spain, and Italy, with notices of the climatic peculiarities adapted to each class, has been made for the purpose of impressing more strongly upon our incipient wine-producers, who seem bent upon diverting this fruit from its true purpose, the dessert and the cuisine, to the production of a fluid of questionable utility in its more diluted alcoholic condition, certainly injurious in its stronger states—the importance of selecting each for his own district those kinds only which are adapted by constitution to the temperature and other peculiarities of each zone or grape region of our Atlantic States. That such zones exist has already been made sufficiently clear to those who have brought an intelligent understanding of the subject to the study of an article on the "Climatology of American grape vines" in the report of the Department of Agriculture for 1862, to which the reader is referred for further information.

Different climates impress upon the grape peculiarities easily distinguished in the wines produced by the same kind of grape grown under different influences. Thus the German Hock grapes yield a wine possessed of distinct qualities when grown along the Main or the Rhine. The same sort of grapes grown near Lisbon yield the Bucellas wine, which retains some of the peculiarities of the original, while the same grapes grown at the Cape of Good Hope yield Cape Hock bearing scarcely any resemblance to the true Rhenish; and the Sercial of Madeira, produced by the same sort of grapes, though a delicious wine, has scarcely any qualities, except durability, like that of the original.

The experience of the European vigneron of the effects of climate in modifying the quality of grapes and their product is paralleled in our own country. In the above we may find an explanation of widely diverse views of growers in different sections, and the varying estimates placed by them upon the value of Concord and other American varieties.

A cultivator on the banks of the Hudson denounces the Concord grape as having a thick, acid pulp, repulsive, "fit only to sell to those who do not know it," and exhausting his enthusiasm in raptures over the "Delaware," finds his opinions indorsed by the experienced editor of a horticultural journal; while an extensive grower in Missouri asserts that the Concord grown in his grounds is almost without pulp, of fine flavor, thin-skinned, sweet, and very good, scarcely inferior to the Delaware, which he cannot succeed in growing perfectly. Were the influences of climate and location properly regarded and allowance made for the increased temperature of western localities, even in the same latitude during the ripening season, such wide diversity of opinion would be readily understood and acknowledged to be honestly entertained, and disgraceful personalities be laid aside. The genial sun of the Mississippi valley dissolves the pulp of the Concord grape, and sweetens and matures its juices beyond anything that the summers in the valley of the Hudson can exhibit, rendering it decidedly better than the Catawba, while it is much more productive, healthy, and hardy. As the cultivation of the Concord is extended further south on the Atlantic slope, its qualities improve from the increased heat of summer in lower latitudes.

A comparison of temperatures in the valley of the Hudson may be made with that at several points in the valley of the Mississippi, in Iowa, Illinois, and Missouri, by means of the following tables. Let West Point, in the valley of the Hudson, latitude 41° 23′ north, where observations have been made for upwards of 31 years, be compared, as regards the mean temperatures for the months during which vegetation is active, with old Fort Armstrong, Rock Island, Illinois, latitude 41° 30′ north, where observations have been made for upwards of eleven years.

	March.	April.	May.	June.	July.	August.	September.	October.	Summer.	Autumn.
	°	°	°	°	°	°	°	°	°	°
West Point	37.63	48.70	59.82	68.41	73.75	71.83	64.31	53.04	71.33	53.19
Fort Armstrong	37.62	51.06	62.70	71.39	76.49	74.47	63.90	52.26	74.12	51.73

West Point and Fort Armstrong are in nearly the same latitude, and yet we observe the mean temperatures through the months of April, May, June, July, and August are about three degrees higher at the latter than at the former place. This excess of summer heat in the valley of the Mississippi becomes greater when we compare the valley of the Hudson with points in Illinois and Missouri further south. Such a comparison must be instituted in order to render more plainly apparent the cause of the discrepancy between the grape-growers of diverse opinions residing at the respective localities, whose summer temperatures we propose to compare. Taking West Point again as a representative of the valley of the Hudson, we have for—

	March.	April.	May.	June.	July.	August.	September.	October.	Summer.	Autumn.
	°	°	°	°	°	°	°	°	°	°
West Point, New York	37.63	48.70	59.82	68.41	73.75	71.83	64.31	53.04	71.30	53.20
Fort Madison, Iowa	38.20	56.80	65.30	74.20	82.50	77.50	71.50	54.10	78.10	55.30
Athens, Illinois	39.60	57.90	65.60	71.80	79.40	77.40	73.00	56.00	76.20	57.20
St. Louis, Missouri	44.40	58.30	66.40	74.00	78.50	76.50	68.70	55.40	76.30	55.00
Highland, Illinois	....	....	....	....	....	....	....	....	77.90	56.80

Here we may observe a difference of from 6 to 9 degrees of temperature in favor of western localities named over those of West Point from April to September, and that while the March mean is somewhat higher in the west, that for April is much greater, thus starting vegetation earlier and urging it more rapidly. This excess is continued through the summer until it is at its height in July; and, while West Point has a mean of but 64.31° for September, the places named in Illinois and Missouri enjoy a mean heat 4 to 9 degrees higher, or that of 68.7° to 73° Fahrenheit, a temperature adequate to the ripening of late maturing grapes for which that of West Point is not fitted.

In order more clearly to illustrate the comparative temperatures of the wine districts of Illinois and Missouri, and those of France, Spain, and Italy, we append a table of mean temperatures for sundry places of observation in the latter named countries :

	March.	April.	May.	June.	July.	August.	September.	October.	Summer.	Autumn.
	°	°	°	°	°	°	°	°	°	°
Toulouse	46.8	53.5	61.0	66.0	70.1	71.1	65.2	56.4	69.1	56.5
Dijon	48.2	51.1	60.6	66.0	70.2	72.5	62.4	53.8	69.6	53.3
Bordeaux	51.3	56.1	60.8	66.9	73.1	73.2	67.1	58.1	71.1	57.9
Lisbon	56.3	59.0	63.6	69.4	72.1	71.2	69.4	62.6	70.9	62.5
Cadiz	55.2	59.6	63.7	68.1	70.2	72.8	70.2	67.1	70.4	65.3
Madeira	62.6	63.5	64.6	67.2	70.1	72.1	71.6	67.1	69.9	67.7
Marseilles	48.4	56.1	63.2	71.0	75.9	71.9	68.7	58.7	72.9	59.2
Naples	51.2	56.7	64.8	70.8	76.1	76.3	69.3	61.9	74.4	61.4

On comparing the above table with that of the means for several places in the Mississippi valley, on page 485, it will be observed that the temperatures for March are much higher than those observed in Illinois and Missouri; those for April and May, at Bordeaux, Marseilles, and Naples, more clearly accord with those of our western wine region. June, July, and August, in the Mississippi valley, are much hotter than the hottest wine districts of Europe in nearly the same latitude; and September exhibits a parallel nearly approaching the European means, while October in the west has fallen sadly away from the high measures known throughout the wine region bordering the Mediterranean, reducing the autumn mean and shortening the season of maturation. The latter mean does not appear to be higher than that of Bordeaux, and much lower than in the more favored localities where the strongest wines are produced; but as September is still very warm and adequate to the ripening of many tender varieties of grapes requiring a long season, the wine regions of Illinois and Missouri may be esteemed comparatively well adapted to the production, in favorable situations, of wines of very good quality.

REASONS WHY THE EUROPEAN WINE GRAPE CANNOT SUCCEED IN THE EASTERN UNITED STATES.

De Candolle, assuming that the vegetation of the vine commences at 10° centigrade or 50° Fahrenheit, and employing this minimum as the limit to vegetation both in spring and autumn, finds, by comparing the aggregate temperatures enjoyed at several places during the existence of this term and upwards, both within and without the region of successful vine culture, that it may be conducted with good promise of remuneration in Europe on slopes well exposed, and at those localities which exhibit the sum of 2900° centigrade, from the day when growth commences with the mean of 10° centigrade in the shade to that on which this mean ceases, provided the number of days of rain does not exceed twelve days per month. An advantage is found to arise in taking account of the number of days of rain rather than of the quantity, for we include in this manner a very important circumstance, the mean condition of the sky as more or less cloudy. As the number of rainy days increases, the heat received by the vine will be diminished, and the chemical influence of the direct rays of the sun be much impaired. Thus this varying element, which is neglected in making up the sums of temperature in the shade, and which it is impossible to estimate at many localities, is recognized in another and definite form by stating the number of days of rain. Unfortunately our meteorological records do not furnish us with these desirable facts.

The reasoning which appears satisfactory as regards the influence of heat and number of rainy days in the European wine districts does not as fully apply to the cultivation of the grape in the United States east of the Mississippi. DeCandolle has sought for the causes which have prevented the successful culture of the grape in the middle regions of the United States, and has failed to discover the reason why it has been abandoned and its place supplied by native varieties. He concludes that there is nothing either in the means or the sums of the temperatures or the number of days of rain that can be shown to be injurious to the vegetation of the vine, but suggests that in abundant rains, especially at the period of blooming, which are known in Europe at those places where the vine has not prospered, combined with other circumstances which have eluded his research, such, perhaps, as diurnal variations of temperature or the humidity of the soil, we may find the true obstacle to the successful culture of the European wine grape in the United States.

It is doubtless to the variable quantity of atmospheric humidity which characterizes the climate of the eastern United States that we ought to attribute the failure of attempts to cultivate the wine grape. Periods of excessive heat and saturation continuing from two to eight days are common in the American summer, but are rare in Europe. The maximum of 100° in the shade is frequently observed in Canada, and south of Boston the mercury may be confidently expected to make one or two visits to the region of 95° and 98° at one or more times during "the heated term." This high heat of 95° is sometimes attended by saturation with moisture, and at such times becomes destructive to human life by causing exhaustion or depression of the vital powers through the joint action of heat and humidity. When the highest measure of 100° to 104° which have been observed occur, when the air is very dry, equally injurious consequences must follow to tender vegetation from the destructive drying of the tissues. In the eastern United States there often occur periods of several days which are burdened with excessive moisture alternated with periods as marked by excessive dryness to which we find no parallel in the wine districts of Europe. Our average of atmospheric humidity is, however, very low, as is indicated by the prevailing forms of vegetation. Our forests do not abound in mosses except in elevated districts. The grasses furnish evidence of aridity which cannot be readily overlooked, and fail to cover the earth with perennial verdure, as in the moister climate of England and western Europe. South of the parallel of 38° north latitude the introduced grasses cannot be cultivated.

Though the uplands of Georgia and the interior northward to Pennsylvania, districts in which the cultivation of the European wine grape has been attempted without success, have many points of resemblance with those of France as respects capacity for cultivation, in the extremes of dryness and humidity they present no features in common. It is to these extremes we must ascribe this wide disparity, for in our country it may be said to be alternately too dry or too wet, too warm or too cold, to conform to the corresponding periods of the life of the vine as experienced in France.*

It is exceedingly difficult to obtain observations which may be properly compared because of the different local conditions of the experiments. A decisive mode of comparing the humidity present in the atmosphere of America and England may be found by measuring the quantity of water naturally evaporated from an exposed surface. The following will serve to show the difference between the evaporating powers of the air in England and in the United States:*

*Blodget's Climatology of the United States, pp. 226, 229.

Quantities of water evaporated in inches of depth.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Whitehaven. English mean of six years..	0.88	1.04	1.77	2.54	4.15	4.54	4.20	3.40	3.12	1.93	1.32	1.09	30.03
Ogdensburg, N. Y., one year	1.65	0.82	2.07	1.63	7.10	6.74	7.79	5.41	7.40	3.95	3.66	1.15	49.37
Syracuse, N. Y., one year	0.67	1.48	2.24	3.42	7.31	7.60	9.08	6.85	5.33	3.02	1.33	1.86	50.20

The first series of quantities above given for Whitehaven, in one of the most humid districts of England, was carefully observed from 1843 to 1848 by evaporating from a shallow copper vessel one and a half inch deep, filled daily and protected from the rain. The annual fall of rain at this place was 42.25 inches, and the amount evaporated was in excess of the rain fall; but generally much less is evaporated than falls each year. In the United States the evaporation is always much greater from a vessel thus supplied and protected from rain than the actual depth of rain precipitated, and we may assume the evaporation from a reservoir surface, when compared with the quantity of rain to be, during the summer months, as two to one, or twice as great. The absorbent power or capacity of the air of England is thus strongly contrasted with that of the United States, the air of the former, under similar conditions, taking up but half the quantity evaporated in the latter. And though the case cited may be an extreme one, and not fully illustrative of the conditions of atmospheric capacity for moisture as it exists in France and Germany, yet the difference will be found one of degree merely, and the average dryness of the American air will prove still largely in excess of that of western Europe.

That it is to excessive atmospheric humidity, alternating with aridity, and both combined with high temperatures, that we must ascribe our failure to cultivate the European wine grape, is attested by the success with which our American varieties are grown under circumstances which combine proper temperature with more uniform humidity, and our ill success when we attempt the extensive cultivation of even our native sorts in localities which are subject to the above extremes. In the districts where the Isabella and Catawba are largely and profitably grown, the vineyards are either surrounded by water or so influenced thereby as to enjoy a comparatively humid atmosphere combined with more moderate summer maxima and long continued autumn heat. Thus the Croton Point vineyards, of Dr. R. T. Underhill, are nearly surrounded by water. The vineyards on Kelley's island, Lake Erie, where the Isabella and Catawba of superior quality are grown very extensively, and with almost uniform success from year to year, are directly under the influence of the lake waters, whose equalizing effects upon the humidity of the air upon its borders must be as marked as is that it exerts upon the mean temperature of summer and its lengthened autumn.*

* An illustration of the influence of the lake in regulating the phases of the vegetation in the region round about may be found in the following, furnished by George C. Huntington, an intelligent meteorologist and vine culturist, of Kelley's island. He has observed that the Isabella and Catawba grapes are uniformly in full bloom on the 20th of June, and accounts for this remarkable uniformity by ascribing it to the influence of the lake, the temperature of whose waters scarcely vary at this season, having, on the 30th of June, exhibited a mean of sixty-nine degrees, Fahrenheit, through a series of five years.

THE TEMPERATURES REQUIRED BY THE AMERICAN GRAPE-VINE.

The following table will exhibit the time of leafing, blooming, and ripening of twelve of the new varieties of native American grapes at Waterloo, New York, latitude 42° 55′ north, longitude 76° 50′ west, in the summer and autumn of 1862, which appears to have been a favorable season, unattended by any unusually unpropitious circumstances. This table, also, shows the number of days from leafing to blooming, the average temperature of each period, and the sum of the mean temperatures for the same, derived from a neighboring meteorological station; also, the number of days between blooming and maturity, the actual average temperature, the sum of the mean temperatures for the same, total number of days from leafing to ripening, average temperature of the entire epoch of growth and aggregate of heat required to perfect the fruit. We have superadded a column of time of stoning, based upon the time of coloring, dating three weeks anterior to the latter appearance, which is very nearly correct. From the latter epoch we have calculated the temperature for the month following, from actual observations, and have appended remarks upon the quality of the product.

The attentive observer of this table will find much therein to interest and instruct. He will remark the order in which the varieties are arranged is not based upon their respective early leafing or blooming, but upon the order of ripening and the aggregate amount of heat required for the entire cycle of growth; that while the average temperature for the term from leafing to blooming remains about 59°, the number of days required by the different kinds varies but slightly, except in the Clinton and Isabella. The amount of heat received during this stage ranges from 1893.33° in the Clinton to 2678.66° in the Delaware; also, that the period comprised between blooming and ripening varies much more widely, from 77 days, required by the Delaware, to 111 days, which were inadequate to the maturation of the Anna. He will perceive that the varieties first in order enjoy during this period the favorable temperature of about 68°, which appears adequate to their ripening, and that the sum of heat received during this period is generally much less than that required by those lower on the list, which do not indeed properly mature, and whose mean temperature is lower because of the prolongation of their period of growth into a cooler season.

Proceeding further, we note the total number of days required from leafing to maturity to vary from 122 days in the Delaware and Hartford Prolific to 154 and beyond in Anna, which did not ripen. The average temperature for the entire period of growth varied but little, but the entire amounts of heat are widely different. Finally, that those which attained the highest perfection enjoyed the highest heat during the month following the commencement of the stoning process, and that those whose temperature at this time fell to 67° or thereabouts were of but indifferent quality, and that those which were below 66° did not ripen at all.

Dates of leafing, blooming, and ripening of sundry varieties of native grape-vines, as observed at Waterloo, New York, in 1862, by F. C. Brehm, and reported in "The Horticulturist," volume XVIII, pages 52 and 53, with average temperatures and aggregates of heat required during each period of growth, derived from daily and monthly means reduced from observations made at a neighboring station.

	Temperature at date of leafing.	Date of leafing.	Days from leafing to blooming.	Date of blooming.	Average temp. from leafing to blooming.	Sum of heat required to blooming.	Date of stoning, (calculated.)	Temp. of month of stoning process.	Days from bloom to ripening.	Date of ripening.	Average temp. from bloom to ripening.	Sum of heat required from bloom to ripening.	Number of days from leafing to ripening.	Average temp. of entire period from leafing to maturity.	Aggregate heat for entire period.	Quality, &c.
	°				°	°		°			°	°		°	°	
Delaware	52.41	May 14	45	June 28	59.52	2678.66	Aug. 1	69.00	77	Sept. 13	68.17	5249.00	122	64.98	7927.66	First quality.
H. Prolific	52.41	May 14	44	June 27	59.03	2607.66	Aug. 9	67.14	78	Sept. 13	68.32	5319.66	122	64.98	7927.66	Ordinary.
U. Village	51.66	May 12	45	June 26	58.95	2653.00	July 21	68.58	80	Sept. 14	67.95	5436.66	125	64.71	8089.66	Good.
Clinton	51.66	May 12	32	June 13	59.16	1893.12	July 24	69.43	95	Sept. 16	66.52	6319.66	127	64.67	8213.00	Good for wine.
Diana	51.40	May 10	44	June 23	58.66	2581.66	Aug. 1	69.00	89	Sept. 20	67.31	5990.66	133	64.45	8572.66	Next to Delaware.
Concord	52.71	May 15	42	June 26	59.13	2483.66	Aug. 9	67.14	91	Sept. 25	67.30	6124.66	133	64.72	8607.66	Poor, foxy.
Isabella*	51.40	May 10	34	June 13	58.73	1999.00	July 24	69.43	104	Sept. 25	66.19	6884.00	138	64.37	8883.00	Good.
Rebecca	53.13	May 16	42	June 27	59.19	2486.00	July 24	69.43	96	Oct. 1	66.91	6414.66	138	64.49	8900.66	Best, (poor bearer.)
Y. Madeira	52.41	May 14	44	June 27	59.26	2607.66	Aug. 8	67.14	96	Oct. 1	66.91	6414.66	140	64.44	9022.33	Unfit for table.
Catawba	52.71	May 15	42	June 26	59.13	2483.66	Aug. 15	65.62	100	Oct. 4	66.65	6665.66	142	64.43	9149.33	Good, but unripe.
To Kalon	52.31	May 13	44	June 26	58.97	2504.66	Aug. 8	67.13	100	Oct. 4	66.65	6665.66	144	64.30	9260.33	Good, liable to rot.
Anna	52.71	May 15	43+	June 27	59.32	2551.00	Sept. 5	50.61	111+	....	65.58	7280. +	154+	....	9831. +	Unripe October 16.

* The Isabella, above observed, was in a sheltered position, and leafed and bloomed earlier than it would otherwise have done. In the open vineyard it appears to require the same initial heat as does the Catawba, and leafs and blooms on the same days.

The only anomaly apparent in the table respects the date of blooming and ripening of the Isabella. The first by comparison with several warmer localities is antedated, perhaps, one week, and the date of maturity may safely be assumed as quite two weeks too early. Dr. Underhill, of Croton Point vineyards, on the Hudson, informs us that the Isabella blooms from the 14th to the 25th of June, and though the fruit is gathered for market from the 14th to the 25th of September, it continues to ripen for five or six weeks. At Kelley's island, Lake Erie, another celebrated locality where the Isabella is successfully cultivated and ripened, as we are informed by George C. Huntington, the Isabella and Catawba almost uniformly bloom on the 20th of June, and that the first does not mature even under a higher heat than that known at Waterloo, New York, until the 15th of October, and that they improve even until the 15th of November.* Both Croton Point and Kelley's island are more favorably situated for early blooming and ripening than is Waterloo, and yet at the former the Isabella blooms and ripens later. The observed temperature is not, therefore, in this instance, a correct index to the wants of the Isabella, because the vine observed was exposed to reflected heat, which raised its temperature 10°, and assimilated its surroundings to those of more southern localities. As an evidence of the value of shelter, this illustration is worthy of remark. The fruit is reported perfectly ripe under the observed temperature, which could not have matured it without the increment derived from shelter.

Observations made on the vine at Brussels show that it pushed its first leaves at a mean date of April 25 for a series of years from 1841 to 1850, and that during this term the heat of the atmosphere in the shade was a mean of 10.25° centigrade, or 50.45° Fahrenheit. This mean was preceded by a sum of temperature which may be esteemed uninfluential, that for March having been almost as low as 6° centigrade, or 42.80° Fahrenheit.

The minimum temperature at which the vine commences foliation, according to Count de Gasparin, is 9.5° centigrade, or 49.10° Fahrenheit. Boussingault admits that the 1st of April may be considered the point of departure for the commencement of the growth of the vine in the department of the Lower Rhine, where his experiments were made, and that in order to favor its growth this period should have a mean temperature of 7.5° centigrade, or 45.50° Fahrenheit, according to observations made at Strasburg. De Candolle believes that the minimum temperature at the time of commencing vegetation in the spring may be that of 8° centigrade, or 46.40° Fahrenheit. He, however, inclines to the belief that 10° centigrade, or 50° Fahrenheit may be considered the temperature at which the vegetation of the vine properly commences, and such we find to be the case in our own experience with our native varieties. At this date (April 24, 1864) the buds of the Concord vines are much swollen; some of them have opened, and several other varieties are in various stages of enlargement, but without showing the leaf. The daily mean temperature for the past seven days has been 11.5° centigrade, or 53.76° Fahrenheit, and for the past two weeks 10.25° centigrade, or 50.42° Fahrenheit, and yesterday the peach blossoms expanded, and to-day the first bloom of the pear appeared

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* At Kelley's island Isabella and Catawba leaf May 5 and 6, respectively, bloom June 20, ripen October 15 and November 1, respectively. By known mean temperatures and aggregates of heat calculated therefrom we learn that the Isabella requires 10,639 degrees, and the Catawba 11,307 degrees, Fahrenheit, from leafing to ripening. These are evidently the sums of heat required in the open vineyard, and are proved to be perfectly in accordance with the results of observation made at Croton Point and Poughkeepsie, New York, and at Haddonfield, New Jersey.

Since the above was written, F. C. Brehm, of Waterloo, informs that he has destroyed nearly every Isabella in his vineyard, as they do not succeed on his rich soil. He also informs that the Diana ripens two weeks earlier than the generality of Isabellas, by which we may fix the date of ripening of the Isabella in the open vineyard at Waterloo at October 4 and thereafter, which is more in accordance with experiments elsewhere.

The mean temperature of the first week of April has been 6.3° centigrade, or 43.30° Fahrenheit; that of the second week of April, 8.3° centigrade, or 46.99° Fahrenheit; and of the third week, 9.15° centigrade, or 48.49° Fahrenheit—numbers which agree very closely with those observed in France and Belgium, as demanded by the vine before and at the commencement of vegetation.

An examination of the table of leafing, blooming, and ripening of sundry American vines, as observed at Waterloo, New York, favorably situated a few miles distant from Cayuga lake, exhibits the fact that the Diana and Clinton began the leafing process at the temperature of 51.40° to 51.66° Fahrenheit for ten to twelve days previous, or from the 1st of May, and that the other varieties opened their leaves under a mean of from 52.41° to 53.13°, beginning from the same date. The leaves did not, however, expand until a day had been experienced having a mean temperature of 60° or upwards; and the same has been our observation to-day, when the first leaves of the Clinton appeared.

De Candolle, in order to determine the possibility of vine culture at various places, employs a table of aggregate temperatures derived from the date when the daily means of 8° and 10° centigrade above freezing first appear, respectively, until the day when the same mean heats are last experienced in autumn. This is based upon the assumption that the entire term is required for the maturation of the various kinds of grapes that will grow and ripen in the latitude noted. Such has not been observed to be the fact in America. Several varieties of native vines ripen their fruit in August or early in September, when the high summer means prevail, and this even near the northern border of grape culture, as we find by the foregoing table. Several mature from the middle to the last of September, while the temperature of this month at Waterloo, New York, for 1862, was 63.04°, being 13° above the mean at which vegetation commenced, and which mean was not reached until the middle of October, when the first frost occurred.

By deducting the average temperature during the period from leafing to blooming from the mean temperature at and prior to leafing, we obtain the available heat necessary to advance the plant to the era of bloom. Taking the Delaware as an example, we find that it commences vegetating at about 52.41° Fahrenheit for 14 days previous, and blooms at a mean of 59.52° Fahrenheit, a difference of 7.11° for 45 days, (the time required,) giving us an average of 319.95° available degrees of heat, according to Fahrenheit's scale, necessary to conduct the Delaware vine to this condition. The average temperature from blooming to maturity is 68.17°, and the difference between this and the initial temperature of 52.41° is 15.76°, which continued for 77 days, the time required, gives us an aggregate from blooming to maturity of 1191.52° Fahrenheit. The latter sum, added to that required from leafing to blooming, 319.95°, exhibits a final aggregate of heat demanded by the Delaware above 52.41° of 1533°.47. This is equal to a mean of 12.57° above the initial for 122 days, the entire period required, or a mean temperature for the season of growth of 64.98°, or 65° nearly.

Waterloo, New York, appears to be very favorably situated for vine-growing, though near the northern border of successful cultivation. Its summer temperature being 66.05°, and the mean for the season from foliation to ripening of the earlier varieties 64.98°, and for those which require a longer season, and yet mature there, a mean of 64.37°. These means accord very closely with those determined as necessary in Europe for the growth and maturation of the hardier varieties of the wine grape; for, says Boussingault, "any country which has not a summer mean of at least 64.4° to 66.2° Fahrenheit, can have but indifferent vineyards." An indispensable requisite to perfect maturity is adequate heat during the later stages, and this is received at Waterloo in September, which enjoys a mean heat of 63° Fahrenheit. But the most important epoch in the life of the vine is that which follows the appearance of the seeds, and at this period it is absolutely necessary that there should exist a month, the mean temperature of which does not fall below 66.2° Fahrenheit, a fact sufficiently demonstrated by the table of European localities, where failure or success attend attempts to cultivate the wine grape at certain places, respectively, as set forth on page 480 of this volume. These results are again confirmed at Waterloo, New York, where, by examination of our table on page 490, the natural product of calculations from the data in our possession, without effort to force an agreement, we find that the two varieties which did not ripen at Waterloo were the Catawba and the Anna, whose month of stoning fell below 66.2° Fahrenheit, or to 65.62°, and 50.61°, or to at least 62°, as shown by another calculation, respectively.

By judicious application of the principles deduced from the foregoing, the extent of a growing season may be readily, and, perhaps, accurately defined, and all those varieties of grapes and other fruits whose demands for heat fall within the limits designated, other circumstances being favorable, be successfully grown. Tables of aggregate temperatures might be constructed either on the principle observed in the table of leafing, blooming, and ripening, or on that noticed above as employed by De Candolle, which would serve as valuable guides in practice.

GENERAL RULES FOR DETERMINING THE FITNESS OF A DISTRICT IN THE UNITED STATES FOR THE GROWTH OF CERTAIN VARIETIES OF VINES.

The following rules derived from a close study of the requirements of the various native grapes will be found very useful to many inquirers who are at a loss to know the fitness of their district for their cultivation, and in connexion with the following tables may serve instead of an isothermal and hyëtographic or rain map prepared to accompany a former article on the "Climatology of American Vines," but not published.

1. Those places which have a summer temperature of 66.5°, a hot month of 70°, and a September of 60°, will ripen the Delaware, Clinton, Perkins, Logan, King, and some other very hardy varieties. The temperature of their growing season corresponds to a mean of 65° and upwards, and an aggregate of heat of about 8,000° Fahrenheit. This district includes many parts of New England and New York, northern Pennsylvania, northern Michigan, Wisconsin, and Iowa.

2. Those places which have a summer of 70°, a hot month of 72°, and a September of 63°, will ripen the Concord, Hartford Prolific, Diana, Crevelling, &c. Their season of growth corresponds to a mean of 67°, and an aggregate of 8,500° and upwards. This district covers part of the southeast and south coast of New England, valleys of Hudson and Mohawk, neighborhood of the minor lakes in western New York, southern border of Lake Ontario, southern Michigan, southern Wisconsin, &c.

3. Those places which have a summer of 72°, a hot month of 73°, and a September of 65°, will ripen the Isabella. Their growing season corresponds to a mean of 70°, and an aggregate of 10,000° of heat. They are not found in the State of New York, except in the southeast extremity, lower valley of the Hudson, and near some of the minor lakes, but appear on the southern border of Lake Erie, in northern Indiana and northern Illinois.

4. Those places which enjoy a summer mean of 73°, a hot month of 75°, and a September of 65°, will ripen the Catawba. Their growing season corresponds to a mean of 72°, and an aggregate of 11,000°. They are not found north of New York city and vicinity, or the southeastern counties of Pennsylvania, middle New Jersey, or southern Ohio, Indiana, Illinois, and Missouri.

5. Those places which bask under a glowing summer of 74°, a hot month of 75°, and a September of 75°, as at Los Angeles, in California, other circumstances being favorable, may ripen the most tender European wine grapes to perfection.

The exceptions to the above rules are found at places influenced by water, whose high or moderate September mean may extend into October without intervening frost.

By consulting the following tables almost any one interested may determine for himself what varieties of grapes he may grow on a small scale. It would not be wise to enter upon the culture without more minute information and larger study respecting the fitness of a locality for grape-growing. Some places are too elevated that otherwise by position might be eligible. The extensive tables of temperature accompanying the very valuable bi-monthly reports of the Agricultural Department will assist some inquirers in determining the mean temperature of their summer, their hot month, and of September, though not as reliable as the means for many years. These reports have been widely disseminated, and can or should be readily accessible in almost every county in the land. The material for the construction of the following tables have been derived from Blodget's extensive list of temperatures in his "Climatology of the United States," and "Results of Meteorological Observations, 1854 to 1859," a report of the Commissioner of Patents, &c.:

Places which are beyond the limit of vine-growing; the normal temperature required for ripening being, for summer, 66°.5; *for hottest month,* 70°; *and for September,* 60° *Fahrenheit.*

Locality.	Summer mean.	July mean.	August mean.	September mean.	Length of observation.
	°	°	°	°	
Charlotte, Prince Edward's island.	66.1	70.5	67.7	59.5	One year.
Quebec, Canada	65.3	66.8	65.5	56.2	Ten years.
Fort Kent, Maine	61.7	62.5	63.5	51.6	Four years.
Eastport, Maine	60.5	62.3	62.4	57.3	Twenty-five years.
Castine, Maine	62.0	64.8	64.7	58.4	Forty years.
Bath, Maine	64.8	68.5	64.6	59.2	Ten and a half years.
Dover, New Hampshire	66.9	70.1	66.7	58.8	Do.
Hanover, New Hampshire	62.8	64.4	62.3	55.0	Three years.
Craftsbury, Vermont	63.6	67.2	62.5	55.8	Six years.
Princeton, Massachusetts	65.8	70.3	64.9	58.6	Two years.
Williamstown, Massachusetts	65.3	68.3	63.4	58.5	Five years.
Pomfret, Connecticut	66.1	69.2	65.4	59.4	Six years.
Cherry Valley, New York	65.4	67.0	65.6	57.8	Fifteen years.
Cazenovia, New York	66.6	68.7	62.5	57.5	Two years.
Utica, New York	66.5	68.5	66.7	58.4	Twenty-three years.
Lowville, New York	63.7	67.8	62.1	56.8	Two and a half years.
Potsdam, New York	66.3	68.4	66.7	57.4	Twenty-one years.
Penetanguishene, Canada	65.2	70.4	68.5	53.2	Two years.
Mackinac, Michigan	62.0	64.5	64.1	55.1	Twenty-four years.
Fort Brady, Michigan	62.0	64.9	62.9	54.6	Thirty-one years.
Fort Howard, Wisconsin	68.5	71.5	67.9	57.2	Four years.
Kenosha, Wisconsin	65.3	68.6	65.7	59.6	Three years.
Fort Ripley, Minnesota	64.9	67.3	64.7	56.7	Six years.
Sandy Lake, Minnesota	64.8	67.6	65.5	58.3	Two years.
Forest City, Minnesota	68.9	71.7	67.8	56.4	Do.
Fort Snelling, Minnesota	70.6	73.4	70.1	58.9	Thirty-five and a half years.
Steilacoom, Washington Territ'y.	62.9	64.2	63.8	57.7	Five and two-thirds years.
Astoria, Washington Territory	61.6	61.6	63.0	58.7	One and one-sixth year.

Places near the northern border of vine culture.

Locality.	Summer mean.	July mean.	August mean.	September mean.	Length of observation.
	°	°	°	°	
Montreal, Canada East	70.8	73.1	70.8	60.6	Twenty-seven years.
Saco, Maine	68.8	70.8	69.4	60.9	Eight years.
Concord, New Hampshire	68.2	71.2	67.2	60.8	Five years.
Manchester, New Hampshire	70.2	74.7	68.6	60.9	Four years.
Burlington, Vermont	67.9	69.9	68.0	59.6	Twenty-one years.
Amherst, Massachusetts	68.6	71.0	69.0	60.0	Fourteen years.
Mendon, Massachusetts	68.4	71.9	68.7	61.0	Seventeen years.
Worcester, Massachusetts	68.3	71.2	67.7	60.8	Six years.
Providence, Rhode Island	68.1	70.6	68.7	60.9	Twenty-three years.
Auburn, New York	67.2	69.8	68.2	59.4	Twenty-two years.
Oswego, New York	66.1	69.8	67.3	61.0	Four years.
Rochester, New York	67.6	69.9	67.9	60.3	Twenty-four years.
Penn Yan, New York	66.7	70.8	66.5	61.4	Five years.
Detroit, Michigan	67.6	69.7	67.5	60.0	Thirteen years.
Milwaukie, Wisconsin	67.3	69.8	67.5	61.2	Eight years.
Chicago, Illinois	67.3	70.8	68.5	60.1	Five years.
Emerald Grove, Wisconsin	68.5	71.3	68.3	60.2	Three years.
St. Anthony's Falls, Minnesota	70.1	73.3	69.4	60.7	One year.
Princeton, Minnesota	71.1	75.7	69.5	59.1	Three years.

Places within the limit of vine culture, but not necessarily, from that cause alone, successful. If atmospheric humidity, &c., exist in a favorable degree success may be more probable.

Salem, Massachusetts	70.1	72.5	70.5	63.0	Forty-three years.
New London, Connecticut	69.3	71.5	70.1	63.3	Eleven years.
West Point, New York	71.3	73.7	71.8	64.3	Thirty-one years.
Albany, New York	70.0	72.1	70.0	61.4	Twenty-eight years.
Geneva, New York	68.8	72.9	66.4	62.2	One year.
Skaneateles, New York	66.0	67.7	69.0	63.0	Do.
Fredonia, New York	68.4	70.9	68.8	61.3	Eighteen years.
Madison, Ohio	69.9	72.4	69.0	63.4	Three years.
Cleveland, Ohio	70.2	72.7	69.1	64.2	Five years.
Kelley's Island, Ohio	69.9	73.2	72.1	62.3	One year.
Collingwood, Ohio	70.4	72.8	69.8	62.9	Four years.
Ann Arbor, Michigan	70.5	72.9	70.0	63.8	Do.
Battle Creek, Michigan	71.6	74.7	71.2	63.8	Six years.
Grand Rapids, Michigan	69.4	73.5	68.2	62.2	Do.
Janesville, Wisconsin	71.2	74.6	70.4	62.9	Do.
Prairie du Chien, Wisconsin	72.3	75.2	72.0	61.5	Nineteen years.
Dubuque, Iowa	72.1	75.2	72.0	66.3	Two years.
New York city, New York	73.0	76.7	73.1	66.6	Four years.
Easton, Pennsylvania	70.5	72.5	69.7	63.6	Five years.
Trenton, New Jersey	70.7	72.8	71.6	63.4	Do.
Philadelphia, Pennsylvania	71.0	72.8	71.5	64.1	Four and three-fourths years.
Chambersburg, Pennsylvania	70.8	77.8	74.3	61.8	Two years.
Gettysburg, Pennsylvania	73.2	76.7	71.9	61.8	Six years.
Bedford, Pennsylvania	72.6	75.0	71.7	64.1	Five years.

Places within the limit of vine culture, &c.—Continued.

Locality.	Summer mean.	July mean.	August mean.	September mean.	Length of observation.
	°	°	°	°	
Baltimore, Maryland	74.3	76.7	74.7	67.8	Twenty-four years.
Frederick, Maryland	74.5	77.7	73.1	66.2	Six years.
Sykesville, Maryland	71.6	73.8	70.5	65.3	Five years.
Washington, District of Columbia	76.3	78.3	76.3	67.7	Thirteen years.
Berryville, Virginia	70.0	75.4	72.0	66.0	Two years.
Richmond, Virginia	75.4	77.6	74.8	67.1	Four years.
Lewisburg, Virginia	71.8	74.4	71.3	64.5	Six years.
Poplar Grove, Virginia	73.0	75.7	72.7	66.1	Four years.
Kanawha, Virginia	74.2	77.2	73.6	66.1	Two and a half years.
Marietta, Ohio	72.9	76.2	73 1	69.9	One year.
Portsmouth, Ohio	75.1	78.3	73.7	66.1	Do.
Cincinnati, Ohio	75.8	79.8	76.3	69.2	Five years, 1855 to 1859.
Cincinnati, Ohio	74.0	76.5	74.2	66.0	Twenty years, 1835 to 1855.
Richmond, Indiana	72.4	74.7	72.5	66.1	Five years.
Peoria, Illinois	74.6	75.6	74.2	69.9	Four years.
Carthage, Illinois	74.9	79.1	75.5	67.8	One year.
St. Louis, Missouri	76.3	78.5	76.5	68.7	Twenty-three years.
Manhattan, Kansas	74.9	76.1	78.6	73.2	One year.

The following will, we hope, clearly illustrate our mode of applying the foregoing principles to practical vine-growing.

By examination of tables of daily mean temperatures before us, we find that at Providence, Rhode Island, a temperature of 52.50° had existed from 1st of May to the 13th, and that on the 8th of September an aggregate of heat had accrued equal to 7,915.7°. This, according to results at Waterloo, New York, is about adequate to the ripening of the Delaware and the Hartford Prolific, which commence leafing at a temperature of 52.41°, and require 7,926.66° of heat. The time required to accumulate the above amount of heat was 118 days, being four days less than at Waterloo. The average temperature for the entire period was 66.23°, and for the month of stoning 68.6°, both of which are amply sufficient for the requirements of these varieties. They may, therefore, be grown with good success at Providence, Rhode Island, other circumstances concurring to favor the attempt.

If the Diana leafed at Providence May 12 at the temperature of 51.40°, as required at Waterloo, and an aggregate of heat of 8,572.66° was demanded, this variety also may be grown. For the sum reached at Providence on September 17, 129 days from date of appearance of the needed initial of 51.40°, was 8,588°, with an average of 66.57°, both of which exceed the demands of the Diana.

The Clinton requires about the same temperature as the Diana, leafing at a lower degree than most other varieties, and consequently earlier. Its initial temperature is 51.66°, which was reached on May 12, 1854, at Providence. The Clinton will ripen for wine with a low measure of heat, 8,213°, which had accumulated on the 11th of September, when 8,223.5° had accrued in 123 days, having an average temperature of 66.85°. At Providence, Rhode Island, the Clinton may, therefore, be successfully grown.

The Concord expands its leaf at an average temperature of 52.77°, which was attained up to the 14th of May, 1854, at Providence. It requires for maturation 8,607.66°, which accrued by the 21st of September, or thereabouts, when 8,581.3° were found to have been reached by addition of the daily means for 129 days, at an average of 66.51° for the entire term. Even with this aggregate it was reported at Waterloo "poor and foxy." The Concord may then be readily grown at Providence, Rhode Island.

Rebecca, leafing at 53.13° on 14th May, required 8,900.66° to advance it to maturity. On the 26th of September the sum of 8,906.9° was attained at Providence in 135 days from date of foliation. If the Rebecca was fully ripened at Waterloo, it might be equally well grown at Providence on a warm soil and under a favorable aspect.

If we suppose the Isabella to bloom at Providence on the 15th of May, when the initial for the Catawba, 52.71°, has been reached, which is highly probable, from comparison of observations at Kelley's island and elsewhere, and that it may mature as early as the 15th of October, which is later than the date of the average appearance of frost, and yet not an erroneous assumption, we find that between these dates a sum of heat will have accumulated of 10,451°. From this we learn that in favorable years when the autumn is warm and the frosts very late that the Isabella may be grown, but that its ripening must in general be uncertain and irregular.

The Catawba and Anna open their leaves at the same temperature as the Delaware, or thereabouts—52.71°—but require more than 11,000° Fahrenheit to ripen them—a sum of heat which is not reached at Providence before the appearance of frost, except in very favorable years. As the temperature declines rapidly after the middle of October, and killing frosts occur near the beginning of the month, not unfrequently, in the average of twenty-eight years on the 11th of October, the latter-named varieties cannot in general be properly ripened at Providence.

From the preceding application of the principles derived from the table and comparison of observations made elsewhere from similar data, on which our limits forbid further enlargement, we conclude that the Delaware and Clinton and Hartford Prolific may certainly, and the Concord, Diana, and Rebecca may generally be grown at Providence, Rhode Island; that Isabella cannot always be perfectly ripened; and that the Catawba and Anna can never be there matured, unless in the long warm autumn of extremely favorable years.

The general conclusions are, that the Delaware, Hartford Prolific, and Clinton belong to a class of grape-vines which requires for ripening about 8,000° of heat; that Concord and Diana demand 8,500°; Rebecca needs about 9,000°; Isabella 10,000°; and Catawba and Anna must be grown where they shall receive from foliation to maturity a sum of heat calculated from the daily mean temperatures which must at least amount to 11,000° of Fahrenheit's scale. Unfortunately extensive tabulated reductions of daily mean temperatures are not of ready access. Those made by Professor Caswell at Providence, Rhode Island, we have been enabled to consult while preparing this paper, but much regret that we have not been able to obtain similar valuable data for sundry places over a wide district. The records we have been enabled to consult have, however, been ample for our general purpose—to establish the principle that we can employ the elements of initial temperatures and duration of heat—combine the values of temperature and time, for the determination of the possibilities of culture in any district, of plants as yet there unknown or untried.

On comparing the table of American grapes exhibiting their dates of leafing, &c., with that in which we have noted the temperature of various places in Europe within and without the wine districts, we observe many points of similarity between our native vines and their foreign congeners. By the table of foreign wine localities we learn that at all those places where the mean for the hottest month falls below 67°, the wine is not good or the fruit never ripens, and that those enjoying a mean for the hottest month above 67° produce superior fruit and wines. This is precisely paralleled in our table of American varieties grown at Waterloo, New York, where we have observed that those which could hasten their growth so that they could take advantage of the high mean of 69°, during the month following the stoning process, were of good or of superior quality; those which stoned so late as to have only 67°, or thereabouts, were inferior, and that those which found a temperature of 65°, or thereabouts, did not ripen.

The short warm summer of northern latitudes with its longer days advances the vine as rapidly as the high temperature in places further south; but the diminished heat of September precludes the proper elaboration of the juices and maturation of the seed and saccharine in the late-growing sorts. By an examination of the table in which is instituted a comparison between the mean temperatures for the growing seasons at West Point, in the valley of the Hudson, and several points in the valley of the Mississippi, we may observe that, while at the former place the mean temperature for September falls to 64.31°—a mean nowhere exceeded in the State of New York from the year 1826 to 1850, as shown by the "Reports, &c.," except at Buffalo, where it was only eight-hundredths of a degree higher, while the mean for all the places observed in the State was 59.87°—our table shows that at Fort Madison, Iowa, the mean for September stood at 71.5°; at Athens, Illinois, 73°; and at St. Louis, 68.7°; while the mean of the hottest month varied between 73° and 82.5°—heats adequate to mature, with the favorable high temperatures of September, vines of the most "southern proclivities," or such as require the longest season and the warmest skies.

Here a comparison between this part of the valley of the Mississippi and the south of France, the vine regions of Portugal, Spain, Italy, and Madeira, will show that the temperature of the warmest month in the Mississippi valley is identical with that of the latter-named places, so famous for their genial summers and generous wines, while the autumn months are equally propitious. The Concord, the Catawba, and Anna, which find the cold of September in middle New York unfavorable to their ripening, when removed to the warm regions of Illinois and Missouri, under their high and long-continued heats, develop qualities so surpassing those they exhibit in the northeastern States, as to be scarcely recognized as the product of the same varieties, respectively, grown in the latter localities.

Those who have attentively perused the foregoing attempt to determine the amount of heat needed by the American wine grape during its various stages of growth will, we doubt not, perceive therein strong proof of the importance of close attention to the demands of each variety when selecting for culture at various localities, and will regard with interest the meteorological peculiarities of their place of habitation. To all such we would say that we believe that if they would add to the knowledge of the mean temperatures of their vineyard, the general fact of adequate atmospheric humidity—for in the present state of meteorological knowledge we cannot determine for each place, by aid of any deductions from instrumental observations yet made and tabulated, any special rules for its determination—and will be guided by the instructions for ascertaining the isotherms bounding the regions of successful grape culture in the United States east of the Mississippi, as enunciated in the Agricultural Department report for 1862, all which our recent research, as developed in this paper, but confirm, they will not have reason to doubt the worth of our suggestions and their practical value.*

*A typographical error of much importance occurs in the article here referred to, which this occasion offers the only opportunity for correcting. On page 195, first line, "America" should read Armenia.

NOTES ON THE WHEAT PLANT, ITS RANGE, ETC.

Although the plants which the earth produces spontaneously appear to be confined in range within certain districts, and few of them would survive a wide change of circumstances, creative Providence has, nevertheless, endowed many of those most essential to man with a greater flexibility of structure, so that the limits of their production may be extended by culture beyond what have, in many instances, been assigned to them by nature. The grasses that yield grains are especially favored in this respect, their culture having been much extended through the knowledge and industry of man. The *Cerealia* also affords remarkable examples of very numerous varieties derived from one species. In Ceylon alone there are one hundred and sixty varieties of rice; of *Panicum*, or millet, very many kinds; and of *Triticum*, or wheat, we have a few well-defined species, which have been increased until, by different modes of cultivation, and the influence of soils and climate, more than two hundred varieties have been produced. From the well-defined species accepted by botanists, and which may be described in general terms as the hard wheats, the soft wheats, and the Polish wheats, all the innumerable varieties known to agriculturists have descended. The hard wheats are the product of warm climates, such as Italy, Sicily, and Barbary. The soft wheats are grown in the northern parts of Europe, as in England, Belgium, Denmark, and Sweden. The Polish wheats grow in the country from which they derive their name, and are also hard wheats. The hard wheats contain much more gluten than the other varieties. This valuable ingredient is a tough, viscid substance, very nutritious, and which, as it abounds in nitrogen, readily promotes fermentation in the dough, and is essential to good light bread. The quantity of nitrogen varies with the soil and climate from five per cent. in some soft wheats to thirty per cent. in the hardest and most transparent. It is the higher proportion of gluten that exists in Italian wheats that fits them for use in the preparation of macaroni and the rich pastes that form so large a portion of the food of the people of that land. The softer wheats contain a larger proportion of starch. The latter are usually grown in England, and require to be well dried and hardened before they can be readily ground into flour.

We have said that many of these varieties of wheat have resulted from influences derived from the soil. Some soils are remarkable, far and wide, for producing good seed, and it is equally well known that this seed degenerates in other soils, so that the original is resorted to for fresh supplies of seed. This is so well known in England that the produce of a certain parish in Cambridgeshire is sold for seed at a price considerably above the average. It is not, however, the experience of all that the finest wheat makes the best seed, but in the choice of seed the nature of the soil upon which it is to be sown must be considered as well as that upon which it grew.

It has been asserted that all the various noted seed-wheats, when analyzed by the chemist, are found to contain the different elements of which they are composed in nearly the same proportion, especially the starch and gluten. For bread, that which contains the most gluten is preferred; but to produce a perfect vegetation there should be no excess of this substance, and no deficiency, and the seed should have arrived at perfect maturity. Moreover, it has also been stated, and with great apparent probability of its truth, that if we wish to grow any peculiar sort of wheat, and find by our preparation of the soil or its original composition that we produce a wheat in which the gluten and starch are in different proportions from that of the original seed, we may conclude that this is owing to more or less nitrogenous matter in the soil—that is, more animal manure—or proportionally more vegetable humus; and by increasing the one or the other, we may bring our wheat to have all the properties of the original seed. By selecting seed from those ears which appeared superior to the others in a field of ripe wheat, sowing them in a garden or in a part of the field, the variety which may have been produced by some fortuitous impregnation, or by some peculiarity of the soil of the spot where it grew, may be perpetuated. By carefully adapting the seed to the soil, and by a careful and garden-like cultivation, and adding those manures which are found to be best adapted to favor its perfect vegetation, crops of wheat have been raised which at one time would have been thought miraculous, and in Great Britain, where only is its culture regarded as its importance demands, and the highest skill, the result of enlightened inquiry into the requirements of this invaluable grain, been persistently applied, the average product has been greatly increased on all soils.

To original defect in the soil or inadequate fertilization we may reasonably ascribe the deterioration observed to follow cultivation of varieties of wheat which at first appeared well adapted to the locality and to the climate. The demand for new seed-wheat to repair the loss arising from continued decline in the product from year to year, should induce cultivators to seek for a cause for this deterioration, either in the condition of the soil and its constituents, or in an unwise culture and indifference to the selection of the best product for continuing the crop. We have many recorded instances of the very valuable results of care in selecting the largest and heaviest grains for seed. In some instances the crop has been quadrupled in quantity and quality by the use of the choicest seed selected from that with which the rest of the field was sown.

When importing seed-wheat and any other seed of new or superior varieties of plants, attention should always be directed to the peculiarities of the soil and climate under which they originated, and those under which it is proposed to grow them. English varieties of spring wheat are sown in February or early in March, have the benefit of early spring growth, and of a milder and moister summer than a spring-sown wheat can have in the eastern United States. The failure that has attended recent attempts to introduce English varieties of wheat is no new thing, such having been the almost universal result for many years past.

The distinction between winter and spring wheat is one which arises entirely from the season in which they have usually been sown, for they can readily be converted into each other by sowing earlier or later, and gradually accelerating or retarding their growths. If a winter variety is caused to germinate slightly, and then checked by exposure to a low temperature, or freezing, until it can be sown in spring, it may be converted into a spring wheat.

The difference in color between red and white wheats is owing chiefly to the influence of the soil, white wheats gradually becoming darker and ultimately red in some stiff, wet soils, and red wheats losing their color and becoming first yellow and then white in rich, light, and mellow soils. The grain changes color sooner than the chaff and straw, hence we have red wheats with white chaff, and white wheats with red chaff. The blue-stem, long cultivated in Virginia, was formerly a red, but is now a beautiful white wheat, says General Harmon, in the Patent Office Report for 1845.

If it be true that each variety of grain is adapted to a specific climate in which it grows perfectly, and where it does not degenerate when supplied with proper and sufficient nourishment, may not the consideration of the origin of each variety we propose to sow be of more importance than has yet been accorded to it in the selection of minor varieties, the product of our own country? The varieties of wheat that have originated, apparently by accident, (for there are no accidents in nature,) or from peculiar culture, do not enjoy all the surroundings necessary for perfect continuous product. Causes yet unexplained are ever at work modifying the germ of the new growth, and the guardian care of man is needed to preserve unimpaired, or to perfect the already improved sorts. In most soils, we are aware that wheat degenerates rapidly if the seed be sown year after year where it was produced. Nor is it sufficient to prevent degeneration that the seed be taken from a different field, but that grown on a soil of different quality is to be preferred, and if from a different climate, but not widely diverse, it is found that the product is increased in quality and in quantity.

English-grown seed when sown in Ireland generally comes to maturity ten days or two weeks earlier than the native grown seed. In general, plants propagated from seed produced on a warm, sandy soil will grow rapidly in whatever soil the seed is sown, and plants from seed produced in a stiff, cold soil are late in growing, even in a warmer soil. On limestone soils, which are often heavy, wheat-seed, the product of sandstone regions, generally succeeds best. The experience of a Kentucky farmer shows that seed-wheat obtained from a northern locality has failed with him, owing to late ripening and consequent injury from rust. The experiment was tried with three varieties of northern-grown seed, and with the same result in each case. When wheat from a southern locality was sown by the same experimenter, his crop ripened early, was free from rust and disease, and improved in sample over the original; while the main crop, in the same district, was ruined by rust and other diseases. This experience was corroborated by the result of four seasons of growth; and the southern-grown seed, because of its early ripening, is rapidly superseding all the later wheats in the district referred to. The kind of wheat introduced from the more southern region of Tennessee, or, perhaps, northern Alabama, is the "Early May," which, though small, possesses superior flouring qualities, and is now the ordinary wheat of some northern counties of Kentucky, where it does not deteriorate, but improves in quality. The controversy that was originated by the introduction of the Tennessee "Early May" wheat into northern localities appears to have settled into the belief that the selection of southern-grown, early-ripening varieties is judicious where it is necessary that the grain should attain early maturity. To escape the rust so destructive in the lower valley of the Ohio and Mississippi, and the midge, that ravager of the late ripening wheats in western New York and New England, early ripening sorts have been successfully introduced, none, it appears, with better promise of usefulness than the "Early May," wherever the soil is sufficiently protected by snow during the winter in more northern districts. The experience of judicious farmers in Ohio, Pennsylvania, New York, and New Hampshire, testifies to the early ripening properties and valuable milling qualities of this variety, of which may be found ample proof in the pages of that excellent agricultural journal, "The Country Gentleman," vols. XIV to XXII.

The "Mediterranean" is an early ripening southern wheat, which it is said was introduced in 1819 from Genoa, Italy, by John Gordon, of Wilmington, Delaware. It is still an early ripening and very valuable wheat, adapted to many districts where the more tender varieties subject to the attacks of the Hessian fly, midge, or the rust, have rendered resort to this kind necessary. The introduction of the Mediterranean has proved an invaluable boon to many districts. Many other valuable kinds, noted for early maturity, &c., are of southern origin. The Rochester, or original White Flint, is said to have been of Spanish origin. The Turkish White Flint is not affected by fly, rust, or midge. The China or China Velvet wheat ripens at the same early date as does the "Mediterranean;" as also does the Malta, or White Smooth Mediterranean. The "Early Japan" wheat, from seed brought by Commodore Perry, is also from a warmer region than our own, and ripens early. So valuable has this variety been deemed by one grower, that he asserts that had Commodore Perry brought many bushels, it would ere this have paid the expenses of the expedition from the increased productiveness through early ripening and adaptation to the wants of the country.

All attempts to ripen wheat early by sending further north for seed have signally failed, says a Kentucky farmer. The experiment of sowing Canada-grown wheat in Pennsylvania resulted in a ripening of the crop two weeks later than that grown from native seed. As the cereals, which, as we have said, possess great flexibility, and are readily subject to the influences of soil and climate, we might naturally expect to find that wheat grown for a long time in southern Tennessee or northern Alabama, where the mean temperature of March equals, if it does not surpass, that of April in northern Kentucky and southern Ohio, would acquire a tendency to early vegetation, which it would retain when removed to more northern localities, and the plant be thus enabled by early maturity to escape the high heats of early summer, and the insect enemies which appear at the period of the late ripening of northern-grown wheats. Though it may be advisable to use southern-grown wheat for seed, the rule, we fear, will not apply if such seed has grown more than two or three degrees further south. All northern planters who have experimented with southern-grown seed-maize have learned that they cannot ripen the crop if the seed has been brought from a few degrees of lower latitude. This arises from the sudden decline of the temperature of September and October, and the early access of killing frosts, which shorten the period of growth to which the large and rank-growing southern kinds of corn have been accustomed, though the summer heats may have been the same as they had known in their native place. In the case of the southern wheats removed to a northern soil, the variety is not more rank or strong-growing, does not appear to require a longer season, but has had impressed upon it a proclivity to early vegetation by the influence of the early heats of March and April, which are not known in the north until April and May, respectively.

The first successful attempts to grow wheat in the West India islands, in more recent times, appears to have been made in 1835, in Jamaica and New Providence. The varieties used in these experiments were the Victoria wheat, which had been grown for two centuries by the Spanish farmers of Caraccas, and an English white wheat, and an English red wheat, also the Victoria wheat of English growth. In these experiments perfect success attended the use of the Caraccas wheat when sown either in Jamaica, at a height of 2,000 to 4,000 feet above the sea, or at New Providence, but just removed above the ocean level. This is ascribed to the long acclimation of this variety to the heats of a tropical winter which may be taken at nearly 70° Fahrenheit, even in the elevated regions of Jamaica and at New Providence in the lower districts. But while the productiveness of the Caraccas wheat was increased by its approach to a lower level, the English seed-wheat sown proved a total failure. Even the English-grown Caraccas was highly productive in New Providence, though the varieties, long inured to the cool, humid climate of Britain, scarcely produced stems, and in one instance spread into a turf refusing to form straw or head under the new aspect of affairs. Thus we perceive that the wheats transferred from a colder to a warmer region did not succeed; and that the Caraccas wheat grown one season in Britain had not lost its peculiarities by the voyage, but was nearly, if not quite, equal in product to its native but untravelled brother, the original Victoria of Caraccas growth. Surely there existed in the latter variety some inherent virtue which even the dull skies of England could not destroy.

THE PRODUCTION OF NEW VARIETIES OF WHEAT.

The production of new varieties of wheat either by careful selection of superior kinds, the spontaneous growth of nature, or by judiciously crossing varieties which possess properties it is desirable should be combined and perpetuated, offers a fitting field for the exercise of the skill of those vegetable physiologists who would advance the welfare of a nation by devoting themselves practically to the increased production of this staff of life. The extraordinary improvements effected in our esculent vegetables and fruits of almost every kind are known to all, and it may be just cause for surprise that the most important growth of temperate climates, the cereals, or wheat, rye, barley, oats, maize, and the grasses generally, should have shared to but a limited extent in these improvements.

That cross-fecundation and hybridization are possible has been fully proved by the results of experiments made by Maund and Raynbird, whose "Hybrid Cereália" received the prize medals at the industrial exhibition in London in 1851; and that success has attended judicious efforts to improve upon the ordinary wheat by continued careful selection of seed, is evident from the product of the "Giant wheat" and "Pedigree wheat," grown by F. F. Hallett, of Brighton, England. By selecting from year to year not only the best heads of wheat, but the best kernels of the finest ears, and using them for seed, this gentleman has produced a variety possessing great fecundity of grain, extraordinary strength of stem, and uniformity in the size of the ear. Some of the heads of these new varieties measured seven inches in length, and were proportionably thick. In some instances one kernel has produced seventy-two heads, containing six thousand four hundred and eighty grains, and a maximum product was obtained of sixty and sixty-two, and in one instance seventy-two bushels per acre. The highest results on the farm of Mr. Hallett were six quarters or fifty-six bushels per acre, which appears to have been produced, not upon a chosen garden spot, but upon several acres. The large numbers named above need not excite surprise or doubt of their probability, since Schuyler county, Illinois, has produced wheat heads six and a half inches long, and Talbot county, Maryland, has exhibited a field of nearly thirty acres which in 1860 yielded very nearly fifty-five bushels of wheat of sixty pounds, each, to the acre, and nine of which produced sixty-four and a half bushels upon each acre. This last was a smooth-headed wheat brought from North Carolina a few years before. William Hotchkiss, of Niagara county, New York, exhibted, at the industrial exhibition in London in 1851, the product of six acres in 1849–'50 which averaged sixty-three and a half bushels to the acre, weighing sixty-three pounds to the bushel. This extraordinary yield was, however, exceeded in the summer of 1853 by Thomas Powell, of the same county, whose field of seven measured acres averaged within a small fraction of seventy bushels to the acre—namely, four hundred and eighty-nine bushels of wheat.—(See the report of Heman Powers, of Lewiston, New York, in the Patent Office Report, agricultural division, for 1853.)

Mr. Hallett describes the system by which he produced his "Pedigree wheat" as follows:

"The best plant is called 'the selection' of the year (say 1861) in which it is thus obtained, and consists of numerous ears containing many hundreds, and even thousands, of grains, which are planted separately, those of each *ear* being kept quite distinct, as, although the best grain of any plant is nearly always found to lie in its best ear, it may be otherwise, and the successive parent *ears* must be preserved. At the following harvest (1862) the best plant forms 'the selection of 1862,' and its produce is continued on the experimental ground, while that of the remaining plants furnishes the annual seed for the farm in the autumn of 1862, and the crops are in 1863 offered to the public. Thus the selection sold is that of 1861, or in any year that of two years before: the latest selection, that of the year immediately preceding, is not sold, being solely employed as the home seed."

The extraordinary improvement induced by Mr. Hallett it is not to be expected would continue to be maintained for many seasons under ordinary field treatment. It is also charged against his wheat that in so far as he has been successful, it has been in fixing the excessive coarseness which their seeding tends to produce, and that his system has not only failed to improve, but has produced great deterioration. This is the opinion of a practical writer and farmer who may have over-estimated this deterioration, as we observe an improved wheat highly lauded and a competitor for public favor which bears the name of the practical farmer above referred to. That there is, however, ground for the belief that the improvement in the quality of the "Pedigree wheat" has not kept pace with size and productiveness, we have testimony in a comparison of sundry new wheats reported in the "Gardener's Chronicle," and reprinted in "the Pennsylvania Farmer and Gardener" for June 1864, where the bread made from "Hallett's Pedigree wheat" is described as "of most inferior description." The error of this improver thus appears to have been that he has disregarded quality in the pursuit of extraordinary size and productiveness. That all these merits are compatible may yet be shown in the productions of other experimenters who shall properly regard them in combination. Be this as it may, it is quite probable that Mr. Hallet's system may furnish valuable hints to those engaged in growing seeds for market, and incite them to closer attention to the importance of securing clean and perfect seed.

A new variety of wheat introduced into a district has in some instances proved of very great value. It is said that the product of one quart, of a variety brought from North Carolina in 1845, had in nine years benefited the farmers of Preble county, Ohio, alone, more than $100,000 by the gain over what would have accrued from the continued use of the old varieties. From a few heads uninjured by rust or midge, found in the midst of a field seriously injured by both maladies, a careful and observant farmer grew the famous Lambert wheat. This variety ripens even earlier than the Mediterranean, and as into the composition of its chaff a larger proportion of silicious matter appears to enter, it probably for that reason escapes the attacks of the midge. A superior variety of spring wheat, known as the China or black-tea wheat, originated from a few kernels found in a chest of black tea. Hunter's wheat, one of the oldest and most esteemed varieties in Scotland, was discovered half a century ago by the roadside in Berwickshire. Through long culture and want of care this variety has greatly deteriorated. The Fenton wheat, a very valuable variety, which yields heavily on very strong soil, such as that on which it originated, was derived from a few ears found growing among the rubbish derived from a quarry of basaltic rock. Piper's thick-set, a wheat which yields largely on meadow soils, having produced sixty bushels to the acre, but is deficient in straw product, was derived from a remarkable ear found in a wheat-field and its product carefully cultivated.

The above-cited examples clearly indicate the importance of careful observation and the judicious selection of material for the production of new or improved kinds. The varieties thus obtained are, however, very apt to deteriorate, and can only be kept pure by continued care in selection. The average wheat crop of England has been estimated at thirty-six bushels per acre. In the United States the average may be placed at or below fifteen bushels per acre. Many English farmers annually raise fifty bushels per acre. This large product is the result of judicious cultivation and care in the choice of seed rather than of the influence of climate, for the same success has attended wheat-growing in America where every attendant circumstance was properly regarded and the demands of the wheat-plant fully supplied.

The principal climatological source of injury to wheat arises from the extreme humid tropical heats to which the warmer temperate zone, both in the Mississippi valley and on the Atlantic slope, is liable, whereby are originated rust, mildew, &c. During the colder months wheat may be grown within the tropics but little removed above the level of the sea, but where the humid heats intrude into the cooler zone, as along the Atlantic coast as high as Norfolk, and over much of the interior plain of the Mississippi, below the Ohio, wheat cannot be successfully grown.

In the months of May and June, 1858, at Marietta, Ohio, south, southwest, and southeast winds prevailed. During May there fell twelve and a half inches of rain, with maximum heats of 84° and 99° for the respective months, and in May twenty-four cloudy days were observed, and in June ten days of obscure sky. This excess of rain was not confined to Ohio, but was felt in all the western States. The consequences of this excess of moisture, obscured sky, and high heats, were the general destruction of the crops of wheat and oats, by a blight or rust on the wheat and a mould on the oats. The last experienced a total failure in three-fourths of all the fields in the valley of the Ohio, those only that escaped were on high ground or had been sowed early. Many fields of wheat were not reaped, but were left to decay, and were ploughed under for the benefit of the succeeding crop.*

From the study of many facts connected with the growth of wheat in temperate and tropical climates, we are led to believe that in the United States the only positive limit to its cultivation on the south is the northern bounds of humid tropical heats, while on the north it may be grown to the utmost northern extremity of Maine, latitude 47° 30′, where the mean temperature for May, June, and July is but 56.11°, and that for the warmest month, July, 62.30° Fahrenheit. The northern boundaries of the United States are, however, by no means the northern limit of its culture. Wheat is grown on the Saskatchewan river, in the territories of the Hudson Bay Company, near Lake Winnipeg, in latitude 54° north, where the months of May, June, and July have a mean temperature of 57.11°, and July enjoys a mean of 61.8°.

On the plains of Bogota, where the temperature rarely exceeds 59°, wheat is reaped in 147 days, having been sown in February and harvested the last week of July, the mean temperature for the entire period having been 58° and 59°. At Quinchuqui the vegetation of wheat begins in February and ends in July, at a mean temperature of between 57° and 58° Fahrenheit. In England the summer of 1853 was in many places at too low a temperature to ripen wheat, and the deficiency was general, and said to have been from one-third to one-half of the usual product. The mean for the months of July and August were 57° and 59°, respectively, or two degrees below the usual average. From the above comparison of data it appears that wheat cannot be successfully grown where the warmest month of its growth, or that wherein the grain is maturing, falls below 60°, or the mean of its period of growth below 56°.

The author of a paper on the "Effect of Temperature on Cultivation," read at a meeting of the London Central Farmers' Club, a resumé of which appears in "The Country Gentleman" for June 11, 1863, states that in England the wheat required, in 1860, 145 days from the first growth to maturity, March 28 to August 20, of which 133 days were actual growing days, having a mean temperature above 42°. In 1861, 130 days were required, during which period no mean below 42° occurred, this being, in his opinion, the minimum at which the vegetation of wheat will continue active. The experiments of this writer, continued through several years, result in the opinion that when the temperature of the soil, during the period included between the time of earing and maturity, falls below 58° to 60° no progress can be made, and unless 60° is exceeded the crop never fairly ripens.

The above appear to accord closely with the requirements of the wheat-plant in the United States. Those places where the mean for May generally falls below 58° and 60° are the New England States and New York, except a few places in the valley of the Hudson and in the southeastern extremity of the State, most of Pennsylvania and New Jersey, except the southern parts, all of Minnesota, Wisconsin, Iowa, Michigan, northern Illinois, northern Indiana, northern Ohio, and in all these districts the wheat crop cannot mature in May. The June mean for most of the districts named is, with few exceptions, such as Washington county, Maine, which is in the extreme eastern part and much exposed to fogs, also some sections of Vermont, Minnesota, and

* Silliman's Journal of Science, N. S., vol. XXVII, pp. 216–217.

Wisconsin, is above 61°, and the process of heading, which in lower and warmer districts takes place early in May, throughout the northern sections of the United States probably occurs late in May or early in June, and the crop is harvested from the middle of July to the first of August.

Those places in the northern States which do not enjoy a temperature of 61° in June have this mean in July, and can therefore grow spring wheat, which is sown from the 10th of April to the 10th of May, and is sufficiently advanced to receive the benefit of the mean of 61°, which is sometimes barely reached in July only, that for August often falling below it, and the wheat is harvested from the 10th to the 20th of September. In Aroostook county, in the extreme northeast of Maine, the mean for July and August are about three degrees higher than in Washington county, at the eastern extreme of the same State, at points where observations have been made, and the wheat is sown in the middle of May and harvested from the last of August to the 1st of September.

In the southern counties of New Jersey, Pennsylvania, Ohio, Indiana, middle Illinois, Missouri, and Kansas the mean of 61° is reached in May, and when not grown in elevated regions the wheat is ready for the reaper sometimes in June, and generally not later than the 10th of July. In districts further south, where not retarded by elevation above the general level, the harvest occurs in June, and in Cabarras county, North Carolina, the "Early May wheat" has ripened in the month from which it takes its name, and in Montgomery county, Alabama, near the southern limit of wheat-growing east of the Mississippi, it ripens about the end of May.

The following observations on the amount of heat required by the wheat plant in different countries and under different degrees of cloudiness may be of interest in this connexion.

Under the comparatively clear sky of Germany, at Arnstadt, experiments show that wheat requires from flowering to maturity 53 days, having a mean temperature of 63°, making an aggregate of 3,339° Fahrenheit.

In the neighborhood of Richmond, Virginia, the "Japan wheat" headed 30th of April, 1860, and was reaped 14th of June, 1860, a period of forty-six days. During the thirty-one days of May the mean temperature was 66.3°, an aggregate of 2,056°.23; for the fourteen days of June, 73.56°, an aggregate of 1,029°.84; from which we learn that from heading to maturity 3,086.07° are required at Richmond, Virginia, when the early variety, known as the "Japan wheat," is sown.

At Haddonfield, New Jersey, early-sown "Mediterranean" wheat headed on the 18th of May, 1864. For seventeen days the temperature had been at a mean of 64.30°. From the 18th to the 31st of May, inclusive, a mean daily temperature of 67.66° was observed, making an aggregate of 947°.27. The thirty days of June enjoyed the high mean temperature of 69°.229, which formed an aggregate of heat of 2,076.89°. The wheat was cut on the 30th of June, in forty-four days from heading, and required an aggregate of heat derived from daily mean temperatures, as observed by a thermometer in the shade, of 3,024.16°, having been hastened to maturity by the almost cloudless skies from the 10th to the 30th of June, combined with intense heats of the last week, and long-continued drought.

In Monroe county, New York, the wheat headed on the 10th of May, 1859, and was reaped on the 8th of July. To ascertain the amount of heat required from heading to maturity, we observe that for the twenty days of May, which enjoyed a mean temperature of 57.17°, there results 1,143.40°; for the thirty days in June, with a mean temperature of 64.72°, an aggregate of 1,941.60°; and for the seven days in July, with a mean temperature of 68°.21, results 477.47°, which combined. forms a final aggregate for fifty-six days from heading to maturity of 3,562.47°.

The above resulting aggregates of heat, derived from the very meagre data our extensive research has brought to light, do not entirely agree with the amount which appears to be required for maturing the crop in Britain. For western New York, where the climate is more moist and cooler than that of New Jersey or Virginia, the aggregate accords very well; but, in the dry districts of the south, the early varieties of "Japan wheat" and "Mediterranean" appear to demand smaller aggregates of heat, as we would reasonably expect they would require from their quality of early ripening.

In England the periods of growth varied from sixty-nine days in 1860, when, for ten days, the thermometer did not rise above 58° Fahrenheit, and fifty-nine days were thus required at an average daily mean of 61½° and an aggregate of 3,629° were received, to fifty days in 1861, when an average was noted of 64½°, and an aggregate of 3,225° were required to ripen the grain. Again, in 1862 fifty-six days, at a mean of 61°, and an aggregate 3,406°, were required to produce the same result. As the wheat in England did not head until the 12th of June, and this process commences here from the 1st to the middle of May, and later, the time as observed in Monroe county, New York, though it nearly corresponds to that of Britain, ripens the crop about one month earlier. The differences observed in the above results may be ascribed to different degrees of cloudiness, which, while it affects the direct heat of the sun, cannot be indicated by the thermometer with precision.

The foregoing observations indicate that, during the period that the wheat plant is passing from the bloom to the ripe fruit, the temperature must be above 60°, or that spring and winter wheat should be sown at such a time that they can take advantage of this mean for the heading process, which commences in the northern States generally about fifty to fifty-five days before maturity.

To the English wheat-grower the most important researches of the English experimenter are those which respect the temperature of the soil at the time of sowing in autumn. As the temperature of the soil does not differ perceptibly from that of the mean temperature of the air for a series of days, observations on the soil may be dispensed with. The results of our own experiments indicate that such is the case for short terms. The observer considers it unsafe to sow autumn wheat until the temperature of the earth has been reduced to 50°, a mean temperature which is seldom reached in the United States in latitude 40° north until the second or third week of October, or until a frost has occurred. His reasons for the opinion are founded on the experience that the best crops of wheat have been grown from seed that remained in the ground upwards of thirty days, which term was required in order to enable the seed to root properly before sprouting luxuriantly, and employing its strength in forming leaves at the expense of the roots. The foregoing observations on the proper time for sowing wheat, we apprehend, are not immediately applicable to our climate, but we have presented them in the hope that they may induce corresponding observations on our own soil and crops, which possibly may enable us to select the proper time for committing the seed to the ground with the best promise of success.

THE RANGE OF THE WHEAT PLANT.

Meyen, in his Geography of Plants, asserts that wheat requires a mean annual heat of 39° Fahrenheit, a summer heat of 56° Fahrenheit, and that much inferior mean heats suffice in the extreme climates of sub-arctic America, provided the summer heat of one hundred to one hundred and twenty days be enough.

At Sitka, in Russian North America, latitude 57°, the mean of 39.7° for the year has been observed, and a summer mean of 51.5°, yet wheat will not ripen, because the warmest month reaches but to 59° Fahrenheit, though two months were maintained at nearly this mean heat through ten years of observations.

We append a list of the names of places beyond the limit of wheat cultivation as evidence of the law of heat influencing the wheat plant; also a series of localities where it is successfully cultivated, with the period of sowing and harvesting, from the northern limit to the southern bound, and from the extreme eastern, in Prince Edward's island, to the southern border in New Mexico, and the western, in California. The interest awakened by the study of this table will, we hope, induce many observers to note with method and accuracy many points concerning wheat culture of which we are at present ignorant, and advance our knowledge of the demands of special varieties.

The following named places lie beyond the boundary of successful wheat cultivation, and in the latitudes respectively appended. They have not a mean of 61° Fahrenheit for the hottest month, though they lie further south than Fort Liard, on Mackenzie's river, latitude 60°, which probably enjoys this mean, for we find it attained at Fort Simpson, on the same meridian, though nearly two degrees further north.

Beyond the north polar limit of successful wheat culture.

Sitka, Russian America	Latitude, 57° N	August temp., 59° F	Wheat does not ripen.
Fort York, on Hudson's bay	do.	July temp., 60°, summer, 54°, year, 26°.	Do.
Edmonton, on Saskatchewan river	Latitude, 53° 40′ N.	1,800 feet high	Often destroyed by frost.
Carlton House, on Saskatchewan river.	Latitude, 52° 51′ N.	1,100 feet high	Do.
Fort Liard, on McKenzie's river	Latitude, 60° N	July temp., 61°?	Grows occasionally.
St. John's, Newfoundland	Latitude, 47° 33′ N.	August temp., 58°; summer, 54°.	Wheat not grown.

Within the limits of wheat cultivation.

BRITISH NORTH AMERICA.

Locality.	Latitude north.	Temperature.	Remarks.
	° ′	°	
Fort Fraser	54 30		Longitude, 121° west; west of the Rocky mountains.
Cumberland House, on Saskatchewan river	53 57	July, 61.8	Sown May 8; reaped in August.
Red River Settlement	50 00	July, 67.0	Wheat grows luxuriantly.
Fort Francis, Rainy Lake district	48 36		Sown May 1; reaped late in August—120 days.
Quebec, Canada East	46 49	August, 67.0	Wheat succeeds.
Prince Edward's Island	46 12	August, 70.5	Extensively grown.
Frederick, New Brunswick	46 00	August, 70.0	Wheat succeeds.
Pictou, Nova Scotia	45 34	July, 66.0	August mean, 65°; wheat succeeds.

Within the limits of wheat cultivation—Continued.

UNITED STATES.

Locality.	Latitude north.	Temperature.	Sown—	Reaped—
	°	°		
Aroostook county, Me	46 to 47	July, 65.0	Middle of May	September 1.
Franklin county, Me	45°00′	July, 65.0	May 20	September 20.
Penobscot county, Me	45 00	Aug., 70.0	May 25 to June 1	Middle of August.
Somerset county, Me	45 00	Aug., 70.0	May 25 to June 1	Aug. 20 to Sept. 20.
Washington county, Me	45 00	Aug., 63.0	April 10 to May 10	September 10 to 20.
St. Lawrence county, N. Y	44 40	July, 68.0	April to June	August.
St. Lawrence county, N. Y	44 40		September 1 to November	July.
Windsor county, Vt	43 30		September 18	July 25.
Oshkosh county, Wis	44 00	June, 70.0	September 1	August 15.
Walworth county, Wis	43 00	June, 70.0	September 1 to 15	July 20.
Hillsdale county, Mich	42 00	June, 70.0	September 10 to 25	July 10 to 20.
Wayne county, Mich	42 15		September 5 to 25	July 5 to 15.
Washtenaw county, Mich	42 15		September 1 to 20	July 8 to 20.
Genesee county, N. Y	43 00		August 15 to September 15	Late in July.
Livingston county, N. Y	42 45		Middle of September	July 20 to August 20.
Ontario county, N. Y	42 45		August 20 to September 25	July 15 to August 1.
Monroe county, N. Y	43 00		(May wheat;) September 25	July 8.
Seneca county, N. Y	42 45		September 10 to 20	July 20.
Seneca county, N. Y	42 45		(Dayton wheat;) September 2	July 13.
Ulster county, N. Y	41 45		(Mediterranean wheat;) September 1 to 20.	July 10 to 20.
Steuben county, N. Y	42 15		August 25 to September 10	July 25.
Hampshire county, Mass	42 00		Early in September	Late in July.
Madison county, Iowa	42 00		September	July 6 to 18.
Scott county, Iowa	42 00		(Spring wheat;) April	July.
Henry county, Iowa	41 00		September	July 1.
Marion county, Iowa	41 00		(Spring wheat;) April 1 to 20	July 15.
Marion county, Iowa	41 00		(Winter wheat;) August 15 to September 20.	Early in July.
Lee county, Iowa	40 45		September	July 5 to 12.
Menard county, Ill	40 00		October 1 to 15	June 28 to July 10.
St. Clair county, Ill	38 30		Last of September to October 18.	
Howard county, Mo	39 00		September 1 to last of October	Last of June.
Delaware county, Ind	40 15		September 15	July 1 to 15.
Rush county, Ind	39 30		September	June 25 to July 5.
Wayne county, Ind	39 45		September 1 to October 15	June 25 to July 7.
Harrison county, Ohio	40 15		(Soulé wheat;) Sept. 1 to 20	July 1 to 10.
Athens county, Ohio	39 30		Early in September	July 1.
Clinton county, Ohio	39 20		(Rock wheat)	July 4.
Lawrence county, Ohio	38 40		(May wheat;) October	Last of May.
Mahoning county, Ohio	41 00		(Mediterranean wheat)	July 15.
Fairfield county, Ohio	39 45		(Mediterranean wheat)	June 15 to July 1.
Westmoreland county, Pa	40 30		September 10 to middle of Oct	Early in July.
Fayette county, Pa	40 00		(Mediterranean wheat;) September 1 to 20.	First week in July.
Mifflin county, Pa	40 30		September 10 to October 1	July 1.
Dauphin county, Pa	40 30		September 1 to October 1	July 4 to 15.
Berks county, Pa	40 30		(Blue stem wheat;) Sept. 10 to 15.	July 4 to 20.
Philadelphia county, Pa	40 00		(Mediterranean wheat;) middle of September to middle of Oct.	Middle of July.

Within the limits of wheat cultivation—Continued.

UNITED STATES.

Locality.	Latitude north.	Temperature.	Sown—	Reaped—
	° ′	°		
Bergen county, N. J	41 00		October 1	July 5 to 15.
Gloucester county, N. J	39 45		October 1	July 1 to 10.
Salem county, N. J	39 30		(Mediterranean wheat;) last of September to October 7.	June 25 to July 1.
Newcastle county, Del	39 45		(Mediterranean wheat;) September 20 to October 10.	
Dover county, Del	39 00		September 20 to October 10	June 15 to 23.
Sussex county, Del	38 50		Last of Sept. to middle of Oct	Last of June to July 1.
Harford county, Md	39 45		September 1 till frozen ground	June 25 to July 15.
Jefferson county, Va	39 15		September 25 to October 15	June 25 to July 1.
Jefferson county, Va	39 15		(Mediterranean wheat;) September 4 to 23.	Third week of July.
Richmond county, Va	37 50		(Japan wheat;) Sept. 16, 1859	June 14, 1860.
Richmond county, Va	37 50		(Early Conner wheat)	June 2.
Richmond county, Va	37 50		(May wheat)	May 26, 1842.
Franklin county, Va	37 00		October 1 to December 15	June 20 to July 10.
Buckingham county, Va	37 50		October 1 to November 15	June 15 to July 4.
Mason county, Ky	38 30		(Early May wheat;) September 1 to October 15.	June 2.
Clark county, Ky	38 00		September 15 to last of October	June and July.
Logan county, Ky	37 00		October and November	June 10 to 30.
Cabarras county, N. C	35 30		(Early May wheat;) November	June 1 to 10.
Bedford county, Tenn	35 30		Middle of Sept. to middle of Nov	June 1 to 14.
Habersham county, Ga	34 45		September 15 to December 1	June 15 to July 15.
Cherokee county, Ala	34 15		October 1 to December	June 1 to 15.
Montgomery county, Ala	34 15			End of May.
Guadaloupe county, Tex	30 00	Mar., 61.0	January 1	June 1.
Santa Fé, New Mexico	36 30	June, 68.0	April	August.
Albuquerque, New Mexico	35 30	May, 63.0	February and March	Last of July.
Doña Aña county, N. Mexico	32 30	May, 71.3	Middle of January	August.
Utah Territory	43 00	May, 65.0	September 1 to May 1	June to September.
Stanislaus county, Cal			(White Chili wheat;) November	June 1.

In connexion with the foregoing the following table of the periods of sowing and harvesting wheat in several districts on the eastern continent may not be found devoid of interest:

Locality.	Sown—		Mean time of harvest.		Time of growth.
Delta of Egypt	Nov.	—	May	—	
Malta	Dec.	1	May	13	One hundred and sixty-three days.
Palermo, Sicily	Dec.	1	May	20	One hundred and seventy days.
Naples	Nov.	16	June	2	One hundred and ninety-five days.
Rome	Nov.	1	July	2	Two hundred and forty-two days.
Alps, 3,000 feet	Sept.	12	Aug.	7	Three hundred and twenty-nine days.
Alps, 4,000 feet	Sept.	8	Aug.	14	Three hundred and forty days.
Central Germany	Nov.	1	July	16	One hundred and thirty-seven days.
South of England			Aug.	4	
Middle of Sweden			Aug.	4	

We have seen that success attended the attempts to grow the acclimated Caraccas wheat even in New Providence under a mean temperature of 72°, which prevails during the winter and spring of the Bahamas, when the humidity is much diminished, and that varieties adapted to the region grow freely on the banks of the Saskatchewan in a high northern latitude, where the highest mean temperature of a summer month is but 61.8°. We have shown that a reduction of two degrees only from the mean temperature of each day, for one or two months in Britain, curtailed a loss of one-third to one-half of the crop of wheat.* This diminution in the product brought upon thousands the fear of famine, and upon all increased expenditure, and upon the nation an aggregate loss of millions of pounds sterling. This prospective deficiency was clearly foreshadowed at the close of July of that year, (1853,) and known or could have been known by those who gave attention to observations of the temperature received at the time from England and northern Europe, with some degree of clearness in anticipation of their realization.

If the diminution of the mean temperature of each day by about two degrees for one or two months over western Europe appear to be a trifling incident, its effects were of vast magnitude to commerce. Mark one of the results in stimulating the export of wheat flour and Indian corn and meal from the United States. In the preceding and following years the export of breadstuffs amounted to the values annexed thereto, as follows:

	Indian corn and meal.	Wheat and wheat flour.
In 1851 we exported	$2,300 000	$11,500,000
In 1852 we exported	2,000.000	14,500,000
In 1853 we exported	2 000,000	19,000.000
In 1854 we exported	7 000 000	49 000 000
In 1855 we exported	8,000,000	12,000,000

We perceive that though the amount of export had been increasing gradually, that in the year ending June, 1854, it trebled the corn and doubled the export of wheat and wheat flour; and that though the demand for corn increased the following year, 1855, that for wheat and wheat flour fell below the average of former years. We may perceive in the above a striking illustration of the vast results attendant upon a seemingly trifling modification of the mean temperature during a critical period in the life of a plant; realize our daily dependence on the wisdom and benevolence of creative Providence, of which every truly enlightened mind perceives fresh evidence wherever it may turn to consider the works of Him who can bless and can blast.

In concluding this part of our subject we cannot refrain from the remark, that, in contemplating wheat culture from the point of view which we have chosen, we have been renewedly impressed with evidences of the wisdom and beneficence of the Almighty Father who watcheth over his children for good. Not only do we remark the flexibility of the cereal plants, so admirably fitted

* Since the above was written we have met with the following in a notice of "An Essay on the Meteorological Conditions which Determine the Profitable and Unprofitable Culture of Farm Crops in Scotland," by Mr. Buchan, 1860:

"The dependence of the Scottish agriculturist on the climate is significantly proclaimed by the statement that 'the chief peculiarity of the climate of Scotland, with regard to the cultivation of the corn crops consists in the mean summer temperature being within *two degrees* of the minimum temperature required for the perfect maturity of wheat and barley crops.' The prudent Scottish agriculturist will do well to bear in mind that a variation in summer temperature, to the extent of two degrees, may blight all his hopes.—Edinburgh Journal of Agriculture, 1861."

for the food of man, and without which he could not exist a civilized being, in that they are capable of adaptation, within certain limits, to the varying climates extending from the equator almost to the Arctic circle; but also, and with renewed cause for admiration, do we perceive how He who made the earth and poised it in space has commanded it should present that aspect to the source of heat and light and life which shall kindly temper his burning rays and divide the seasons, giving to wider zones the moderate springs that shall with increasing mean advance towards the north, bearing with them the warmth, and just the warmth, adequate to mature the wheat, the rye, the oats, and maize, spreading a table for millions of men where, but for this simple obliquity of the axis of the earth, a waste, frozen and inhospitable, would spread its barren desolation to the remorseless skies.

REMARKS ON THE ACCLIMATION OF PLANTS.

It has often been asserted, and is generally believed, that tender exotics may by degrees be accustomed to a colder climate, and thus become acclimatized. Some have believed that by sowing the seeds of such plants, in the first instance, in a warm, temperate region, then collecting the seeds produced by these plants and sowing them in colder districts, the species may eventually be rendered hardy. Many plants, it is imagined, have become hardy, which were originally so. We are apt to suppose that plants which grow in tropical countries must necessarily be tender, and adapted only to hot-house culture, not reflecting that they may have grown in very elevated and cold regions in those countries. Such is the case with many species introduced from Japan, Chili, and Nepal, which appear to be hardy in England. Of the dahlia, the heliotrope, the potato, the Lima bean, it may be said long culture has done nothing to increase their hardiness.

Sound views respecting the geography of plants would correct the prevailing errors regarding acclimation. The acclimatizing of plants, or, as it is supposed to be, inuring them to lower temperatures than those they have been accustomed to or have required in their native habitats, does not appear to be a possibility. It has been satisfactorily determined that a plant must receive the same amount of heat for the proper performance of certain processes necessary to the production of leaves, flowers, and fruit, whether in places to which it is indigenous, or far removed therefrom in more northern latitudes. The definite degree which it has demanded during certain epochs of growth is still required wherever it may grow; but the aggregate of heat may be received during a shorter term in high latitudes because of the greatly increased length of the day, and the processes be hastened and maturity attained at an earlier date. This is well illustrated in the growth of maize or Indian corn, which is said to be remarkably accommodating, though it must have a semi-tropical heat wherever grown, if only for a few weeks, and this heat it obtains even beyond the northern limits of the United States. It is well known that the varieties of maize grown near the northern limit of its cultivation ripen earlier than those which are esteemed valuable further south. Man has applied to his purposes the property possessed by many plants of adapting themselves to the new conditions, and the many varieties of maize, wheat, &c., attest the possibility of change within certain limits. Thus the season required by the maize varies from six months in the elevated plains of Santa Fé, in South America, to four months in the middle United States, and two and a half months in the Rainy Lake district, northwest of Lake Superior, a seemingly extraordinary transformation of its natural habits and associations. This plant must, however, enjoy for a few weeks, wherever grown, a semi-tropical mean heat of 67°, and the period required for its growth is proportioned to the abruptness of the temperature curve, or the rapid increase and high degree of heat reached during its growth. The several varieties of maize which have acquired the peculiarity of hastening their period of maturity when judiciously planted, enable the farmer to extend the cultivation over every district in which the summer temperature reaches a certain point, however brief the duration of heat, provided the definite aggregate adapted to each variety shall have been received. The extraordinary high temperature experienced in certain northern localities remote from the ocean, and the intense calorific and chemical action of the sun's rays, enhanced by the extreme length of the days of summer, enable this plant to mature in high northern latitudes. From the success that has attended the growth of many varieties of maize, it is supposed that many other plants may be acclimated, and that those whose epoch of growth would extend over a period of low temperatures in northern localities may, like the maize, be successfully carried towards the pole, if but new varieties adapted to the new conditions could be produced. Such hopeful experimenters forget that the maize is receiving on its further northern border the same, or nearly the same, aggregate of heat it demands in its most favored clime, is exposed to the influence of the same high mean during its most critical period, and, consequently, can elaborate its juices and mature its seed as well in the shorter hot season of the north as in the more temperate longer season of the south.

The principle above enunciated is, however, subject to some modifications as regards its application to certain physiological changes which have been observed to result from long-continued efforts to cultivate plants under unnatural conditions. Plants are, without doubt, capable of modification within certain limits. Witness the numberless varieties of grains and fruits, some of which appear to be more hardy than their progenitors. Many of these which appear to, or really do, thrive in more northern districts than those from which they were derived, have merely acquired a greater susceptibility to the influences of light and heat, and are thence aroused into earlier action, quickened in their vital functions, and mature under a lesser aggregate of heat as measured by the thermometer, though for the critical periods of their existence they demand the same mean temperature as the original from which they were derived.

It is in the power of man to fix these peculiarities when observed, and in a measure to produce them by the selection of those which promise well, and continuing the selection with adequate care through several generations. Vilmorin, by skilfully applying the principles which influence plants in their tendencies to sport into new varieties and directing them into the desired channel, has almost created a new race of beets containing twice as much sugar as their ancestors, and promising to be readily perpetuated.*

Acclimating the tender plants of the tropics, and inuring them to the cold seasons of the north or temperate latitudes, is, therefore, impossible, though some minor modifications upon those of short growth during the periods of fervid heat of the northern summer have been made. The olive and the orange have not been rendered more hardy, and the peach appears to be still endowed with the same tenderness of bud it has always shown.

The difficulties of acclimation may be illustrated by the fact that certain vegetable products can be grown in particular latitudes, while others, though they may attain considerable size, cannot be grown with any useful result. For instance, in England the vine will never yield grapes capable of making wine even of a quality equal to champagne; nor will tobacco ever acquire that peculiar principle which gives it, in the estimation of many, so great a value when grown in some other countries; and yet both the vine and the tobacco plant flourish in the soil of England. The botanist and the meteorologist can

* Silliman's Journal of Science, vol. XXII, p. 448, new series

explain why this is so, and thus prevent the commencement of speculations which must end in loss and disappointment.

It is of great importance to be able to define accurately when a plant may be said to suit a particular climate. It is not enough that it live and send out leaves: it must be able to produce flowers and seeds and to elaborate the peculiar secretions and products on which its qualities depend. Indian hemp has grown in England, even, to the height of ten feet, with thick stems, vigorous leaves, and abundance of flowers, but it did not produce the resinous matter upon which its supposed value as a medicinal agent depends.

The rhubarb of Turkey, which, as regards size and vigor of the plant, thrives well in England, does not produce a root of any medicinal value, or of the same quality as that grown in Chinese Tartary, from which, though known as "Turkey rhubarb," it is derived.

The leaves of the tea plant are harmless, or but slightly stimulating in certain latitudes, while they become narcotic and unwholesome in others. This fact can be explained by the study of the connexion which exists between climate and vegetation—a question to be solved by the botanist and meteorologist. It is science only that can explain the failure of attempts to cultivate the tea plant in Madeira and in the Indian archipelago, while a variety of the Chinese plant is now cultivated in the upper districts of India with great success.

The introduction of tea culture into India—a culture which is likely to become of vast importance—had its origin in the observation made by English residents that a kind of tea plant was indigenous in Assam. The discovery had been made ten years previous, but from the absence of competent botanists, and consequent ignorance of the true character of the plants, it was not turned to profitable account. It is to the published opinions of Dr. Royle, who, from a consideration of the similarity of latitude, climate and vegetation, as far as any information could be obtained, was of the opinion that tea could be successfully cultivated in the Himalayan mountains, we are to ascribe the practical adoption of plans that have been, after a long and arduous struggle, attended with complete success. Basing his opinion upon the known varieties in climate corresponding to varying elevations, he suggested the propriety of experimental planting in certain districts in the mountains elevated about 5,000 feet above the sea.

The success attending the experiment, when fully established on a sound basis, produced a remarkable demand for land, and applications for grants poured in, and were complied with by the government on most liberal terms. In Assam alone there are now upwards of 160 plantations owned by sixty companies and individuals, which occupy 20,000 acres of land actually under tea cultivation, bearing an estimated annual crop of 2,000,000 pounds of tea; while grants of land to the amount of 123,000 acres for tea-growing had been made up to the end of 1863. In Cachar, an adjacent province, more than 6,000 acres have been brought under cultivation, and the crop is estimated at nearly 400,000 pounds of tea. In the northwest provinces, and in the Punjab, where the Chinese tea plant is cultivated, the rate of progress appears to be most remarkable, where the statistics, which may be called marvellous, prove the movement to be a national one. The native princes, the Maharaja of Cashmere, the Raja of Nadawn, and several other Rajas, English and native planters, among the Himalayas, are entering largely into the culture, and the demand for seed and plants has been so great that in 1862 eighty-nine tons of the former and two million four hundred thousand of the latter were distributed gratis by the government, yet the demand was not supplied.* All that has been done and is doing for tea culture in India is but a feeble foreshadowing

* Tea cultivation, cotton, and other agricultural experiments in India—a review by W. Nassau Lees, LL.D

of an enormous cultivation and trade. We are told that tea plants are now thriving over 4½° of latitude and 80° of longitude, a tract containing 35,000 square miles, capable of producing, were the area all planted, upwards of 900,000,000 pounds of tea, and with high cultivation of doubling this high figure.

While the valley of the Brahmapootra and the slopes of the lowest range of the Himalayas are being clothed with tea plantations, the cultivation of coffee has advanced with rapid strides in the highlands of southern India. The introduction of the plant is by tradition ascribed to a Mahomedan pilgrim, who brought seven berries of coffee from Mocha, about two centuries ago, and planted them near his hermitage in the wild hills of Mysore. But it is only of late years that the produce has been considerable. Under improved administrations, and regulation of the modes of taking up and holding land, the plant is extending over tens of thousands of acres. The number of native planters is estimated at nearly four thousand, and is fast increasing in numbers. In Mysore, where but little available land remains, the mountain and forest wastes have been turned into rich productive gardens. From being the most wild and desolate parts of Mysore, these districts have become prosperous, and the people have been raised from poverty to comfort, and in many instances to wealth.

There is another plant which promises to take a high place in point of interest and value among the products of India. The credit of first suggesting the transplantation of cinchona trees, or those producing quinine, into India, is due to Dr. Royle, who pointed out the Neilgherry hills as suitable sites for the experiment. Here are found a climate, an amount of moisture, a vegetation, and an elevation above the sea, more analogous to those of the cinchona forests in South America than can be met with in any other part of India. There, accordingly, the large body of plants conveyed in Wardian cases from Peru and Ecuador, where they were collected by Mr. C. R. Markham, under many difficulties and discouragements, were finally planted, to become the parents of millions of future denizens of this delightful region. The many varieties of cinchona, each requiring its peculiar climate as respects warmth, humidity, and protection, as well as soil and elevation, were here each provided with the requisites for healthy and successful growth. Already upwards of 150,000 plants of the eleven species of cinchona are growing, and permanent plantations established to the number of 40,000 trees, and the prospect for the extensive cultivation by private enterprise is already very encouraging.*

Under the combined influences of liberal grants of land, wise expenditure for improving the modes of intercommunication and increasing on a magnificent scale the means of irrigation, and the recent planting among the agriculturists of India, the productive cultivation of the staples above referred to, the torpor of centuries is fast giving way before the quickening influences of science applied to the practical purposes of life. In the language of the Edinburgh Review: "The wheels of progress are fairly set in motion, and it demands but scanty powers of observation to see that society is moving onward at a pace almost Anglo Saxon in its rapidity."

The above afford very striking examples of the value of an acquaintance with the botanical peculiarities of plants combined with accurate knowledge of their climatic requirements. Those only who are acquainted with botanical geography could point out the most efficient methods of conducting the experiments to a successful issue. They also furnish evidence of the grand results that may follow the wise application of the power of government when directed by accurate knowledge. Agriculture, trade, fortune, food, population, health, may all be powerfully affected by the transfer of a little packet of seed,

* Edinburgh Review for October, 1863.

or by one of those modern contrivances known as "Wardian cases," which have so facilitated the interchange of the vegetable productions of the globe. It is only when such efforts are directed by competent knowledge that they can succeed; and the example of the decided success attending the culture of tea, coffee, and cinchona in India should not be lost upon those who direct similar attempts in our own land. All that has been done for India within the last ten years, it is with regret we say it, and much more than has been done, might have been reached many years ago had scientific inquiry and liberal and enlightened government gone hand-in-hand, co-workers, as they should always be, for the benefit of humanity. To transfer from foreign countries vegetable products, whose introduction may serve to increase the activity of trade, foster new forms of industry and enlarge the measure of human comfort and the common weal, is one of the noblest duties of a government; and the efforts of our own in this cause, though not always wisely directed, should continue to receive the encouragement of all who have it in their power to facilitate its means of doing good, and who have the prosperity of the nation at heart.

The attempts to introduce the tea plant into the United States have not been as successful as those made in India, nor even as those made in Brazil. The government attempts in the latter country were indeed a failure; but there exist extensive tea plantations in Brazil, and large quantities of tea, that could not be distinguished from the Chinese preparation, have been there made. In the United States the single private enterprise, but indifferently managed and early abandoned, is the only attempt to introduce tea culture of very recent date. The experiment of Junius Smith, in South Carolina, in 1848, furnishes no evidence of the incompatibility of our climate with its successful culture. It was, indeed, attempted in 1772, in Georgia, with no better result. The tea plants appear to have grown, and to have been perfectly hardy, but were neglected upon a barren soil, to improve which no effort was made, and the culture gradually languished. It may perhaps be proper to ascribe the indifferent success to the peculiar social condition of the southern population, semi-barbarous, with but few educated dominant minds, averse to improvement or to change of any kind, and especially to the introduction of any culture that would tend to render independent the class of poor landless whites whose elevation would weaken, if not eventually destroy, the power of the "lords of the rice tierce and cotton bale, sugar-box and human cattle." Our more enlarged and accurate acquaintance with the climate of the hilly slopes of southern Virginia, the Carolinas, and Georgia, ought to enable us to compare their peculiarities with those known to be favorable to the tea plant in China and India; and we do not entertain a doubt of the perfect feasibility of introducing the tea culture into those districts, when the sound of conflict shall have ceased, order have been restored, and the unworthy population of the region displaced by northern patriots, with heads and hands competent and worthy to fulfil the mission that awaits them. That mission we believe to be to restore the fertility of the south, redeem the land from the thraldom of ignorance and barbarism, plant therein the tree of liberty and all manner of trees that the climate will sustain, and rear upon the soil, blessed with a genial air and kindly sunshine, the homes of industry, Christian piety, and purity, and happiness, a gracious Providence designed should there arise for His obedient children.

Our space will not permit us to enlarge upon this very interesting branch of our subject, already extended far beyond the limits originally designed. Those who desire to acquaint themselves with the history of the cultivation of tea in India will read with interest a work on "Tea cultivation, cotton, and other agricultural experiments in India," by W. Nassau Lees, LL.D., already referred to; "Two visits to the tea countries of China and the British tea plantations of the Himalayas," by Robert Fortune; "Wanderings in China," by the same; "Brazil and the Brazilians," by D. P. Kidder and J. C. Fletcher, American clergymen, twenty years resident in Brazil; articles on "tea culture" and the experimental garden at Washington, D. C., &c., in the volumes of the Patent Office Report, agricultural division, for 1857, 1859, &c.

Ignorance, if not always the parent of fraud, is ever apt to become the prey of the unscrupulous and designing. Ignorance may itself mislead with the best intentions, for presumption is often but the measure of want of knowledge. An instance is at hand of very recent date. Had the true character of the tea plant and its climatology been well understood, we would not have had to lament the mistake that has been made by some whom we charitably hope were well-meaning but erring enthusiasts, who have persuaded themselves that the genuine tea plant has been found growing in wild profusion, indigenous, in the mountain districts of northern Pennsylvania. A moderate acquaintance with our botany would not have permitted them to imagine the common *Ceanothus Americana*, or New Jersey tea, to be identical with their favorite *Thea viridis*, or rather with a variety of it, the *Thea Assamica*. So far from being identical, these plants are not found in the same genus, as we perceive, nor in the same order, nor even in the same sub-class of Dicotyledons; nor does the New Jersey tea contain, as shown by the analysis made by Dr Gibbs, of the Lawrence scientific school at Cambridge, Massachusetts, any Theine whatever!

It may seem to many who advocate the use of tea as a beverage that the extended cultivation of a plant seemingly so valuable should be encouraged. To such we would suggest, in the absence of direct experiments with the genuine tea plant, the propriety of seeking among our indigenous plants for those that may contain the principle of Theine, to which the virtues of tea are ascribed. There are doubtless several growing wild in the United States which will produce this substance, and perhaps those most likely to furnish it may be found in the natural order *Ternströmiacea*, to which the Chinese tea plant belongs. Linnæus declares that species of the same genus possess similar virtues—a doctrine admitted to be incontrovertible, and which reduces the whole history of medical or economical uses of the vegetable kingdom to a comparatively small number of general laws, whereby the properties of a species we have never seen before may be determined by what we already know of some other species to which it is related. The above order *Ternströmiacea* contains the Gordonia and Stuartia, both growing in this country; the former, the holly-bay of the south, is native in the latitude of Charleston, South Carolina, and the latter is found on the mountains of Virginia and Tennessee, and is quite hardy in the neighborhood of Philadelphia, at the Bartram Botanic Garden. There are few trees or shrubs whose flowers can compare in beauty with those of the *Stuartia pentagynia*. As plants of the same natural order, as above remarked, often possess properties closely allied, sometimes identical, the above-named *Gordonia pubescens* in the south, and *Stuartia pentagynia* in more northern districts, might, on examination, prove at least much more valuable substitutes for the *Thea viridis* or *Thea Assamica* than the New Jersey tea, which, says Dr. Darlington, "must have sorely tried the patriotism of our grandmothers."

The foregoing outlines of the laws regulating the effect of heat, &c., upon plants will, we hope, lead to some valuable practical results. The climate we cannot modify to any very important extent; but the injurious influences we may shun by judicious choice of locality, seasons of growth, more fitting selection of varieties of plants, superior and better adapted seeds, and by improving, through our physiological knowledge, the various vegetable products upon which we must operate.

CONCLUDING REMARKS ON THE NECESSITY FOR A MORE ENLIGHTENED AGRICULTURE IN THE UNITED STATES.

We do not flatter ourselves that we have developed anything in the foregoing pages particularly novel or especially valuable. We shall be satisfied if, by giving to our agricultural friends an outline of the vegetation of the globe as affected by climatic peculiarities, accompanied by some illustrations of the value of a right application of a knowledge of botanical geography, we succeed in inviting their attention to those which influence our own land, and so interest them that they may be induced to observe and study for themselves the phenomena of meteorology and vegetable physiology, &c., in connexion with the progress of their crops and the various processes of vegetation. If we succeed in awakening some indifferent ones to a just conception of the importance of the subject, in order to a correct understanding of American agriculture, and in exhibiting to them and others how they may aid in placing it upon a scientific basis, the only sound basis upon which anything dependent upon the influences of natural phenomena can be built, we shall not have occasion to regret our effort.

Though man has lived upon the earth several thousand years, and has tilled the ground and reaped its products, he yet knows but little of the art, still less of the science of agriculture. What he has learned is merely the result of groping in the dark, the fruits of conjecture and experiment unguided by a knowledge of principles. Were the practitioners of every other art as ignorant of the principles upon which their processes are founded, we would not have emerged from the darkness of past ages, and almost every modern discovery and invention would be unknown. It is to modern science that we are indebted for our progress in physical comforts and the vast accessions of enjoyment which have been added to the lives of the cultivated classes, and which are partaken of, in measure, by even the least intellectual. Very few of these great discoveries have been made by chance and by ignorant persons, much fewer than is by some supposed. They have generally been made by persons of competent knowledge, who have sought for them, and who have met their reward through much pains-taking investigation. The facts that have gradually accumulated, the observations recorded by patient observers, have been applied by those who were more skilled, and who have been led to extend their inquiries beyond the depths already known, and to bring up therefrom new truths which add to the pleasure or the well-being of mankind.

They who are themselves unacquainted with the principles of their art must be incapable of employing opportunities for experiment, must be unable to observe aright or to investigate, and can never strike out anything new that may be useful in art, or curious or interesting in science. They, on the other hand, who are familiar with the reasons for the processes they employ may, perhaps, become improvers of the art they work at, or even discoverers in the science connected with it. They are daily handling the tools and materials with which new experiments are to be made, daily witnessing the operations of nature, are always in the way of perceiving what is wanting or what is amiss in the old methods, and have a better opportunity for making improvements, and, if they possess the requisite ability, can take advantage of them; for, as has been well said by an able writer on the chemistry of agriculture: "He that is master of principles is like a watchman in a belfry—the whole city is before him. He who cannot rise above detail is like a man in an alley, who does not know what is passing in the next street."

It is by no means necessary that a man should do nothing else but study known truths, or devote himself to investigation, in order to become skilled in the knowledge of the principles of his art or profession. Some of the greatest men of science have been engaged in the pursuits of active life, devoting to study only a modicum of time beyond that required by the demands of business. One of the most successful farmers of Europe is also one of the most profound of philosophers, and has written one of the most valuable works on the economy of agriculture extant.* The time has passed when it was deemed absurd to consider these callings incompatible, and he who now deems the application of science to agriculture a theme for ridicule has himself become a fair subject for the pity, if not for the contempt, of well-informed men.

Every farmer knows that the quantity of produce which may be obtained from a given space of ground varies much, other things being equal, according to the skill of the cultivator; but every one is not aware that skill is in reality merely the application of the rules of vegetable physiology to each particular case. This application is frequently made by those who are unconscious of the derivation of the rules. We are apt to overlook the causes that have influenced a course of practice, and to ascribe the improvement we witness to a mere advance in art, not considering that the advance must have had a cause, and that the cause can only be the work of some master-hand, which is afterwards blindly followed by the community.

The introduction of new or improved varieties of fruits has doubled and trebled the produce in many districts of our country. But how many who profit by the change, who are enriched by the increase, consider that they owe all this to the patient skill of the vegetable physiologist and horticulturist? The new varieties of the potato, many of which greatly surpass in productiveness the older sorts, are greedily sought by the farmer, and the names of Garnet, Chili, Cuzco, and Pink-eye Rusty-coat, *et id omne genus*, are in every mouth. But who considers the skill and care, the knowledge of the laws of vegetable growth, the research into the chemistry of vegetation, or the patient, laborious application of knowledge derived from a profound study of botanical principles, all of which are involved in the production of a new sort, or even turns to ponder the name of him who has proved a benefactor to his species? †

How many farmers know that to Thomas Andrew Knight, an English gentleman of wealth and education, and the best practical gardener of his day, we owe those experiments in vegetable physiology which have resulted in the production of a vast number of new varieties of apples, pears, plums, cherries, &c., of great value, both in England and in this country? How many are aware that the principles this philosopher advanced have led to still greater improvements among our own horticulturists, and seem destined to produce others, of the magnitude and importance of which he forms no conception! Who that cultivates the turnip, a crop yet to be largely extended in this country, and which is the most important in England, where it is the great foundation of all the best systems of cropping, remembers that it is to an English statesman, Viscount Charles Townshend, able and honest in an intriguing government, chief minister to George I, we owe the introduction of this invaluable root into England? ‡ In this seeming simple act of urging upon the farmers of Britain the cultivation of this apparently contemptible root, he has done more for his fellow-countrymen than whole galleries of famous politicians, who, instead of being benefactors, rather merit the denunciation of the poet, as—

"Destroyers rightlier called, and plagues of men."

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* Boussingault's Rural Economy.

† Since the above was written we have with pleasure remarked the effort now making by many farmers of the State of New York towards obtaining means for a testimonial fund, for presentation to C. E. Goodrich, as an evidence of their appreciation of his long, laborious, and unremunerated labors for the improvement and culture of the potato. Such actions merit unqualified praise, and are as creditable to the donors as to the worthy recipient.

‡ This has been questioned; but if he did not originally introduce, he aided greatly in extending its cultivation and usefulness. His sobriquet of "Turnip Townshend" strengthens our position that he introduced the turnip into districts where it was unknown.

A long series of the names of benefactors of the farmer might be given—men who have expended fortunes in experiments, or given the labor of their lives in elevating the calling, by studying the improvements found in other countries, and, amid obloquy and ridicule, planting them among their own people.

Sir Richard Weston, who introduced clover into England about 1645, was a diplomatist and ambassador of James I to the Elector Palatine.

John Evelyn, whose "Sylva" gave a great impetus to rural pursuits among the landed gentry of England, was employed in public service.

Jethro Tull, who introduced the drill husbandry, was a barrister, yet was the first to recommend and practice horse-hoeing, and that but a century and a half ago.

Smith, of Deanston, whose system of draining has brought millions to the English agriculturists, was a proprietor of cotton works.

Arthur Young, who carried on experiments of every kind regardless of expense, "and in fact, by his enthusiasm, outfarmed himself," who saw through his own losses his country's gain, and by his tours through England and Wales and on the continent, and his numerous publications and observations for the general good, conferred a vast benefit upon agricultural interests, "was just the man not to farm profitably," but the very man destined to give more practical and cautious men a sufficient impetus to lift them out of the stagnation in which they had been bred, and in which, were it not for the influence of such men, they would ever remain.

Coke, afterwards earl of Leicester, must conclude our list of the great benefactors of the farmer and elevators of the agriculturist above the dull, dead level of ancestral routine. Such innovators have almost invariably arisen from outside the profession, the barrister, the retired manufacturer, the statesman, the nobleman, and the prince having each in turn aided in advancing the cause of improved culture of the soil, in which all have a common interest. The improvements made by Mr. Coke were extraordinary. By skill, capital, and enterprise he became the founder of the agriculture of immense estates, which he transformed from blowing sand and flinty gravel to a fertile domain. Tracts that were not worth to a tenant three shillings an acre became under his management, and that of those to whom his judicious leasies gave an enduring interest, capable of producing eighty bushels of barley per acre, which was double the average product of the county of Norfolk, in which his estates lay, and treble that of many counties of the kingdom to this day.

The names of many others might be added to the above names, *that, by the great example of what they have accomplished, encourage us to have faith in improvements yet to come.* These are the genuine heroes, the conquerors of ignorance and prejudice, who have crowned themselves with ennobling honors, heroes whose memory the world should not willingly let die.

No country can boast a greater number of intelligent farmers than can the northern section of the United States; nowhere else are agricultural periodicals and standard publications more largely patronized; in no other country are the discoveries and experience of the better-informed, or more skilful, or more curious sooner made available for the benefit of all; nowhere else exist a people enjoying so free intercourse, or so prone to use the opportunities locomotive and epistolary; no country exhibits a more varied surface or more varied produce; in fine, no other people possess more largely all the materials for the promotion and exhibition of an enlightened agriculture; but though, as farmers, we surpass those of every other country, England and Belgium, perhaps, excepted, we are still very far from possessing that enlightened acquaintance with its principles the avocation demands and our opportunities afford. Unfortunately the sum of mental training enjoyed by the sons of farmers is generally but the meagre teaching of the common school, which, though valuable as it is in comparison with that afforded to the people of other lands, Prussia excepted, falls far below the actual demands of the age and of the profession. There are, however, many hundreds of young farmers who have received an academic or collegiate education, and have, by self-instruction based thereon, (which is, indeed, the only education truly valuable, for the academy and the college but teach how to learn,) made themselves masters of the general principles of their art. On these devolve the duty to aid their brothers by putting them forward on the track of improvement. To all such we would hold out words of invitation to come forward and engage in this useful and honorable work. A wide field is open to all willing laborers, who, with observing faculties, trained by knowledge of the elements of natural and physical science to note the phenomena occurring around them daily, can with judgment record and report the results of their observations to those who, by condensing and tabulating, shall make their multifarious notes available for the instruction of their fellows.

"Whatever is individual and peculiar in our country must be studied by onrselves; we cannot expect the savans of Europe to make the investigation for us. Many practical questions in American agriculture demand answers, and success cannot be expected without the union of science with practical experience."

The climate of the United States is a peculiar one, marked by extremes of heat and cold, of wet and dry. It is as essential to study its characteristics as it is to determine the properties of our various soils. A want of meteorological knowledge and consequent want of adaptation of our industry to the laws of climate, both general and local, is a frequent source of loss to the farmer. A system of observations is efficiently carried on by the Smithsonian Institution, at Washington, D. C., aided by numerous correspondents in almost every State and Territory, through which it is hoped the climate of the United States will yet be as thoroughly understood as its geology and its geography. This kind of information is one of the essential elements on which to found a system of scientific agriculture adapted to the various local climates of the different portions of our extended country. The degree of heat and cold and moisture in various localities, and the usual periods of their occurrence, together with their effects upon different agricultural productions, are of incalculable importance in aiding research into the laws by which the growth of such products is regulated, and will enable the farmer to judge with some degree of certainty whether any given article can be profitably cultivated. Many wide sections of our country are, however, left without an observer, and we are in ignorance of the peculiar climate of districts almost in our midst. The amount of rain which falls along the sea-shore of New Jersey, from Cape May to Sandy Hook, and in the interior, midway between the river and the ocean, has never been observed or reported, nor do we know the mean temperature of any place throughout this entire region for any season. That it differs from the climate of southeastern Pennsylvania is apparent, but wherein, and to what degree, has not been determined. The foregoing is but one of many regions that might be named wherein observations might be profitably instituted. To aid in this good work should be the desire of every educated farmer. He may enter upon a series of observations on the weather with proper instruments at command, in which employment he will find not only pleasure, but positive benefit from the knowledge acquired and the habits of method and close attention the practice will induce.

There is a wide field open to all, and in which the skilful and persevering may calculate upon success. In the efforts at improving our fruits, grains, and vegetables many will find both pleasure and profit. This field is but partially occupied, and is one in which there is ample room for many experimenters, who, if they bring an ordinary amount of attention and knowledge of plants and their physiology, will be certain to reap a harvest. Those who propose to experiment in the improvement of wheat by selection and cultivation may consult with profit an article on the subject, taken from the "North British Agriculturist," republished in "The Country Gentleman," volume XVIII, page 219, (1861;) also Mr. Hallett's description of his mode of procedure, an extract from his published results, may be found in "The Annual of Scientific Discovery," for 1864, edited by D. A. Wells, M. D., pages 307, 308. Experimenters in hybridization or cross-fertilization may find some light thrown on the process followed by Mr. Maund in the production of his hybrid wheats, exhibited at the Industrial Exhibition in London in 1851, by consulting the Patent Office Report, agricultural division, for 1855, pages 181, 186; also "The Wheat Plant," by John H. Klippart, pages 81–85, a work abounding in valuable information, interesting to every farmer, and especially interesting to the wheat-growers of the great State of Ohio, from whom its statistics were mainly derived.

In an industrial point of view the production of a new prolific variety of any of the cereal grains—wheat, oats, rye, or maize—is of immense national importance. A new variety which will yield a few bushels more per acre over the ordinary kinds would greatly increase the aggregate yield of our soils.* In this direction an extensive and inviting field is open to experimenters. The same may be said of many other products of the soil, which, by judicious selection or careful hybridization might be greatly improved. The success which has attended the efforts of many amateur cultivators in their attempts to produce new varieties of fruits should encourage renewed efforts. Dr. J. P. Kirtland, of Cleveland, Ohio, has produced no less than twenty-eight varieties of excellent cherries, which were esteemed by his pomological friends as surpassing most of the old and best varieties. Strange as it may seem, and unwilling as we may be to believe, that one experimenter could in a short time originate so many superior varieties of cherries, it is nevertheless true that such have been produced, and, also, that time but confirms the good opinion early formed of them, and the belief that they will take precedence over all other kinds yet introduced. The experiments in hybridization instituted by Edward Rogers, of Salem, Massachusetts, which, it is believed, have resulted in the production of several excellent varieties of grapes, will incite others to enter this line of experiment with hopes of similar results.

There is much room for improvement in our fruits by the selection of seed of good varieties for the production of hardier kinds, or better adapted to their place of origin. Hon. Marshal P. Wilder remarks:

> "The immense loss sustained by American cultivators who have attempted to introduce varieties of fruits not adapted to the soil and climate, suggest the importance of raising from seed native sorts which, in most instances, possess some peculiar advantage. It is now generally conceded that the plants indigenous to a country will flourish at home better than those that have had their origin in foreign localities."—Proceedings of American Pomological Society, 1854, p. 12.

The United States possesses a very varied flora, which has not been fully illustrated. There are many sections whose herbs, shrubs, and trees are not fully known. As every educated farmer, it is presumed, has made some acquaintance with botany, and unless he has, he can make but minor claims to education, as this science is of the first importance in his profession, he can readily observe and record the names of all the forest trees at least; and if he can catalogue the common minor plants, or all that are met with in his township or wider district, his contribution would become so much the more valuable, as more full and minute. Such catalogues, returned from every section of the

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* Dr. Vœlcker, in a recent lecture before the Royal Institution, London, stated that in the county of Norfolk the average produce of wheat was, in 1773, fifteen bushels per acre; in 1796, twenty-eight bushels per acre; in 1862, thirty two to thirty-six bushels per acre, the increase being due to drainage, tillage, and to the *growth of improved varieties.*—Annual of Scientific Discovery, 1864, p. 202.

Union, would prove of great value to those who have occupied themselves in attempts to thoroughly elucidate the productions, climate, and physical geography of our country.

Every farmer, even the uneducated, may contribute to the progress of his art, by observing the dates of the chief periods in the vegetation of plants. Let him make notes of the time of seeding and of germination, the periods of the revival in spring, the date of blooming of various grain-producing plants their maturity, &c., regarding especially in each case the peculiar *variety*. Let him observe the dates of leafing, blooming and ripening of the various kinds of peaches, pears, apples, grapes, &c., noting, particularly, the especial variety, for it is upon this that the value of such notes will depend. If the observer combine with these notes of the changes in vegetation well-ascertained facts of mean temperature and humidity derived from daily observations of the air, &c., his contributions will become of much higher value. It is a knowledge, of minute facts, some of which might be regarded by many as too insignificant for notice, that is occasionally found to afford the safest guide in many questions of difficulty in agriculture as in every other art. Every farmer may also aid the cause by assisting the agent of the Commissioner of Agriculture in each county of every State, in his inquiries into the condition of the crops, by collecting statistics, &c., &c., and by encouraging the work he has begun, and strengthening his zealous labors in our behalf.

Every cultivated mind of healthy activity has felt the need of an object upon which it can concentrate its powers. In this connexion, the language of the distinguished Secretary of the Smithsonian Institution appears especially instructive, and deserving the attention of the educated sons of farmers:

> "It is scarcely possible to estimate too highly, in reference to the happiness of the individual, as well as to the promotion of knowledge, the choice in early life of some object to which the thoughts can be habitually turned during moments of leisure, and to which observations may be directed during periods of recreation, relative to which facts may be gleaned from casual reading and during journeys of business or pleasure. It is well that every one should have some favorite subject of which he has a more minute knowledge than any of his neighbors. It is well that he should know some one thing profoundly, in order that he may estimate by it his deficiencies in others."—Report of Dr. Joseph Henry, Secretary of Smithsonian Institution, 1857, p. 25.

It should not be matter for surprise that more farmers become insane in proportion to their number than the members of any other profession, when we consider the extent to which their muscles are tasked at the expense of the brain. "Their life is a dull routine; there is a sameness and tameness about it, a paucity of subjects for contemplation most dangerous to mental integrity."* The proper remedy against the sad effects of a plodding routine existence is increased mental activity, a more harmonious exercise of muscle and of mind. It is a sad truth that the majority of young farmers grow up like ill weeds, untrained, uncultivated, untaught in the natural and physical sciences, for studying which they have so ample opportunities. Declining too often on the vulgar level of debasing pleasures, they refuse the sweets of literature and the delights of knowledge until they are left without an aspiration beyond the acquisition of wealth or the mere continuance of animal existence. Never taught to respect their profession, what marvel that they should not esteem it the most important as well as the most interesting and the most delightful that can occupy the attention of a mind rightly constituted and properly educated; that the study of its principles and their judicious application to practice afford scope for every faculty to the fullest extent; that it is in truth a profession worthy the mental powers of any man be he ever so intellectual. In England the study

* See an excellent article on the "Health of Farmers' Families" in Report of the Agricultural Department, 1862, an article that should be read again and again in every farmers' family in the land.

of the principles and practice of farming engage the attention of the most advanced minds, and the educated gentry enter with zeal into agricultural pursuits. No problems which task the powers of the mathematician, no points of law which plague the lawyer, no questions of medicine which bother the doctor, are half as difficult, half as instructive, or half as important, as are the problems of agriculture. Instead of regarding it as a drudgery and unworthy the attention of the clever sons of farmers, if they could view it aright, they would see in their profession a wide and promising field for scientific research, an elevated arena in which to exercise and task their mental powers, and one in which distinction may be attained, and that more worthily than through the real drudgery of professions of very questionable utility.

If to the eye of taste a waste uncultivated field is repulsive, what to the eye of educated judgments is a waste neglected mind? What opportunities for benefiting the possessor, his neighbors, his country and his age, lie fallow and unimproved. Here are energies but stimulating the growth of noisome weeds; there, the barrenness of death. Such do we daily see around us among the young men—the young farmers of our land. They know not or heed not the opportunities for improvement that surround them, that press upon them, nay, that solicit their acceptance of the boon of culture. Alas, how many of them have yet to learn that "an enlightened people understand that in our age culture is the only true distinction among nations," and equally among individuals which compose the nation.

"Why should agricultural wisdom continue to be a groping backward and downward instead of forward and upward; a digging among old fossils, rather than penetrating originalities?" Why should not farmers become intellectual and progressive? Does not superior intelligence in farming as in every other calling make the better workman? Does not the well being and progress of the country depend upon the farmers, and their wise application of the teachings of advancing science? "A man may be a farmer, no doubt, in most un blessed ignorance of the physical phenomena occurring around him, but ignorant he cannot be without experiencing the baleful effects of ignorance. And seeing that all terrestrial arrangements, however apparently unconnected, do eventually mingle and combine in the production of the results ordained by the intelligence of the Supremely Wise, we believe it most injurious to the interests of agriculture that farmers should have but a limited acquaintance with those complex agencies which must be in harmonious co-operation before even a blade of grass can spring from the soil."

No art or calling requires for its full comprehension and perfect practice the aid of as many branches of systematized knowledge as does that of the farmer. No profession claims a wider range of wants or calls more largely on the man of science, or sooner exhausts his attainments. Witness already the applications of chemistry which have caused a growth beyond its ability to supply adequate information in explanation of new difficulties which the acute practical mind is daily meeting with. It ought not to be expected of science that it should explain every difficulty as it arises, or make plain every anomaly in cultivation, or render the art of farming as certain and as easily understood and practiced as the manufacture of cloth or iron. The perfect practice of agriculture is a subject infinitely more difficult and profound than any other art, mechanical or manufacturing. "Agriculture, in its true sense, is an encyclopedia in itself—requiring great knowledge, fine powers of observation, high mental cultivation, assiduous thought and study." The intelligent and educated young farmer, who enters upon the business imbued with the right spirit, will find that when the torch of science shall have illumined the field of his labors, he will discover attractions in the many operations of the farm to which he is now a stranger. The dew, the rain, the sun, the winds, the clouds, the clear sky, the floods and the droughts, the rocks, the soils, the native plants and the introduced weeds, the chemistry and physiology of vegetation, and all the myriad operations that are daily occurring around him, will become like so many volumes of a mighty library teeming with mysteries, but each of which he is prepared to peruse, and, in measure, to understand.

It has been laid to the charge of science that in its deductions it is often at war with itself, and such it must be, because it is progressive. It is in fact undeveloped, but struggling towards a more perfect stage. It has, perhaps, promised more than it has performed, but much more has been expected of it than should have been promised. It is much to have dissipated into "thin air" the old, erroneous notions in agriculture, and to have placed us upon the track of rational investigation. Practical knowledge of our calling is of prime importance; observation and experience must ever be the foundations on which to build the superstructure of science, and we are convinced that it is not by theoretical instruction in the halls of any college that agriculture is to advance, or that the present generation of farmers is to be rendered an improvement on the last, if they do not add to that clearer insight into the principles of their art which it is the mission of science to teach, the industry and thrift, the business capacity and judgment of their fathers, and combine therewith, through *self-instruction*, a higher and truer culture of mind and heart.

The earnest student of the very interesting branch of inquiry, a very meagre sketch of which we have attempted in the foregoing pages, will attentively peruse the following popular works, which should be found in the library of every inquiring farmer, and be studied by their sons and daughters throughout the land: Mary Somerville's Physical Geography, Guyot's "Earth and Man," Humboldt's Aspects of Nature, Schould's Earth Plants and Man, and Boussingault's Rural Economy.

A popular geographical botany, with a preface by Dr. Danberry, will be found very instructive, but for more minute and extended information he will consult Murray's Encyclopedia of Geography, volume I, pages 236–254, and volume II, pages 406–425; Balfour's Text-Book of Botany; Dr. Darlington's Agricultural Botany; De Candolle's Geographical Botany; Johnston's Physical Atlas; Agassiz's Lake Superior; Dr. Cooper on the Distribution of the Forest Trees in North America, in the Patent Office Report (Agricultural) for 1860, and Smithsonian Report for 1858; Blodget's Agricultural Climatology of the United States, in Patent Office Report (Agricultural) for 1853; Russell's Lectures on Meteorology, in Smithsonian Report, 1854; Blodget's Climatology of the United States; and various excellent articles by Dr. Joseph Henry, of the Smithsonian, in the valuable reports of that institution for 1855 and 1856, and in the Patent Office Reports (agricultural division) for 1856, 1857, 1858, and 1859.

COAL-OIL IN WEST VIRGINIA.

BY C. H. SHATTUCK, PARKERSBURG, WEST VIRGINIA.

ANIMAL oils, rushes, resinous knots, even nutshells, and other substances have been used at different times as light-producers.

It is not necessary, however, in this article to dwell on obsolete illuminations except as they may incidentally exhibit to better advantage the important position which petroleum, as a light-producer, occupies before the world.

The large quantities of this substance now consumed invest every place in which it is found with an importance corresponding to the amount produced. Even a cursory examination of this subject will excite no little wonder at the great productiveness of some of the oil regions of this country; and it will also strike the observer with surprise when he remembers the tardiness with which the wealth of these regions was developed. It would have been hard to have convinced, six years ago, even the least sceptical on such subjects, that to-day we would have wells right in our midst yielding thousands upon thousands of gallons of oil daily.

The history of petroleum in America commences in Indian times. The early settlers in this country found the Indians using it for medicines, for paint, and in their religious ceremonies. But whatever may have been the knowledge and uses of petroleum in this country up to the present time, it is now clear that henceforth it must hold a prominent place among the articles of commerce. It must not be supposed that the history of petroleum commences in America.

As a fuel it is no stranger to the French, to the dwellers on the Caspian, nor to the Norwegians. As an illuminating agent it is fast supplanting the animal and vegetable oils. The lamps of India are fed by it; the streets of Genoa are illuminated by means of it; and there is, perhaps, no considerable city, either in the Old or New World, where the new forms of lamps adapted to the use of kerosene are not found in use.

Many scientific men have affirmed that the slime with which the artisans at the tower of Babel cemented their structure was composed in part of this same coal-oil. The walls of Babylon were smeared with it, and the Dead sea, which we are told buries Sodom and Gomorrah, is a basin in which rock-oil is profusely accumulated.

The Spaniards who discovered Trinidad, we are informed, gazed with amazement upon a lake of pure petroleum. Rock-oil is found in Sicily, and has illuminated its cities. Italy, France, and England, all have had their reservoirs of petroleum. Whether we consider either the abundance of the supply, or the great comfort and benefit derived from the use of petroleum, its recent discovery in this country must be ranked as one of the greatest events of the age. The pumping, barrelling, and refining of it, will require the labor and reward the diligence of multitudes of men, and as an article for light, as well as for various manufacturing purposes, it will ever be in demand. It is well known that Seneca or rock-oil has long been famous for its medical properties; little, however, did those who used it in small quantities for this purpose dream of the abundant reservoirs which slumbered so quietly in their subterranean beds. We find that no practical movement was made in search of the native article until as late as the year 1854, when a company, Messrs. Eveleth & Bissell, of New York, organized and made preparations for boring on Oil creek, Venango county, Pennsylvania; still, it was not until 1858 that the borings proved a success. This delay was not owing to a scarcity of oil, as events afterward proved, but rather to a want of energy in pushing the work to completion, probably a lack of confidence in final success. The first well, at the depth of seventy-one feet, developed the oil; the yield at first was but four hundred gallons, but soon arose to one thousand gallons daily. Enthusiasm now began in earnest, and Titusville, a small town near the well on Oil creek, rose from a long obscurity to great distinction. Meanwhile attention was turned in other directions, and from this epoch we date the history of the

OIL INTEREST OF WEST VIRGINIA.

With the oil excitement at its height in Pennsylvania, of course it was not long before the coal-oil business of West Virginia began to teem with busy operations, and enterprising capitalists diligently engaged in collecting the rich stores of petroleum which were discovered in her territory. The first operators in West Virginia were J. T. Johnston & Co., from near Pittsburg. These parties commenced their operations on Hughes river, Wirt county, in November, 1859. They bored a number of wells with varying success. Soon after Messrs. Hazlet & Co., of Wheeling, began to operate in the vicinity of Petroleum, (a small town and station named from the product of the region,) on the line of the Northwestern Virginia railroad. These gentlemen were more successful than the parties last named; and this same vicinity has remained one of the most prolific portions of the oil regions of this State. We are at this time unable to give accurately the yearly yield of this region, yet we know that it has been and is still very great.

In the spring of 1860 Mr. S. D. Karnes leased from Mr. John V. Rathbone an old well which, in former years, had been bored for salt purposes. This well was situated on Kanawha river, in Wirt county, eight miles above the town of Elizabeth, the county seat. In the hands of Mr. Karnes it proved very productive, yielding from fifteen hundred to two thousand gallons daily.

The oil now commanded a good price in market, and it became manifest that this region (known as Burning Spring, from a gas spring in the neighborhood) was certain to reward the labors of operators. The attention of many was immediately turned to this district, and when, in December, 1860, Mr. J. C. Rathbone bored a well, and pumped from it daily from eight to ten thousand gallons of oil, the excitement became great. There were now three districts producing abundant supplies of petroleum in West Virginia. Men of all classes—mechanics, lawyers, laborers of all kinds—turned their feet in this direction, and soon became actively engaged in the business of procuring and shipping oil. All the land in the immediate vicinity of the working or producing wells, and much at a distance from them, was leased or purchased by capitalists eager to embark in the business. Buildings in the neighborhood, which had rejoiced in the name of hotel or inn, were speedily crowded to overflowing; quiet farm-houses, hitherto only humble and unpretending dwellings, were forced from a quiet obscurity to a bustling notoriety. The farms of J. C. and J. V. Rathbone soon became a city of huts. Nothing could be seen but great piles of barrels, derricks, scaffolds, and cisterns; nothing heard but the puff of the steam-engine, and the click, click, of the drill!

The process of boring or drilling is simple. The drill generally used is about eighteen inches in length, shaped at the point quite like the hand drills commonly used by quarrymen, and corresponding in size to the well wished to be bored. This is secured to the auger stem, a two-inch round iron bar from fifteen to twenty feet long, weighing, probably, from three to four hundred pounds. This is raised from the rock or bottom of the well twelve to twenty inches, as the case may be, either by the application of steam or lever power, and the fall of the iron from these heights does the drilling. By the steam power the drill will strike from twenty-five to forty times per minute. Poles are attached as the well deepens.

To those unacquainted the process would seem tedious; yet drilling or boring in such material as is usually found in West Virginia, from the surface to a depth of four hundred feet, will average, probably, twelve feet per every twenty-four hours. The usual diameter of wells is four inches.

West Virginia now began to rejoice over her newly developed sources of wealth, and to look forward to a bright future. The "peculiar institution" of Virginia had hitherto excluded many men from her limits. Indeed, so well understood had this fact become, that many of her best men, although not generally opposed to it, regretted the domination of this power here. Yet all now indulged the hope that the day was dawning which should see, before its noon, the wooded hills and neglected valleys of West Virginia doffing their rugged garb, and putting on the robes of a thorough and expanded cultivation; and, as preliminary to this, they hailed with a welcome the coming of those who, reared and trained in the practice of active and honorable industry, should give their labor and substance to the development of the resources of their State. But these hopes were of short duration. The active efforts of those who had moved to the new field of labor were only well begun when the hostile shots were fired upon Fort Sumter. There were heroes sweating and delving in the oil regions as well as elsewhere.

The promises of wealth which the oil regions had made, and which now seemed about to be realized, were forgotten. Princely fortunes lost their charms when an imperilled country called her sons to her defence, and now those who but recently came to these localities to pursue the avocations of peace, departed to practice the arts of war.

Operations on any extensive scale were now impracticable; and even if splendid results had not been impossible on account of a scarcity of laborers, the murderous raids of guerillas would have completed what the other begun. A few who remained and endeavored to perpetuate what had been so well commenced labored on, notwithstanding the new difficulties. Yet the predatory incursions of guerilla bands made any large shipments of oil almost impossible. Nevertheless, despite all the obstacles thus interposed, and which were understood fully only by those who have been compelled to contend against them, there was produced at the one point of Burning Spring alone, in the year 1861, four million gallons of oil. In the year 1862 three millions two hundred thousand gallons were sent to market from this same point. The product of 1863 does not, probably, exceed two millions of gallons.

When, however, it is remembered that this large amount of oil was produced in one section alone of not over one mile square, and under circumstances the most unfavorable to production, the reader may form some idea of what might be done under circumstances that would deserve to be called auspicious.

It must not be supposed that in estimating the oil interest of West Virginia the small tract or point just named embraces the entire oil-producing district of the State. Explorations made for the discovery of oil in West Virginia, it must be remembered, had only begun three years since. The force of circumstances concentrated the efforts of explorers in the territory around this district. Oil was first discovered here in abundant quantities. People naturally flocked to this point, and before curiosity and investigation had been able to exhaust the objects of attraction here, and turn to search for new fields, the so-called secession of Virginia, with all its baneful evils, fell like a blight upon the land. While the supply from this district was diminished to some extent, other regions, unexplored, some of which are now proving as productive, remained untouched.

These territories, from which enterprise was banished by the war, remained, with all their mineral and oleaginous wealth, unrevealed, quietly awaiting the time when, without the din and perils of war, the men of toil could enter the subterraneous chambers and bring forth their treasures to the world. This period has at last arrived. Steadily the rebellious forces have been pushed and driven back until this portion of West Virginia, at least, can be said to be entirely free from them. Men begin to feel again that they are safe and secure under the old government, and with this feeling comes the revival of business. But few days have elapsed since the development of an entirely new oil district. A few months since Messrs. J. B. Blair & Co. began operating on Bull creek, and at the depth of 250 feet, on the 16th of this month, (March,) they struck a vein of oil which has continued flowing at the rate of a thousand barrels of oil per day since. A curious fact connected with the oil-beds here is the following: Commencing at Burning Spring, on the Kanawha river, we trace a belt or upheaving of the rock, causing a vein of rock some 20 feet in width to stand perpendicular on its edge, and running north one degree east, crossing Hughes river at the oil wells already spoken of; also crossing the railroad near the oil wells of Hazlet & Co., and crossing Bull creek at the wells first spoken of, Messrs. J. B. Blair & Co.'s; thence on and crossing the Ohio river, the oil district appearing to follow this upheaving, or rather this upheaving appearing to designate where oil exists. All along this line may be found gas or burning springs. As these gas springs are an excellent indication of oil, it may be safely said that oil will be discovered the entire length of this belt, thus giving West Virginia almost treble the amount of oil territory to that of Pennsylvania. Already borings have commenced on and all along this line; probably there will not be less than one hundred wells sunk this season at different points yet undeveloped between Burning Spring and the Ohio river. That many will be successful cannot be doubted. Professor Rogers, in an able article on the history of petroleum, brought out last July, believes the great basin to be near the Ohio river, in this State. Indeed, the large yield of the wells on Bull creek, five miles from the Ohio river, recently discovered, would seem to be proof of this assertion. It is not intended here to discuss the theory of the origin of petroleum, nor yet its composition, or gravity of the several oils obtained in West Virginia. In regard to the latter, suffice to say they differ little from the Pennsylvania oils, a very able report of which we have from Professor J. B. Lesley, just published. Indeed, these great oil-bearing districts differ but little in any respect, both being hilly, clayey soil, well watered, and with an abundance of timber.

It will be observed that the yield of petroleum here during the year 1863 is less than former years. This, however, cannot be taken as an index of the real productiveness of the region; it may be said this is all that was brought to market.

In May last the Rathbone district was, together with all the apparatus, burned and entirely destroyed by the rebel forces under General Jones. Twenty thousand barrels of oil were burned with it. The losses were heavy, and, of course, were severely felt, both in material destroyed and time spent in rebuilding; had these disasters been averted, the yield would have been equal to former years.

We rejoice to believe that the day is now come when, in peace and without hindrance, West Virginia will be permitted to demonstrate the true extent and richness of her oil districts. The wise and energetic administration of the affairs of our State is beginning even now to tell in our behalf.

The infant State is a giant even in its infancy; and when once it is able to give an undivided attention and care to its great internal interests, it will be manifest to the world that the promise of its babyhood was only a truthful augury of the prowess and splendor of riper years.

The treason which once lurked stealthily or shook its gory locks defiantly among us is now skulking to its grave. Men are daily feeling more and more that traitors are infamous, and that loyalty and honorable industry are the surest elements of power and progress; and we venture to affirm that when, under the effects of a general education and a wise and energetic government, the State of West Virginia fairly begins her course, she will take rank high up and far forward among her noble sisters, and will have no cause to blush when she looks at the emblems which betoken the sources of her power. When her mineral wealth begins to be developed, when her reservoirs of oil, her vast beds of coal, lead, and iron ore have become known in their true character, when her facilities for refining these articles are known, and all her resources for producing have been unfolded in their full proportion, we think her sister States will not be reluctant to award honor and admiration and warm welcome to the star that last began to shine in our national constellation.

Oil is brought to Parkersburg, the general oil market of the State, from Burning Spring during the spring and fall, by flatboats on the Kanawha river at a cost of seventy-five cents per barrel; other seasons, when the river is not navigable, it is wagoned at a cost of two dollars per barrel. It is well to mention here that a bill has recently passed the Virginia legislature for the improvement of this river. A company has already been formed, sufficient stock subscribed, and we may expect that soon the Kanawha will be navigable all the year.

From Hughes river and Petroleum districts the oil is hauled to points on the Northwestern Virginia railroad at a cost of twenty-five to fifty cents per barrel, and from Bull creek it is hauled to the Ohio river at a cost of fifty cents per barrel.

THE ITALIAN HONEY-BEE;

OR THE

CULTURE AND ITALIANIZATION OF THE NATIVE OR BLACK HONEY-BEE.

BY RICHARD COLVIN, BALTIMORE, MARYLAND.

THE first attempt to import the Italian honey-bee into the United States, it is believed, was made about the year 1855, by Messrs. Samuel Wagner and Edward Jessop, of York, Pennsylvania; but, in consequence of inadequate provision for their safety on so long a voyage, they perished before their arrival.

In the winter of 1858–'59 another attempt was made by Mr. Wagner, Rev. L. L. Langstroth, and myself. The order was placed in the hands of the surgeon of the steamer, (to whose charge the bees were to have been committed on the return voyage,) with instructions to transmit it to Mr. Dzierzon on reaching Liverpool; but, in consequence of his determining to leave the ship to engage in other service on his arrival at Bremen, it was not done, and this effort failed. Subsequently arrangements were made by which, in the latter part of that year, we received seven living queens. At the same time, and on board the same steamer, Mr. P. J. Mahan, of Philadelphia, brought one or more queens, which were supposed to be of doubtful purity. Only two or three young queens were reared by us during that fall and winter, and in the following spring we found all our imported stock had perished.

In conjunction with Mr. Wagner I determined to make another trial, and another order was immediately despatched. The queens, however, did not arrive until the following June. Meantime, about the month of May, Mr. S. B. Parsons, of Flushing, Long Island, received an importation of them from the northern part of Italy, some of the progeny of which he placed in the hands of the Rev. L. L. Langstroth, Mr. W. W. Carey, Mr. M. Quimby, and other skilful apiarians, who, with Mr. C. W. Rose, a subsequent importer, and perhaps some others, have bred and disseminated them pretty widely through our country.

In consequence of a severe attack of illness in the latter part of the summer of 1860 I was unable to accomplish much beyond the rearing of some fifteen or twenty queens, which were impregnated with native drones. Aware that European breeders had found difficulty in breeding them pure, and learning that similar difficulties seemed to be encountered by those breeding them in this country, I determined, before disposing of any queens, to Italianize my entire apiary from the purest stock to be procured, and accordingly made subsequent importations from the most reliable sources, including the vicinity of Lake Como. None, however, excelled, if equalled, those procured from Mr. Dzierzon, from whose stock my present Italian apiary has been bred.

As the natural history and cultivation of this race of bees does not, in general, materially vary from that of our native bee, (and a detailed account of it would be too lengthy for this article, and has already been published in the excellent work of Rev. L. L. Langstroth, entitled "Langstroth on the Honey-Bee,") I shall state simply such leading facts of their general history as may seem necessary for a clear understanding of the particular subjects upon which it is proposed to treat.

A colony or hive of bees in its normal condition, during the honey season, contains three kinds of bees, viz: "The queen," "workers," and "drones." In addition to these, under certain other conditions, there sometimes exists another kind called "fertile workers," of which I shall speak hereafter.

The queen is the only fully developed female in the hive. She is impregnated but once, copulating with the drone on the wing and high up in the air, which, if delayed beyond three weeks after she is hatched, she remains unimpregnated for life, producing drone eggs only. She is capable of laying two thousand or more eggs in twenty-four hours. She has a sting, but uses it only in deadly conflict with another queen. She lives to the age of four or five years. When she begins to show evidence of decrepitude her "workers" rear another to take her place, and both are tolerated and protected by the workers in the hive until the young queen becomes fecundated and capable of filling the duties of her ancestor.

The drones are the male bees. They have no sting, are not provided with the means suitable for gathering honey or secreting wax, and except that by the heat of their bodies they aid in rearing brood, they appear to have no duties to perform except the impregnation of the queen, which instantly causes the death of the copulating drone. Their numbers depend greatly upon the quantity of "drone comb," (which is composed of larger cells than the "worker comb,") which is contained in the hive. They have no sting, and unless the colony is queenless, are destroyed by the workers as soon as the honey harvest has passed and swarming ceased.

The workers are females, whose ovaries are so imperfectly developed as to incapacitate them for laying eggs. They gather the honey, build the combs, hatch and nurse the young, raise queens, and perform generally the laborious duties of the hive. They are seldom able to sting more than once, as the sting remains fastened by its barbs in the wound, and being, with its poison-sack, drawn from the abdomen of the bee, soon causes its death.

By puffing smoke into their hives, or keeping them in a state of great alarm for twenty or thirty minutes, they will gorge themselves with honey, and become perfectly good-natured and harmless, unless squeezed or hurt, and may then be handled with perfect impunity. During the honey harvest, when their labors are constant and heavy, they often die within three or four months; but those bred later in the summer and fall, when the honey season is passed, and whose labors are light, survive until the following May or June. Usually the queen will lay only as many eggs at a time as her colony of workers are capable of hatching and feeding. Should she exceed this number, however, the workers have a convenient method of correcting her mistake by eating the excess. The eggs are hatched by the heat of the bodies of the mature bees, the workers of which also feed and nurse them until mature—the queens requiring sixteen, the workers twenty-one, and drones twenty-four days, for their full development, counting from the time the egg is laid. A low degree of temperature in the hive may lengthen these periods a day or two, and a very high temperature, on the contrary, may shorten it a day.

Few, if any, bees are bred in the latitude of the northern and middle States between the first day of November and the following February, during which many, having reached their appointed time, die, while others perish from exposure to cold and other causes; thus often reducing their numbers one-half between the first and last periods, at which time the queen again resumes her laying, and continues it, to a greater or less extent, until the following October or November

As soon as the hive becomes densely populated, if the honey pasturage is bountiful in its supplies, the workers rear a young queen or queens, at the maturity of the first of which the old queen leaves the hive, followed by a portion of the workers of all ages above two weeks, and "swarms;" but "swarming," (not desertion of the hives,) seldom if ever takes place except under the following conditions: A populous colony; a mature young queen, almost if not quite ready to emerge from her cell; a bountiful supply of honey pasturage, and clear weather.

As the workers frequently commence the rearing of a dozen or more queens when they prepare for swarming, which queens mature at different periods, or on different days, they are often led to swarm to excess, by which the old stock, as well as the later swarms, are rendered worthless. When the first or old queen takes out the first swarm, she leaves behind her a young queen, which, under the most favorable circumstances, seldom commences to lay until at least the eighth day after the old one has left. Meantime a large number of young bees and another queen may be hatched, and before the first-hatched queen has laid any eggs, she may carry off the second swarm, and so also the third, and sometimes, though rarely in this section of the country, a fourth, by which time (no eggs having been laid in the interim) *all* the brood is hatched, and nearly all has been "swarmed out," the last one, or, perhaps, the last two swarms, being so small, and *so late* as to be unable to build comb and lay up sufficient stores for their winter support, and the parent hive with an inadequate number of bees to either protect its combs from moth or produce a sufficient stock of bees or honey for their sustenance the following winter. This presents one extreme. The opposite is where (although the colony is populous) no swarming takes place, and the bees seem to hang listlessly around a hive filled with honey. This may, and often does, occur in consequence of an excess of honey in the hive in the spring, which prevents the rearing of large numbers of bees at one brood. They gradually, perhaps, become populous, and, during the same time, by filling the cells with honey as soon as made vacant by the hatching of the young bees, they arrive at a stage in which there is very little room for breeding or further increasing their number, and having no room in the hive in which to store any surplus honey, listlessly do nothing. This condition is also sometimes produced in consequence of inclement weather setting in just at the time they are about ready to swarm, and continuing until all the young queens have been destroyed, and a very large number of workers hatched, which, before young queens can again be reared, on the return of fair weather, fill the brood cells, or most of them, with honey as fast as the young bees in them emerge, and thus bring about that "opulent" condition which disinclines them to swarming, as in this condition but few more bees can be bred that season. Such colonies are very apt to enter the winter with a greatly diminished population of old bees, many of which must die before spring, besides those chilled to death between these thick, cold walls of honey.

Such stocks are likely to prove the least productive in the apiary, so long as burdened with the excess of honey, and afterwards, until they have had time and season to recover.

When the combs in such colonies are movable, of course the seasonable exchange of a few empty frames or combs for those they have filled with honey will at once enable them to resume breeding, and by the timely provision to populous colonies of suitable surplus honey receptacles, (each having a small piece or pieces of new comb attached by means of melted wax, or otherwise, to the underside of its top, as an inducement to commence,) they will store surplus honey in these receptacles, thereby leaving those in the brood chamber at the disposition of the queen for breeding purposes.

The difficulty of inducing them to work in these surplus honey receptacles is greatly obviated by placing them over the brood chamber and having no "honey-board" or intervening partition between them and the brood chamber. A successful remedy for preventing the queen from going up into the receptacles to deposit eggs, and the consequent storage of pollen therein by the workers, thereby injuring the quality and appearance of the surplus honey, may be found in using movable frames in sections, or otherwise, made about one and one-half inch in breadth on their tops, and placing between these frames thin perforated partitions, or comb guides. The space thus allowed for the combs being too thick for one brood comb, and too thin for two, the workers build but one, the cells of which, being too deep for brood cells, present, together with the presence of the comb guides, such uninviting quarters for her royal ladyship that, in the storage of over a ton of honey in such receptacles, I have not had a single instance of egg-laying in receptacles thus arranged. The frames or sections may be made of such size as to contain any desired quantity of honey within their capacity. If several sections are used in one frame they should be made to fit exactly, and without grooves, so that they may be easily and quickly removed by a little pressure. As queens seem to possess an inveterate hatred toward each other, and seldom both separate alive when they meet, the workers are compelled to guard the cells of the young queens, during the time they are being reared, against the attacks of the old queen; and I have often seen her driven hastily away when she attempted to approach them. Under these circumstances it would seem most unnatural that she should deposit an egg in a queen cell; and although several distinguished European apiarians take the opposite view, and assert it as impracticable for the workers to take an egg or young grub from a worker cell and transfer it to a queen cell, I have witnessed so many instances of their having done so that there can no longer be any doubt upon this point. One of my imported Italian queens this summer gave some evidences of infirmity, and although the colony was not in a condition to swarm, at least eight or ten young queens have been, at different periods, reared by the workers in her hive. One of these queen cells was constructed upon the outside combs which *were filled with honey,* and where no other eggs were or had been laid during the season, and where the queen would not be likely to go, or to find the cell. The same precaution, but in a less striking degree, was exercised by them with two others of the queen cells. On two occasions I found the young queens hatched, and one of them had evidently been "out" at least three or four days, yet both the old and young queens were being treated with the kindness and attention with which queens are usually treated by the workers. Late in the month of August the queen deposited some three hundred drone eggs in drone cells, at a period when colonies with younger queens were destroying them, indicating clearly their preparations to meet the contingency of her early and final exit. The carrying of eggs and grub from one cell to another is an important fact to be noticed in the rearing of Italian queens, of which I shall hereafter speak.

When a colony is deprived of its queen the workers will build none but drone or store combs until they are again possessed of one, and they not unfrequently build a large excess of drone combs in the brood chamber of their hives when possessed of a queen, which, as she never deposits any but drone eggs in them, is productive of the most injurious effects so long as it is allowed to remain there. In the early part of the season, or until about the first or middle of April, queens will seldom deposit drone eggs; but as soon as their pasturage begins to yield a bountiful supply of honey, they commence laying them, and then lay eggs in each and every consecutive comb and cell (whether drone or worker) within the compass that their workers can keep warm, or hatch, and continue to do so until the honey pasturage begins to decilne, which is, here, generally about the first of July, when they will again discard the drone egg-laying. Meantime, however, if there has been a great excess of drones in the brood chamber, the drone progeny, (being only consumers,) often upon their exit, leave too little honey to sustain the colony the following winter. If the space occupied by these drone combs had been occupied by worker combs there would have been producers reared instead of consumers, which would, of course, have greatly changed the quantity of its product, and saved it from the danger of starvation. There are very few hives which do not contain a greater or less excess of this kind of comb, by which the quantity of surplus honey which might be produced in our country is greatly lessened. Control of the combs, of course, enables the bee-keeper to remedy this evil.

For various important reasons *colonies should at all times be kept populous.* It is only by the *united heat of large numbers* of bees clustering closely together in their hive that they are enabled, without extra care, to withstand the rigors of the winters in our middle, western, and northern States. Hives made of thick boards possess but little, if any, advantage for their protection. As an experiment on this point I had two hives constructed of pine lumber, the boards of one only one-eighth of an inch in thickness, and those of the other one-fourth of an inch thick. They were Langstroth's movable comb hives, battened at the corners to give sufficient strength and retain their shape. A populous colony, sufficiently provisioned, was placed in each last fall. They stood in the open air without any shelter whatever, except their hive, and on examining them in the spring they were in as good, if not better, condition than similar colonies in similar hives made of boards an inch thick, and placed on the same bench with like exposure. During the three intensely cold days in the month of January, six less populous colonies in hives made of thick lumber perished from the cold, which was very severe. The advantage of populous colonies in this respect is obvious; nor does it stop here. Where colonies are populous during winter, they not only consume proportionately less honey, but *commence breeding much earlier in the spring*, rearing *larger numbers at each brood*, and *filling their hive with bees by the time the honey-producing flowers bloom.* They also throw off large swarms early in the season, which, having nearly the entire honey harvest before them, are enabled frequently, not only to lay up an abundance for their own support the following winter, but furnish their owner with a liberal surplus, while the present stock has also ample time and opportunity, before the end of the honey harvest, to lay up large stores of honey. Colonies kept constantly populous bid defiance to the bee-moth, as well as other enemies; require far less care and attention from their owner; and from them alone are his profits realized. To secure in perpetuity this desirable object the bee-keeper must understand the subject fully, and be able to avail himself of the advantages furnished by the movable comb system of bee-keeping, for without it he often cannot ascertain the existence of evils in season to remedy them, or remedy them if he did. With it this is but the work of a few minutes, and possessing full control of their combs he can administer the "ounce of preventive" in a most admirable manner; can increase, diminish, or keep stationary the number of his colonies at will, and provide properly for all their requirements with the least possible trouble and inconvenience. In illustration of this I will answer a question which has been asked me probably more than one hundred times: Why did my bees die last winter—the hive was full of honey? The anxious inquirer has unconsciously answered his own question. "The hive was full of honey," and the bees, compelled to cluster in *the sheets between thick, cold walls of honey*, which their animal heat was inadequate to warm, had frozen to death. Another late swarm, perhaps, standing by its side, had starved to death in and between empty combs. The simple exchange of a few full for a few empty combs between these two colonies would have saved both, and placed them in their best condition for breeding in early spring, for it must not be lost sight of that the colony in which the combs are *all filled* with honey has no room for breeding, while the other would have nothing to feed the young, if bred, until it would be furnished by the flowers, which may not bloom before the following May. Colonies, and particularly weak ones, which are thus retarded in breeding during the early part of the season, cannot become populous until much of the honey harvest has passed, if not entirely over, and then, failing to secure a sufficient "winter supply," perish of hunger, or desert their hives, and in attempting to enter others are often stung to death. By simply giving such a weak stock, early in spring, one or two combs of honey and *nearly matured brood* from a populous colony in exchange for as many *empty* combs, the weak colony can, in a few days, be made so populous as to give full scope to the laying powers of its queen, and become densely populated by the time the honey harvest opens in the spring. The moth, which is generally regarded as the greatest enemy to bee culture, seldom attacks, and never successfully overcomes, a populous colony. In a large majority of cases where they have done so the cause has been the loss of the queen. This loss can seldom be ascertained in other hives before the work is so far accomplished as to be irrecoverable, while, with the aid of the movable comb hive, it, as well as the intelligent and seasonable application of the proper remedy, is but the work of a few minutes. These are but a few of the many vitally important advantages which the Rev. L. L. Langstroth has contributed to the bee culture by the invention of his admirable hive.

DESCRIPTION OF THE ITALIAN BEE.

The Italian honey-bee differs from our native or black bee in color, size, temperament, productiveness, industry, and power of endurance.

THE QUEEN.

The abdomen of the queen is somewhat more lengthy than that of the native queen. The abdominal rings of the Italian queens do not possess like degrees of brilliancy of color. Whether this is the result of accident, or otherwise, I have as yet been unable definitely to determine, but have noticed that the darker colors (which are few) are more frequently bred in the old dark-colored combs than in new. The bright or standard color of the queens, when first hatched, is of a yellowish or straw color, commencing at the waist and extending nearly to the lower extremity of her abdomen, which is of a dark chestnut brown color, the yellow, as it approaches the three lower abdominal rings, gradually blending in the brown; the lower edges of the four uppermost yellow abdominal rings sometimes having a very narrow bordering of darker shade than the balance. When first hatched they are long and slender, but in the course of four or five days the abdomen contracts in length, and frequently presents a rusty brownish appearance until two or three days after impregnation, when the abdomen becomes gradually elongated and somewhat distended, and assumes a somewhat darker shade of its original bright color. Subsequent years of age slightly increases the dark shade of coloring. When she ceases laying in the fall or winter her abdomen again contracts, its length resembling somewhat its size and shape prior to impregnation.

THE DRONES

vary much more in color. On some the only perceptible difference between them and the native drone is a slightly lighter shade in the narrow border on the lower edges of their abdominal rings. While the upper half of the abdomen of others will be entirely of a rich yellow or orange color, others are spotted, and a few I have seen which were almost entirely of a whitish yellow, interspersed with spots of a brownish color. In shape and size they resemble our native drone.

"THE WORKER."

The abdomen of the Italian worker bee is somewhat longer than that of the native. This is more perceptible when it is gorged with honey or returning to its hive heavily laden with honey. The lower extremity of the abdomen is also more slenderly pointed, which, together with its rich coloring, gives it a more graceful and elegant appearance. The three first abdominal rings (including the one joined to the waist) are of a beautiful yellow or straw color. The second and third, and sometimes the first, of these rings or bands are edged with a narrow border of dark brown or black. The first does not always extend entirely across on the back of the bee, and is very slender, each succeeding one slightly increasing in breadth. Queens which breed any workers with a less number of yellow abdominal rings than three, are assuredly not pure. Where they have the full number of yellowish bands, and those bands are of a smoky cast and black, bordering unusually wide, it is, at least, an indication of doubtful purity. It not unfrequently occurs that queens three-fourths pure, breed workers all, or nearly all, thus marked. The temperament of the pure Italian bee is exceedingly gentle. They not only rarely offer to sting, but seldom manifest any anger. Though their hives be opened from day to day the whole season through, the same docility is manifested by pure colonies as when disturbed only a few times during the season, so that this is unquestionably an inherent characteristic. When they do sting, however, it is done with the greatest imaginable determination and force. Any amalgamation between the Italian and native bee destroys their docility, and an equal-bred hybrid, or lower grade of cross between them, is often terrifically ferocious and intractable when greatly aggravated. I have been stung by them with such ferocity that the stinging bee expired in the very act, its abdomen curling up as if itself stung. I can account for this only upon the supposition that, in consequence of the violence of its anger or of the exercise of its force in stinging, its poison-sack is ruptured within it, producing instant death, as its contortion is precisely similar to that which follows when it has been stung by another bee, which produces certain, but not always *instant,* death. Nothing arouses the anger of bees quicker or to a greater degree than the smell of this poison. Hence, when stung, the sting should be immediately extracted from the wound, and all the odor of poison destroyed by washing, or otherwise.

The native honey-bee cannot resist partaking of honey or liquid sweets when offered to it, and will gorge itself with them in a few minutes, no matter how angry it may have been at the time of their presentation. Not so with the greatly enraged hybrid, intent upon vengeance. It pays no regard whatever to them, though offered a dozen times; nor will smoke itself always prove efficacious in subduing it under such circumstances, unless it be confined to its hive and the smoke forced in to such a degree of density as to endanger their lives from suffocation. Kept in this condition for half an hour they will be found somewhat subdued; often, however, a few minutes' breathing of fresh air restores their former vindictiveness, and they resume its manifestation with renewed vigor; and, though gorged with honey, it does not seem to abate it a particle. Once thoroughly enraged, these degenerates seem to remember it the entire season. In fact, I had one colony which resumed their "sharp practice" in the spring of the following season. There is, however, a great difference in the temperament of different colonies of the impure race, some of the higher Italian grades manifesting much of the gentleness of the pure race. The physical strength and courage of the Italian bee is greater than that of the native, which it speedily overcomes in either single combat or battle array. A colony of native bees, once attacked by an Italian colony of nearly equal numbers, cannot successfully resist them, and soon becomse its prey, unless timely succor be extended to it. They are by no means conscientious on this point. As soon as they can no longer procure honey from the flowers, they may be found lurking about in search of weak or defenceless colonies, which they soon destroy if permitted. Still, however, so long as the honey harvest abounds they seem not to think of robbing. May we not, therefore, attribute it to their *excessive industry?* for in this they also excel, working both later in the evening and earlier in the morning, as well as much later in the season, than the native bee. Our honey harvest usually, in this section of country, terminates about the middle of July. Last year I found them building combs and storing surplus honey during a great part of August and September. They doubtless obtained it from some source unfrequented by the native bee, as the latter were at that time consuming the honey they had previously gathered. As queens continue to lay in the summer and fall, so long as their workers continue to obtain supplies of honey from abroad, they of course breed later in the season than the native bee. This is of vastly great advantage in sections of country where they are compelled by cold to lie dormant so great a part of the year. As they seldom swarm late in the season, the bees bred at this period enable the colony to enter the winter with a large population of *young* bees, the larger portion of which survive until one or two numerous broods have been hatched in the following spring, and the colony prepared in numbers to swarm, as well as in every other respect to avail themselves of all the benefits of the honey harvest the moment it presents itself. To this fact, and their great powers of endurance, I attribute much of their productiveness. There is, however, one other most striking feature which, doubtless, is greatly contributive to it. I allude to the rapidity of their breeding. As soon as the weather becomes sufficiently warm in the spring to prevent the chilling of their more hardy brood, if you will open the hive and examine their combs you will find entire sheets of it filled with young in process of maturation, all attended by a few scattering bees, presenting almost the appearance of a deserted colony. This enables them to far outstrip native colonies of like size in building up a strong population *early in the season*, which is vital to their prosperity; for, if the bees are hatched and ready to enter upon their work as soon as the harvest presents itself, all that can be done may be and will; but (as is the case, probably, in six-tenths of all stocks of native bees) if not hatched until the harvest is one-half or more passed, of course much is lost; and when we consider that, in the greater part of the country lying north of Mason and Dixon's line, the honey harvest lasts only about two months, during portions of which the bees are kept in their hives and their pasturage rendered barren by rains, it will be seen that a few days of *favorable* weather is to them an item of no inconsiderable importance. I have had in a period of two weeks, at the height of the honey harvest, nearly thirty-five pounds of honey stored in surplus honey receptacles, besides building the combs in which they stored it, which, as they consume about twenty pounds of honey in secreting the wax used in constructing one pound of combs, would be equivalent to about seventy pounds of honey gathered by a single colony in two weeks. The great redeeming point in the character of the hybrids is that they possess much of the fertility, industry, and productiveness of the pure race. Their stinging propensities, however, in connexion with the fact that they are likely to degenerate rapidly and return to the habits of the natives, will prevent their becoming favorites, aside from other objections which will be found hereinafter.

BREEDING.

It is indispensable, or at least of the utmost importance, that those who attempt to breed the Italian bee purely should familiarize themselves with the appearance and character of the pure race, in order to detect degeneracy before it has reached a point at which it may cost them much trouble and care to remedy it. Of course, the nearer pure the impure becomes, the more difficult the detection of the impurity; and bees, like animals in this respect, sometimes "take sides" in breeding—so much so that I have had hybrid stock which none but an expert could have distinguished by their markings from pure. It has been generally supposed in this country that queens were pure which produced workers the first three abdominal rings below the waist of which were of a yellowish or straw color, with a black edging or border. This test *alone*, however, cannot with safety be depended upon. Queens which are three-fourths or nearer pure, not unfrequently produce workers thus marked; but if queens are bred from the eggs of such tainted queens, they or their immediate progeny will almost invariably, by their *markings*, discover their impurity. This mode of testing has been adopted by the Rev. Mr. Kleine and other distinguished European apiarians as the only one upon which entire reliance can be placed. The trouble, expense, and time required to apply it, however, renders it particularly objectionable to breeders, who are exceedingly anxious that the country should be supplied with queens in the shortest possible time within which they can be produced, regardless of a little impurity, which may cost the purchaser months of care and trouble to eradicate after he has procured a pure queen; hence it is exceedingly desirable, both to breeders and purchasers, that some other means more readily accessible should be furnished. This has already been done, at least approximately; but as yet I have not seen it so clearly described as to enable a novice to readily and fully distinguish it without having previously seen pure Italian bees. This test is their extreme docility, perfect composure, and quietness when being handled, or under circumstances which would greatly excite and irritate the native or hybrid. One of the chief recommendations of this bee, which was heralded to the American people on its introduction, was its extreme docility, even under great provocation, and I frankly confess that five years of their cultivation, coupled with constant series of experiments during that period, has with me fully confirmed this repute of their character; and I have been greatly surprised to learn, through the agricultural prints and other sources, that Mr. Quimby and some other skilful apiarians cannot agree with me upon this point. Out of probably six to eight hundred queens that I have reared, not one of reliable purity has failed upon this point. So uniformly and invariably is this the case that I should, without hesitation, condemn as impure any stock, whatever its markings, which did not possess this characteristic, unless by oft-repeated and excessive annoyance their anger had been greatly and repeatedly provoked.

On lifting the combs covered by pure Italian workers out of the hive, scarcely any of them will leave it, nor show any indications of anger or discomposure, beyond a careful watchfulness against the encroachments of robbers and protection to their queen, brood, and honey. Another peculiarity is the great tenacity with which they cling to their combs. In a few instances, where the combs have been filled with honey, I have actually shaken the frames to pieces without being able to dislodge all the bees. Colonies which closely approximate purity possess, in some degree, these peculiarities; hence the necessity for persons who propose to breed these bees, to first familiarize themselves with these peculiarities by visiting an apiary of undoubted purity.

ITALIANIZING AN APIARY.

This is done by rearing queens from the eggs of the pure Italian queen, removing the native queen from her hive, and substituting the Italian in her place and stead.

REARING QUEENS.

This process is greatly facilitated by the use of the movable comb hive; indeed, without its use I should almost despair of success in Italianizing an apiary of even moderate size. There are so many circumstances attending this process which require frequent examinations and a perfect knowledge of what is transpiring in the hive, that their use is almost if not absolutely indispensable to success. I shall therefore assume it in this article. The same egg which produces the worker bee, and as such is *twenty-one* days in maturing, is, through the agency of nutritious food and other operations of the workers, converted into a queen in *sixteen*. The process of its conversion must be commenced, however, before the egg has reached the end of its sixth day's age, unless, as is sometimes though rarely the case, its hatching and development are retarded. Old bees, or those which have remained in the hive over winter, will seldom rear queens; it is therefore necessary to use those recently hatched for the purpose.

It is not necessary to employ an entire colony full size; a nucleus of a quart or more of young bees with three or more combs will answer the purpose even better, as the time consumed in examinations is thereby lessened, and a great saving effected. They are better protected, and in some respects more controllable, by being placed in a small hive to suit the size of the nucleus; but I have sometimes partitioned off a Langstroth hive into three apartments, and used each apartment for a separate nucleus with tolerable success. The partition, however, should entirely separate apartments, and prevent communication between them. As bees which have once flown from the hive will, if removed but a short distance, on flying out again, return to the same spot where the hive formerly stood, it is very useful, in extensive breeding, to have two apiaries, or localities for keeping them, a mile or more apart. By this means nuclei may be formed in one, which, on being removed to the other, are unable to find their way back, and therefore adhere to their new locality. Bees which have never flown from their hive do not require this precaution, as but one mature queen is tolerated in each hive, except in case of preparation for swarming; and bees, so long as possessed of a queen, will not rear another. All nuclei for rearing queens must be made queenless, and deprived of all combs containing native eggs which have not been laid longer than six days. They should then be furnished with a comb, or piece of comb, containing the eggs of a pure Italian queen, which if not abundant, the comb containing them may be cut into strips three-fourths of an inch in width by about six inches in length, and this strip inserted into a frame of comb, the strip resting horizontally upon bearings of half an inch at its ends, with an open space cut out between these bearings, and under the strip containing the eggs, an inch in breadth. The bees will generally so distribute the queen's cells along the length, and at the lower edge of the strip of comb containing the eggs, as to admit of their being separated without much loss. The comb containing the eggs should hang between two others, containing a sufficiency of honey and pollen to amply supply their wants. These combs, however, should contain no eggs or grub young enough to be convertible into queens; otherwise the bees may select these native or impure eggs or grub for queens, and rear the pure Italian eggs as workers only. This is the more important from the fact that they sometimes transfer eggs and grub from one cell to another, or from a worker to a queen cell. They may therefore take an impure egg or grub, and by placing it in a cell constructed upon the comb containing the pure Italian eggs, lead the breeder to suppose it pure; and should it be nearly so, and produce a progeny not easily distinguishable from the pure race, it may be the means of introducing impurity into the apiary, which, failing soon to discover, may be so extensively disseminated through it as to require much time, care, labor, and loss to eradicate it.

The dissemination of large numbers of impure queens which has already taken place in this country will be productive of much mischief in this respect. It should never be lost sight of that, although the *drone* progeny of a queen reared from a pure Italian egg, but impregnated by an impure or even native drone, may be pure Italian, (which is now considered by Europeans, as well as many American breeders, as an established fact;) yet that is the *only pure* progeny which a pure virgin queen thus impregnated is capable of producing; and that, should she die, and another queen be reared from her eggs resembling the hybridized mother, without the knowledge of the breeder, though *she* should be impregnated by a pure Italian drone, she would produce *no pure* progeny whatever, though it might closely resemble it; and, by the introduction of such a queen into an apiary, incalculable mischief may and generally does follow.

The bees will generally construct upon such a strip of comb from one to ten or twelve queen cells, frequently by enlarging worker cells, and extending them, thus enlarged, vertically downward in the space made vacant under the strip. The queen cells vary in length from three-eighths of an inch to one and three-eighths inch, and resemble small teats, much in the shape and form of a small peanut shell. Each shell contains a single queen, and as soon as the first of them is hatched she proceeds to destroy all the others by tearing open, or inciting the workers to tear open, their cells, when she will sting them to death and the workers drag them out of the hive. As the first maturing queen may be hatched on the *ninth* or *tenth* day after the eggs and grub have been given to the nucleus to rear them from, it becomes necessary, in order to save all but the first hatched from destruction, on the *ninth* day, to provide a similar queenless nucleus or miniature colony for the reception of each of the young queens, and to cut out all except one of them, distributing them separately to each nucleus by cutting an aperture in one of its combs, and fitting the queen cell into it. Great care is required in performing this operation in order to prevent the young queen from being injured or destroyed. Some of them will at that time be found to have just changed into its pupæ or chrysalis stage of development, when they are so tender that a slight pressure, jar, or too long exposure to the cool air, may destroy their vitality. Where these queen cells are distributed to colonies which have but recently been deprived of their queens, and still have eggs or grub young enough to be convertible into queens, they not unfrequently destroy the transferred one, even to the third and fourth trial; and in some instances I have had them to continue it when they had no longer any material for young queens left. In such cases they will sometimes receive a hatched or mature queen; but in others they pertinaciously refuse to receive any, but in that case will occasionally rear one or more from eggs which may be furnished them immediately after those which they had have from age ceased to be convertible into queens. In a few instances, however, they will, for a time, refuse to receive or rear all and any queens. When this is the case, it is best to break it up and unite it to another. These obstinate and contrary nuclei are apt to become infested with "*fertile workers*," which, while they resemble the ordinary worker bee, are capable of laying eggs which produce *drones only*. In rearing queens the workers not unfrequently, after feeding a number of the worker larvæ for two or three days upon the royal jelly, (upon which embyro queens are fed as if intending to convert them into queens,) suddenly cease to supply a portion of them with it, and thenceforward supply them with such food only as is used in the development of the ordinary worker bee, completing their development as such.

It has been supposed by Huber, and other distinguished apiarians, that the royal food which they for a time enjoy produces the development requisite to enable them to perform this queenly function. They are often very prolific, laying thousands of eggs in drone and worker cells indiscriminately, sometimes depositing a dozen or more in a single cell. They are generally bred more abundantly at the season when colonies containing fertile queens have destroyed their drones, and where they happen to be impure, or not of full Italian blood are often productive of great annoyance and mischief in Italianizing an apiary, as their progeny sometimes far outnumber the pure Italian drones then living. The young queens, matured during their existence, are likely to be impregnated by them. They are the more obnoxious from the fact that, where their progeny is nearly pure, the mischief they create may not be discovered in the first generation, and its consequences may become so widely spread in the apiary as to require great watchfulness and careful pruning, for a considerable time, to eradicate it. Inasmuch as they can seldom be distinguished by their appearance from the ordinary worker, and are rarely to be caught in the act of laying, it is next to impossible to discover and remove them but by furnishing the nucleus with a fertile queen, or uniting it to a colony which has such an one. The laying generally ceases. Whether or not they are then destroyed I have not yet been able to discover. But to return to our young queens. Occasionally some of those which are not destroyed, and come to maturity, are found to be defective, generally, in the wings, sometimes having only one, or none at all. As queens copulate with the drones only on the wing and in the air, all such defective queens are of course worthless, except as "drone-layers," and, unless wanted as such, should at once be removed, and their places supplied by other sealed queens, or eggs, for the purpose of rearing them. The young queens, which mature perfect if favored with warm and fair weather, and drones are abundant, generally leave their hives to copulate with the drone on the *seventh day* after they are hatched, and on the following day, if impregnated, they commence laying.

From the period of hatching to that of impregnation, which, in favorable weather, is generally from seven to fourteen days, many young queens are lost, or perish from various causes, a few of which it may be well to enumerate. They may be caught by the bee martin; become exhausted, fall to the ground, become chilled, or, from exhaustion, be unable again to rise; their wings being short, sometimes when she flies out the workers follow her, as in swarming, and all desert their home together; at others they attempt to enter another hive, and are stung to death by its inmates. Occasionally, when all return to their own domicile, the workers, as if displeased with the procedure, seize their queen, and, forming themselves into a knot, squeeze her to death. I am by no means confident that this affectionate embrace springs from maternal affection; still they might sting her to death in a moment, while I have known them to be engaged in this hugging process for three successive days together, and the queen still living, while in other cases they will continue to hug her carcass for several hours after life has become extinct. As soon as they discover her decease they drag her to the entrance and cast her out of the hive.

After impregnation has taken place, and she has safely returned to her hive, losses are comparatively few, unless the nucleus hive or colony be too small to satisfy her prolific demands, when she will disencumber herself of eggs by depositing them on the edges, or in large numbers in the cells, and then desert and seek a wider field for her operations by entering, or attempting to enter, another hive, in which effort she generally perishes. At other times, in such small nucleus hives, the population becomes too dense for comfort, and they "swarm." Usually, however, in such cases, as in starving, it is rather a desertion than swarming, as no queen cells or workers remain behind. I have found it very convenient and safe to use a small hive made on the Langstroth movable comb principle, large enough to accommodate three or four combs of full size. When they become too densely populated I divide them, or rob them of brood before hatched, in order to prevent it. Where they chance to become too weak I furnish them brood from other hives; so also with honey, thus keeping them in proper condition for my purposes. Where persons are Italianizing their own apiaries only, and would have no further use for small or nucleus hives afterward, they may either partition off a "Langstroth" hive nto three apartments, as before mentioned, using each apartment for a single nucleus, or, consenting to encounter the loss in honey and brood consequent upon the colony's being queenless for a time, and the trouble of search in using their entire colonies, they may abstract the native queens and introduce the Italian queen in a *sealed state*, taking care that she passes safely through all the subsequent casualties to which she may be exposed.

The advantage of this method is that the risk of *safe introduction* into full colonies is encountered *before much time has been expended upon them;* and if lost, her loss is comparatively small, though at the height of the breeding and honey seasons it is not so insignificant to the colony's prosperity.

In all cases where the young queens become impregnated by the native or impure Italian drones they should be supplanted by others, as speedily as possible, reared from Italian eggs of unquestionable purity; and this precautionary process should be repeated until every colony in the apiary is supplied with a queen of undoubted purity. A most singular peculiarity of some of the young Italian queens is that, during the first few days after their impregnation takes place, they lay none but drone eggs, often depositing them in "worker" cells, a blunder which she never after unconsciously commits until she reaches advanced age.

The power of laying either kind of eggs seems, too, entirely under the control of her own volition. Where a hive is deprived of all its drone combs, and entirely *filled* with worker combs, if the season for swarming has arrived, and her colony has become populous, as a last resort in preparing for the impregnation of her successor she will lay drone eggs in worker cells. The workers will also, in such an emergency, sometimes by enlarging a few worker cells, convert them into drone cells. The worker cell is only one-fifth of an inch in diameter, while that of the drone is one-fourth of an inch. Repeated examinations have failed to discover any difference between the respective sizes of the comb cells of the Italian bee and those of the native beyond the variation to be found in different combs of our native bee.

INTRODUCING QUEENS.

The worker bees manifest great affection for their queen. I have more than once been stung by them. When catching or holding her she would utter a cry of distress. When deprived of her they manifest the greatest sorrow and anxiety for her recovery, yet, on hastily returning her an hour or more after, I have seen them, in some cases, instantly sting her to death. The cause of this singular and most unnatural treatment was for some time a mystery; but after repeated experiments I became convinced that it was owing greatly to the manner of presentation, and the temper of the recipients when she was presented. Subsequent experiments have confirmed this opinion. The worker bee is exceedingly watchful and impulsive. The slightest quick motion arouses and excites it for an attack, and if, when in this condition, one of its own sister workers alights suddenly near it she is liable to be seized, and I have sometimes seen her stung to death before the mistake was discovered. Once excited to combat, they seem completely abandoned to the destruction of the object of their attack; and although they quickly recognize the scent of a queen, yet, under the impulse of angry excitement, they do not often stop short of her destruction. The knowledge of these facts has led to the adoption of various expedients for the safe introduction of queens. As these processes may be most safely and conveniently accomplished with the use of the movable frame hive invented by the Rev. L. L. Langstroth, (by which I have been greatly aided,) I shall, in explaining them, assume its use.

The first, and probably safest, mode which I shall describe is as follows: In the morning of a pleasant day, when the bees are flying freely, take from one of the most populous hives four or five combs containing honey and nearly mature brood. Shake from them, into their own hive, the old or hatched bees, and hang the combs properly into an empty hive, which should then be carefully closed so as to prevent the escape of the Italian queen, which should then be placed in it by opening one of the holes in the honey-board over where the combs are hung, and dropping her through it on the top of a comb. Then close the board, and, after removing the before-mentioned populous colony from its stand to another at some distance, place the hive containing the Italian queen on the stand from which the other was removed, and partially open its entrance. The bees which have been out gathering honey, on returning to the accustomed spot, will enter the hive containing the Italian queen. Gorged with honey, exhausted by the fatigue of a long flight, disconcerted by the apparent desertion which has taken place during their absence, and not knowing where to find their original hive, they will at once adopt the new home and queen.

If this operation is performed between the first of May and middle of June, by filling the empty space left in both hives with empty frames, two colonies may be formed of the one, which is one method of performing what is called "artificial swarming." But if it be done after this period, and when the scarcity of honey pasturage would render it unwise or unsafe to form a new colony, then the native queen should at once be abstracted from her colony, and a few hours later, when the workers have discovered their loss and have become dispirited by their unsuccessful search for her, the hive containing the Italian queen should be placed on a level spot of ground near its future stand, with a swarming cloth tacked to and spread on the ground in front of it. Then, after smoking or alarming the remaining bees contained in the original hive until they are gorged with honey, they should be shaken from their combs on the swarming cloth. As soon as they have entered the hive, now placed on its stand, (which they will do in a short time,) on their becoming quiet and composed, open the hive and hang into it the remainder of their combs, thus by degrees transferring the entire contents, except the native queen, from one hive to the other.

This process is somewhat tedious, but I have not yet learned of a single instance where it has been unsuccessful, except by the escape of the Italian queen before any of the bees had entered her hive; and this may be prevented by clipping one of her wings. As a colony will never receive a strange queen so long as they possess a fertile one, in all the processes for introducing queens the first act to be performed is the abstraction of the incumbent queen, and the apprisal of the workers of their loss by shaking the bees from several combs into their hives. This usually so alarms them that they proceed at once to gorge themselves with honey, which renders them so docile and tractable that I have, in a great number of cases, introduced Italian queens as soon after as they indicated their consciousness of the loss of their queen, by their moaning noise, by simply taking the Italian queens by their wings, with the thumb and forefinger of my right hand, and *slowly* and *gently* placing them on the top of the combs of the queenless colony among the workers, *still holding her fast, however, until the workers indicate their willingness to receive and treat her kindly,* which they usually do by offering her food, and such other manifestations of favor as they habitually display towards their own queen. This allays all her fears of violence from them, and when released, which may be done, if kindly treated, within a minute after presentation, she will glide down between the combs with perfect composure, which, in turn, allays all suspicion or excitement among the workers, and relieves her from danger. If, however, on presenting her, she is attacked by the workers, she should, without delay, be withdrawn, (without, however, making such a quick or rapid movement as to excite the bees,) and the attacking bees instantly crushed. In the course of a few minutes she may again be presented, sometimes with success; but if not, she should be removed as before, and replaced with her own nucleus, in doing which the same precaution should be used as in presenting her to the new colony, otherwise she may perish by the cruelty of her bees. On the following day, after smoking the queenless colony until all the bees are thoroughly subdued and gorged with honey, the queen may again be presented as before directed. If they shall refuse to receive her, it is safer to let them remain for seven days from the time they were deprived of their queen, by which time it will be found they have constructed a greater or less number of queen cells upon their combs, in which embryo queens are being reared. All these should be removed, or the embryo queens destroyed. On the following day, after again smoking as above described, the queen may be presented as before.

Last year, in introducing probably sixty queens by this process, only three or four failed of success. It, however, requires some skill, judgment, and experience in handling bees.

Another method is to first remove the incumbent queen, and on the following day prepare a small fine-meshed wire box or case, (not of brass or copper,) about three inches long by one and one-half inch in diameter, with an aperture at one end large enough for the free passage of the queen. In this cage should be placed a small piece of honey-comb containing enough honey for the queen and half a dozen bees for a period of four or five days. The queen, with half a dozen "workers," should then be placed in it, and the entrance of the aperture closed with a covering of wax, the cage suspended firmly between two combs in that part of the hive where most of the bees are clustered, and in such position that the bees in the hive may communicate readily with the queen, and have free access to the wax-closed aperture. They will soon gnaw it open and release her. Several other contrivances have been resorted to, but with limited success. I succeeded, in my early experiments, in making some safe introductions by immersing the queen in honey at the time of presenting her, but found, ultimately, that unless the recipients were in the proper *mood*, at the time of her presentation, they would sometimes kill her.

An incident showing the discrimination of these wonderful little insects occurred in midsummer, some three or four years ago. On searching for an *unimpregnated* queen, (then about two weeks old,) and failing to find her, I presented the colony an *impregnated* Italian queen; and, as she glided down the comb, I observed they did not treat her with that marked kindness which I had expected. The hive was closed, and at the end of about half an hour, on again opening it, I discovered two knots of bees, each containing a queen; and on separating the one containing the unimpregnated queen, I found her lifeless, while the fertile queen, though a stranger, was still retained alive.

PROFITS AND IMPORTANCE OF BEE CULTURE.

The profits of bee culture, like other pursuits in life, depend greatly upon the knowledge of the subject possessed by the bee-keeper and the *proper management* of his bees. The difference in continuance and abundance of pasturage in different localities will of course produce widely different results, but there are very few, if any, localities in the United States habitable by man in which bees *properly managed* will not pay a bountiful compensation for their cultivation, while in the more favorable localities four or five hundred per cent. per annum is no unusual product. In California, and in some of the southern States, where the pasturage continues to abound for the greater part or nearly the whole of the year, the product is often still greater. An average of fifty pounds surplus honey per year from each colony, under proper management, would therefore be a very low estimate.*

According to the census of 1860 there are 2,423,895 farmers in the United States and Territories. All these, besides many engaged in other pursuits, might conveniently and profitably engage in bee culture. Allowing an average of only ten colonies to each of these—say two and one half millions of persons—(and it might be 100 colonies each without encountering the danger of overstocking, as there is now a number of apiaries in this country containing over 100 colonies,) and the average annual product of each colony at 50 pounds, the aggregate product would be twelve hundred and fifty millions of pounds, which at 25 cents per pound would amount to upwards of three hundred millions of dollars annually.

According to the census of 1850 there were produced in the United States and Territories in that year 14,853,790 pounds of beeswax and honey, while that of 1860 is 1,357,864 pounds beeswax and 25,028,991 pounds of honey, showing an increase of about $77\frac{2}{3}$ per cent.

Prior to the publication by Mr. Langstroth of his excellent work on bee culture, and the introduction of his movable comb system of bee keeping, the pursuit had for some years been gradually, and in some localities rapidly declining, owing greatly to the ravages of the bee moth; inventions of hives *for* the prevention of which were not lacking in either abundance or variety. Many of these, however, instead of preventing it, proved most excellent auxiliaries for the spread of its devastations; while others, perhaps from ignorance of their habits, were so constructed as to prove, sooner or later, certain destruction to any colonies that might be placed in them. Several kinds of these hives had been extensively used throughout a great part of our country, producing destruction wherever introduced, until repeated trials and diappointments had driven beekeepers generally to the conclusion that profitable bee culture had ceased to be practicable in this country, and so discouraged many as to cause them to abandon the pursuit entirely. The expectation that any hive, *of itself* will ever be found to prevent the ravages of the bee moth, is an absurdity, which none but the ignorant or malicious will assert. The *bees* themselves are the only safe and efficient protectors against the moth, and *where properly cultivated* are *fully competent* to the task. Still, until the requisite knowledge of the subject becomes generally disseminated, this prejudice will doubtless continue to a greater or less extent to exist. It is, however, most encouraging to know that already there are a few extensive apiaries in different sections of our country, which, under enlightened cultivation, produce annually an average of from five to fifty dollars' worth of honey and wax to each colony; the quantity varying in consequence of difference in locality and management. These apiaries are, however, comparatively few, and in view of the great importance of this branch of agriculture it is deserving of far more notice and consideration than it has hitherto received. A single half acre of ground furnishes abundant space for the location of an apiary of two hundred colonies, which, (I am sure I speak within bounds in saying,) under proper cultivation, in an average locality, can be made to yield from three to four tons of honey annually, the production of which (unlike that of sugar or any of the cereal crops of our country) is spontaneous, requiring no ploughing or toil of man for its production; nor does it, like those, exhaust the fertility of the soil. In fact, it is simply *saving from waste* that which nature provides in most lavish

* In the middle and western States it is not uncommon in some localities for single colonies (in apiaries of 100 or more) to produce 100 pounds and sometimes as high as 200 pounds surplus honey in a good season. Query: If any *one* colony in a large apiary produces such a result, why should not all? The pasturage being *equally near* and *abundant to all*, it is obvious that the true reason must be found in the difference of condition or management (or both) of the different colonies.

abundance, by bringing into proper use the means provided for its collection and preservation. This subject presses itself the more urgently for favorable consideration at this time, from the fact that one of the principal sources from which our "sweets" have heretofore been obtained has (in consequence of our national difficulties) been almost entirely cut off, while the vicissitudes of war have incapacitated a vast number of persons in the rural districts of our country for pursuing their usual vocations, (though still capable of attending to the manual of bee culture.) It has also left many widows* and orphan children without the means of support, who may, in this pursuit, find at least a competence.

As this however must depend in a great measure upon their skill and management, and as the mass of them at present know but little of the subject, it becomes an object of much importance to establish some means for the general dissemination of the requisite information as speedily as may be. Foremost among these, I should regard the establishment of a periodical devoted exclusively to bee culture. The publication of such a journal was commenced at the beginning of the year 1861, by Mr. Samuel Wagner, of York, Pennsylvania, whose long experience and perfect familiarity with the history and practice of bee culture, both here and in Europe, eminently fitted him for the undertaking. It was continued with marked ability to the close of that year, when in consequence of the general prostration of business, and absorption of public attention by the war, it was thought best to suspend its publication for the time being, and await a more propitious season. Doubtless were its value more extensively known, it would receive such encouragement as would justify the resumption of its publication immediately. While the standard works of "Langstroth on the Honey Bee," and "Quinby's Mysteries of Bee Keeping," should be read by all, such a journal coming to its subscribers at stated periods, keeping pace with the improvements and discoveries that may be made from time to time, and furnishing practical experiments and results, could not fail to greatly interest and profit the bee-keeper. The adoption of this journal, as premiums of half a dozen or more copies each, by all the agricultural societies in our country, would doubtless furnish the support needed to justify the resumption of its publication, and I am quite confident it would to many prove one of the *most acceptable* premiums that could be offered.

Next in importance is the establishment of apiaries in connexion with the various State agricultural colleges, now or hereafter to be established in the various States, and the employment of such skilful and *practical* teachers as would be fully competent to impart thorough instruction in this department. Such apiaries have been for several years in successful operation in some parts of Europe, and under judicious management here would not only prove of vast benefit for the purpose of imparting instruction, but might also yield a considerable revenue, or at least prove self-sustaining.

NOTE.—Apiarians generally have limited the possibility of the impregnation of the queen bee to within three weeks from the date of her maturity, and state that it rarely occurs at a later period; but I have in a few instances had them impregnated at later periods; one quite recently on the thirty-fifth day after she emerged from the royal cell; and instances have been cited in which it has occurred at still later periods. In some cases, however, it is only partial, the queen laying worker eggs but a short time, and in limited numbers only.

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* Already a number of ladies are extensively and most successfully engaged in bee culture, one of whom I am informed has nearly four thousand pounds of surplus honey, besides a considerable number of swarms, the product of about 100 colonies of bees this year.

REPORT OF THE SUPERINTENDENT

OF THE

EXPERIMENTAL GARDEN.

SIR: I have the honor of submitting a report of progress in the Experimental Garden attached to the Department of Agriculture.

In my last report brief allusion was made to the necessity of the department having at its disposal increased facilities for the cultivation of specimens of the various cereals, vegetables, and fruits, in order to test their comparative merits. The necessity for a series of such experiments is very great; most of our cultivated grains and vegetables have run into a vast number of varieties, many of them comparatively worthless,

In a sale catalogue of agricultural and garden seeds now before me, there are enumerated 52 varieties of peas, 32 varieties of beans, 34 varieties of lettuce, 18 varieties of onions, 48 varieties of turnips, 42 varieties of cabbage, and 10 varieties of celery. No one desires, neither is it necessary, to cultivate all of these; it is, therefore, of much importance to know which are best and most suitable for the purpose required—whether early or late, large or small; whether productive, of good keeping qualities, or otherwise. Possessed of such information the buyer could make his purchases understandingly, and the seller would speedily drop unsalable sorts from his list, and both would be gainers. Pomological authors have done much toward diffusing a discriminative knowledge of fruits, and it certainly is of equal importance to procure and disseminate the comparative merits of vegetables and grains, describe them properly, establish synonyms, and unhesitatingly condemn those that are useless or of inferior merit.

As a commencement toward carrying out the above suggestions, forty varieties of potatoes were procured, but owing to the very limited extent of ground in the garden, only a small quantity of each kind could be planted. The season proved dry and unfavorable, consequently the result of the crops was not deemed sufficient basis upon which to found an opinion as to their comparative merits. Similar attempts were made with peas, turnips, and other plants, with like results.

The utility of establishing orchards of the various fruit trees must be keenly apparent to all who are conversant with the importance of this interest. Every variety of fruit suited to the climate should here be represented, if for no other purpose than that of assisting toward a correct nomenclature. But the advantages of such a collection would not be confined to that alone. Every peculiarity connected with growth would be exhibited, and, if carefully noted, would comprehend a fund of information of great value to the country.

The garden embraces about six acres of ground, an area so limited as to preclude the idea of even commencing the formation of orchards for the purposes suggested. As a garden of examples in culture it is well suited, but for purposes of comparative experiments in field and general garden crops it is altogether inadequate. In view of the necessity of commencing a collection of fruits for the purposes alluded to, means were taken to secure most of the leading varieties of the *small* fruits, such as grapes, strawberries, raspberries, and currants. Of the two first-named kinds a good assortment has been planted, which will afford facilities for comparison at an early period.

GRAPES.

Considerable attention has been given to the collection of improved native grapes. The various casualties to which this plant is subject, the rapidly increasing number of new varieties, and the general interest manifested in its culture, suggested the propriety of exertion in order to make the garden list as complete as possible. Accordingly, about one hundred varieties were planted in the spring of 1863, all of which are believed to be properly named.

These have been placed under conditions as nearly alike as possible, and will fruit in the summer of 1865, when their comparative merits will be ascertained, and those unworthy of further attention expunged from the collection. By this means it is reasonable to hope something may be done towards weeding out worthless sorts that only hinder the rapid extension of those that are really of value.

The list will be increased as rapidly as possible, and when the objects and intentions of the garden become more generally known, those who possess new and valuable seedlings will doubtless willingly furnish a specimen of such for comparative trial with those already in the collection, in return receiving a guarantee that no plants of such new kinds will be sent out of the garden without permission of the donor. Several new seedlings have already been received on these terms, for, as a matter of course, it cannot be supposed that rare kinds will be received for unlimited propagation and gratuitous distribution.

The collection of hardy, or reputed hardy, varieties of grapes at present consists of the following sorts:

Anna.
Allen's Hybrid.
Albino.
Alvey.
Adirondac.
Baldwin's Lenoir.
Brandywine.
Blood's White.
Blood's Black.
Brackett's Seedling.
Beansville.
Berks.
Cloanthe.
Chillicothe.
Canby's August.
Cunningham.
Cynthiana.
Concord.
Clinton.
Columbian White.
Cuyahoga.
Crevelling.
Clara.
Cassady.
Catawba.
Chippewa.
Christine.
Coppermine.
Cheowa.
Clever.
Clappier.
Cairnano.
Devereaux.
Dracut Amber.
Delaware.
Diana.
Elsinboro.
Emily.
Flickwir.
Franklin.
Flora.
Garrigues.
Greverson.
Gravel.
Helen.
Hammil's Seedling.
Hiawasse.
Hyde's Eliza.
Henshaw.
Herbemont.
Hooker.
Hartford Prolific.
Huntingdon.
Hearthenge.
Isabella.
Ive's Seedling.
Jacobi.
Ketchum.
Lenoir.
Logan.
Lincoln.
Louisa.
Louisville.
Lydia.
Little Giant.
Mary Ann.
Maxatawny.
Murdock.
McLean.
Marion.
Mead's Seedling.
Marker.
Miles.
Northern Muscadine.
New Buda.
Norton's Virginia.
North America.
Ohio Claret.
Ontario.
Ohio Segar Box.
Old House.
Otoe.
Pauline.
Purple Favorite.
Powell.
Perkins.
Rachel.
Raabe.
Regina.
Rebecca.
Red River.
Rogers's Hybrid, No. 1.
Rogers's Hybrid, No. 2.
Rogers's Hybrid, No. 3.
Rogers's Hybrid, No. 4.
Rogers's Hybrid, No. 9.
Rogers's Hybrid, No. 12.
Rogers's Hybrid, No. 13.
Rogers's Hybrid, No. 14.

Rogers's Hybrid, No. 15.
Rogers's Hybrid, No. 19.
Rogers's Hybrid, No. 20.
Rogers's Hybrid, No. 22.
Rogers's Hybrid, No. 27.
Rogers's Hybrid, No. 33.
Rogers's Hybrid, No. 34.
Shaker.
To-Kalon.
Taylor.
Traminer.
Telegraph.
Union Village.
Wilmington.
Woodbury.
Wilder's, No. 6.

STRAWBERRIES.

In accordance with the objects of the garden, a commencement has been made toward a collection of strawberries. The following varieties are under cultivation:

Austin.
Amazon.
Burr's New Pine.
Brighton Pine.
Bartlett.
Bonte de St. Julian.
Boston Pine.
Cutter's Seedling.
Carolina Superba.
Downer's Prolific.
Duke de Brabant.
Excellente.
Fillbasket.
French's Seedling.
Fillmore.
Golden-seeded.
Glenalbine.
Hooker.
Honeur de la Belgique.
Imperial Scarlet.
Jucunda.
Jenny Lind.
Jesse Read.
La tour de Mauborg.
Longworth's Prolific.
Lady's Finger.
McAvoy's Superior.
May Queen.
Madame Vilmorin.
Moyamensing.
Oscar.
Pineapple.
Russell's Seedling.
Ross's Phœnix.
Reine Hortense.
Scott's Seedling.
Seedling Eliza.
Sir Adair.
Sir Harry.
Stirling Castle Pine.
Sir Charles Napier.
Trollope's Victoria.
Triomphe de Gand.
Vicomptesse Hericaurt de Thury.
Wonderful.
Wilson's Albany.
Walker.
Wizard of the North.

In compliance with your request, the following notes on miscellaneous horticultural operations have been prepared as an exposition of the practice pursued in the garden of the department:

ORCHARD HOUSES.

A small orchard house has been erected and put in operation for the double purposes of presenting an example of a cheap plant structure, and to illustrate the method of fruit culture by restricting root-growth.

The orchard house is comparatively a new feature among horticultural structures. It is simply a miniature orchard under glass. At first sight such an arrangement would seem altogether superfluous, as our climate is so favorable to fruit-growing; but while this is perhaps true in a general sense, we find, on looking closely into the particulars, that many portions of the country are not so favorably situated in this respect as others, as, of course, might be expected where the climate ranges from a frigid to a torrid zone. Then, again, the injury resulting from insects, from early and late frosts, from extremes of temperature, from blight, mildew, rot, and other casualties, all combine in completing a formidable phalanx of difficulties, too familiar to fruit-growers.

The genial modified temperature of the orchard house exempts the inmates from the injury resulting from sudden and extreme changes and their concomitant evils, while the insect family, so destructive to our fields and orchards, can readily be destroyed or excluded.

While these advantages are in themselves of importance, yet they are only incidental and consequent upon a principle in plant-growth which is entirely under control in house culture. This principle is clearly stated by Lindley in the following sentences:

"Whatever produces excessive vigor in plants is favorable to the production of leaf buds, and unfavorable to the production of flower buds; while, on the other hand, such circumstances as tend to diminish luxuriance and to check rapid vegetation, without affecting the health of the individual, are more favorable to the production of flower buds than of leaf buds."

These sentences contain a theorem upon which success in fruit culture mainly depends, and upon which are founded the various devices and expedients resorted to by intelligent fruit-growers.

A fruit-bearing tree must attain to a certain degree of maturity before it can produce fruit, and this period may be hastened or retarded, as willed by the cultivator. Recognizing the fact that an extra luxuriant growth and a fruitful condition of the plant are to a certain extent antagonistic properties, and also that in soils of ordinary fertility the wood-producing force strongly predominates, fruit-growers practice various expedients, with a view to check mere wood-growth and encourage the formation of fruit buds. Grafting strong growing sorts upon those of less vigor is a favorite and effectual mode; bending down the branches, pruning the roots, and restraining root-growth by confining them to limited areas, are processes practiced with more or less success.

Restricting growth by confining the roots is the most immediately effective of all modes, and this is one of the conditions obtained in orchard houses. To effect this purpose the trees are placed in pots or boxes; the roots speedily fill them, and further extension is checked, resulting in thoroughly matured wood-growth, and a profuse formation of flower buds. The main difference between the interior arrangement of a greenhouse and that of an orchard house is, that in the first named the pots or boxes are set on shelves supported by stagings, while in the latter they are placed on a bed of soil. Much of the success attending the system depends upon this peculiarity. The limited portion of soil contained in the pot would not, in itself, be sufficient to enable the plant to mature a good crop; but by placing the pots on a bed of soil, the roots will protude through the holes in the bottom and ramify unrestricted while the fruit is maturing, and a comparatively heavy crop can be produced.

It has already been remarked that an over-luxuriant growth of branches will defeat the object of retaining a fruitful habit, and if the pots are left permanently in this position barren growths would follow. Therefore, as soon as the fruit is matured, further extension of growth is to be checked by turning the pot so as to twist the roots. This operation should be repeated once a week until the roots are entirely separated from the pot. This will completely check wood-growth, and the branches will again become studded thickly with fruit buds preparatory for another crop.

The principles upon which this mode of culture is founded are so apparent, and their practical application so simple, that they can be understood even by a tyro in vegetable physiology.

With a view to admit of a more rapid extension of root-growth during the fruit-maturing period, several trees have been placed in pots with perforated sides. The perforations are half an inch in diameter, and placed two inches apart over the whole side surface of the pot. These pots are plunged until the rims are level with the surface of the soil, and the young roots speedily avail themselves of these openings and occupy the surrounding soil. It may here be remarked that we have used these pots in the greenhouse. The holes are stuffed with moss, and the plant potted in the usual mode. The free admission of air to the roots, and the reduced evaporating pot surface, renders the necessity for watering less frequent, and many greenhouse plants thrive better in these than in the pots as generally constructed.

In order to furnish examples of various modes of applying the principles of house culture of fruits, a small house has been arranged with a shallow bed of soil, in which the trees are planted without pots. This is perhaps a more permanent arrangement than that previously described, and possesses decided advantages with regard to the details of management. The depth of the soil does not exceed nine inches, and its drainage and ventilation carefully secured. In this mode the plants are as completely under control as when grown in pots. When a tendency to overgrowth becomes apparent, the trees are root-pruned by running in a sharp spade round them, an operation requiring only a few minutes to each tree.

Any kind of fruit tree may be successfully cultivated under glass. Peaches, nectarines, plums, cherries, apricots, gooseberries, and even pears and apples, have been produced in great perfection in orchard houses.

MANAGEMENT OF THE HOUSE.

The most important point is ample ventilation; a closely pent, damp atmosphere is fatal. A free circulation of air should constantly prevail, even if fire-heat is applied in spring. To force early fruit the ventilators should not be tightly closed, except during severe frosts. No heat should, by any means, be applied further than to keep the temperature above the freezing point. A heating apparatus will be found very valuable, enabling the cultivator to take advantage of warm weather in February without fear of losing the crop by March frosts. A simple furnace and flue will answer every purpose.

The greatest watchfulness should be given to keep the plants free of insects. Syringing with water daily will assist wonderfully in warding them off. The most troublesome are the aphides and the red spider. Fumigating with tobacco will destroy the former, and dusting with sulphur the latter.

GROWING FRUIT TREES IN WOODEN TROUGHS.

Very prolific dwarf trees may be produced in wooden troughs in the open air. These are made with twelve-inch wide boards for sides and bottom, nailing the sides firmly to the bottom to guard against roots protruding into the soil beneath. These may be of any length; the trees set about three feet apart. As in pot culture, so in these troughs the roots are restricted, and an early fruitful condition secured.

Those who have acres of peach orchards will not be likely to adopt this mode of culture; but there are many city yards where fifty feet in length of such trees could be introduced, and would not only prove an agreeable recreation to the owner, but would also furnish an amount of fruit which would astonish those who have not taken lessons from nature in fruit-growing.

In northern latitudes, where peaches, apricots, and nectarines will not thrive in ordinary orchard culture, an arrangement of this kind on the sheltered side of a garden fence may be introduced with profit. The facility of protection during winter will readily occur, even to those not particularly gifted with inventive faculties; and where other modes of protection will not suffice, the boxes may be made in lengths of eight or ten feet, and the whole affair carried into a barn, cellar, or under a protecting shed, covering the roots with straw, to prevent injury from severe frosts.

LEAF BLISTER ON THE PEACH, ETC.

The curl or blistered appearance so frequent on the leaves of peaches in early summer is one of those questions annually canvassed by rural writers. The prevailing opinion still inclines to the belief that it is the result of insects. The fact that the aphis is frequently observed on these diseased leaves keeps up the lingering probability that they are the cause, notwithstanding that they are as ften absent as present on the curled leaves.

So many instances have been noted where portions only of a tree have been attacked (the rest of the tree being protected) that it seems almost unnecessary to make any further effort to prove its atmospheric origin. Early in April, 1863, two peach trees were selected from a collection then in full leaf in the orchard house, and placed in the open air. In a few days there was scarcely a healthy uncurled leaf on the trees, and no aphis visible.

PRUNING.

Pruning is an operation of vast importance in the management of trees, and the principles upon which it is founded must be clearly understood before complete success in fruit culture can be attained.

Plants left to nature maintain a well-balanced reciprocal action between their branches and roots; and every branch, bud, or leaf that is removed must exercise an influence either injurious or beneficial, and no one should attempt to remove branches unless they foresee the effects and influence of such removals.

The time of pruning, whether during summer or during winter, will depend upon the object to be attained; a brief consideration of plant-growth will assist us in determining this question.

When a seed is deposited in a suitable germinating medium, its first effort is to send a root downwards in the earth, and then push a shoot upwards in the air. The seed contains within itself all the nutriment necessary for this process; but as soon as the young plant is so far formed, its mode of existence is changed, and it becomes dependent upon the soil and atmosphere for future support.

The elementary substances absorbed by the roots undergo decomposition through the influence of the leaves, and the material is thus prepared for further root-growth and extension. The roots have no inherent power of extension, but are dependent upon the health and action of the foliage; and, although in germination the roots are first formed, their growth is due to the action of the foliage of the plant that produced the seed from which they emitted.

It is, therefore, apparent that the increase in size of the plant, the quality and quantity of its secretions, and the extension of its roots, are all dependent upon the healthy action of leaves.

When it is considered how essential the foliage is to the healthy development of the plant, we may well pause before infringing upon the reciprocal action nature has established between the roots and branches; for it is evident that every branch or leaf removed has an effect either for good or for evil upon the plant. The correlative action between leaves and roots being so intimately connected, it follows that any diminution of leaf-growth during the period of active vegetation must retard root development. Hence it is an axiom, now becoming recognized, that summer pruning weakens growth, while winter pruning produces a contrary effect.

Summer pruning can be useful where wood-growth is to be checked, and it will be repressed in proportion to the severity of the removal of foliage. Fruit trees, when planted in a generous soil, frequently attain a luxuriance incompatible with a fruitful habit, and their flowering may be somewhat hastened by judicious summer pruning or pinching, so as to retard wood-growth; but care must be exercised, and much observation and experience are requisite, before the object can be safely attained.

Winter pruning invigorates wood-growth. When a portion of the branches of a tree is removed after the fall of the leaves, the balance of growth is destroyed and the roots have the preponderance; the remaining buds will now shoot forth with increased vigor—an important consideration with trees or vines that have become weakened from overbearing, or any other cause, imparting new vigor to weak and sickly plants.

The time for winter pruning may also be regulated by the condition of the plant; if pruned immediately after the leaves fall or ripen, the shoots will be stronger the succeeding season than they would be if the operation had been delayed until spring. This arises from the fact that during winter the plant still continues to absorb food by its roots, which is distributed over the branches;

and as the principal flow of sap is always directed to the extreme points of shoots, the highest buds are most fully developed. If, therefore, pruning is delayed till spring, this accumulation is cut and thrown away, and to that extent the plant is weakened. Early winter pruning is eminently advantageous to native grapes. As the retained buds become charged with sap during winter, they start vigorously and advance rapidly—a matter of much moment where the summers are rather short for ripening the fruit and wood of these plants.

There is a tendency in many varieties of trees to form strong central growths at the expense of the side branches, more especially while the plants are young. Pruning these strong shoots in winter only increases the evil, unless summer pruning is attended to by pinching out the ends of every shoot before it gains sufficient headway to injure the growth of the lower branches. Strong growths should be pruned in summer and weak ones in winter. In the management of hedges, where uniformity of growth is all-important, this rule should be constantly kept in view.

When the size of a tree is the only object sought, summer pruning should not be practiced. But it may be said that pruning of any kind is a negative operation, and probably it is within the limits of possibility that trees may be trained to any form, and maintained in a fruitful condition without any instrumental pruning whatever, unless to remedy disease and casualties. It is much easier, for instance, to rub off a bud in May than it is to cut out a branch in December; and if a judicious system of disbudding and pinching was strictly followed, there would be no occasion for winter pruning; or, were it possible to place a tree in such a soil, and under such conditions that it would only make a moderate growth of well-matured wood, little, if any, pruning would be required. But as all of these conditions are difficult to realize in happy combination, we have to resort to pruning, and a knowledge of the principles involved will materially assist the operator.

EXPEDIENTS FOR PROMOTING FRUITFULNESS IN PLANTS.

All expedients for inducing early fruiting are founded upon the well-known law that excessive growth and great prolificness cannot simultaneously exist in the same plant. Some of the most familiar modes of inducing fruit are as under:

1. BY DWARFING.

In pomological parlance, trees are said to be *dwarfed* when grafted or budded on stocks of weaker growth than themselves. Thus we have the pear on the quince, the cherry on the mahelab, the apple on the Paradise stock, the peach on the plum, &c. This is a popular and efficient mode of rendering trees fruitful. Properly speaking, any low tree is dwarf; the term when applied to a system is merely technical.

2. BY BENDING THE BRANCHES.

This process practically consists in allowing the branches of a young tree to grow undisturbed by the pruning knife for several years until the plant attains considerable size; the young shoots are then bent down and secured to pegs fastened in the ground. This mode is eminently adapted for standard pear trees, especially such varieties as Dix, Bartlett, Sheldon, and others that make long yearly shoots; these when bent down soon become studded thickly with blossom spurs, and very ornamental and symmetrical trees can be formed by a little attention to the bending and regulating the shoots; the pendent form soon becomes fixed, and trees so treated are certain to be productive. The proper season to commence tying down is the month of August; the young wood will then be sufficiently matured to bend, and many of the most forward buds will form short fruit spurs, and bloom the following spring. Trees and plants of all kinds can be incited to flower and fruit, no matter how luxuriant their growth, by careful observance of the bending process. Horizontal training is a modification of this system, and is a well-known method of encouraging fruitfulness.

3. BY PRUNING THE ROOTS.

When a tree has reached a fruit-bearing size, and shows no symptoms of a fruit-bearing disposition, but instead, throws out vigorous branches, root-pruning is a very efficacious mode of checking growth. In highly cultivated gardens, where trees are planted, and the roots have access to the rich soil, an immense crop of branches will be produced, but little, if any, fruit. Root-pruning will check such growths most effectually and render the trees fruitful. The operation is performed by digging out a circular trench at a distance of from three to six feet from the stem, according to the size of the tree, and cutting all the roots that are encountered or can be reached. The soil is again thrown back, and the process is completed. If done in August the supply of sap will immediately be lessened, the wood-maturing principle accelerated, and fruit buds formed. The operation has been performed in spring with but little benefit, but if done in the fall cannot fail in producing the desired results.

Root-pruning has successfully been applied to young evergreens that, in consequence of growing late in fall, are liable to have the points of shoots injured by early frost. When growth is stopped by root-pruning the shoots mature sufficiently to withstand the winter without being injured. A few years of such treatment when the plant is young is found sufficient, as the specimen will attain hardihood with age.

4. BY RINGING THE BRANCHES.

This operation is performed by removing a ring of the bark from a branch, so as to arrest circulation. This, however, is done with a view to hastening the ripening process of fruit, and has long been practiced, particularly on the grape-vine. It is, however, of doubtful utility, as the branch beyond the point of operation is destroyed. It has the effect of not only hastening the ripening, but the fruit will be somewhat increased in size. Grapes produced in this manner are easily recognized by their thick skins and coarse texture of the fruit.

5. BY LIMITING ROOT GROWTH.

The most satisfactory application of the principle is that of restricting the growth by confining the roots in pots, boxes, or other similar conveniences, as is well exemplified by the great crops produced on fruit treets in pots. Florists are also alive to the fact that their flowering plants will blossom most profusely when the pots become well filled with roots.

GENERAL REMARKS.

The mechanical condition of the soil is of more importance in fruit culture than its chemical constitution. In its preparation, therefore, the aim should be to secure good depth with perfect drainage, and avoid heavy dressings of rich manures. The object is to maintain a moderately luxuriant growth with early and thorough maturity in the wood, and this can be best attained in comparatively poor soils.

KEEPING GRASS LAWNS.

To have a perfect lawn it is absolutely necessary to have it properly laid down at the outset. This, however, does not consist so much in enriching the soil as in rendering it friable and porous by draining, subsoiling, and pulverizing.

The main feature in keeping lawns is frequent mowing, and if this is neglected fine lawns cannot be maintained. It will matter but little how much expense and skill may have been incurred in the preparation and seeding of the ground if it is allowed to grow at random afterwards, as the strongest foliaged grasses and clover will eventually supersede the finer kinds if the cutting is not regularly attended to. On the other hand, lawns that have been but indifferently prepared may be rendered close and regular by frequent mowing and judicious top-dressing.

Early cutting prevents the growth of the coarser grasses and induces lateral growth on the finer, thus covering the surface with a dense foliage, which resists the effects of sun and long-continued dry weather.

Every lawn of any pretensions should be kept smooth by a machine. Not only is it economical as regards labor, but it is scarcely practicable to keep it with a scythe so smooth, thick, and velvety as can be done with a good lawn-mower. Another advantage is that the grass is not removed, but falls down in a shower over the roots, forming a very efficient mulching, and enabling us to impart to our pleasure grounds all the character of the finest lawns, an attainment that has hitherto been deemed beyond our ability to realize.

When the grass becomes thin and of weakly growth a top-dressing of good stable manure should be laid over the surface in December. It is important that the manure should be well rotted before being used, and as occasion offers during winter it should be broken up and manipulated with an iron rake. The object in view is to distribute it evenly over the whole surface. Break it finely, so that it will settle down and nourish the grass roots. When spring opens, the rough, strawy portions, if any are left, should be removed; otherwise it would interfere with the proper keeping of the surface.

NIGHT TEMPERATURE IN GLASS STRUCTURES.

One of the most prevalent and injurious errors in the management of greenhouses and other plant-houses is that of keeping the temperature too high during the night. With many the aim seems to be to maintain as high a degree of heat during darkness as during light, a practice opposed both by science and the results of experience, and one that cannot be too severely condemned.

It has been observed that plants will lengthen very fast during darkness in a high, moist atmosphere, and it has therefore been supposed that a gain in growth is thus secured, but strictly, this is not the fact. Any extension ot growth made under such conditions is at the expense of that made during the presence of light, as it is only then that those chemical changes are in operation that change the matters absorbed by the roots into the woody fibre and other constituents of plants; consequently the same quantity of material is simply elongated as in drawing out a wire, which may be lengthened without adding anything to its structure.

Plants grown in a nearly uniform temperature under glass seldom ripen or mature their wood in a thorough manner, the buds are immature and make feeble growth, and the whole plant contracts a delicate habit of constitution, which renders it incapable of withstanding the slightest neglect without injury, thus entailing great care to keep it even in its sickly condition, and never, by any means, developing its natural capacities. On the contrary, plants constantly subjected to a suitable lowering of night temperature are more robust, have short-jointed and matured growths, flowers not only expand more fully, but remain longer in perfection, fruits better colored and flavored, and more perfect in every respect than those developed in an atmosphere of uniform heat and moisture.

With regard to greenhouse plants, it should be remembered that they require no heat during night further than to exclude frost. It has been stated and urged as a reason for keeping a higher temperature that it is necessary to do so in order to secure a succession of bloom, but it has been amply proved that by allowing a more liberal heat, say from 70° to 80°, during day, that a more profuse crop of flowers will be gained than in the more equable conditions insisted upon.

Another injury consequent upon a high night temperature during winter arises from the great extraction of moisture from the atmosphere. To maintain an inside temperature of even 50° when the external is near zero involves a rapid generation of heat, and as the capacity of air for taking moisture increases in proportion to its rise, a great demand is made upon the plants and everything in the house capable of giving up moisture. The quantity of water thus carried off may be seen by the deposition of ice on the inner surface of the glass after a night of severe frost. Ice one-fourth of an inch in thickness is often found under these circumstances, the result of condensation and freezing of the water carried from the contained moisture in the atmosphere and from the surfaces of the plants. The parched and unhealthy aspect of the plants subjected to such treatment is sufficient evidence against the propriety of the practice. The expense of fuel and labor required to maintain this injurious temperature is also an important consideration.

CULTIVATION.

The great aim of all thorough cultivators is to maintain a continued healthy and vigorous growth from the period the seed vegetates until the plant reaches its maturity. The word *cultivation* may be defined as a term whereby we recognize those operations necessary to maintain a constant and proper equilibrium of the elements of plant-growth. Therefore, in order that we should be able to do so understandingly, it is absolutely necessary that we be thoroughly conversant with the principles governing vegetable growth; in the absence of such knowledge practice is merely empirical.

One of the prominent operations in culture is that of stirring the surface of the soil around growing crops. The soil may be looked upon as the laboratory of nature where her great decomposing agencies, air and water, prepare the food of plants, and the object of culture is to facilitate these chemical operations as far as our knowledge will admit; and experience fully proves that frequent forking, loosening or stirring the surface stratum of the soil, thus allowing an unimpeded access of air and moisture to penetrate and follow the various ramifications of plant roots, is undoubtedly the most essential item in what is termed cultivation.

The efficacy of this treatment depends, however, upon the nature and condition of the soil, as, also, upon the time and mode of performing the operation. Unless the subsoil is also porous and permeable, its benefits will be comparatively slight. Hence soils that are not naturally pervious must be rendered so by draining and subsoiling.

Soils so treated will continue to support vegetation in a healthy and luxuriant growth even in long-continued dry seasons. This is owing to the facility with which the rain water can penetrate deeply, its downward passage being encouraged by the admission of air, and when, in addition to drainage, the surface is kept loose and open, the rains of a heavy shower penetrate at once instead of passing off on the surface, as will be the case when the top soil is compact, and the sub-soil undisturbed. Clayey and tenacious soils require more careful treatment than those of a gravelly or sandy character; these are liable to become hardened on the surface after even slight showers. This is occasioned by their easy solubility, and good management of such soils demand that they should be surface-stirred after every heavy rain. Much now depends upon the time such stirring is performed. Between the softening of the surface by rains and its hardening again by sun and dry air there is a period when it is in the most favorable condition for culture. Here it is difficult to lay down a definite rule, as the practice that would be suitable for one soil and climate would be unsuited to another differently circumstanced. The principle being understood, the practice may readily be deduced. In order to facilitate cultivation all crops should be grown as far as practicable on the drill system.

There is room for improvement in this respect, especially in garden culture. Garden crops should invariably be grown in drills sufficiently wide apart to admit of deep hoeing and forking. And it may further be remarked that there is a wide distinction between what is frequently termed a well-kept garden and one that is well cultivated. The former may be kept perfectly clear of weeds by the use of hoe and rake, every spot smooth and polished, and although vegetation may wilt and present a starved and stunted aspect, yet many people would pronounce such gardening as perfect. This, however, is not cultivation. Hoeing, as understood by a thorough culturist, means more than merely killing weeds. He aims at having the soil deeply and thoroughly broken up, and left loose, rough, and untramped. His criterion of beauty here is not influenced by the element of smoothness.

SPRING AND FALL PLANTING OF TREES.

The relative advantages of spring and fall planting have given rise to many opinions, and it is not strange that a wide difference in opinion should be held on the question, since so much of success or failure depends upon the season, locality, and other attendant circumstances. The influencing agents of vegetation are subject to such a vast variety of modifications, which can neither be foreseen nor prevented, that no isolated observation, however truthfully noted, will suffice as a guide in establishing definite rules; and it may be remarked that the many seemingly conflicting opinions upon certain points of practice could, in most instances, be reconciled if all the attending facts and circumstances were clearly produced, but these items are difficult to obtain.

Perhaps the strongest argument in favor of fall planting is the particularly favorable peculiarities in the relative conditions of the soil and the atmosphere at that season. Independent of this, it is theoretically true that autumn is the best time for removing trees. A plant that has occupied its position for several years cannot be removed without curtailing and injuring its roots more or less, but there are certain portions of the year when the roots are of minimum importance to the plant. It is very evident that they are most essential when the tree is in full foliage and vigorous growth, and during this period any reduction of roots would be speedily perceptible; on the other hand, when the seasonal growth is completed, and the plant defoliated, the offices of the roots are less important. From the above we learn that the best time to transplant is between the fall of the leaves in autumn and the bursting of the buds into growth in spring, or during what is termed the dormant season.

The "particularly favorable conditions of the soil and air" may now be noted. During the month of October the soil averages ten degrees warmer than the atmosphere. This forms a species of natural hot-bed into which we place a newly removed tree, the formation of young roots is encouraged, and before many weeks elapse the plant is well established, and enabled to withstand the vicissitudes of winter and make an early and vigorous start in the following spring. The low atmospheric temperature prevents any growth in the branches, which is so far favorable under the circumstances.

In spring we find these physical conditions reversed; the soil is then cold, and accumulates heat slowly while the air rapidly increases in warmth; the buds are excited to growth, new leaves are formed in advance of the roots, each leaf acts as a pump extracting sap from the branches and trunk of the tree, which as yet has no active roots to supply the demand; and if evaporation is severe and continued, the plant must either succumb or receive such a check as will require the whole season to recover. Hence it may frequently be observed that spring-planted trees will show a profusion of leaves, apparently vigorous and healthy, but suddenly wither and decay under the influence of clear, dry, and warm weather.

These so far show great advantages in favor of fall planting, but there are other considerations to be canvassed before deciding the question. It is very clear that unless planting is performed within a certain period the advantage of immediate root-growth will not be secured; if delayed beyond the first week in November, success will be less certain. The best period is undoubtedly as soon as the leaves change color, stripping off the foliage before removal.

The character of the soil and location will also materially influence success. In undrained clayey soils the trees may not get sufficient root-hold to enable them to resist the throwing-out tendency of alternate freezing and thawing, or the young spongioles may be destroyed by constant saturation. Again, in very bleak and exposed localities, the drying winds of spring may exhaust the juices faster than the young roots can supply the demands of evaporation. Of course, the very evident precaution of securing the plant from swaying should be attended to, otherwise many of the young rootlets will be twisted off Staking may have to be necessary where the trees are tall, but it is much preferable to stay them with a slight mound of soil over the roots, which can be removed when of no further use. It will, also, be of great benefit if the frost can be kept from penetrating to the roots. A covering of loose material will be a protection—a wise precaution even on well-established trees.

In northern latitudes, where the winters commence early and continue long and severe, fall planting will not so generally be successful, as in more temperate regions, except in particularly favorable localities. Early spring planting, taking the precaution to prune the branches, so as to restore the balance destroyed by the root mutilation inseparable from removals, and mulching over the roots, so as to retain moisture during summer, will be the most likely auxiliaries towards success.

Evergreens can, in all cases, be most successfully transplanted just as growth commences. When the young shoots exhibit symptoms of pushing, they can be removed without risk of failure with ordinary care. They may also be removed in August and September, so that they can have a good season to furnish new roots before winter. Early spring removal of such trees is not so advisable, as they have a large evaporating surface, which, when subjected to drying spring winds, require a constant action of root to maintain life.

LIQUID MANURE TO PLANTS IN POT CULTURE.

The importance of liquid manure in general cultivation is acknowledged, but the expense of its application on an extensive scale, such as to farm crops, furnishes a strong reason against its use.

It is also acknowledged that the liquid state is the best in which stimulating and fertilizing ingredients can be presented to the roots, as they can only absorb nourishment through the medium of water, and all matters that enter into the interior of plants must be in a soluble condition, or so minutely divided as to be carried along with water before they can enter into the vessels of the plant.

In the pot culture of plants, where the amount of soil is limited, the use of liquid manures is of vast service when judiciously applied, but much harm may be occasioned by its indiscriminate use. Many persons consider it necessary to resort to the use of guano and other solutions on sickly plants, and are surprised to find that the application only hastens the dissolution of the patient.

It is only healthy and well-rooted plants that are to be benefited by manures, and such as are well supplied with hungry roots, but growing slowly for want of nutriment. Such plants as have been for years in the same pot or tub, as we frequently find orange and lemon trees, camelias, oleanders, &c., will be greatly stimulated by the application of manurial liquids during their period of growth. For plants of all kinds that have their pots filled with roots it will be serviceable, and to such as fuchsias, pelargoniums, cineraries, &c., while in flower, they will bloom longer and in greater perfection. But it should be kept in mind that stimulants should not be applied while flower buds are forming, as it might induce an increased wood-growth at the expense of the flowering principle.

Manurial liquids may be applied most freely when growth is active, discontinued during the formation of flower buds, and applied more sparingly during the expansion of the blossoms. It is a safe rule to dilute severely, and use the solution in a perfectly clear state. Thick, muddy water will not be of much benefit, and stops up the pores in the soil, preventing free action of atmospheric gases to the roots.

Almost any substance that has manurial properties, and will dissolve readily, may be rendered available. Every greenhouse or conservatory should have a barrel fitted for the purpose. If furnished with a false bottom of close wire, and a tap between it and the bottom of the barrel for drawing out the liquid, manure water can easily be prepared.

PROPAGATION BY CUTTINGS.

To be successful in any pursuit it is very necessary that we should be conversant with the *rationale* upon which our operations are founded, and in no horticultural process does this apply with so much force as in plant propagation by cuttings

There is, however, much in connexion with this subject that remains unexplained. We know not why it is that some plants will propagate readily, while others, seemingly of similar structure, with the greatest tardiness and difficulty.

A cutting may be described as a portion of the branch of a plant that is removed and placed in a position to form roots, so as to become an independent individual, possessing all the properties, and being a living representative of the original from which it was taken. Cuttings are of various kinds. Young, tender shoots, perfectly matured growths, and wood in all stages of maturity intermediate between these extremes, are used for cuttings.

The best condition of wood-growth also varies with the kind of plant. This is a question that can only be ascertained by experiment. We know of no external appearance that will indicate the special proportionate arrangement of the constituents of plants most favorable for the formation of roots from cuttings.

As the extension of roots is dependent upon the previous or simultaneous action of foliage, it is found that, in general, the best shoots for propagation are those possessing a considerable portion of the organized matter consequent upon a ripening of wood-growth, but in which the process of vegetation is still in full operation; in other words, those shoots that have commenced to mature, but still possessed of healthy and active foliage, familiarly termed "half-ripened wood."

The art of "striking" cuttings mainly consists in guarding against the exhaustion of the sap of the shoot by evaporation until roots are formed to support it.

The various expedients resorted to, such as keeping the cuttings in close frames, covering them with bell glasses, shading from sun, &c., have for their object the preservation of the juices of the shoot.

The reason for the adoption of these expedients being known, their necessity in individual cases will readily be understood. The greatest care is required in the case of young, tender cuttings, and the least with those of matured wood. Cuttings of the latter frequently succeed when planted in the open air without further care or attention. On the other hand, a young succulent cutting, furnished with one or more leaves, must be carefully guarded against excess of light and aridity. Shading from bright sun will be required to prevent the foliage from wilting, and its surrounding atmosphere must be sufficiently moist to prevent evaporation from its surfaces.

The great stimulants of vegetable life are heat, air, light, and moisture, and in the management of cuttings these agents must be regulated with care and precision.

Under certain conditions, cuttings will grow and produce a few leaves without any attempt at the formation of roots, while under different circumstances the same kind of cuttings will produce roots without indicating the slightest symptoms of bud-growth. Heat is the active stimulant of the vital forces of plants, and when the atmosphere by which they are surrounded is of a comparatively higher temperature than the soil in which they are placed, the branches are excited before the roots receive any impulse. On the contrary, when the soil is warmer than the air, the root-forming process will be active, although the branches show no indication of growth. Of course neither of these conditions can continue exclusively for any lengthened period, for without a reciprocal action all growth will, in time, cease. These effects are frequently illustrated in tree-planting in spring. Towards the latter portion of spring and the early part of summer the air is many degrees warmer than the soil; the heated atmosphere excites the buds, and leaves are developed; but the recently disturbed roots in the colder soil have not yet been excited, and are not in a state to supply the demands of the foliage, the juices of the tree are soon exhausted, and the promised healthy growth is suddenly and hopelessly checked.

The main point of consideration, therefore, in the management of cuttings, so far as mere application of heat is concerned, is to stimulate into action the processes carried on in the vessels of the cutting inserted in the soil while the upward bud-growth is retarded. This is secured by heating the soil, and not heating the air. The rule is that cuttings should be kept in an atmospherical temperature as low as the nature of the plant will allow, and the soil in which they are inserted should be warmed as high as the roots will endure. The more completely these conditions are maintained the greater the certainty of success, and with ordinary care few failures need occur.

"Bottom heat," as it is termed, or a warming of the soil, may be attained by various means. Those whose requirements are extensive usually have a structure specially fitted to the purposes of propagation, where the soil is heated by hot water either in pipes, or wooden or cement tanks. The latter mode is, perhaps, the best; but where the quantity desired is limited to the wants of an ordinary flower garden or greenhouse, no special structure need be necessary. A small hot-bed, with frame, will afford considerable convenience; and those who have a greenhouse may form one of the best propagating shelves by enclosing a portion of the heating channel, whether flue or pipes, at the warmest end, so as to form a tight chamber, with the heater passing through it. Usually there is a front shelf in greenhouses over the heating apparatus, so that by simply enclosing a space below it, an air-chamber will be formed, where the heat will collect and warm a bed of sand or soil laid on the shelf. For all ordinary purposes this will be found sufficient, and the space can be enlarged to suit the wants of the propagator.

WILLIAM SAUNDERS.

Hon. ISAAC NEWTON,
Commissioner of the Department of Agriculture.

REPORT OF THE ENTOMOLOGIST.

Sir: In compliance with orders received, the accompanying paper is respectfully submitted to you for the Agricultural Report of 1863. The subject suggested by you being the various methods at present adopted by agriculturists to destroy or diminish the numbers of noxious insects which annually injure our crops, I present the following observations made partly by myself and partly compiled from the works of various entomological authors, and the leading and most reliable agricultural journals. The subject is one of vast importance to the farming community when we consider the injury caused by the depredations of three small insects alone, viz: the wheat-weevil, the midge, and the Hessian fly; or the ravages of the curculio amongst our fruit, which in several localities have proved so destructive as to cause some horticulturists to abandon the culture of certain fruit trees altogether. Correct drawings have also been made, which may be engraved for the next year's Report, if required.

As entomologist of this department, besides the regular daily official duty, all the subjects of general natural history, such as insectivorous birds, specimens of fruits, textile materials, hemp, cotton, flax, &c., have been handed over to my charge for preservation and arrangement during the past year. Much time has been devoted to laying the foundation for a cabinet or museum of agriculture, which, it is hoped, will eventually prove a valuable adjunct to this department, both for reference and as a means of preserving new or valuable specimens of our cereals, fruits, vegetable products, and natural history. In former years many of these have been forwarded to the office, and, although duly registered and acknowledged, have hitherto been either lost, mislaid, or destroyed, for the want of a proper room in which to arrange and preserve them. This cabinet is intended to contain specimens of our principal fauna and flora; samples of maize, wheat, barley, and other cereal productions; colored models of the fruits and esculent roots, with descriptive labels of name, synonyms, and references to horticultural works in which they are correctly described; the native insectivorous and predaceous animals, birds, and insects, each specimen being correctly labelled with both the scientific and common or English name by which it is most generally recognized; the food, habits, and, if injurious, the best means at present known of destroying them. Specimens of all our textile materials, such as flax, flax-cotton, cotton, wool, and silk, (many of which are at present in the possession of this department,) are likewise to be preserved in this cabinet, as showing in the first place the seed, and afterwards the raw material or plant, with specimens exhibiting the various stages of progress the fibre has to undergo until it becomes the perfect manufactured article.

It is to be hoped that the public will see the benefit arising from such a cabinet, and help to contribute to its formation. This central collection once made, all the duplicates can be sent to the various State agricultural societies to form the nuclei of State collections, where any farmer may learn to distinguish the most reliable and best fruits or vegetable products for his peculiar locality; the beneficial birds, animals, or insects, and the best means of destroying such as are very injurious. Such a cabinet once commenced, every year would but add to its growth and utility, as many of the old errors could very readily be rectified by constantly having reliable specimens at hand to correct mistakes in nomenclature or popular prejudice.

As the articles on entomology, in the former agricultural reports, have given such full and lucid descriptions of the habits, form, and color of several of the insects injurious to the farmer that the most noxious of them can readily be identified, it has been thought of more consequence to devote a few pages in the present report to a general description of the habits and instincts of those most destructive and best known, with a short tabular view of their arrangement, classification, and the various metamorphoses or changes of form they undergo before attaining the perfect or winged state, and the methods already employed to destroy them, or, at least, to diminish their numbers. In order to do this, the best of our American authorities on the subject, viz., Dr. Harris and Dr. Fitch, and various foreign authors, Mr. Curtis, Köllar, and others, have been consulted, and extracts have been taken from the leading agricultural papers and journals as to the success or failure of experiments already made by well-known and reliable farmers and horticulturists. It is not, indeed, expected that a practical farmer can spare the time to study the anatomical structure of an insect, or its scientific nomenclature; but it is certainly of the greatest consequence for him to know the peculiar habits and transformations of any particular insect destroying his crops, as it may be very easy for him to kill it in one of the three stages of its existence, and almost, if not quite, impossible in the other two. We will take, for example, the female moth, miller, or candle-fly, as it is commonly termed; this can be readily crushed with one blow in a second of time, whilst it would take hours of searching to find the hundreds of mischievous caterpillars which emerge from the eggs she will, if undisturbed, deposit upon the leaves of culinary vegetables from one end of the garden or field to the other.

Again: all insects must not be considered as injurious to the farmer, some of them being, on the contrary, highly beneficial, as preying upon the noxious insects themselves, waging a war of extermination upon them at all times; for instance, the common ladybugs, so-called, (with the exception of a large one found on squash and melon vines,) in both their larva and perfect state, live almost entirely upon the myriads of plant lice which infest and overrun our oats, vegetables, and young fruit trees. It will also be necessary to give a brief sketch of the different orders into which insects are divided for the benefit of such farmers as have not read the former reports. The same remedy which would act for a beetle, would not be of the least service when applied for a moth or miller, their structure and habits being entirely dissimilar. The following classification has, therefore, been made or compiled merely for the use of young farmers, and is not intended to interfere with any former classification made by scientific entomologists having the works of the various authors who have devoted their whole time to the subject, but is merely given in order to enable working farmers readily to classify and describe any of the various insects which daily come under their observation, and, when writing, to call them by their proper names. Beetles, wasps, flies, or, indeed, almost anything that either crawls or flies, bites or stings, are now included under the common name of bug, which, if properly used, should be applied to one order of insects alone.

All true insects have six legs, and the mouth is provided with either jaws for biting, or a trunk or proboscis for piercing and sucking; so that here we have the first great division, namely, biting insects with jaws, or sucking insects with a trunk or piercer. The bees and wasps form a connecting link between the true biting insects which possess jaws, and the sucking insects which have merely a sucker or piercer, being provided with both jaws, which they use to bite and tear the materials with which they construct their habitations, and a ligula or tongue which is employed to suck up their liquid nourishment. The second division is made from the form and texture of the wings and wing cases; these vary very much in all the different orders, whilst those few which are apterous or possess no wings whatever, or only the vestiges of them, have been classed in the orders to which they evidently belong, both from the structure of their mouth and general affinity. Thus the flea, although wingless, is placed among the flies or diptera, as possessing a piercer or trunk, and the rudiments of wings which are undeveloped. The number of wings is generally four. In beetles the upper pair are hard or leathery, and covering another pair of a membranous texture, and generally transparent; in the butterfly, however, all the four wings are exposed.

Form of mouth.	Wings.	
Mouth furnished with jaws, and formed for biting or mastication.	Four wings: the upper pair hard or leathery, and covering a pair underneath; *under wings* folded only *transversely*, or having a sort of elbow.	*Coleoptera*, (beetles, or sheath-winged insects.)
	Four wings: the upper pair hard, or leathery, and covering a pair underneath; *under wings* folded *lengthwise* like a fan.	*Orthoptera*, (cockroaches, grasshoppers, katydids, &c.)
	Four wings: membranous and reticulated, the veins resembling *net work*.	*Neuroptera*, (dragon fly, May fly, &c.)
Mouth armed with distinct mandibles, or jaws, and also having a ligula, tongue, or proboscis for suction.	Four wings: membranous and divided into large cells.	*Hymenoptera*, (ichneumon flies, &c., wasps, bees, &c.)
Mouth furnished with a piercer, or sucker, and not capable of biting solid substances.	Four wings, covered with colored scales resembling powder or dust; mouth with *a spiral trunk* only.	*Lepidoptera*, (butterflies, moths, millers, &c.)
	Four wings, generally placed *horizontally*; the upper pair being half of a leathery texture, and the other half being membranous; mouth armed with a conical beak.	*Heteroptera*, (plant bugs, squash bug, chinch bug.)
	Four wings, generally slanting upwards when at rest, like the roof of a house, and frequently of the same membranous texture; mouth armed with a beak.	*Homoptera*, (cicada, or singing locust, plant and bark lice.)
	Two wings only; mouth a proboscis, for sucking; sometimes having small, lancet-like appendages for piercing, concealed inside the trunk as in the horse fly, &c.	*Diptera*, (mosquito and house fly, bot fly, horse fly, &c.)

Insects also undergo three metamorphoses or changes of form. First, the eggs are deposited by the female in or upon some vegetable or animal substance on which the young larvæ live and feed. These eggs produce grubs, caterpillars, or maggots, which are indiscriminately called larvæ, from a Latin word signifying a mask or disguise, as the insect in this preparatory state bears not the sligliest resemblance to the full-grown and perfect insect. The larva, after feeding voraciously, sheds its skin, and the pupa or chrysalis makes its appearance; in this second stage of its existence the pupa takes no sustenance whatever, but lies almost motionless, the limbs of the future insect appearing as if wrapped up in swaddling clothes; hence the name pupa, which also is a Latin word, signifying a puppet or baby. Finally, this outer envelope is thrown off, and the perfect beetle, bee, butterfly, or fly, emerges from the shed skin, fully furnished with wings, and capable of continuing the species, and laying the eggs which are to produce another generation. With the grasshopper and plant bug, however, the eggs also are laid, but the young emerge from them small in size, certainly, but resembling the parent insect in form, and furnished with legs for locomotion, but having no wings; they then shed their skins, and rudimentary wings appear. In this intermediate state they also continue to feed. Finally the last skins are shed, and they come forth into the world provided with perfect wings, and able to perpetuate their species. In this description it must, however, be observed that, in the intermediate or pupa state, grasshoppers and plant bugs are as active as ever, and, unlike the above-mentioned insects, (beetles, butterflies, bees, and flies,) continue to feed voraciously, and to destroy plants with unabated vigor. It will be proper to observe here that many of the diptera, or true two-winged flies, undergo their metamorphoses within the hardened case or skin of the larva or grub.

Some entomologists, nevertheless, have not regarded the structure of the mouth in the perfect insect or image, and from which the former synopsis has been made, but have classified them according to the metamorphoses or changes of form they undergo before attaining the perfect state. As it would be perfectly impossible for any person entirely unacquainted with their habits and changes to classify them according to this method, we prefer the former arrangement as most easy for the agriculturist, the perfect insect being almost always attainable, whereas the larvæ as yet have been very little studied in this country. But as it may throw some light upon their habits, and occupy but a small space, we shall give the classification of Burmeister according to their metamorphosis or change of form which has already been explained.

Insects undergoing a perfect metamorphosis, or change of form. (Example, butterfly.)	I. *Coleoptera*, (beetles) ..	Four wings of dissimilar texture: the fore wings horny the hind wings membranous.
	II. *Lepidoptera*, (butterflies.)	Four wings, similar texture; wholly or only partly covered with fine dust, like scales.
	III. *Hymenoptera*, (vein-winged insects, bees, wasps, &c.)	Four wings, similar texture; naked, and having branch-like veins running through them.
	IV. *Diptera*, (two-winged flies.)	Two wings only; naked, transparent, and in place of the two hind wings, generally having on each side a slender stalk-like appendage, terminating with a button or knob-like end.
Insects undergoing an imperfect metamorphosis, or change of form. (Example, grasshopper.)	V. *Neuroptera*, (net-veined insects.)	Four wings of the *same texture*, with narrow-meshed netted veins.
	VI. *Orthoptera*, (straight-winged insects.)	Four wings of dissimilar texture: the fore wings like parchment; the hinder pair membranous, broader, and folded lengthwise.
	VII. *Hemiptera*, (half winged insects.)*	Four wings of dissimilar texture: the fore wings horny or leathery at the base; the hinder pair with branching veins.

Enough having been said, however, to give the young farmer some general idea of the orders into which insects are divided, and their changes of form, we will now proceed to the remedies proposed either to destroy them or to drive them from the plants or animals they infest. The subject is one of vast importance not only to the farmer, but likewise to the consumer, who would wish to have good and cheap necessaries of life.

To give some idea of the amount of damage done by insects alone I will merely cite two instances: Curtis, an English writer on the subject of farm insects, states that in 1786 the turnip crop destroyed by insects in Devonshire alone was valued at one hundred thousand pounds; and Dr. Fitch, of New

* This includes also Homoptera of the former classification.

York, states that in 1854 the destruction to the wheat crop, caused by the wheat midge, amounted to over fifteen hundred thousand dollars. Considering the loss to the wheat crop alone caused by the ravages of only three minute insects, viz., the wheat midge, the Hessian fly, and the grain weevil, to say nothing of the various other crops and fruit, the most sceptical of unbelievers will be convinced of the importance of instituting a regular series of inquiries and experiments in order to destroy them, and of making the results known to the public through the medium of the Report of this department, or the pages of local agricultural journals. It is true that many of the remedies already proposed by closet naturalists or book farmers, are almost as absurd as old Pliny's receipt to make a swarm of bees, namely, that if the swarm is entirely lost it may be replaced by the aid of the belly of an ox newly killed, covered with dung. Virgil also says that this may be done with the body of a young bull, and in the same way that the carcase of a horse produces wasps and hornets, and that of an ass, beetles.—(Pliny III, 24.) In like manner, in our time, we see it has been recommended to swathe or clothe the trunk of plum trees with cotton batting to prevent the plum weevil from laboriously climbing up the tree to deposit her eggs in the plums, altogether ignoring the fact that the said curculio can fly, and thus reach the forbidden fruit much more rapidly and readily. Again, we see it recommended to put a roll of brimstone or flour of sulphur into an auger hole bored in the trunks of trees to kill the caterpillars and insects which destroy the foliage; whereas any chemist knows that sulphur being insoluble in water will not mingle with the sap, but remain unchanged and undiminished for an indefinite period of time. These two examples we have merely mentioned to prove how absurd it is to recommend remedies without first inquiring into the habits of the insect or nature of the plant.

COLEOPTERA.

We will now commence with the Coleoptera, or horny-case winged insects, the larvæ of which are mostly naked grubs of a white or yellowish color. They are furnished with a distinct head, and some of them have six legs, whilst others have no legs whatever; they live concealed under the earth or stones, beneath the bark, and in the wood of trees, or sometimes upon the leaves of plants and trees. In the pupa (or second state) they lie with their limbs drawn closely to the body and pass that state in cavities made by the larvæ, unprotected by any silken web. The Cicindelidæ, or tiger-beetles, so named from their activity, bright colors, and ferocity, in both the larva and perfect state, live by preying upon other insects; in the larva state they live in holes in the ground, seizing and devouring any unfortunate insect which may happen to cross the opening of their dens. Boys frequently catch them for fish-bait by inserting a stalk of grass into the hole. This is seized by the jaws of the larva, which is then suddenly brought to the surface with a jerk as soon as the insect has taken firm hold.

The perfect tiger-beetles are of bright metallic colors, and barred or spotted with creamy white; they may be seen on any hot, sunshiny day running or flying a short distance, and then alighting on the ground on roads and in sandy situations. The predaceous ground-beetles, or *Carabidæ*, are also beneficial, as preying upon other insects and caterpillars. There is one of this family, however, (*Pangus caliginosus*,) the habits of which require further investigation, as it has been accused of preying upon wheat; and what renders this charge more probable is the fact that two European insects of the same family (*Zabrus gibbus* and *Harpalus ruficornis*) are said to eat grain. This large brownish black beetle certainly is found in immense numbers under wheat stacks, but may possibly frequent such situations merely for the sake of the shade, moisture, and small insects commonly found in these places. But in two instances we have seen it mounted high on grass, apparently eating the seeds from the head, no other insect being visible to the naked eye. The question, therefore, is open to discussion as to whether it actually departs from the habits of the rest of the family, which almost all live upon other insects.

The true wire-worm (which must not be confounded with the julus or centipede) is the larva of a species of elater, or click-beetle, commonly known by the trivial name of snapping-bug, from its habit of being able to throw itself some distance in the air with a sudden click when laid upon its back; it is said to pass five years in the larva or feeding state, and resembles the common meal worm, the body being cylindrical, very tough, of a yellowish brown color, and furnished with a distinct head, and only six legs; centipedes, on the contrary, have an indefinite number.

Wire-worms feed upon the roots of plants, and are thus frequently very destructive to vegetation. Curtis states that "soot and lime," "chloride of lime water," or "nitrate of soda, will destroy them." He likewise says that "spirits of tar and sand," or "refuse lime from the gas-works," will have the same effect, and that "salt on light lands is highly efficacious."

A writer in the American Agriculturist observes, however, that salt, two to three bushels per acre, will have no effect; fifty to one hundred bushels per acre might have some effect; and that two bushels per rod (one hundred and fifty bushels per acre) did not stop their ravages. Another writer recommends corn-cobs, with the idea that the worms will burrow into the cob and leave the crop unmolested. This, however, is not very probable. Some farmers recommend fall ploughing as destroying the grubs by turning over the sod, and thus bringing the grubs to the surface, where they will be quickly found and killed by birds and small animals.

Harris and some English authors recommend "sliced potatoes or turnips to be strewed in rows in the field or garden as a bait for the wire-worm;" the pieces to be examined every morning, and the insects which burrow into them to be collected and destroyed; this, however, would be practicable only on a very small scale. A writer in the Scottish Farmer states that the late Mr. Pusey found rape cake had the effect of destroying numbers of the wire-worms, and when grass land is very much overrun with them it is also said to be advisable to pare and burn the sod. Moles, crows, and other birds, eat immense numbers of these larvæ.

The perfect insect of the *Buprestis,* or borer, we find in the cherry, &c., is somewhat similar in shape to the elater or click-beetle above mentioned, but is much broader and generally of metallic lustre; it is also unable to spring upwards when placed upon its back. The larvæ, which have long, narrow, flattened bodies suddenly widening towards the head, have no legs, and live in the wood of the apple, cherry, hickory, peach, oak, and pine. The same remedies, cutting out the worms, &c., are recommended, as are practiced for the apple-borer. Harris says "that when trees are very much infested by the larvæ it will be better to cut them down and burn immediately, rather than suffer them to stand until the borers have completed their transformations and made their escape; also that woodpeckers are much more successful in discovering their retreats and in digging out the defenceless culprits than the most skilful gardener or nurseryman."

The *Lamellicornia,* or beetles having the end of the antennæ terminating in a number of laminæ or plates, is a very numerous family; the larvæ are fat greasy-looking grubs, whitish, without eyes, and having six pretty long legs The common white grub, which is so plentiful in dung heaps, is a good example. Some of them feed upon manure, others are found in rotten wood, or feed upon the roots of plants. The common tumble-bug is a good example of the species infesting manure. There are some, however, which pass the larva state in rotten wood and decaying stumps, and are comparatively innoxious.

The horn-bug or stag-beetle is an example of this class. The spotted *Pelidnota*, however, a large, broad, oval, glossy, yellowish brown beetle, with six black spots on the wing-covers, is sometimes very injurious to the foliage of the grape-vine. Harris states that the only method of destroying them is to pick them off by hand and crush them under foot; this should be done early in the morning when the beetles are somewhat torpid, as if disturbed in the middle of the day they are apt to fly away.

We now come to a family of beetles which are very injurious to the farmer, as destroying the roots of his grain and grass when in the larva state, and also devouring the foliage of his fruit and shade trees in the perfect or beetle state. These are the true leaf-eaters or May beetles. The larvæ live under ground for three years, (some authors state even longer,) feeding upon roots and vegetable matter, and are fat, clumsy, greasy-looking grubs, yellowish white in color, with a yellowish brown head, and six legs. They generally lie coiled up in a semicircular shape, and have a large swollen hinder extremity. Harris states that "the crow devours not only the perfect insect, but the larva," (sometimes called by the farmers the white grub,) "for which purpose it is often observed to follow the plough." Mr. Bartlett, from personal experience, states "that their instinct also enables the crow to find the grub when deeply imbedded in the soil, and has seen the holes from which the larvæ had been taken by this bird." Jays also feed upon them; the night-hawk, whip-poor-will, and domestic poultry destroy vast numbers of the perfect beetles; and amongst animals, hogs, weasels, rats, skunks, moles, and field mice also feed upon them in the larva or perfect state. Köllar states that "breaking up the ground in warm weather, when the grubs are not deep under the surface, is the surest means of destroying the larvæ of an allied species found in Europe." The American Agriculturist also mentions an accidental experiment in which ploughing early in the autumn destroyed the grub-worm, and suggests that the fields might be turned over in February if the weather permit. A foreign journal, speaking of a grub having similar habits, states that "a farmer mixed with the seed a quantity of guano equal to about one hundred weight to the acre of land to be sown, and sowed by hand the seed thus prepared;" the land thus treated did not suffer from their attacks, whilst other fields without the guano were very much injured. Dr. Fitch says "It is not probable that any substance can be applied of sufficient power to kill the grubs without also injuring the vegetation," and suggests that if the grubs are very numerous the patch infested should be converted into a hog pasture.

As regards the best means of destroying the perfect May beetle, Harris recommends shaking the trees early in the morning over a cloth spread upon the ground underneath the tree, as the beetles at that time do not attempt to fly; after which they may be scalded and given as food to swine. Mr. Bartlett suggests that "as they have a great penchant for lighted lamps and candles, fires should be lighted up in the fields in the evenings, into which the beetles would fly and be thus destroyed;" this remedy, however, was tried by a friend and found not to be very successful.

The rose beetle is becoming exceedingly numerous, and in some places where it was previously almost unknown is now very destructive to the grape-vine. The female lays about 30 eggs in the ground; the larvæ feed upon tender roots, and in the autumn or beginning of winter descend deeper to pass the cold weather in a semi-torpid state. The perfect insect appears above ground in May and June; it destroys the foliage of fruit and forest trees, vegetables, grass, corn, and, in fact, almost any vegetable substance in the shape of flowers or leaves. As the larvæ resemble those of the May beetle in their habits, the same remedies might be applied, but as yet no special remedy has been recommended for destroying them in this stage of their existence. With regard to the rose beetle in its perfect or winged state, Harris recommends hand-picking or shaking them into tin vessels containing a little water, or putting sheets under the trees and then shaking them down, afterwards taking care, when they are thus collected, to burn or otherwise destroy them. Some persons have attempted to drive them away by smoking the bushes with scraps of burning leather or watering the plant with whale-oil soap. These have already been tried and found to be comparatively of no value, the smoke only lasting just as long as the leather is burning; and if the solution of whale-oil soap be made strong enough to injure the insect, it also serves the twofold purpose of injuring the young foliage and shoots of the plant or tree. Others recommend ashes or lime to be dusted on the plants when wet with dew or rain; but this has likewise proved of very little service. Whale-oil soap mixed with turpentine was also tried by ourselves, and it is true that at first the rose beetles appeared to be somewhat sickened by the application, but they very soon revived and commenced to eat with renewed vigor and relish the very roses which had been dipped in the mixture. The Gishurst compound, an English preparation for destroying insects, composed of soap and other materials at present unknown to us, certainly did kill all the rose beetles almost instantaneously on some rose bushes we were experimenting upon, the drenched and dying beetles being put into a box to assure ourselves that they would not revive like the others treated with whale-oil soap and turpentine. One experiment like this, however, does not satisfy us, and it must be repeated before recommending it to others. Hand-picking tried last season resulted thus: the first and second time an immense number was collected; the third and fourth days the numbers decreased, and continued to do so each succeeding day, until at length the rose bushes and a few flowers were saved. It remains yet to be seen whether they will come again in such numbers the present year.

The rose beetles appeared to prefer the lighter colored or blush roses, and, perhaps, if roses of common varieties, that bloom profusely at the time the vine blossoms, were planted as decoys or baits near grape-vines, the insects, preferring them as food, might more readily be captured and destroyed; the only objection being that the roses might also attract rose beetles from other quarters which otherwise would not come. The common ox-eye daisy and various other flowers appear to attract immense numbers of them, and even the common elder, which is said to be generally offensive to insects, when in flower is frequently covered with these noxious pests. Harris states that rose beetles are eaten greedily by domesticated fowls, but after a short time we have observed our fowls appeared to be either surfeited or else disgusted with their long, spiney, and sharp legs, and refused to eat them altogether. Moles are also said to destroy them. At present, however, the only remedy appears to be either hand-picking or shaking the perfect insects into a cloth or a pan partially filled with water. For every perfect female destroyed, supposing her eggs to hatch and complete their transformation, we may calculate that thirty are killed for another season. This should be done by the horticulturists simultaneously in a neighborhood, as it is of very little consequence to kill the rose beetles in a single small garden, whilst kind neighbors are breeding tens of thousands to replace those you have so diligently sought for and destroyed.

The Indian cetonia, a beetle a little more than half an inch in length, of a dirty yellow color, spattered over with numerous black spots and covered with hairs, is frequently seen, especially in spring, flying about near the ground, and making a humming noise like the humble bee, for which it might be mistaken by a casual observer, and does considerable injury in certain localities by eating and burrowing into ripe peaches and other fruits. As they also feed upon the sweet sap of trees, it might be advisable to hang wide-mouthed bottles in the trees filled with sweetened water, sugar, and vinegar, into which they would be decoyed and drowned. This is merely mentioned as a suggestion, the perfect insect appearing to be attracted by sweet substances like the beautiful green June beetle. Of this last-named insect I have observed a dozen to be collected in the space of about six inches on the bark of a tree recently wounded, and from which the sweet sap was slowly exuding. These June beetles do considerable injury to the ripe fig in the south by wounding and burrowing into the fruit.

Amongst the beetles having the antennæ or feelers ending in a two or four jointed club, we find the so-called bacon beetle, injurious to dried meat and salted provisions. There are also several others of the hairy larvæ, which destroy skins and feathers. These insects are also very destructive in collections of natural history and dried insects. The best means of exterminating them in an entomological cabinet we have found to be the free use of the strongest scented benzine applied in the boxes every two or three weeks. Camphor and kreosote have also been recommended for the same purpose, but are much more expensive. The large yellowish brown and black carrion beetles, found in dead animals, also belong to this family, but do no harm. The short-winged beetles, commonly known as rove beetles, have such very short wing-cases, covering only a part of the abdomen or hind body, that by young entomologists they would scarcely be classed among the sheath-winged insects. They, however, are not injurious, many of them being even beneficial as preying on other insects.

We now come to the water beetles, which are easily distinguished by their oval form, and hind legs fringed with hairs, most admirably adapted to swimming. These insects mostly pass the larva state in the water, and the perfect beetle, although generally found on or under the water, is able to fly from pond to pond. This is generally done at night, or during damp, cloudy weather. The height to which they sometimes fly is very great, one of the largest species having been found on the flat roof of a building six stories in height. The little black beetles seen sporting on the surface of the water, dancing, as it were, in regular circles, present a somewhat singular structure of the eyes, as they possess four, two of them arranged so as to be above the surface of the water and two of them below. We have frequently seen them capture and devour other insects, which accidentally have fallen into the water. All this family are beneficial, as destroying aquatic larvæ and insects, although some of the larger species are said also to destroy fish spawn.

The meal worm, found in flour and meal, is the larva of a blackish brown colored beetle. These meal worms are much used in Germany by bird fanciers, and are recommended as food for the nightingale, and would be excellent for mocking birds and other soft-billed insectivorous birds when kept in cages in this country. These meal worms are preserved in covered stone jars filled with stale bread, old meal, flannel, &c., and may be bred and used as required. When infesting meal or flour the larvæ may be separated from it by sifting through a fine sieve, and if very numerous artificial heat might be used, as for the grain weevil.

The black, ash gray, and striped potato fly, or cantharis, injures the foliage of the potato. Harris states that they may be destroyed by brushing or shaking from the plants into broad tin buckets or basins partly filled with water with a small portion of turpentine, or caught by sweeping a deep muslin net over the plants, and then emptying them for one or two minutes into scalding water. When properly dried they may be used instead of the European blister fly, or sold to druggists. We hear, however, that "unleached ashes or air-slacked lime sown upon vegetables whilst the dew is on them," although generally distasteful to insects, would be of little use with the cantharides. Their larvæ live under ground, probably on roots, and are of a slender, depressed form, and possess six legs.

We shall now take up the curculionidæ, snout beetles or weevils. The heads of these insects are always more or less prolonged into the shape of a snout or proboscis, armed at the extremity with jaws for biting. The larvæ have the head indistinct, are almost always footless, and live generally in fruit, wood, and vegetable substances. The common whitish grub found in plums, chestnuts, and acorns is a good example of their form and habits. The destructive curculio or plum weevil belongs to this family, and perhaps more has been written about this insect and remedies proposed than for any other. It not only attacks the plum, but also the nectarine, peach, apple, pear, cherry, quince, and, according to one author, the walnut also. The eggs are deposited singly in a crescent-shaped incision made by the proboscis of the female in and under the skin of the fruit when small. The larvæ when hatched burrows obliquely into the fruit, penetrating to the stone, causing the fruit to drop to the ground. It then enters the earth, and the pupa is formed under ground. The first brood appears about three weeks after the larva has entered the ground, and the late broods pass the winter as larvæ according to Dr. Harris; but Dr. Fitch, when speaking of the insects affecting the trunk, bark, and limbs of the pear, in the New York State Agricultural Report for 1856, says that "beetles which are hatched in the latter part of the season, finding no young fruit in which they can deposit their eggs, are obliged to resort to the smooth, tender bark of the branches of our different fruit trees, and the worms from these eggs repose *in*, not under, the bark through the winter, and produce the beetles, which appear the following June, and oviposit in the young fruit." There has been considerable difference of opinion on this point, some stating that they remain as grubs all winter in the earth; others say that the pupæ are formed in the autumn, and remain as such under ground until spring; whilst others are of the opinion that the perfect beetles themselves hybernate. We can only say that, although for several years the bark of trees, under stones, and similar places have been thoroughly searched, as yet not one true plum weevil has been found, while several other insects are very numerous even in the depth of winter in such situations. Should it, however, prove that neither larvæ nor pupæ remain under ground all winter, the application of salt or any other substance during the spring would prove useless. As regards destroying the perfect insect, Dr. Harris says, "Let the trees be briskly shaken or suddenly jarred every morning and evening during the time the insects appear in the beetle form. When thus disturbed they may be caught in a sheet spread under the tree, from which they should be gathered into a large, wide-mouthed bottle or other tight vessel, and be thrown into the fire." A friend states that he has been very successful by jarring the trees at midnight, when the beetles are collected on them; also, keeping the fruit covered with a constant whitewash with a little glue added to it, which is applied with a syringe as often as is necessary, has been recommended. All fallen fruit should be immediately gathered and thrown into a tight vessel, and after it has been boiled or steamed to kill the enclosed grubs, may be given as food to swine. A very strong decoction of quassia bark is said also to protect the plums from the stings or punctures of the curculio. If, perhaps, a little soap were added, it would make the liquid spread more evenly upon their smooth and waxy surface. Mr. Cummings, of the New York Observer, recommends syringing the trees with a mixture of four gallons lime-water, four gallons tobacco-water, one pound of whale-oil soap, and four ounces of sulphur. The tobacco and water in solution Dr. Fitch thinks good, "but the other ingredients add nothing to the value of the mixture." A somewhat similar mixture is recommended in the Cincinnatus, as also sulphur, lime, and hot water. These mixtures must be applied from the beginning, when the fruit is first formed, until the curculio disappears, and renewed whenever washed off by heavy rains. "Hanging elder bushes in the plum trees" has also been recommended, but has no effect whatever. Such remedies as "bruising the tree so as to arrest the gum, which will exude from the wounded place and prevent its going to the fruit, thus cutting off what he supposes to be the food of the larvæ," "entrapping the curculio in bottles of sweetened water," and "swathing the trunk with cotton batting to prevent the insect from ascending the main trunk," may be classed with Pliny's recipe for making a swarm of bees out of an ox, already spoken of. The Ohio Farmer says that accidentally a bottle of coal oil was broken, and the sawdust in which the bottles were packed was thoroughly saturated with it. This sawdust being put at the foot of a plum tree about the time of blossoming, the fruit was saved. This circumstance led to further experiments with like favorable results.

A practical horticulturist, Mr. Saunders, upon whose judgment we place much reliance, tells us, in support of this statement about the coal oil, that he observed the plums on the portion of a plum tree hanging directly over a shed recently covered with coal tar were not attacked by the curculio, whilst on other parts of the tree the fruit was very much injured. It has also been stated that trees to the branches of which pieces of cloth dipped in coal tar, or in whose branches open, wide-mouthed bottles of coal tar have been suspended, are avoided by the plum weevil; but we can only state from our own personal observation that, in our immediate vicinity, the forest trees near a gasometer and gas-house appeared to be as much infested with caterpillars and other insects as the rest of the grove. The remedy may, however, be tried, with the caution that gas tar, if put upon trees, is said to be injurious. As nothing has appeared of late about Mr. Mathew's celebrated curculio remedy, we suppose the thing has died a natural death. Mr. C. Schultz recommends burning gas tar in pots under the trees, the smoke of which will drive the curculio away; and it is well known that a dense smoke of almost anything to the windward of trees will drive all the insects off, for the time only, however, that the smoke lasts. In the Cultivator of 1862 we find it stated that "gas lime, which can be procured at any gas works, is a sure protection from the attacks of the curculio, if scattered among and upon plum trees while in bloom, and continued immediately succeeding a rain." In 1863 the same journal says, that "air-slacked lime" (others recommend unleached ashes) "dusted over the young fruit will have a tendency to prevent the attacks of the plum weevil, and air-slacked lime, with a small quantity of fine salt, sowed beneath the trees, will destroy a great number of insects in the ground." It has been believed that plum trees planted over water are not subject to the attacks of the curculio. Such, however, is not the case, as tested by an experiment of Dr. Fitch, where the fruit wilted and dropped into the tanks placed under the trees. The fruit dropping into the water, however, will drown the larvæ enclosed in it, and thus decrease their numbers. Dr. Fitch recommends all fruit to be picked up and either burnt or given to swine; and that when jarring (not shaking) the trees, soon after the blossoms have fallen, in order to prevent the bark being bruised, it would be well to place a strip of carpeting or coarse cloth against the tree to receive the blows; others recommend the mallet or club itself to be covered with carpeting, and when the fallen insects have been collected in the sheet underneath, to burn or otherwise destroy them. The whole contents of the sheet must be burned, as the curculio, when feigning death, resembles nothing so much as a dried and dead bud, and if care is not taken will be thrown away as such. This has frequently been the case in our own experience. Hogs are said to be very useful in a plum orchard where the trunks of the trees are protected, so that the swine cannot rub against them and thereby loosen the roots or bark; and if something were planted that the hogs could root up to feed upon, or corn widely scattered over the orchard, they would be induced to root up the earth in search of their food, and all fallen fruit, with the grub in it, would inevitably be found and destroyed. Neighbors should join in their endeavors to eradicate this pest, as the curculio can fly from one orchard to another in quest of plums. Paving the tree around the roots and under the branches, or making it impervious to the grub when leaving the fallen plum, has been recommended. A hen and chickens placed under a tree are very beneficial, especially if the tree be frequently jarred by persons passing by, the beetles falling to the ground, when they are eagerly seized by the chickens. Indeed, several persons have stated that where plum trees have been planted in a hen or hog yard the fruit has been preserved intact. Quick or unslacked lime strewed upon the surface of the earth underneath the tree in the spring, after the frost has come out of th ground, is said by some to be efficacious in destroying the curculio as it issues from its subterranean winter retreat.

The plum knot, which infests the plum tree and the morello cherry, was said by some to be caused by the curculio, and by others by a species of katydid. It is now found to be a vegetable or fungoid growth, and was described by Dr. L. D. Von Schweinitz forty years ago under the name of *Sphæria morbosa.* The knot commences with a visible enlargement and swelling of the bark. This afterwards increases until it breaks the outer skin, subsequently assuming a black, rough, warty appearance. It is true that this knot, if cut open, will frequently be found to contain not only the grub of the curculio, but likewise several other larvæ and insects. This, however, is merely the effect, and not the cause, of the disease, the curculio finding in this swelling of the bark a fit place to deposit her eggs. Thick-skinned plums are said to resist the attacks of the curculio much better than the thinner-skinned varieties, the Lombard having the reputation among some of being almost curculio proof; but whether it is so or not we are unable to say.

In the neighborhood of Washington several oak trees are covered with warts or knots similar to those on the plum, only much larger and more woody. These are found only in peculiar localities and on particular trees, sometimes hundreds of yards apart from each other, the knots frequently appearing on one limb only.

Cutting out the knot or wart, and afterwards covering the wound with shellac varnish, has been recommended as a cure; but in our own experience this merely serves as a temporary remedy. Even when the wounds had been washed with a strong dilution of nitric or sulphuric acid and water, the disease invariably appeared either above or below the old scar, and frequently broke out in an apparently healthy branch. At length the knot appeared on the trunks, and the trees had to be cut down as useless and unsightly. The American Agriculturist for 1863, however, says the knots should be cut off two or three times a year, in June, July, and September, being always careful to eradicate every particle of the fungus, for if a solitary uninjured cell be left it will rapidly increase as if it were a spore, and will soon break out again. In the mean time let the trunks and larger branches of the trees be thoroughly scrubbed with strong brine, say twice during the season, to destroy any spores that may have lodged on the bark, and at the end of three years this pest will have become almost entirely exterminated. Some varieties of the plum appear to be more liable to this disease than others. In our own orchard the frost plum or gage was affected the worst. Mr. B. D. Walsh, in the Prairie Farmer, describes another weevil, injuring the plum and crab-apple, under the name of the plum gauger, as it "bores into the plum not only to deposit its egg, but also for food, forming thereby round holes down to the very kernel, varying in size from a pea to a radish seed." No method of extirpating this insect has been suggested, but the remedies recommended for the injury caused by the curculio might be of utility should its habits prove to be the same.

Where only a few plums are wanted to be preserved as specimens from a new graft or bud, we have frequently cut out the egg of the curculio with the point of a penknife, and thus saved our specimen.

The northern granary weevil and the southern rice weevil differ very little in form to the casual observer, the latter being merely smaller, and having light brown spots on the wing cases. Curtis states a curious fact, that the granary weevil in England "is destitute of the organs of flight, whilst the rice weevil has a pair of serviceable wings." Both of them are very injurious to grain and corn, and the rice weevil is very destructive to the southern rice. The egg of the northern granary weevil is deposited on the grain; the larvæ burrow inside and feed upon its inner substance; the perfect weevil makes its escape from a small hole bored through the outer skin. Curtis says, "it is calculated that 6,045 individuals may be reared from one pair of European weevils in one summer." Dr. Harris says, that these insects "are effectually destroyed by kiln-drying the wheat; and grain that is kept cool, well ventilated, and frequently moved, is said to be free from their attack;" also, "by winnowing and sifting rice in the spring, the beetles can be separated, and should be immediately gathered and destroyed." Curtis states that "placing the grain in close cellars is the worst of all proceedings, as the weevils delight in darkness and being undisturbed." He recommends "frequently stirring or turning over the heaps of wheat;" he also says that the scent of spirits of turpentine, or the fumes of sulphur, did not appear to incommode the insects;" but in an experiment tried by ourselves in 1854 or 1855, the odor of a few drops of chloroform killed both larva and weevil in some closely corked bottles of samples of wheat in the Agricultural Department; the same bottles being opened a year afterwards, retained the scent. Benzine would, perhaps, have the same effect, and be much cheaper, but, most probably, would also impart a nauseous taste and smell to the grain. Wheat kept in bottles, thus treated with chloroform for a week, germinated when planted.

Curtis says that "the larvæ as well as the weevils are destroyed at 190° Fahrenheit, but it also scorches the grain;" and that "a room heated to 130° by hot-water pipes has been constructed in Madeira, which answers every purpose," and "wheat subjected to this high temperature vegetated in the ground." He also says "that fleeces of wool laid on the grain heaps attract and kill the insects." A larger weevil, called the hunter-weevil, has been much complained of in certain localities, as eating the leaves of corn. A very similar insect is found near the Pedee river, in South Carolina, the larva of which feeds in the stalk of corn, thereby entirely destroying the plant. This is merely mentioned to warn farmers, in case they should find individual plants among their corn withering, and in a yellow, sickly state, that perhaps the larva of a hunter-weevil, or one very nearly allied to it, may be the cause of all the damage. The only remedy at present recommended is hand-picking and burning the infested plants. Another curculio (*Epicærus fallax*) is very injurious in the neighborhood of Washington, in the weevil or perfect state, to the leaves of young cabbages, clover, and various other plants. It appears, however, to be local, as we have received no complaints about it, except from Iowa, where it injures the foliage of the cherry and apple trees, and gooseberry bushes also. No remedies, however, have been recommended, as its habits have not been much investigated. We, however, have caught great numbers when sweeping with a bag net over clover fields.

The larvæ of the white-pine weevil injure pine trees by boring into the leading shoot, thus destroying the growth and symmetry of the tree. Harris recommends "the injured leading shoot to be cut off in August, or as soon as it is perceived to be dead, and to burn it, together with its inhabitants." The larvæ of the pitch-eating weevil, and others, devour the substance under the bark of pine trees, and perhaps the method used for decoying the pine-eating beetles in Europe may be practiced here with advantage. This consists in sticking some newly cut branches of pine trees in the ground in an open space during the season when the insects are about to lay their eggs; in a few hours these branches will be covered with the beetles, which may be shaken in a cloth and burned.

The weevils inhabiting nuts, acorns, chincapins, and chestnuts, are distinguished by their very long projecting and slender bills or trunks. The egg is deposited in the young fruit, and the grubs are found in the interior. They afterwards enter the earth and change to pupæ and perfect weevils. No remedy has yet been found.

The pea weevil destroys the interior substance or future seed-leaves of the pea, seeds of locust and other leguminous plants. The egg is deposited singly in punctures made by the female, on the pod. The larvæ, when hatched, penetrate through the pod and bury themselves in the pea opposite the puncture, where they eat the interior of the pea. The pupa is formed in the pea itself, and in spring the perfect insect comes out of a round hole eaten through the skin. Many of these worm-eaten peas will germinate, as the germ is seldom injured by the larva. Latreille and others recommend putting the seed peas in hot water a minute or two just before planting, by which means the weevils will be killed and the sprouting of the peas be quickened. Curtis states that "an immersion of four minutes in boiling water will kill almost all the peas." The American Agriculturist, 1860, says "that the water should not be above 170 to 180° Fahrenheit." Late-sown peas escape their attacks, and if sown as late as the middle of June, are seldom infested with this weevil. If peas are kept over the year, they are free from this pest, the beetle having deserted them. Mr. Curtis states that "kiln-drying at a heat of 133 to 144 degrees will kill the insects without altering the quality of the pulse, but such seed will no longer vegetate."

The New York weevil is a very large curculio of a gray color, marked with whitish lines and black dots. It destroys the buds and gnaws the young twigs of the pear, plum, cherry, maple, oak, &c. As they are not very numerous yet, and appear to be local, no remedy has been proposed. Hand-picking and shaking them off the trees in a similar manner to the plum weevil might answer, if they should increase so as to become very injurious.

Many of the small bark beetles destroy trees, by eating holes in the soft inner substance of the bark. Familiar examples of their work may be seen in almost any old dead tree or fence-rail. When the bark is removed it exhibits singular parallel passages or galleries diverging at almost right angles from a main stem or shoot. Other passages eaten by these insects look like coarse, irregular printing or drawings. These bark beetles injure apple, pear, peach, elm, pine, cedar and other trees. The pear-blight beetle is sometimes very destructive to pear trees, causing the branches to wither and die in an apparently unaccountable manner. The egg is deposited probably behind the root of the bud on a twig, in July or August. The larva or grub eats from the heart of the bud through the sap-wood to the heart-wood, afterwards forming a circular burrow in the heart-wood, thus cutting off the circulation of the sap. The pupa is formed at the bottom of the burrow, and the perfect insect appears from June to August. Dr. Harris says that "the remedy, as suggested by Mr. Lowell and Professor Peck, to prevent other limbs from being subsequently attacked in the same way, consists in cutting off the blasted limb below the seat of the injury and burning it before the perfect insect has made its escape." The trees should be examined daily in June, and every blighted limb immediately cut off. The injury caused by this insect being merely local, should not be confounded with the real fire blight of the pear, which appears to be a constitutional disease of the tree, caused, some say, by atmospheric influences, and others by severe winters. Dr. Berckmans says "it is owing to the unhealthy condition of the tree, bad or improper soil, too much moisture, sudden variations of the temperature, (we have observed several of our trees to be affected immediately after a severe thunder-storm,) and incompatibility of graft and stock." In the Cultivator of 1862, it is said to be a cryptogamic plant. Mr Walsh, in the Prairie Farmer, thinks a blight can be caused by the punctures made in the tree by a species of leaf-hopper to receive their eggs. Lime, iron-cinders, and other materials dug in the ground about the roots, have been recommended by many. But Mr. Saunders states it to be caused by excessive evaporation in early spring, or late winter, when the ground is frozen and absorption from the soil by the root is impossible, whilst at the same time evaporation is progressing in the upper part of the tree. He recommends covering the roots in early winter with a few inches of charcoal dust, which will entirely prevent the penetration of frost. He likewise states that cutting down until all discolored wood is removed, will cause the plant to recover. For the bark beetles infesting other forest and fruit trees, Köllar, in Europe, says that "we should encourage woodpeckers and tomtits." Titmice or chickadees, and gold-crested wrens, in this country, destroy numbers of them, as the contents of their stomachs will testify. One of this family of beetles was stated to be the cause of the disease called the "yellows" in the peach, but this is said to be a mistake. Others having dissected the trees affected and finding no beetles, state that the injury is caused by vitiated sap, and that the insects are the effect and not the cause of the disease. Trees in a feeble or unhealthy condition are almost invariably the first attacked by the larvæ of bark or wood beetles.

The larvæ of the long-horned beetles, the perfect insects of which do much injury to the wood of trees, are distinguished by their very long antennæ, horns, or feelers. These larvæ are generally of a whitish or yellowish color, and are furnished with six either very short legs or none whatever, and a flat head armed with strong jaws. We find familiar examples of this family in the apple and locust borer, oak pruner, &c. The larva of the destructive apple-tree borer is a footless white grub, in shape somewhat broadest towards the head, which is of a chestnut brown color. The perfect beetle is also of a chestnut brown, having two longitudinal white stripes on the wing cases. The egg is deposited on the bark near the root in June and July. The larva feeds on the wood, and remains in the larva state two or three years; when young it feeds under the bark, forming and enlarging the cell it makes there, where it continues for some months; it then attacks the heart-wood.

Trees infested by these insects should be examined about September, and if a dark-colored spot is found, varying from the size of a five-cent piece to a dollar, it is probable that a grub will be discovered; it can easily be dug out with a sharp-pointed knife, as it lies directly under the bark; but if the worm has penetrated deeply into the wood, other remedies have been suggested, such as probing the hole with a slender sharp-pointed wire or whalebone, thrusting it in until it pierces the worm, and when, if withdrawn, the end of it is found to be wet, it is highly probable that the borer is pierced and will perish. Plugging the hole with camphor and cotton or sponge pellets saturated with camphor, benzine, turpentine, and other strong-smelling substances, then stopping up the mouth of the hole with putty or yellow soap, has been recommended; also throwing boiling water into the holes by means of a syringe. It is best, however, to seize time by the forelock, and prevent the eggs from being deposited at all; to do so, the trunks of the trees should be first scraped, if the bark is rough, early in June, when the insect lays its eggs, and then scrubbed or washed with one pound of whale-oil soap to one gallon of water; (soft or common hard soap will do if whale-oil soap is not to be procured.) This should be done particularly near the base of the tree, and repeated whenever washed off by rains. Bandaging the trunk two or three inches below the earth and several inches above ground with coarse muslin, thick paper, paper tarred, or tin foil on the outside, are said to be very useful in keeping the female from depositing her eggs. The Cultivator of 1863 recommends heading down the tree low enough to shade the trunk; softsoaping the trunk is also advised.

The locust trees are very much injured by a borer which is also the larva or grub of a long-horned beetle. The perfect beetle of the locust borer is of a medium size, and of a velvety black color, with transverse yellow bands, one of the yellow bands forming a W on the wing cases. The eggs are deposited seven or eight in clusters in crevices of the bark. The larvæ burrow into the bark, and at first devour the soft inner substance; they afterwards bore into the sap-wood. These beautiful beetles may be found running up and down the trunks of locusts, or feeding on the blossoms of golden rod and other plants. Dr. Harris recommends "the trees to be whitewashed or covered with a grafting composition to prevent the female from depositing her eggs;" but this being almost impossible to any extent, he also says that "young trees attacked should be headed down to destroy the grubs in them, and the perfect beetles should be sought for, gathered, and killed." Putting sulphur or calomel in an auger hole bored in the trunk has no effect at all on the insects. Woodpeckers and other birds, in this case and for other wood-boring larvæ, are the best remedies we can recommend; and we have frequently observed that where the indiscriminate shooting of small birds is permitted—nay, even sometimes encouraged—the locust trees bear full testimony to the fact in their jagged, broken, and miserable appearance.

There is also another long-horned beetle, about half an inch in length, called the oak pruner, which cuts off the branches of oak and sometimes of fruit trees. The egg is deposited in June and July on the twig; the larvæ feed on the wood in the interior of the branch, and finally gnaw the wood away transversely from within, leaving only a strip of bark untouched; the branches thus cut off fall to the ground in autumn, carrying the grubs with them, where, protected by the moisture of the ground and dead leaves, they pass the winter. In spring the pupæ are formed, and the perfect insects appear in June and July. To destroy this insect it is merely requisite to collect all the fallen branches in the autumn and burn them, when the insects within must necessarily perish in the flames.

When in Iowa some years ago we found a long-horned beetle, called the *Prickly Leptostylus,* to be very destructive under the bark of apple trees. The beetle is rather more than the third of an inch in length; the larvæ feed under the bark; the pupæ are formed in oval nests of woody fibres, also under the bark; and the perfect insect comes out in July and August. The remedy recommended is to examine the discolored places in the bark and cut out the larvæ; perhaps softsoaping the tree would prevent the female depositing her eggs, as advised for the real apple borer. The larvæ of several long-horned beetles are very destructive to the wood of oak, maple, pine, fir, hemlock, and other trees; but these we shall pass over, as the remedies already mentioned will also do for them. There is one, however, that must receive a short notice as injuring the stems of raspberries and blackberries. This is the *Oberea tripunctata,* of Melsheimer's catalogue. An egg being deposited singly in August on the stem near a leaf or small twig, the larva when hatched burrows in the pith and causes the stem to wither and die. To eradicate this insect all stems affected should be immediately cut down and burned.

The small leaf-eating beetles constitute another family, many of them being very injurious to the horticulturist. Their larvæ generally have well-developed legs, and live upon leaves of plants and trees. The beetles are of a short, compressed form, of a small size, and mostly of clear bright colors. The three-lined leaf beetle found on the potato, the striped cucumber beetle, the steel-blue grape-vine beetle, and the minute flea beetle, belong to this family. The three-lined potato-leaf beetle deposits its eggs in clusters of six to eight in June on the leaves of potatoes; the larvæ are filthy looking yellowish grubs, generally covered on the back with slimy fæces or dirt. The pupa is formed under the earth, and the perfect insects appear in July and August to lay the eggs for a second generation, the pupæ of which remain in the earth all winter.

The beetle is about a quarter of an inch in length, of a rusty buff or orange color, with three black stripes on the wing covers. Harris recommends "brushing them from the leaves into shallow vessels containing salt and water or vinegar." Lime and ashes strewed over the plants are said to destroy the larvæ.

The striped cucumber beetle is smaller than the potato beetle, and is of a light yellow color, with three black stripes on the wing covers. Their larvæ probably feed in the ground, and it is the perfect beetle that injures and feeds upon the leaves. There are two flea beetles that are very injurious to young plants especially, eating innumerable holes in the tender first leaves, often killing the plants. One is of a black color, and the other is marked with two wavy stripes of yellow on the wing covers. In regard to a similar insect in England, very destructive to turnips, Curtis says that the females lay two hundred and fifty to three hundred eggs; the larvæ also feed upon the leaf; the pupæ remain in the ground all winter, and the perfect insects or beetles fly by scent against the wind. As the same remedies will apply to the striped cucumber beetle and both the flea beetles, we will proceed to enumerate them. Dr. Harris mentions sprinkling the vines with a mixture of tobacco and red pepper, soot, plaster, lime, plaster and superphosphate or guano, charcoal dust, Scotch snuff, wood or coal ashes; nay, even common dry road dust has been recommended to be sprinkled over the plants when wet; also watering the plants with a solution of one ounce Glauber salts to one quart of water, tobacco-water, soapsuds of common and whale-oil soap, an infusion of elder, walnut leaves or hops, tansy or wormwood tea, aloes and water, lime-water, or a strong infusion of quassia bark, sprinkled over the plants with a watering-pot, will, it is said, render the leaves so nauseous as to prevent the insects attacking them. When the plants are placed singly in hills, like cucumbers, "pieces of paper or cloth saturated with kerosene oil," or "sticks of wood, the upper parts of which have been smeared with coal tar or oil, set in the ground near and around the plant," are said to repel insects.

Where many cucumbers are raised, it is also the practice to sow plenty of seed at first, and then at four or five successive periods planting more seed close to those first planted, so as to supply the insects with abundance of young food to feed upon, when the stronger growing plants remain untouched. But the best plan appears to be to protect the young hills with small boxes one foot square and six or eight inches high, without bottoms, and with the top covered with gauze or millinet, until the plants are large enough to need no protection. Loose cotton batting pegged over the young plants is said to protect them in a similar manner. Harris recommends sweeping with a bag-net. This might be improved by forming the net somewhat like a fyke or fishing-net, having the first (strong cotton or linen) bag fixed to a hoop somewhat shallow and funnel-shaped, ending in a tubular case made of tin, having a hole in which a cork can be placed, and a second bag, much longer, affixed to the same hoop, also ending in a small hole with a similar short tin tube, closed also with a cork. When in use the inner cork is taken out, the net or bag is swept or brushed over the plants, and all the insects caught must necessarily pass into the second bag through the hole, which may then be stopped with the cork. When full the bottom cork can be taken out, and the enclosed insects shaken into hot water without the danger of losing the most of them, which we have frequently experienced when sweeping with a single long sweep-net or bag. It is true that when used over grass the large bag would be partially filled with grass seeds, but none of the insects captured would be able to escape. Burning the land over in the fall is also recommended when the insects are very numerous in cucumber fields. Hens and chickens destroy a great number. Toads also eat them, and we found at least twenty striped cucumber beetles in the stomach of one phœbe bird shot some time ago.

In regard to an insect similar to our flea beetle in England attacking the turnip, Curtis says, "that the rapid growth of the plant is the best remedy; sowing plenty of seed is requisite; that burning is beneficial; lime and soot are doubtful, but probably good in wet weather; watering with weak brine is beneficial." He also advises the use of a bag-net, and says "that the sowing of quicklime, coal ashes, and soot has been attended with various success, generally with beneficial results. Brushing the fields with elder is sometimes useful."

The larvæ and perfect insects of the steel-blue grape-vine beetle are sometimes very injurious to the grape. They also attack the plum, elm, and other trees. Harris says "the careful and systematic use of lime will obviate in a great degree the danger which has been experienced from this insect;" also, that lime, if dusted over the plants when wet, (others say when dry,) or watering them with an alkaline solution of one pound of hard soap to ten gallons of soapsuds, is beneficial. Köllar says an infusion of the tea of wormwood or a decoction of walnut leaves (perhaps strong quassia tea might answer) will prevent the beetles from touching the leaves. Others advise the use of the sweep bag-net, already mentioned, or syringing the plants with whale-oil soap and water.

A beetle very destructive to asparagus has made its appearance on Long island, and, if not checked, will ultimately spread over the country. A similar insect is found in Europe. Köllar recommends hand-picking; and it has been stated that a hen and chickens will exterminate them if placed in a coop near the beds. The larvæ of the elm-tree beetle destroy the foliage of the elm, more especially of the European. The eggs are deposited in clusters under the leaf in May and June; the larvæ or grubs eat the soft inner substance of the foliage, causing it to assume a scorched appearance, as if the tree had been subjected to fire; these larvæ then descend by the trunk and form pupæ on the ground near the trunk. The perfect beetle appears in July, and lays eggs for a second brood, to destroy a second crop of foliage. A correspondent of the American Agriculturist for 1863 states that an English elm tree that had holes bored in the trunk, and the holes then filled with powdered corrosive sublimate, and plugged with wax, was untouched by the beetle for six or seven years; but the editor is sceptical as to the benefit, and we ourselves very much doubt the utility of any such remedy. In Washington, D. C., tobacco-water has been used to syringe the trees, (some say with good effect;) but it does not appear to save them, as many trees have been cut down on account of this insect. We have observed, however, that when the larvæ of the first crop descend, they almost invariably come down by the trunk, and in a day or two change into motionless, yellowish pupæ on the ground, very near the trunk of the tree, where they remain for several days in a quiet and helpless condition. This is the time to attack them, when they lie in heaps like grains of wheat within a circumference of three or four feet immediately surrounding the main body of the tree; handfuls of them may be picked up near the root of any large infested elm. A tight enclosure of boards, about one foot in height, with tar on the top of it to prevent the larvæ from crawling out, might be put around the trees, say one or two feet from the trunk, the ground well consolidated within this enclosure, and every morning during the season of their metamorphosis thousands of motionless pupæ might be destroyed by lime, hot water, or other similar means. It is of no use, however, to do this to a single tree if there are other infested elms near, as the perfect beetles are able to fly to a considerable distance.

A leaf-eating beetle, commonly known by the name of the ten-striped spearman, has done considerable damage to the foliage of the potato in Iowa and other parts of the west. Mr. B. D. Walsh states that the female deposits her eggs early in the summer; their larvæ feed voraciously for several weeks on the green leaves. The pupa is formed under ground; two broods appear in one season. He advises farmers to syringe the infested plants with tobacco boiled in strong lye, or some other offensive mixture; perhaps a strong decoction of quassia wood would answer. We have found a similar insect on the common horse nettle in Georgia.

We now come to the family of ladybirds, or bugs, as they are incorrectly termed. All these (save one species) may be considered highly beneficial to the agriculturist in both the larva and pupa state, as they destroy myriads of plant and bark lice, and other insects, which, if left unchecked by this and other predatory insects, would multiply so fast as to destroy almost all vegetation. We have seen one species, *(Chilocorus bivulnerus,)* black, with two red spots on the wing cases, busily employed in the spring tearing open the cases of the bark lice on pines, and devouring the eggs deposited beneath them. Another species destroys the orange bark louse. We have even seen some of the ladybirds pierce the skin of newly changed chrysalides to feed upon their juices. There is one of this family, (the spotted squash beetle or bug,) however, the larva and pupa of which are very destructive to the foliage and flowers of squash, melon, and cucumber plants. The eggs are placed in irregular groups or clusters on the under side of the leaves. The yellow larvæ are covered with branching spines. The pupa is formed in the thorny skin of the larva. This injurious ladybird may be readily distinguished from the beneficial ladybird by its larger size, more yellow color, and by having seven roundish, black spots on each wing cover when closed, and four smaller spots upon the thorax or middle part of the body. Mr. Uhler recommends sweeping them from the plants with a net; and perhaps, if the same remedies were employed to make the leaves distasteful to the insects, as recommended for the striped cucumber beetle, they might be found to answer.

This part (No. 1) concludes an account of the remedies already proposed and practiced for the destruction of the coleopterous insects or beetles. As the whole subject would occupy too much space in the present volume, the other orders, viz., the grasshoppers, dragon flies, wasps and hornets, butterflies and moths, plant bugs, plant lice, and flies, will necessarily be deferred until the Report of 1864.

TOWNEND GLOVER.

Hon. ISAAC NEWTON,
Commissioner of Agriculture.

REPORT OF AGRICULTURAL STATISTICS.

AUGUST, 1864.

SIR: In laying before you my first annual report of the statistical division of the Department of Agriculture, it is proper that I should refer to the objects proposed to be accomplished by it. Aside from some of a minor and incidental nature, the principal are:

1. The collection of agricultural statistics showing the condition and amount of the crops at brief intervals, monthly or bi-monthly, as the interests of agriculture demand. The object of these statistics, and the plan adopted for their collection, are stated at length in the accompanying report.

2. The collection and arrangement of such statistical matter as exhibits the commerce, both foreign and domestic, in the leading agricultural products:

that, having the tables always at hand, and understanding from them the influence of this commerce on prices, the farmer may intelligently direct his labor to the culture of such crops as the statistics indicate will be most in demand.

3. The collection of information on all subjects connected with the advancement of agriculture. This information is obtained through circulars issued to correspondents, in which inquiries are made as to the condition and amount of the various crops, and also of the causes of success or failure. For want of space in the present volume, the following report embraces no topics of this character, but they are published in the bi-monthly reports, and will find a prominent place in the next annual report from this division.

4. In order to accomplish the foregoing objects it became indispensably necessary to publish a monthly report. This was done during the summer and fall of 1863, after which it was changed to bi-monthly, because returns of the circulars could not be had in time for a monthly.

Through these reports the condition and amount of the crops have been laid before the country quickly, that the grower of and the trader in agricultural products might base commerce on them by the law of supply and demand; and their influence has everywhere been acknowledged as beneficial to both, and not less so to the consumer. They have been distributed to correspondents, who reply to the circulars, and to their assistants; to agricultural societies; to members of Congress, and to all persons desiring them.

With these brief references to the leading objects sought to be accomplished by this division, I pass to as brief a statement of the general topics embraced in the following pages. They are:

1. A notice of the plan adopted for the collection of statistics of the annual products of the farm, as compared with those in use in England and Prussia.

2. The tables for each of the loyal States, exhibiting estimates made, in accordance with this plan, of the amount, acreage, price, and value of their chief crops, with a summary of the amount, acreage, and value of each crop; of the amount, acreage, and value of all; their increase and decrease, and the per cent. of these, for the years 1862 and 1863; also, a table of the amount of farm stock in January, 1864.

3. Tables of the exports of the principal agricultural products of these States, their prices at New York and in England; the receipts and shipments of them at the two principal centring points—Chicago and New York—and their prices at these cities.

LEWIS BOLLMAN, *Statistician.*

The COMMISSIONER OF AGRICULTURE.

PART I.—THE PLAN ADOPTED FOR THE ANNUAL COLLECTION OF THE YIELD OF THE CROPS AND THE AMOUNT OF FARM STOCK, BY THE AGRICULTURAL DEPARTMENT, WITH A NOTICE OF THAT IN USE IN ENGLAND AND PRUSSIA.

The commerce of the world is so dependent on agricultural productions, that to ascertain their annual amount has become an object of the greatest utility. No less dependent on them are manufactures, and all the industry employed therein. The textile material, as cotton, wool, and flax, is essential to the great clothing manufactories, and the animal, cereal, and vegetable food to sustain the health and strength of their operatives. A scarcity of these, or their abundance, affects the exchanges of the world. In view of this absolute dependence on agricultural production, the nations of the earth, especially those like England, which do not supply their own wants by their own agriculture, or like Prussia and the United States, which largely export agricultural products to the manufacturing nations, are forming plans to ascertain the yield of their annual harvests.

The modes adopted have several objects in view. One, as the decennial census of the United States, aims to ascertain the general progress of the nation and its direction. Another, as the fifth-year census of Massachusetts, has the same object in view, but to determine these at shorter intervals. A third mode is seen in the annual censuses of several of the States, as of Ohio, Iowa, Kansas, and California, which, to the objects already named, add the additional one of affecting the course of agricultural and manufacturing industry by pointing out wherein lies its excess or deficiency. A fourth one goes yet further, and endeavors to estimate the amount of the crops before they have passed from the hands of the producer, that he may reap the just reward of his toil—a price greater or less, as the annual production may be small or great. It seeks not only to show the general progress and direction of agricultural industry, but the *market values* of its productions.

1. *Great Britain.*—In this nation, where agriculture has attained such high perfection, no mode of ascertaining its product, established by law, exists. The farmers of England oppose it, whilst those of Scotland favor it. Attempts have been made in Parliament to establish one, but as yet unsuccessfully. Their only result has been to elicit the reasons of this hostility of the English farmers, which, so far as we have seen them, are refuted by experience here. But in the absence of a national mode, the Mark Lane Express has endeavored to supply the want of it by its own enterprise. We, therefore, refer to its plan as the English mode.

In its issue of February 8, 1864, we find its report of the cereal crops for 1863 of wheat, barley, oats, and potatoes, and in that of February 22 for the crops of beans, peas, turnips, and mangolds. To exhibit the plan adopted by the Express we take its introductory remarks, and its return of the first-named crops for the county or shire of Devon, and that of the last-named for the county of Bedford.

The Express says:

"According to our annual custom, we present in to-day's impression a tabular view of the results of the harvest of 1863, the substance of more than six hundred letters from all parts of England, and from the most respectable and reliable authorities. In another table will be found a condensed view of these results, bringing them into a few lines, and showing at one glance the most correct estimate of the actual produce of the country that can be obtained, so far as the principal articles of human food are concerned. The remaining crops will be treated of in a future number of the paper."

From this "condensed view" we take the returns for the counties of Devon and of Bedford, that the reader may clearly see their character. The names following the county are the places from which the returns are made:

An estimate of the yield of the crops of England for 1863.

County.	Wheat.	Barley.	Oats.	Potatoes.
DEVONSHIRE.				
Bampton	Three quarters per acre; this is over average, and quality good.	Four quarters per acre, two-thirds stained by the wet.	About an average, of good quality	Good crops, quality never better.
Barnstable	Four quarters per acre, the yield and quality good.	Four to six quarters per acre, weight 52 to 56 pounds, and bright.	An average, 36 to 40 pounds per bushel.	An average, and little diseased.
Bideford	An average, say from two to three quarters per acre.	Average, say four to five quarters per acre.	Four to six quarters per acre	An average, not much diseased.
Chumleigh	Twenty bushels per acre, of good quality.	An average crop	An average	Over average, early sorts half diseased.
Coombe	Two and a half quarters per acre	Three quarters per acre	Four quarters per acre	Fair crop, half diseased.
Crediton	Full one quarter above average, and very good crop.	Over average, and good quality	Five to six quarters per acre	Good crop, one-third diseased.
Hollacombe	Two and a quarter quarters per acre, or an average.	Three quarters per acre, or under average.	Three and a half quarters per acre, or under average.	Best crop for eighteen years.
Holsworthy	Average crop, in some places damaged by the weather.		Very light crop, straw spoiled with wet.	Good crop.
Honiton	Considerably over an average	Over an average.	Over an average	Best crop for many years.
Lamerton	Over average, (say twenty bushels per acre,) very good quality.	Over average, thirty-five bushels per acre, quality good.	Yield and quality good, straw deficient.	Better than for many years.
Ottery St. Mary	Considerably over the average, or three quarters per acre.	Over average, or five quarters per acre.	About an average	Over average, but half diseased.
Plymouth	Good in quantity, condition damp, quality weak.	Quantity good, quality inferior	Good in quantity and quality	Quantity and quality good.
Plymouth	Above average, damaged by the wet harvest.	Quantity an average, quality bad	Above average, but soft quality from wet.	Good crop, disease as usual.
South Molton	A good crop	Good crop	On the whole pretty good	Generally good, but turn bad in pits.
Tavistock	About three quarters per acre, or over average.	About four quarters per acre, badly harvested.	About six quarters per acre	Large crop, of good quality.
Tiverton	One quarter, above an average per acre.	Five bushels per acre, above average	A good average crop	Good crops, much diseased.
Torrington	Considerably above an average, and well harvested.	Early crops well saved, the remainder damaged.	An average, but variable in quality	Quantity and quality good.
Ugborough	Two and a half to four and a half quarters per acre, or over average.	Above average, but much unfit for malt.	Above average, and of excellent quality.	

An estimate of the yield of the crops of England for 1863.

County.	Beans.	Peas.	Turnips.	Mangolds.
BEDFORD.				
Bedford	About an average, although hardly so.	Where grown a full average	Many very bad, few good, much less than an average.	Some early sown good, but many a total failure.
Biddenham	Under an average	Under an average	Considerably under average	Considerably under average.
Biggleswade	Four quarters per acre		Under an average	Much under average.
Bletsoe	Not so good as last year	Very good crops.	Not above half a crop	Very bad.
Carlton	Under an average	An average	Under average	Under average.
Everton	Not an average	An average	Good crops	Inferior crop.
Harrold	Under an average		Under an average	Nearly a failure.
Keysoe	Under an average	An average	Very much under an average	Not half a crop.
Luton	An average	An average	Under average	Very bad.
Milton Bryan	Four and a half quarters per acre	Four quarters per acre	Very bad	Very good.
Sandy	A very good crop		Early Swedes diseased, late sown a good average.	Very light crops.
Shefford	About five loads per acre	From seven to eight loads per acre	From ten to twelve tons per acre	Sixteen to twenty tons per acre.
Silsoe	Very good, over an average		Very bad in general, especially the Swedes.	Not so good as usual.
Toddington	An average	An average	Under average	Under average.
Wilden	One quarter, over an average	An average	Very poor crop	Plant missed, mostly ploughed up.
Woburn	An average, quality good, not very well podded.	Where grown a heavy crop	Very bad crop, but much improved since harvest.	On light soils a crop, heavy land a failure.

The plan as seen in these extracts has great objections. After reading all the returns, who can tell their result? They convey an impression that the crops are good, but how much above or below a standard, or a normal, or an average crop, no one can tell. They are too prolix, although as much condensed as the plan will allow. For the forty counties of England they would require thirty-two pages of the size of those of this report. For the United States they would demand a large volume, which would be read by not more than one person in a half million of our population. Nor does this plan institute a comparison with the crop of any preceding year. These objections do not obtain to the plans adopted in the United States or Prussia.

2. *Prussia.*—This nation has a department of agriculture, presided over by a secretary. In its operations agricultural societies act as an aid to the department. They meet together and make up an annual report of the crops. We have no knowledge of the means adopted by them to collect the information they embody in their report, but the following quotations from their report for 1862 will show the plan adopted. Their estimates, it will be seen, are comparative, and the standard of comparison is one hundred, representing an imaginary normal crop. As no census has ever been taken there of the number of bushels produced in any one year, the comparison must always be with this imaginary standard; nor can their returns be reduced to bushels, as they are here, for want of a basis which such census would furnish. The report is given for "governmental districts," which are nine in number, and the returns from which it is compiled are four hundred and twenty-nine.

The *first* table exhibits the amount of the crops for the province of Prussia, with remarks on the quality, &c.

The *second*, the summary for all the provinces.

The *third*, the average yield for ten years of the provinces.

THE HARVEST IN THE SEVERAL PROVINCES OF PRUSSIA.

1st *Province of Prussia; from* 81 *Reports.*

	Governmental districts.	Grains.						Vegetables.					Straw.					
		Wheat.	Rye.	Barley.	Oats.	Peas.	Buckwheat.	Potatoes.	Rape.	Sugar beet.	Other kinds of turnip and kale.	Lupine.	Wheat.	Rye.	Barley.	Oats.	Peas.	Buckwheat.
1	Kingsberg	0.79	0.92	1.12	1.17	1.14	0.59	0.63	0.87	0.70	0.86	1.01	0.97	0.90	1.14	1.19	1.23	0.60
2	Gumbinen	0.67	0.94	1.13	1.18	0.91	....	0.53	0.96	1.00	0.93	0.90	0.93	0.96	1.14	1.18	1.05	....
3	Marienwerdert	1.02	1.01	1.02	1.02	1.23	0.77	0.97	0.75	0.80	0.72	1.02	1.02	1.04	0.97	0.98	1.26	0.81
4	Dantzig	0.83	1.01	1.06	1.07	1.21	0.70	0.89	0.79	1.0[illegible]	0.71	0.94	0.97	1.01	1.04	1.07	1.22	0.68
	Average	0.83	0.97	1.08	1.11	1.12	0.69	0.76	0.84	0.88	0.81	0.97	0.97	0.98	1.07	1.10	1.19	0.70

Remarks on the crops of the neighborhood of Kingsberg.

Average weight: Of wheat, 82 pounds; of rye, 79 pounds; of barley, 68 pounds; of oats, 52 pounds; of peas, 85 pounds; of buckwheat, 57 pounds; of potatoes, 96 pounds; of rape, 71 pounds per scheffel. (1½ bushel.) Hay of both cuttings, 0.92; first cut of a bad quality in many places; second cut of very good quality. Other field crops, 0.98; flax, 1.02; wool crop, 0.99.

Wheat suffered much from rust; turnips from maggots. Potatoes showed the well-known disease of the vine, their development being therefore checked in many places, and suffering at the same time from maggots; beans suffered from mildew.

SUMMARY.

Returns of crops in the several provinces.

Province.	Grains.						Vegetables.					Straw.					
	Wheat.	Rye.	Barley.	Oats.	Peas.	Buckwheat.	Potatoes.	Rape.	Sugar beet.	Other kinds of turnip and kale.	Lupine.	Wheat.	Rye.	Barley.	Oats.	Peas.	Buckwheat.
Prussia	0.83	0.97	1.08	1.00	1.12	0.69	0.76	0.84	0.88	0.81	0.97	0.97	0.98	1.07	1.00	1.19	0.70
Posen	0.88	0.89	0.89	1.02	1.00	0.72	0.89	0.69	0.62	0.68	1.06	0.82	0.87	0.85	0.98	1.02	0.70
Pommern	0.82	0.82	1.01	1.14	1.05	0.39	0.78	0.88	0.81	0.86	1.03	0.80	0.82	1.02	1.14	1.10	0.57
Brandenburg	0.90	0.98	0.96	1.00	0.89	0.76	1.02	0.85	0.89	0.82	1.15	0.87	0.93	0.94	1.00	0.98	0.84
Silesia	0.97	0.97	0.94	1.02	0.93	0.79	0.99	0.70	0.78	0.80	1.06	0.98	1.02	0.93	1.05	0.96	0.83
Saxony	0.96	0.93	0.95	1.07	0.99	0.90	0.74	0.67	0.92	0.96	1.15	0.92	0.93	0.96	1.08	1.06	0.98
Westphalia	0.87	0.78	0.99	1.13	0.95	0.83	0.76	0.74	0.76	0.82	0.86	0.87	0.86	0.98	1.12	0.97	0.86
Rhenish province	0.91	0.73	0.95	1.10	1.03	0.81	0.71	0.69	0.90	0.89	1.07	0.92	0.83	0.94	1.09	1.02	0.84
Hohenzollern	....	0.83	1.04	0.97	0.97	....	0.80	0.95	1.01	1.00	....	....	0.79	0.95	1.91	0.97	....
Average	0.89	0.88	0.98	1.05	0.99	0.74	0.83	0.78	0.84	0.85	1.04	0.89	0.89	0.96	1.05	1.03	0.79

Average yield of the harvest of all provinces during the last ten years.

Year.	Wheat.	Rye.	Barley.	Oats.	Peas.	Potatoes.	Rape.	Sugar beet.	Lupine.
1853	0.85	0.84	0.88	0.91	0.70	0.57	......	......	......
1854	0.99	0.98	0.99	1.04	0.92	0.56	......	......	......
1855	0.61	0.66	0.95	0.98	0.67	0.61	......	......	......
1856	0.94	1.00	1.00	1.04	1.05	0.82	......	......	......
1857	1.02	1.01	0.73	0.61	0.44	0.95	......	......	......
1858	0.73	0.83	0.65	0.62	0.37	0.90	......	......	......
1859	0.89	0.77	0.70	0.83	0.72	0.81	......	......	......
1860	0.97	0.99	0.92	1.05	0.89	0.58	0.93	0.95	......
1861	0.95	0.80	0.93	0.99	0.86	0.66	0.74	0.87	0.78
1862	0.89	0.88	0.98	1.09	0.99	0.83	0.78	0.84	1.04
Average of 10 years	0.88	0.88	0.87	0.92	0.76	0.73	......	......	......

These tables are named the harvest returns. In Prussia the grain is not threshed until during the winter. In the United States it is mostly threshed in the months of August and September, that the wheat may be hauled to the grain depots at railroads before the roads become bad in winter, and that the straw, which is stacked in the fields or in the barnyards, may be eaten by the stock during winter.

In April circulars are issued to four hundred and thirty local agricultural societies, which select the most intelligent farmers to answer them. The yield per acre, as tested by the threshing, is returned, and these returns are called the "Threshing Returns." They are sent to the local societies, and by the presidents of these returned to the Royal Board of Agriculture, where they are revised and compared, and the results published. In the published report the number of bushels of each crop is stated.

This plan is an admirable one. It represents the least change in the crop by having one hundred to indicate the standard of comparison, for a difference of

$\frac{1}{100}$ may be noted. The returns give definite ideas, and are capable of a condensation that fits them for a territory of the largest extent. The machinery through which it acts is excellent, and the final examinations and reports are made by the secretary general of the Royal Board of Agriculture, who is a privy councillor.

3. *United States.*—Before stating the plan pursued in this department, it is proper to allude to the causes which called it into existence.

The vast agriculture of the United States, and the remoteness of the regions of great production from the places of consumption, require several sales to be made between the producer and consumer. The meats and large quantities of breadstuffs are sold in the months of November and December.

The banks, to meet the great demands upon them for the purchase of so large products in so short a time, reduce their discounts largely in the fall, and thus the opening of the fall markets is in a greatly lessened amount of paper circulation. The scarcity of money, the abundance of the crops, with other well arranged alarms about the prospect of a European demand, led to a depression of prices, which generally was not well got over before the crops had passed from the control of the producer.

Against this injustice intelligent farmers would remonstrate; but what availed their scattered and unconcerted efforts against the influences they encountered? But with the successful formation of county and State agricultural associations, the means of more concerted action were at hand.

The following circular, addressed to other State agricultural societies by the president of the Maryland State Agricultural Society, shows the nature and the purpose of the first effort to collect, speedily, returns of the annual crops:

"CENTREVILLE, QUEEN ANNE COUNTY, MD., *July* 16, 1855.

"DEAR SIR: For the promotion of the farming interest of the country we are anxious to procure the earliest reliable information possible of the crops, that the same may be laid before the farmer to guide him in the selection of the best time to dispose of the fruits of his labors. This duty should properly be imposed upon an agricultural department of the general government; but in the absence of such provision, and in view of the artful practices of speculators and others, operating most disastrously through the base venality of the public press, upon this leading interest, the obligation is devolved upon us.

"The question arises, how shall we best discharge it? Shall we rest content, as heretofore, to do nothing; to sit with our hands before us without an effort to secure that information which by concert of action is entirely within our reach; to see our brother farmers robbed of twenty to thirty per cent. of the labors of their hands, by the superior information and cunning of the astute purchaser, merely from an indisposition on our part to make that exertion necessary to secure the important end we should earnestly labor to accomplish? The answer is but too plain, and pronounces such a course to be altogether unworthy of sensible men. Let this charge, then, of inefficiency, of want of energy to secure our own interest, no longer rest upon us; but if we have not already, let us at once so organize the societies of our respective States as to make them efficient in procuring this information so all-important to the farmers.

"Let us have gentlemen of intelligence and reliable judgment in each county of our respective States, connected not only by position as officers, but by interest, too, with our State societies, that we may have a right to call on statedly for information touching the crops of their different localities. They can be directed to forward their reports to some selected officer, whose duty it should be to collate them and disseminate the information thus deduced through the public press, and by circulars transmitted to each of the State agricultural societies of the Union.

"We will invite your attention to the organization of our Maryland Agricultural Society as well adapted to promote the object contemplated, and for your information ask your perusal of a circular, which we herewith enclose, and which we had the honor of addressing to our sister societies at the time of its date.

"We hope to be able to lay before you a statement of the wheat, grass, and oat crops of Maryland by the 1st of September, and of the corn crop by the 1st or middle of November.

"Earnestly soliciting your co-operation in this important matter,

"I have the honor to be your obedient servant,

"JAMES T. EARLE,

"*President of Maryland State Agricultural Society.*

"To ——— ———,

"*President of* ——— *State Agricultural Society.*"

Mr. Earle, at the same time, issued a circular to individuals and county societies, asking them to report, by the tenth of October following, the state of the crops, whether above or below an average, and the causes that have beneficially or prejudicially affected the crops.

These efforts assumed a more definite form in the plan adopted by the editor of the *American Agriculturist,* Orange Judd. In 1862 he issued a circular to his subscribers and others, containing five sets of inquiries, one for each of the months from May to September, and all alike. The following is a copy of the circular issued by him; the explanations which were a part of it we omit.

REPORT, JUNE 10, 1862.

State of ————, *county of* ————, *township of* ————, *by* ————, *(at* ———— *P. O.)*

Weather for one month past, as compared with average for five years past.	WINTER WHEAT.			SPRING WHEAT.			CORN.			RYE.		OATS.		MEADOW.		POTATOES.		FRUIT.		Add any other crop largely grown in your section.	
	Amount of surface sown, as compared with 1861.	Amount of surface sown, as compared with average for five years.	Appearance or prospects at this date.	Amount of surface sown, as compared with 1861.	Amount of surface sown, as compared with average for five years.	Appearance or prospects at this date.	Amount of surface planted, as compared with 1861.	Amount of surface planted, as compared with average for five years.	Appearance or prospects at this date.	Amount of surface sown, as compared with average for five years.	Appearance or prospects at this date.	Amount of surface sown, as compared with average for five years.	Appearance or prospects at this date.	Amount of surface, as compared with average for five years past.	Appearance or prospects at this date.	Amount of surface planted, as compared with average for five years.	Appearance or prospects at this date.	Prospects at this date.		Amount growing, as compared with average for five years past.	Prospects at this date.
																		Apples.	Peaches.		
A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	R	S	T	U	V	W	X

In the omitted explanations the number 10 is made to represent an average crop, instead of 100 in the Prussian plan. This is better adapted to the climate and magnitude of the crops of the United States, for its fraction of *one-tenth* approximates sufficiently near to represent the actual production of a county. In preparing tables for each State from the county returns it has been found necessary to retain fractions of tenths when the number of farm stock or of bushels of grain have to be calculated from the compiled returns in tenths for each State.

But the details of the plan of Mr. Judd are defective in this—that they ask the correspondents to give annual averages for five years, when they have no basis on which to make them. This should be the work of the central agency, which should have all the statistics necessary to make the proper deductions. They are defective, too, in asking the same questions for each month. This department has felt the necessity of asking many questions suggested by the returns of the preceding month. But we presume that to economize the expenses in printing, postage, and labor in compiling the returns, was the cause of having the questions for each month alike. To Mr. Judd belongs the credit of giving definite shape to a plan for the annual collection of the statistics of the crops, by which their amount could be approximated to sufficiently near for all practical purposes. His plan is virtually the same as the Prussian, and it is the one adopted by this department. The details, however, have been much changed by it, and made applicable to almost every matter belonging to agricultural production.

4. *The means used in the practical operations of the plan.*—It is proper that these should be noticed, for we believe that before long this plan will be adopted in all commercial nations.

Every month during the summer, and bi-monthly during the winter, the department issued circulars to its correspondents. These are persons recommended by members of Congress and others. The first trial showed that they could not give reliable statements as to the number of bushels or pounds of any product, but very useful information whether the crop inquired about was a tenth or more greater or less than the preceding crop. Such information, whilst it is not to be implicitly relied upon, is, nevertheless, a most important element in calculating the bushels or pounds of a crop.

The number of such correspondents should not exceed *one* for an ordinary sized county of 400 square miles, or twenty miles square, and about five assistants. They are not paid any compensation, except in copies of the Annual and Monthly Reports and seeds, and they ought to receive a copy of the abridged census reports, and of the unabridged, so far as relates to agriculture, for the purpose of aiding them in the discharge of their duties.

On a day named in the circular their returns are sent to the department by the mail, and as fast as received they are entered on rolls for each State, and when all are entered, the returns are added up and the product divided by the number of counties returned for each crop. This gives the general average for each State in *tenths* and *fractions of a tenth.*

The next step is to calculate from these averages the product of a crop in bushels or pounds, because these best exhibit the increase or deficiency. Herein, at this time, lies the chief difficulty of the practical workings of the plan.

For want of the census returns showing the product of the *counties*, the correspondents have nothing upon which to base their estimate of present crops. Had this department been in existence in 1861, and had placed before it the returns for the counties, it could have made up *county* estimates from year to year since 1860, based on the estimates for each preceding year and the returns of the correspondents for the succeeding one. The publication of these would have aided the correspondents in their judgment. Since 1860 the effect of the civil war has completely revolutionized agriculture. With these two difficulties, (the first of which should not have occurred, and the last will cease with the restoration of peace,) the labor of estimating the amount of the crops in bushels and pounds is very great. It involves an examination of the general progress of the agriculture of each State for a series of years, which is shown chiefly by the census returns of 1840, 1850, and 1860. The *per cent.* increase must be ascertained of the progress made by each State in each crop, at different periods of this progress, also special causes acting on production, as railways, or other improvements in transportation, or on prices, as unusual commercial demand, or in change of products by the growth of manufactures. The duration, extent, and intensity of their action must be considered. At this time the points of government supplies must not be overlooked. How far each section of the country will be influenced by these causes must be judged of from a personal knowledge of the general agricultural condition of the country and of much of its local peculiarities. National and State censuses must be compared, and from every source of information must be derived the means of correcting the returns of correspondents, who, under the circumstances in which the country and they themselves are placed, cannot be regarded as always correct. In ordinary times none of these disarranging causes are at work, and hence, when once the plan is fairly in operation, the annually published estimates of the production of *counties* will sufficiently guide the judgment of correspondents, especially when greater experience shall have familiarized them with their duties. But with all these extraordinary difficulties to contend against, the returns of correspondents are far more reliable than most of those made by township and county assessors, who collect agricultural statistics for several of the States. The omissions of these assessors are so many, their indifference and carelessness so great, the reluctance of the people so general to render an account of their annual products, lest they may be subjected to taxes, that the collected returns present most unreliable results.

5. *The utility of these statistics.*—The statistics of the amount of the crops compiled in this manner have had their utility fully tested during the present year. That year was one of a most extraordinary character. To the disturbing causes from civil war were added the injuries to fall crops from frosts of unexampled destructiveness. The corn crop was lessened by them 135,548,018 bushels, and when this fact was made known through the monthly report of the department, an advance of twenty cents a bushel for corn was at once established. The decrease in the weight and number of hogs was shown in the report for October, which subsequent returns from the packing houses corroborated, and this statement exerted its legitimate influence on the market prices. The farmer received an advance that was justly due to him under the operation of the law of supply and demand. The large advance in the prices of the products of the hog is occasioned, not only by the difference in the values of gold and currency, but also by the decrease of hogs since the packing season, as shown in the report of March and April.

Most of the statements made of the amounts of the crops and of the farm stock have been tested by time and by commercial transactions, and they have been sustained in a most gratifying manner. In none of them has there been any material error. If, then, the plan of estimating these amounts has successfully stood the test in a time so extraordinary, it cannot fail when, with peace, our agricultural industry returns to its accustomed directions, and with ordinary seasons our usual abundant crops are realized.

6. Having stated the objects sought to be accomplished by estimates of the amount of the annual crops and of the farm stock, the plan of making such estimates, and the results so far accomplished by it, I proceed to embody, in the following tables, the amount of our crops for 1863, as thus ascertained, the average yield per acre, the number of acres under cultivation of each crop, the average value per bushel or pound, and the average total value of each crop for the States, individually and collectively.

PART II.—TABLES OF THE AMOUNTS, &C., OF THE PRODUCTS OF THE LOYAL STATES.

As the information derived from circulars addressed to the correspondents of the department is the chief element of these estimates, a copy of the questions in one of the circulars is here given, that their nature may be seen, and the character of the information more clearly understood. This table exhibits the average answers for each State.

TABLE No. 1.

Showing the average yield per acre of the crops of 1863, *and the average prices for them in the month of November*, 1863.

STATES.	Average yield of corn per acre in 1863.	Average price of corn per bushel in November.	Average yield of wheat per acre in 1863.	Average price of wheat per bushel in November.	Average yield of rye per acre in 1863.	Average price of rye per bushel in November.	Average yield of oats per acre in 1863.	Average price of oats per bushel in November.	Average yield of barley per acre in 1863.	Average price of barley per bushel in November.	Average yield of buckwheat per acre in 1863.	Average price of buckwheat per bushel in November.	Average yield of potatoes per acre in 1863.	Average price of potatoes per bushel in November.	Average yield of hay, in tons, per acre, in 1863.	Average price of hay per ton in November.	Average yield of tobacco leaf per acre in 1863.	Average price of tobacco leaf per pound in November.	Average yield per acre of flax straw per ton, and seed per bushel, in 1863.		Average price of flax straw per ton, and seed per bushel, in 1863.	
																			Tons.	*Bush.*	*Straw.*	*Seed.*
Maine	34	$1 17	12	$1 76	13	$1 20	26	$0 67	23	$1 08	27	$0 71	126	$0 45	¾	$15 27	......	......	......	......	......	......
New Hampshire	36	1 26	14	1 92	16	1 29	30	62½	23	1 08	20	1 19	121	46	1⅓	14 00	......	......	......	......	......	......
Vermont	39	1 16	12	1 58	15	1 17	35	64	27	1 07	24	69	97	50	1	8 59	......	......	......	......	......	......
Massachusetts	35	1 20⅓	14½	1 94	16	1 28½	26	80	22	1 06¾	18½	87	106	68	1⅛	17 58	1,446	......	......	......	......	......
Rhode Island	48	1 17	20	1 50	17	1 20	35	70	23	1 18	......	......	95	77	1¼	20 00	1,300	$0 25	......	......	......	......
Connecticut	33	1 20	15½	1 67	14	1 24	31	72	25	1 06	14	93	107	67	1¼	15 00	1,500	25	......	......	......	......
Delaware	25	1 00	18	1 60	10	1 00	20	70	20	1 20	10	1 00	75	80	1	25 00	......	......	......	......	......	......
New York	33	1 01	14	1 39½	15⅝	1 07½	28	70	21 1-5	1 18	16	73½	85	54	1¼	13 28	1,167	20	1½	9	$10 00	$2 33
New Jersey	34½	1 00	18	1 53	15	1 14	23⅜	73	22½	1 07½	16⅓	90½	75⅓	62	1⅛	19 00	1,550	18⅓	1½	10	15 25	2 33
Pennsylvania	33½	94	16	1 42⅓	13⅓	1 08	25⅛	69	22	1 21⅓	15	84	102	61¾	1	19 00	1,277	19⅜	1½	9	11 00	2 20
Maryland	23	91	11⅓	1 64½	12	1 08	15	63	......	......	21½	89	71	71	1¼	22 00	650	9⅓	1½	10	......	......
Kentucky	34	63½	13⅝	1 02	13	91	23⅜	65	28	1 25	25	57½	92½	72	1	18 25	975	14½	......	12	......	1 25
Ohio	30⅞	74	13¼	1 13	14	89	23⅜	58⅜	22½	1 15	11	87	72½	76	1	16 75	757	14 5-9	1	9	8 00	1 83
Michigan	28⅛	74	13	1 31	13	89	27	55	21⅛	1 09	10	97	96⅓	51	1¼	11 25	1,067	20½	2	10	12 50	3 00
Indiana	24½	68¼	14¼	1 06	16	93	24½	58	23	1 25	16	86	62	76	1¼	14 50	769	12	1½	8	5 00	1 67
Illinois	21	62½	12 1-5	1 05	16	74½	30	57	22	94⅛	11	71	70	74	1½	11 50	666	12¾	1	8	7 00	1 81
Missouri	32	52	16	1 02	17	64	27⅜	57	23	98⅜	14½	72½	103	59	1 3-5	14 00	750	11½	......	8	......	1 90
Wisconsin	27	64	14⅓	92	15¼	74½	34½	52	22	96¼	10	75⅓	97⅓	39⅝	1½	9 00	1,133	13	1	9	......	1 94
Minnesota	23⅛	65½	15	70½	18	60	27	63½	23⅜	73¾	14	84	103	44⅛	1½	6 00	......	12	......	12	......	......
Iowa	32	40	14	76	18	59	32⅓	39	24½	84½	16	93	91	41	1⅝	7 00	745	18½	1	9	5 00	1 15
Kansas	43	31	19	88	23	62⅛	35	38	27	85½	21	63	112	47	2	5 00	880	20	2	11	......	......
Nebraska Territory	32 3-5	37	20	58⅛	30	48⅓	33⅛	57	43	32 2-5	......	......	82½	82½	1⅛	4 62	......	......	......	......	......	......

TABLE NO. 2.—*Crops, &c., for* 1863.

From the foregoing table, and the estimated crop of last year, the following tables are compiled.

CALIFORNIA.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	478,169				
Wheat, bushels	11,664,203				
Rye, bushels	15,505				
Oats, bushels	1,057,592				
Barley, bushels	5,293,442				
Buckwheat, bushels	14,850				
Tobacco, pounds	34,850				
Hay, tons					
Potatoes, bushels	1,298,474				

CONNECTICUT.

Indian corn, bushels	2,059,835	33	62,419	$1 20	$2,471,802
Wheat, bushels	59,901	15	3,993	1 67	100,035
Rye, bushels	618,762	14	44,197	1 24	767,265
Oats, bushels	1,764,329	29	60,839	72	1,270,317
Barley, bushels	20,813	25	833	1 06	22,062
Buckwheat, bushels	300,629	14	21,473	93	279,585
Tobacco, pounds	7,500,166	1,250	6,000	25	1,875,041
Hay, tons	562,445	1¼	449,956	15 00	8,436,675
Potatoes, bushels	2,016,462	107	18,845	67	1,351,030
			668,555		16,573,812

DELAWARE.

Indian corn, bushels	3,892,337	25	155,693	$1 00	$3,892,337
Wheat, bushels	1,217,254	18	67,625	1 60	1,947,606
Rye, bushels	37,412	10	3,741	1 00	37,412
Oats, bushels	1,570,364	20	78,518	70	1,099,255
Barley, bushels	5,105	20	255	1 20	6,126
Buckwheat, bushels	18,399	10	1,840	1 00	18,399
Tobacco, pounds	15,618	300	52	18	2,811
Hay, tons	36,049	1	36,049	25 00	901,225
Potatoes, bushels	302,345	75	4,031	80	241,876
			343,804		8,147,053

TABLE No. 2—Continued.

INDIANA.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	54,602,273	24	2,275,095	$0 68	$37,129,545
Wheat, bushels	20,292,160	14	1,449,440	1 08	21,915,533
Rye, bushels	411,343	16	25,709	93	382,549
Oats, bushels	5,531,630	24	230,485	58	3,208,345
Barley, bushels	311,191	23	13,530	1 25	388,989
Buckwheat, bushels	183,898	16	11,494	86	155,152
Tobacco, pounds	10,416,314	769	13,545	12	1,249,958
Hay, tons	677,677	1¼	542,142	14 50	9,826,316
Potatoes, bushels	3,485,617	62	56,219	76	2,649,069
	....	....	4,617,659	....	76,905,456

ILLINOIS.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	83,013,681	22	3,773,349	$0 62	$51,479,442
Wheat, bushels	31,408,163	12	2,617,347	1 05	32,978,571
Rye, bushels	883,190	16	55,199	74	653,561
Oats, bushels	19,681,420	24	820,059	56	11,021,595
Barley, bushels	1,205,042	22	54,775	95	1,144,790
Buckwheat, bushels	258,802	11	23,527	71	183,749
Tobacco, pounds	20,397,537	666	30,627	12¾	2,600,686
Hay, tons	1,742,552	1½	1,161,707	11 50	20,039,348
Potatoes, bushels	5,155,523	70	73,650	74	3,815,087
	....	....	6,254,622	....	123,916,829

IOWA.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	34,538,276	27	1,279,194	$0 40	$13,815,310
Wheat, bushels	12,649,807	14	903,558	76	9,613,853
Rye, bushels	122,392	18	6,799	59	72,211
Oats, bushels	7,761,141	26	298,505	39	3,026,845
Barley, bushels	599,432	24	24,976	84	503,523
Buckwheat, bushels	155,914	16	9,745	93	145,000
Tobacco, pounds	300,402	745	403	18½	55,574
Hay, tons	594,099	1¾	339,485	7 00	4,158,693
Potatoes, bushels	2,880,549	91	31,,654	41	1,181,025
	....	....	2,894,319	....	32,571,834

KANSAS.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	8,518,251	41	193,597	$0 30	$2,555,475
Wheat, bushels	262,953	16	16,434	88	231,399
Rye, bushels	5,184	20	259	62	3,214
Oats, bushels	116,270	30	3,876	38	44,183
Barley, bushels	5,448	25	218	86	4,685
Buckwheat, bushels	27,966	21	1,332	63	17,619
Tobacco, pounds	26,881	880	30½	20	5,376
Hay, tons	76,218	2	38,109	5 00	381,090
Potatoes, bushels	425,952	102	4,176	47	200,197
	....	....	258,031	....	3,443,238

TABLE No. 2—Continued.

MICHIGAN.

Names of products.	Total bushels or pounds	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	10,633,097	28	379,753	$0 74	$7,868,492
Wheat, bushels	13,966,153	13	1,074,319	1 31	18,295,660
Rye, bushels	494,197	13	38,015	89	439,809
Oats, bushels	5,430,797	27	201,141	55	2,986,938
Barley, bushels	407,885	21	19,423	1 09	444,595
Buckwheat, bushels	630,457	10	63,046	97	611,544
Tobacco, pounds	207,061	966	214	20½	42,447
Hay, tons	908,290	1¼	726,632	11 25	10,218,262
Potatoes, bushels	4,738,260	96	49,357	51	2,416,513
	....	....	2,548,890	....	33,324,260

MAINE.

Names of products.	Total bushels or pounds	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	1,855,285	31	59,848	$1 17	$2,170,683
Wheat, bushels	215,734	12	17,978	1 76	379,692
Rye, bushels	165,951	13	12,765	1 20	199,141
Oats, bushels	3,364,581	25	134,583	67	2,254,269
Barley, bushels	1,002,636	23	43,593	1 08	1,082,847
Buckwheat, bushels	407,424	22	18,519	58	236,306
Tobacco, pounds	7,000	....	....	18	1,260
Hay, tons	1,170,859	¾	1,561,145	15 25	17,855,680
Potatoes, bushels	6,693,348	113	59,233	45	3,012,007
	....	....	1,907,664	....	27,191,885

MARYLAND.

Names of products.	Total bushels or pounds	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	14,444,922	23	628,040	$0 91	$13,144,879
Wheat, bushels	7,208,828	11	655,348	1 64	11,822,478
Rye, bushels	548,011	12	45,668	1 08	591,852
Oats, bushels	4,072,421	15	271,494	63	2,565,625
Barley, bushels	19,699	20	985	1 20	23,639
Buckwheat, bushels	218,405	21	10,400	89	194,380
Tobacco, pounds	48,721,415	650	74,956	10	4,872,141
Hay, tons	156,195	1¼	124,956	22 00	3,435,190
Potatoes, bushels	1,213,707	71	17,094	71	861,732
	....	....	1,828,941	....	37,511,916

MINNESOTA.

Names of products.	Total bushels or pounds	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	2,756,898	23	119,865	$0 61	$1,681,708
Wheat, bushels	2,634,975	14	188,213	70	1,844,483
Rye, bushels	179,791	18	9,988	60	107,875
Oats, bushels	2,053,848	27	76,068	64	1,314,463
Barley, bushels	156,412	24	6,517	80	125,130
Buckwheat, bushels	20,758	13	1,597	83	17,229
Tobacco, pounds	43,324	700	62	12	5,199
Hay, tons	329,943	1½	219,962	6 00	1,979,658
Potatoes, bushels	2,433,534	103	23,627	44	1,070,755
	....	....	645,899	....	24,343,078

TABLE No. 2—Continued.

MISSOURI.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	43,743,295	29	1,508,389	$0 52	$22,746,513
Wheat, bushels	2,853,621	16	178,351	1 02	2,910,693
Rye, bushels	219,947	17	12,938	64	140,766
Oats, bushels	2,128,522	25	85,141	57	1,213,258
Barley, bushels	171,377	23	7,451	98	167,950
Buckwheat, bushels	95,703	14	6,836	72	68,906
Tobacco, pounds	26,340,505	750	35,121	11½	3,029,158
Hay, tons	373,756	1¼	299,005	14 00	5,232,584
Potatoes, bushels	1,493,519	103	14,500	59	881,176
			2,147,732		36,391,004

MASSACHUSETTS.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	2,465,215	33	74,703	$1 20	$2,958,258
Wheat, bushels	129,765	14	9,269	1 94	251,744
Rye, bushels	388,085	16	24,255	1 29	500,630
Oats, bushels	1,327,585	26	51,061	80	1,062,068
Barley, bushels	151,752	22	6,898	1 04	157,822
Buckwheat, bushels	123,302	19	6,490	87	107,273
Tobacco, pounds	5,200,000	1,200	4,333	26½	1,378,000
Hay, tons	908,289	1⅓	681,367	17 58	15,967,720
Potatoes, bushels	2,881,711	106	27,186	68	1,959,563
			885,582		24,343,078

NEW HAMPSHIRE.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	1,835,113	30	61,170	$1 17	$2,146,482
Wheat, bushels	255,163	14	18,226	1 92	489,913
Rye, bushels	145,830	16	9,114	1 29	189,121
Oats, bushels	1,345,829	27	49,846	62	834,414
Barley, bushels	127,159	23	5,529	1 08	137,332
Buckwheat, bushels	98,995	20	4,950	1 19	118,804
Tobacco, pounds	7,000	800	9	25	1,750
Hay, tons	848,417	1	848,417	14 00	11,877,838
Potatoes, bushels	3,310,163	112	29,555	46	1,522,675
			1,026,816		17,318,329

NEW JERSEY.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	11,025,669	34	324,284	$1 00	$11,025,669
Wheat, bushels	1,808,128	16	113,008	1 53	2,766,436
Rye, bushels	1,499,497	15	99,966	1 14	1,709,427
Oats, bushels	4,902,263	24	204,261	73	3,579,052
Barley, bushels	29,098	22	1,323	1 07	31,135
Buckwheat, bushels	947,577	16	59,224	90	852,819
Tobacco, pounds	194,330	12 00	162	18	34,979
Hay, tons	423,783	1½	282,522	19 00	8,051,877
Potatoes, bushels	4,693,151	75	62,576	62	2,909,754
			1,147,326		30,961,148

TABLE No. 2—Continued.

NEW YORK.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	24,073,257	33	729,492	$1 00	$24,073,257
Wheat, bushels	13,021,650	14	930,118	1 39	18,100,094
Rye, bushels	5,385,268	14	384,662	1 07	5,762,237
Oats, bushels	43,968,916	28	1,570,318	70	30,778,241
Barley, bushels	4,882,778	21	232,513	1 18	5,763,678
Buckwheat, bushels	5,378,675	16	336,167	73	3,926,433
Tobacco, pounds	10,088,017	1,167	8,644	20	2,017,603
Hay, tons	4,445,982	1¼	3,556,786	13 00	57,797,766
Potatoes, bushels	29,753,393	84	354,207	50	14.876,696
	....	....	8,102,907	....	163,095,805

OHIO.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	57,433,802	24	2,393,075	$0 74	$42,501,013
Wheat, bushels	28,742,963	13	2,210,997	1 13	32,479,548
Rye, bushels	863,232	14	61,659	88	759,644
Oats. bushels	12,024,028	24	501,001	58	6,973,936
Barley, bushels	1,399,086	22	63,594	1 15	1,608,949
Buckwheat, bushels	827,364	11	75,215	87	719,807
Tobacco, pounds	28,081,869	757	37,096	14½	4,071,871
Hay, tons	1,347,710	1	1,347,710	16 75	22,574,143
Potatoes	4,103,005	72	56,986	76	3,118,284
	....	....	6,749,333	....	114,807,195

PENNSYLVANIA.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	30,721,821	33	930,964	$0 94	$28,878,512
Wheat, bushels	15,654,255	14	1,118,161	1 42	22,229,042
Rye, bushels	6,843,427	13	526,417	1 08	7,390,901
Oats, bushels	34,233,936	25	1,369,357	69	23,622,416
Barley, bushels	573,174	22	26,053	1 21	693,541
Buckwheat, bushels	5,794,907	15	386,327	83	4,809,773
Tobacco, pounds	5,567,774	1,120	4,971	29	1,113,555
Hay, tons	1,571,794	1	1,571,794	19 00	29.864,086
Potatoes	14,609,335	97	150,612	62	9,057,788
	....	....	6,084,676	....	127,659,612

RHODE ISLAND.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	413,021	35	11,801	$1 17	$483,235
Wheat, bushels	1,413	16	88	1 50	2,119
Rye, bushels	33,911	17	1,995	1 20	40,693
Oats, bushels	203,192	28	7,257	70	142,234
Barley, bushels	46,117	23	2,005	1 18	54,418
Buckwheat, bushels	3,871	18	215	1 00	3,871
Tobacco, pounds	1,680	1,150	1½	25	420
Hay, tons	82,725	1¼	66,180	20 00	1,654,500
Potatoes, bushels	435,084	95	4,577	77	335,015
	....	....	94,119	....	2,716,505

TABLE No. 2—Continued.

VERMONT.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	1,743,522	33	52,834	$1 16	$2,022,486
Wheat, bushels	452,683	12	37,724	1 58	715,239
Rye, bushels	130,976	15	8,732	1 17	153,242
Oats, bushels	3,950,556	30	131,685	64	2,528,356
Barley, bushels	94,102	26	3,619	1 07	100,689
Buckwheat, bushels	233,906	24	9,746	61	142,683
Tobacco, pounds	40,000	800	50	20	8,000
Hay, tons	1,182,785	1	1,182,785	8 59	10,160,103
Potatoes, bushels	3,603,972	97	37,154	50	1,801,986
	....	....	1,464,329	....	17,632,784

WISCONSIN.

Names of products.	Total bushels or pounds.	Average yield per acre.	No. of acres to each crop.	Value per bus'l or pound.	Total value of crops.
Indian corn, bushels	8,069,642	27	298,876	$0 63	$5,083,874
Wheat, bushels	20,842,359	14	1,488,739	92	19,174,970
Rye, bushels	1,012,929	15	67,529	74	749,567
Oats, bushels	14,598,236	27	540,675	52	7,591,083
Barley, bushels	950,589	22	43,209	96	912,565
Buckwheat, bushels	59,170	10	5,917	76	44,969
Tobacco, pounds	153,189	1,033	148	13	19,915
Hay, tons	907,162	1½	604,775	9 00	8,164,458
Potatoes, bushels	4,356,568	97	44,913	39	1,699,062
	....	....	3,094,781	....	43,440,463

TABLE No. 3.

Summaries for each State showing the bushels, number of acres, and value of each crop.

States.	Indian corn.			Wheat.			Rye.		
	Bushels.	No. of acres.	Value of crop.	Bushels.	No. of acres.	Value of crop.	Bushels.	No. of acres.	Value of crop.
California	478, 169	....	....	11, 664, 203	....	....	15, 505	....	....
Connecticut	2, 059, 835	62, 419	$2, 471, 802	59, 901	3, 993	$100, 035	618, 762	44, 197	$767, 265
Delaware	3, 892, 337	155, 693	3, 892, 337	1, 217, 254	67, 625	1, 947, 606	37, 412	3, 741	37, 412
Illinois	83, 013, 681	3, 773, 349	51, 479, 442	31, 408, 163	2, 617, 347	32, 978, 571	883, 190	55, 199	653, 561
Indiana	54, 602, 273	2, 275, 095	37, 129, 545	20, 292, 160	1, 449, 440	21, 915, 533	411, 343	25, 709	382, 549
Iowa	31, 538, 276	1, 279, 194	13, 815, 310	12, 649, 807	903, 558	9, 613, 853	122, 392	6, 799	72, 211
Kansas	8, 518, 251	193, 597	2, 555, 475	262, 953	16, 434	231, 399	5, 184	259	3, 214
Kentucky	52, 835, 997	1, 553, 999	33, 550, 818	5, 516, 108	426, 624	5, 657, 030	791, 447	60, 890	720, 214
Maine	1, 855, 285	59, 848	2, 170, 683	215, 734	17, 978	379, 692	165, 951	12, 765	199, 141
Maryland	14, 441, 922	628, 040	13, 144, 879	7, 208, 828	655, 348	11, 822, 478	548, 011	45, 668	591, 852
Massachusetts	2, 465, 215	74, 703	2, 958, 258	129, 765	9, 269	251, 744	388, 085	24, 255	500, 630
Michigan	10, 633, 097	379, 753	7, 868, 492	13, 966, 153	1, 071, 319	18, 295, 660	494, 197	38, 015	439, 809
Minnesota	2, 756, 898	119, 865	1, 681, 708	2, 634, 975	188, 213	1, 841, 483	179, 791	9, 988	107, 875
Missouri	43, 743, 295	1, 508, 389	22, 746, 513	2, 853, 621	178, 351	2, 910, 693	219, 947	12, 938	110, 766
New Hampshire	1, 835, 113	61, 170	2, 146, 482	255, 163	18, 226	489, 913	145, 830	9, 114	189, 121
New York	21, 073, 257	729, 492	24, 073, 257	13, 021, 650	930, 118	18, 100, 094	5, 385, 268	384, 662	5, 762, 237
New Jersey	11, 025, 669	324, 284	11, 025, 669	1, 808, 128	113, 008	2, 766, 436	1, 499, 497	99, 966	1, 709, 427
Ohio	57, 433, 802	2, 393, 075	42, 501, 013	28, 742, 963	2, 210, 997	32, 479, 548	863, 232	61, 659	759, 644
Pennsylvania	30, 721, 821	930, 964	28, 878, 512	15, 654, 255	1, 118, 161	22, 229, 042	6, 843, 427	526, 417	7, 390, 901
Rhode Island	413, 021	11, 801	483, 235	1, 413	88	2, 119	33, 911	1, 995	40, 693
Vermont	1, 743, 522	52, 834	2, 022, 486	452, 683	37, 724	715, 239	130, 976	8, 732	153, 242
Wisconsin	8, 069, 642	298, 876	5, 083, 874	20, 842, 359	1, 488, 739	19, 174, 970	1, 012, 929	67, 529	749, 567
Total	451, 153, 378	16, 865, 440	311, 669, 790	190, 888, 239	13, 525, 560	203, 906, 138	20, 796, 287	1, 500, 497	21, 371, 331

TABLE No. 3—Continued.

STATES.	OATS.			BARLEY.			BUCKWHEAT.		
	Bushels.	No. of acres.	Value of crop.	Bushels.	No. of acres.	Value of crop.	Bushels.	No. of acres.	Value of crop.
California	1, 057, 592	....	....	5, 293, 442	....	....	14, 850	....	....
Connecticut	1, 764, 329	60, 839	$1, 270, 317	20, 813	833	$22, 062	300, 629	21, 473	$279, 585
Delaware	1, 570, 364	78, 518	1, 099, 255	5, 105	255	6, 126	18, 399	1, 840	18, 399
Illinois	19, 681, 420	820, 659	11, 021, 595	1, 205, 042	54, 775	1, 444, 791	258, 802	23, 527	183, 749
Indiana	5, 531, 630	230, 485	3, 208, 345	311, 191	13, 530	388, 989	183, 898	11, 494	155, 152
Iowa	7, 761, 141	298, 505	3, 026, 845	599, 432	24, 976	503, 523	155, 914	9, 745	145, 000
Kansas	116, 270	3, 876	44, 183	5, 448	218	4, 685	27, 966	1, 332	17, 619
Kentucky	3, 562, 772	154, 903	2, 315, 802	302, 014	10, 786	377, 518	14, 187	567	8, 087
Maine	3, 364, 581	134, 583	2, 254, 269	1, 002, 636	43, 593	1, 082, 847	407, 424	18, 519	236, 306
Maryland	4, 072, 421	271, 494	2, 565, 625	19, 699	985	23, 639	218, 405	10, 400	194, 380
Massachusetts	1, 327, 585	51, 061	1, 062, 068	151, 752	6, 898	157, 822	123, 302	6, 490	107, 273
Michigan	5, 430, 797	201, 141	2, 986, 938	407, 885	19, 423	444, 595	630, 457	63, 046	611, 544
Minnesota	2, 053, 848	76, 068	1, 314, 463	156, 412	6, 517	125, 130	20, 758	1, 597	17, 229
Missouri	2, 128, 522	85, 141	1, 213, 258	171, 377	7, 451	167, 950	95, 703	6, 836	68, 906
New Hampshire	1, 345, 829	49, 846	834, 414	127, 159	5, 529	137, 332	98, 995	4, 950	118, 804
New York	43, 968, 916	1, 570, 318	30, 778, 241	4, 882, 778	232, 513	5, 763, 678	5, 378, 675	336, 167	3, 926, 433
New Jersey	4, 902, 263	204, 261	3, 579, 052	29, 098	1, 323	31, 135	947, 577	59, 224	852, 819
Ohio	12, 024, 028	501, 001	6, 973, 936	1, 399, 066	63, 594	1, 608, 940	827, 364	75, 215	719, 807
Pennsylvania	34, 233, 936	1 369, 357	23, 622, 416	573, 174	26, 053	693, 541	5, 794, 907	386, 327	4, 809, 773
Rhode Island	203, 192	7, 257	142, 234	46, 117	2, 005	54, 418	3, 871	215	3, 871
Vermont	3, 950, 556	131, 685	2, 528, 356	94, 102	3, 619	100, 689	233, 906	9, 746	142, 683
Wisconsin	14, 598, 236	540, 675	7, 591, 083	950, 589	43, 209	912, 565	59, 170	5, 917	44, 969
Total	174, 770, 228	6, 841, 077	109, 432, 695	17, 754, 351	568, 085	14, 051, 983	15, 815, 159	1, 054, 627	12, 662, 388

TABLE No. 3—Continued.

STATES.	TOBACCO.			HAY.			POTATOES.		
	Pounds.	No. of acres.	Value of crop.	Tons.	No. of acres.	Value of crop.	Bushels.	No. of acres.	Value of crop.
California	34, 850	....	....	....	....	....	1, 298, 474	....	....
Connecticut	7, 500, 166	6, 000	$1, 875, 041	562, 445	419, 956	$8, 436, 675	2, 016, 462	18, 845	$1, 351, 030
Delaware	15, 618	52	2, 811	36, 049	36, 049	901, 225	302, 345	4, 031	241, 876
Illinois	20, 397, 537	30, 627	2, 600, 686	1, 742, 552	1, 161, 707	20, 039, 348	5, 155, 523	73, 650	3, 815, 087
Indiana	10, 416, 314	13, 545	1, 249, 958	677, 677	542, 142	9, 826, 316	3, 485, 617	56, 219	2, 649, 069
Iowa	300, 402	403	55, 574	594, 099	339, 485	4, 158, 693	2, 880, 549	31, 654	1, 181, 025
Kansas	26, 881	30¼	5, 376	76, 218	38, 109	381, 090	425, 952	4, 176	200, 197
Kentucky	113, 912, 938	116, 833¼	16, 517, 376	....	....	....	1, 449, 138	15, 752	1, 043, 379
Maine	7, 000	....	1, 260	1, 170, 859	1, 561, 145	17, 855, 680	6, 693, 348	59, 233	3, 012, 007
Maryland	48, 271, 415	74, 956	4, 872, 141	156, 195	124, 956	3, 435, 190	1, 213, 707	17, 094	861, 732
Massachusetts	5, 200, 000	4, 333	1, 378, 000	908, 289	681, 387	15, 967, 720	2, 881, 711	27, 186	1, 959, 563
Michigan	207, 061	214	42, 447	908, 290	726, 632	10, 218, 262	4, 738, 260	49, 357	2, 416, 513
Minnesota	43, 324	62	5, 199	329, 943	219, 962	1, 979, 658	2, 433, 534	23, 627	1, 070, 755
Missouri	26, 340, 505	35, 121	3, 029, 158	373, 756	299, 005	5, 232, 584	1, 493, 519	14, 500	881, 176
New Hampshire	50, 000	62	12, 500	848, 417	848, 417	11, 877, 838	3, 310, 163	29, 555	1, 522, 675
New York	10, 088, 017	8, 644	2, 017, 871	4, 445, 982	3, 556, 786	57, 797, 766	29, 753, 393	354, 207	14, 876, 696
New Jersey	194, 330	162	34, 979	423, 783	282, 522	8, 051, 877	4, 693, 151	62, 576	2, 909, 754
Ohio	28, 081, 869	37, 096	4, 071, 871	1, 347, 710	1, 317, 710	22, 574, 143	4, 103, 005	56, 986	3, 118, 284
Pennsylvania	5, 567, 774	4, 971	1, 113, 555	1, 571, 791	1, 571, 794	29, 864, 686	14, 609, 335	150, 612	9, 057, 788
Rhode Island	1, 680	1½	420	82, 725	66, 180	1, 654, 500	435, 084	4, 577	335, 015
Vermont	40, 000	50	8, 000	1, 182, 785	1, 182, 785	10, 160, 103	3, 603, 972	37, 154	1, 801, 986
Wisconsin	153, 189	148	19, 915	907, 162	604, 775	8, 164, 458	4, 356, 568	44, 913	1, 699, 062
Total	276, 850, 870	333, 257	40, 913, 870	18, 346, 720	15, 641, 504	248, 677, 122	101, 712, 810	1, 145, 556	56, 004, 669

TABLE No. 4.

General summary showing the number of bushels, &c., of each crop, the number of acres of each, the value of each, and the bushels, acres, and value of all, and the increase and decrease for the years 1862 *and* 1863, *omitting California and Kentucky, for want of returns from the former in* 1863, *and from the latter in* 1862.

Names of products.	1862.	1863.	Increase.	Decrease.	Per cent. decrease.
Indian corn......bushels..	533, 387, 230	397, 839, 212	....	135, 548, 018	.25
Wheat ....do....	177, 957, 172	173, 677, 928	....	4, 279, 244	.024
Rye ....do....	20, 577, 971	19, 989, 335	....	588, 636	.028
Oats...............do....	169, 681, 113	170, 129, 864	448, 751	Increase..	.003
Barley.............do....	12, 385, 647	12, 158, 895	....	226, 752	.018
Buckwheat ....do....	18, 763, 756	15, 786, 122	....	2, 977, 634	.16
Potatoes...........do....	112, 577, 482	98, 965, 198	....	13, 612, 284	.12
Total	1, 045, 330, 371	888, 546, 534	....	157, 232, 568	
Hay ....tons..	21, 110, 370	18, 346, 730	....	2, 763, 640	.15
Tobacco ....pounds..	136, 751, 746	163, 353, 082	26, 601, 336	....	.19

Names of products.	1862.	1863.	Increase.	Per cent. increase.
Indian corn.......................acres...	14, 273, 714	15, 312, 441	1, 038, 727	.07
Wheat ....do....	11, 115, 830	13, 098, 936	1, 913, 106	.18
Rye ....do....	1, 136, 160	1, 439, 607	303, 447	.27
Oats ....do....	5, 832, 538	6, 686, 171	853, 636	.15
Barley ....do....	426, 362	557, 299	130, 937	.30
Buckwheat ....do....	809, 777	1, 054, 060	244, 283	.30
Potatoes ....do....	940, 069	1, 129, 804	189, 735	.20
Hay ....do....	14, 899, 902	15, 641, 504	741, 602	.05
Tobacco ....do....	134, 588	216, 423	81, 835	.61
Total..............................	49, 568, 940	55, 136, 248	5, 567, 308	

Names of products.	1862.	1863.	Increase.	Per cent. increase.
Indian corn ....value...	$187, 049, 578	$278, 118, 972	$91, 069, 394	.49
Wheat ....do....	166, 674, 311	198, 249, 108	31, 574, 797	.19
Rye ....do....	14, 403, 419	20, 651, 117	6, 247, 698	.43
Oats ....do....	62, 120, 719	107, 116, 893	44, 996, 174	.72
Barley ....do....	10, 641, 359	13, 674, 465	3, 033, 106	.28
Buckwheat...........................do....	10, 611, 897	12, 654, 301	2, 042, 404	.19
Potatoes ....do....	44, 589, 141	54, 961, 290	10, 372, 149	.23
Hay ....do....	194 399, 375	248, 677, 122	54, 277, 747	.28
Tobacco ....do....	16, 397, 696	24, 385, 744	7, 988, 048	.49
Total..............................	706, 887, 495	958, 489, 012	251, 601, 517	

General average showing the yield per acre, and price per bushel, &c., of each crop for all of the loyal States.

Names of products.	Yield per acre in 1862.	Yield per acre in 1863.	Decrease.	Per cent. decrease.
Indian corn.......................bushels..	37 3-10	25 9-10	11 4-10	.30
Wheat ....do....	16 0-10	13 3-10	2 7-10	.17
Rye...............................do....	18 1-10	13 9-10	4 2-10	.23
Oats ....do....	29 0-10	25. 4-10	3 6-10	.12
Barley ....do....	29 0-10	21 8-10	7 2-10	.25
Buckwheat...........................do....	23 2-10	15 0-10	8 2-10	.35
Potatoes ....do....	119 0-10	99 6-10	19 4-10	.16
Hay...............................tons..	1 42-100	1 17-100	25-100	.017
Tobacco...........................pounds..	1,019 0-10	754 6-10	264 4-10	.26

TABLE No. 4—Continued.

Names of products.	Price in 1862.	Price in 1863.	Increase.	Per cent. increase.
Indian corn........................bushels..	$0 34 8-10	$0 69 9-10	$0 35 1-10	1.00
Wheat........................do....	93 7-10	1 14 0-10	20 3-10	.22
Rye........................do....	70 0-10	1 03 0-10	33 0-10	.47
Oats........................do....	36 6-10	62 3-10	25 7-10	.70
Barley........................do....	86 0-10	1 11 0-10	26 0-10	.30
Buckwheat........................do....	56 5-10	80 2-10	23 7-10	.42
Potatoes........................do....	39 7-10	55 6-10	15 9-10	.40
Hay........................tons..	9 20 0-10	13 50 0-10	4 30 0-10	.47
Tobacco........................pounds..	11 9-10	14 9-10	3 0-10	.25

The foregoing table (No. 4) needs some explanation to be properly understood.

1. *The number of bushels.*—The estimates of these have been made with great care, and they approximate closely to the actual amount of the crops of 1862 and 1863.

2. *The number of acres.*—This division of the general table has less correctness than any other. The correspondents of the department return to it the yield per acre of each crop in their respective counties. A correct judgment of what that yield is, if, like all other matters of human knowledge, is one requiring time and study to perfect it. The return giving the yield per acre of the crops of 1862 was among the first made to this department by its correspondents. In alluding to it in my last report I remarked that, as the correspondents were "among the best farmers, their returns of the yield per acre represent more, perhaps, those of good farming than of good and bad together." The estimates were undoubtedly too high. As the acreage of a crop is determined by dividing the yield per acre into the amount of the whole crop, it is readily seen that the number of acres will be less as the yield per acre is increased. Hence the general acreage of 1862 was too low, because the yield per acre was placed too high.

In 1863 the correspondents had attained that knowledge which was essential to an approximate correctness, and the returns for that year may be regarded as coriect. The table of acres, therefore, shows too few acres for 1862, except in hay and tobacco, and, as a consequence, the increase in acreage in 1863 is too great. This is clearly seen in the increase in wheat. The yield per acre in 1862 was 16 bushels; in 1863, $13\frac{3}{10}$ bushels. To one well versed in the general average yields the estimate for 1862 will be seen to be much too great.

This fault in the table is incident to the *commencement* of this plan for the collection of statistics, and not to the plan itself, and it has been especially pointed out that it may be seen how important it is to sustain a correspondence where experienced judgments are so essential to obtaining correct information.

3. *The value.*—The values are thus estimated: The correspondents give the average prices of each crop in their counties, and from these the general average of a State is made and multiplied into the amount of a crop. No more correct mode can be adopted by which to estimate the general value of a crop, except by first estimating the value of the products of each county, but this cannot be done because no returns of the crops of each county for 1860 have yet been published from the Census bureau.

The table included in No. 4 exhibit some striking facts. Although the corn crop was less in 1863 by 163,352,132 bushels than in 1862, yet its value was $83,840,324 greater. The general average price per bushel in 1862 was thirty-four and eight-tenths cents, and in 1863 sixty-nine and nine-tenths cents—an increase of 100 per cent. The wants of the government and the decreased crop caused a heavy advance in corn in districts where not unfrequently it had been used as a fuel. The scarcity in many sections forced an emigration of stock into these districts that at once raised the price from almost nothing to one that contributed much to raise the general average price of 1863. The difference between currency and gold had some influence on prices, but by reference to table No. 11, in a subsequent part of this report, it will be seen that the general increase in gold value of the month of November, 1863, was but 18 per cent. over the same month in 1862, the times when the prices were reported to the department. Yet the increase of these prices was 100 per cent.

As the wheat crop was nearly the same in both years, and the export trade not greatly less in 1863, the price of wheat will more nearly show the difference in currency and gold values. The crop of 1863 was less than that of 1862 by 4,279,244 bushels, its increased total value 19 per cent., and the increased price per bushel 22 per cent. Here the relative influence of currency and supply are seen. Similar facts will serve to explain the remaining crops of the tables. It is proper to add that like tables have not heretofore been made, either in America or Europe, and that the lesson taught by them is as instructive as the table is novel.

TABLE RELATING TO FARM STOCK.

The presence of civil war caused a cessation of the heavy trade in farm stock between the west and the south, and following it came an extraordinary demand for the same from the government. The influence of both had a strong tendency to lessen the amount of stock, except in sheep, the demand for wool causing a rapid increase of them. Under such circumstances it became necessary to determine the condition of the farm stock, and in January circulars were issued for this purpose. The following tables exhibit the returns to the circulars, showing those for the several States in tenths and the estimated numbers from these returns and those of the census of 1860.

TABLE No. 5.

Table of returns of farm stock in each of the loyal States in January 1864, *showing the tenths increase and decrease, as returned by correspondents.*

STATES.	Average number of horses as compared with 1861.	Average number of mules as compared with 1861.	Average number of cattle as compared with 1861.	Average number of cows as compared with 1861.	Average number of hogs as compared with Jan., 1863.	Average number of sheep as compared with Jan., 1863.
Maine	9	13	9	10	8	13
New Hampshire	9	..	9	9	9	13
Vermont	8	..	10	9	9	11
Massachusetts	11	8	10	11	9	13
Rhode Island	10	..	11	11	8	10
Connecticut	10	10	10	11	9	11
New York	9	10	10	11	9	12
New Jersey	10	10	10	10	9	12
Pennsylvania	9	10	10	10	8	12
Maryland	9	9	9	9	9	12
Kentucky	7	14	7	7	10	11
Ohio	8	11	8	9	8	12
Michigan	9	13	10	10	8	12
Indiana	8	8	9	10	8	13
Illinois	9	10	10	10	8	14
Missouri	7	6	7	9	8	10
Wisconsin	11	13	12	12	9	13
Iowa	11	11	13	15	10	20
Minnesota	13	16	13	13	8	17
Kansas	11	12	14	15	10	15
West Virginia	..	..	11	..	11	..
Nebraska Territory	13	15	15	14	13	15

TABLE No. 6.

Table exhibiting the number of the most important farm stock for 1859, *as returned by the census report of* 1860, *and the estimated numbers that were in the several loyal States in January*, 1864, *as estimated from the above returns in tenths.*

States.	HORSES.		MULES.		CATTLE AND OXEN.		COWS.		SHEEP.		HOGS.	
	Year 1859.	Year (Jan.) 1864.	Year 1859.	Year (Jan.) 1864.	Year 1859.	Year (Jan.) 1864.	Year 1859.	Year (Jan.) 1864.	Year 1859.	Year (Jan.) 1864.	Year 1859.	Year (Jan.) 1864.
Maine	60,638	56,375	104	124	229,619	211,227	147,315	150,065	452,472	823,498	54,783	46,610
New Hampshire	41,101	38,226	10	10	169,587	151,901	94,880	87,500	310,534	565,271	51,935	42,584
Vermont	67,250	54,790	35	35	192,219	190,119	171,698	167,954	721,993	1,112,969	49,433	38,421
Massachusetts	47,786	52,160	108	119	135,422	136,526	144,499	167,651	114,829	194,190	73,948	63,263
Rhode Island	7,121	7,306	10	12	19,405	20,553	19,700	21,290	32,624	32,624	17,478	14,512
Connecticut	33,276	34,554	82	88	143,028	146,190	98,878	109,714	117,107	179,343	75,120	67,122
Delaware	16,562	17,104	2,294	2,500	35,126	35,358	22,595	23,289	18,857	20,000	47,848	40,248
New York	503,725	463,545	1,553	1,671	849,539	830,184	1,123,634	1,220,200	2,617,855	4,237,324	910,178	823,508
New Jersey	79,707	82,857	6,362	6,816	99,976	101,466	138,818	142,834	135,228	194,728	236,089	219,759
Pennsylvania	437,654	409,594	8,832	10,146	745,946	770,390	673,547	702,211	1,631,540	2,610,458	1,031,266	976,150
Maryland	93,406	87,355	9,829	9,599	153,778	145,986	99,463	101,983	155,765	224,202	387,756	381,788
Kentucky	355,704	272,785	117,635	89,627	566,844	425,443	269,215	191,495	938,990	774,667	2,330,595	1,922,740
Ohio	622,829	589,242	6,917	8,376	963,541	864,206	696,309	690,337	3,063,887	4,779,662	2,175,623	2,320,664
Michigan	154,168	155,970	359	539	333,632	365,445	200,635	220,825	1,467,477	2,465,360	374,664	399,642
Indiana	409,504	385,690	18,627	20,563	678,972	655,870	491,033	505,711	991,175	1,933,790	2,498,528	2,665,096
Illinois	575,161	575,162	38,881	49,257	972,850	1,043,946	532,731	580,343	775,230	1,627.983	2,279,722	2,421,703
Missouri	361,874	272,429	80,941	64,056	823,741	614,355	345,243	303,020	937,445	753,084	2,354,425	1,412,653
Wisconsin	116,192	146,733	1,019	1,535	318,870	431,955	193,996	266,311	332,454	692,803	333,957	400,749
Iowa	174,957	288,678	5,713	12,206	347,708	561,338	188,546	282,819	258,228	1,032,912	921,161	1,581,741
Minnesota	17,122	26,486	395	659	78,622	122,284	40,386	68,495	13,123	42,388	101,252	114,753
Kansas	18,882	24,923	1,430	2,059	61,133	97,812	26,726	49,089	15,702	43,204	128,309	160,386
Nebraska Ter'y	4,522	7,178	473	850	21,590	42,885	7,125	13,162	1,757	5,931	25,965	34,620
Total	4,199,141	4,049,142	301,609	280,847	7,941,148	7,965,439	5,726,964	6,066,748	15,104,272	24,346,391	17,060,035	16,148,712

NOTE.—The preliminary census report contains two tables of stock—one, which seems to embrace the stock on the farms; the other does not show from whence its numbers were derived, but it is presumed to be those in the markets, on their way there, and in cities, &c. As the returns of the correspondents of the department embrace those on the farm only, the comparison is more correctly exhibited by rejecting the second table in the preliminary census report.

The above table of farm stock is compiled from the Census Report for 1860, and the returns made to this department by its correspondents in January, 1864. The column for 1859 is taken from the census, that for 1864 has been estimated.

The plan adopted for taking these statistics could not have been put to a severer test than in the formation of this table. In 1861, the usual increase was checked by political events, for they broke up that heavy trade in stock, and its products, which had always existed between the west and the south. The war has made heavy demands for horses and mules, and greatly increased that for cattle and hogs. The want of cotton has multiplied in an extraordinary degree the number of sheep. The presence of war in some of the loyal States, the scarcity of food in others, and the demands of the war, have caused an unusual movement of stock from one State to another. Hence the usual per cent. increase or decrease cannot be relied on as a means of determining the numbers for 1864. Had this department been in existence in 1860, and every year since then made estimates of the amount of farm stock, more especially if the census returns of each county had been published, the difficulties now existing would have been in a great measure removed. Still the table is given in full confidence of its general correctness.

It will be seen from it that there is a general decrease of stock, except in sheep, which have most gratifyingly increased, and a very slight advance in the numbers of cattle and cows. This table is instructive, for it points out the direction that the industry of the farmer should take.

By comparing the census returns of farm stock in 1850 and 1860 it will be seen that horses increased 47 per cent. in that decade. The same rate of increase would have given 18$\frac{4}{5}$ per cent. for the increase from 1860 to 1864, and the rate of increase should have been proportionally greater for the loyal States. But instead of that rate of increase, which would have added 789,438 to the horses of these States, there is a decrease of 150,000. There should have been, therefore, at least 939,438 horses more than we now have. Such a deficit will require a supply that will not be equal to the demand for years to come. A correspondent in Ohio writes that the farmers in his county were quitting horses and cattle, and directing their attention to mules and sheep. An evil in our agricultural operations is, that the farmer is governed too much by present demand, and continues in the course it directs too long. The vast production of American agriculture can soon supply any want when concentrated on the commodity needed, and hence over-production will quickly ensue. Whilst mules and sheep are much needed, other wants should be regarded, and of these, horses should not be overlooked.

The increase of mules from 1850 to 1860 was 102 per cent., and a like increase for the years embraced in the table of stock would be 40$\frac{4}{5}$ per cent. This would make an increase of 123,056, whereas the decrease is 20,762. These facts point to the profit that awaits mule-raising.

The increase of cattle and oxen from 1850 to 1860 was 32 per cent. The same rate of increase would have made that for the four years from 1860 to 1864 for the loyal States 13$\frac{3}{5}$ per cent., equal in number to 1,064,113. Yet the increase has been but 24,291.

Of cows, similar calculations show that the increase from 1850 to 1860 was 36 per cent., and for the four years of the table it should have been at least 14$\frac{2}{5}$ per cent. for these States. This would have given an increase of 824,682, but it is only 339,784.

The progress in sheep husbandry is highly gratifying. The table exhibits an increase of 9,242,119 since 1860, and if the increase of this spring is added, the whole will not be less than 100 per cent., making the present number at least 30,000,000. The wool clip of this spring could not have been less than 75,000,000 pounds. And looking to the high rates of all material for clothing, it is obvious that wool-growing has not reached its maximum condition.

The table shows a decrease in hogs of 911,323. Great as this is, and much as it has influenced the prices of the hog product, yet the deficiency has become greater since January, when the returns were made to the department. The great scarcity of corn, and its high price, caused farmers to abandon their young hogs last winter, and many perished. The present condition of the corn crop will not induce any great extension of hog-raising, and hence the products of the hog must command prices that cannot but make greater attention to this stock one of the highest sources of profit to the farmer.

PART III.—TABLES OF IMPORTS AND EXPORTS, AND OF THE EXPORTS OF THE PRINCIPAL AGRICULTURAL PRODUCTS FROM NEW YORK AND THEIR PRICES; OF THE RECEIPTS, SHIPMENTS, AND PRICES OF THEM AT CHICAGO AND NEW YORK; OF THE IMPORTS OF WHEAT BY GREAT BRITAIN, AND OF OUR EXPORTS OF PROVISIONS; OF HOGS AND CATTLE AT CHICAGO, AND OF THE HOG CROP AND PRICES AT CINCINNATI.

Commerce in agricultural products so affects their value, and so greatly encourages or represses the productive energies of the farmer, that a general view of its condition in the loyal States becomes a necessary part of the report of this division of the department.

The exports of our agricultural productions, although small in amount when compared with our home consumption, become of great importance as relieving our market of a surplus which would weigh down home prices; and, as the exports must bear a certain proportion to the imports—no nation being able long to buy where it does not sell—they must be considered together. The tables given show the import and export trade in a general manner, but the exports of the leading articles of farm produce from New York are given in detail, together with their prices, and the price of gold; also tables showing the foreign demand for wheat as exhibited in the imports of Great Britain; and of our provisions, as seen in the exports of these to all places.

The internal or home commerce is of the highest importance; the only mode of presenting it is by selecting the points where agricultural products chiefly centre; and, accordingly, tables of the receipts and shipments of these for Chicago and New York are given, with their prices.

TABTE No. 7.

Imports and exports from New York.

IMPORTS.

Year.	Dry goods.	Specie.	Other merch'se.	Total imports.
1860	$103,927,100	$8,852,330	$125,481,030	$238,260,460
1861	43,636,689	37,088,413	81,043,688	162,768,790
1862	56,121,227	1,390,277	117,140,813	174,652,317
1863	67,274,547	1,525,811	118,814,219	187,614,577
1864, 6 mos., fr. Jan. 1 to July 1	46,359,979	....	....	129,312,035

EXPORTS.

Year.	Domestic produce.	Specie.	Foreign md'se exported.	Total exports.
1860	$95,468,296	$42,191,171	$8,023,994	$145,683,451
1861	131,325,995	4,236,250	7,368,906	142,931,151
1862	149,179,591	59,437,021	7,755,231	216,371,843
1863	164,249,177	49,754,066	6,461,791	220,465,034
1864, 6 mos., fr. Jan. 1 to July 1	84,684,595	29,268,846	5,224,707	119,178,148

TABLE NO. 8.

Exports of gold and silver from San Francisco.

Year.	To eastern ports.	To England.	To China.	To Panama.	To other countries.	Total.
1860	$35,719 296	$2,672,936	$3,374.780	$300,819	$258,185	$42,325,916
1861	32,628,011	4,061,779	3,541,279	349,769	95,922	40,666,758
1862	26,194,035	12,950,146	2,660,754	434,508	322,324	42,561,761
1863	10,389,330	28,467,256	4,206,370	2,503,296	505,667	46,071,920
1864, 6 mos.	5,607,940	19,835,269	2,911,743	186,245	452,514	28,993,711

Exports of gold and silver from New York and San Francisco.

On the supposition that the gold exported from San Francisco to eastern ports is exported from New York, by deducting the column representing this export from the total, and adding to the product the exports of specie from New York, the following table exhibits the amount of foreign exports of specie from these ports:

1860	$48,797,791
1861	12,275,155
1862	75,804,747
1863	85,436,656
1864*	52,654,617

*For six months only.

Table No. 9.

Amount of exports from New York of the leading articles of agricultural production.

	1860.	1861.	1862.	1863.	1864, 6 mos.
Wheat flour, barrels.	1,926,202	3,110,646	2,971,818	2,527,338	1,009,823
Rye flour......do...	8,614	11,807	8,397	5,461	1,993
Corn meal.....do...	89,570	108,385	132,606	140,561	64,029
Wheat.......bushels.	13,538,039	28,889,914	25,564,755	15,424,889	6,821,943
Corn...........do...	3,726,786	12,456,265	12,020,848	7,533,431	147,109
Rye...........do...	450	1,000,405	1,104,549	416,369	405
Barley.........do...	8,280	3,927	42,061	52,439	150
Oats...........do...	103,076	160,825	210,669	126,556	21,707
Peas...........do...	....	139,284	113,819	110,911	139,761
Cotton..........bales..	216,880	152,562	24,400	13,945	22,348
Hay...........do...	20,977	15,776	46,674	19,986	15,653
Hops...........do...	32,641	28,337	33,409	25,409	15,175
Leaf tobacco, p'kages.	93,031	116,538	113,575	107,439	51,075
Man. tobacco, pounds.	6,561,160	3,152,484	1,598,044	3,542,210	2,058,316
Petroleum...gallons.	....	1,112,476	10,887,701	28,250,721	7,674,535
Pork.........barrels.	91,640	116,654	181,302	192,983	82,135
Beef...........do...	40,003	29,013	32,997	41,632	20,996
Beef..........tierces.	55,328	33,924	51,571	62,868	39,090
Cut meats... pounds.	19,447,163	50,565,732	145,102,758	183,519,060	80,754,546
Butter..........do...	10,987,495	23,159,391	30,603,235	23,060,799	5,815,113
Cheese..........do...	23,252,712	40,041,225	39,200,439	40,781,168	13,427,992
Lard...........do...	18,866,178	47,290,409	126,651,091	120,881,862	32,993,544
Tallow..........do...	14,895,969	25,820,335	43,868,920	43,487,731	19,745,740

Table No. 10.

Prices in New York and England.

	1860.	1861.	1862.	1863.	*January,* 1864.	*July,* 1864.	England. *July,* 1864.
Wheat flour............barrel..	$5 30	$5 35	$5 50	$6 05	$7 00	$10 50	$5 76
Wheat flour, best.........do....	....	7 50	7 50	8 75	11 00	12 50	....
Rye flour..................do....	3 90	4 00	3 87½	5 45	6 65	8 00	....
Corn meal..................do....	3 80	3 15	3 00	4 00	5 65	8 00	....
Wheat, best............bushel..	1 50	1 45	1 50	1 60	1 80	2 55	1 20
Corn......................do....	95	72	64	82	1 30	1 68	85
Rye.......................do....	94	75	83	96	1 30	1 90	93
Barley....................do....	....	....	....	....	1 45	2 15	84
Oats......................do....	47	37	43	71	93	99	62
Peas......................do....	....	....	....	....	1 12½	1 44	1 00
Cotton...................pound..	11	12½	35½	68½	82	1 50	61
Hay, 100...................do....	....	90	77½	85	1 45	1 35	....
Hops......................do....	18	25	20	23	33	28	....
Leaf tobacco...............do....	4 to 12	4 to 13	8 to 16	13 to 30	12½ to 29	13½ to 42	....
Petroleum, refined.......gallon..	....	....	....	....	48	86	....
Pork, mess...............barrel..	16 25	16 00	12 00	14 50	19 50	42 50	....
Pork, prime................do....	11 75	10 50	8 50	12 50	14 50	35 00	....
Beef, mess.................do....	5 50	6 00	5 50	12 00	14 00	17 00	....
Hams.....................pound..	9	8	6	8	11	17½	19
Shoulders..................do....	....	5½	4¾	5¾	8½	15	....
Lard.......................do....	10	10⅜	8⅝	10	13	19½	13
Butter, State..............do....	20	18	19	22	29	35	19
Butter, Orange county.....do....	....	22	22	25	32	42	....
Cheese.....................do....	11	10	7	12	15½	18	12
Tallow.....................do....	10	9¼	9⅜	10¼	12	18	9
Wool, common...............do....	40	30	50	60	75	1 10	48

Table No. 11.

THE PRICE OF GOLD.

As the price of gold was the chief element in advancing the prices of domestic produce, which are given in currency values, the following table is essential to a full understanding of the foregoing price tables :

	1862.	1863.	1864.		1862.	1863.	1864.
Jan'y 2........	112	135	152	July 2........	119	144	237
9........	115	138	152	9........	116	131	275
16........	112	146	155	16........	116	126	253
23........	113	147	158	23........	119	126	254
30........	113	157	157	30........	114	127	256
Feb'y 6........	113	157	159	Aug. 6........	114	127	....
13........	114	155	159	13........	114	127	....
20........	113	163	161	20........	115	124	....
27........	112	171	161	27........	115	124	....
March 5........	112	155	162	Sept. 5........	119	131	....
12........	111	161	162	12........	119	129	....
19........	111	155	162	19........	117	135	....
26........	111	139	170	26........	120	139	....
April 2........	112	153	168	Oct. 2........	123	142	....
9........	111	147	171	9........	127	147	....
16........	111	154	180	16........	133	153	....
23........	111	150	179	23........	132	146	....
30........	112	150	180	30........	130	146	....
May 7........	112	155	172	Nov. 7........	131	147	....
14........	113	150	172	14........	131	147	....
21........	113	150	183	21........	130	153	....
28........	114	143	186	28........	129	146	....
June 4........	113	146	191	Dec. 4........	133	152	....
11........	114	142	199	11........	132	152	....
18........	115	144	196	18........	132	152	....
25........	118	145	220	25........	133	152	....

ENGLISH IMPORTS OF WHEAT.

The total amount for the last ten years, and the countries from which the principal supplies were received; capabilities of Russia to successfully compete with the United States.

The buoyancy of our own grain markets is so dependent on those of Great Britain that their condition is always an object of interest to the American farmer. We therefore take the following tables from the London Mark Lane Express, which show the English imports of wheat for the last ten years, and the countries from which are received the principal amounts :

Imports of wheat into Great Britain.

Year.	Total imports in quarters.	From United States.	From Prussia.	From Russia.	From Egypt.	From the Canadas.
1854	3,431,227	417,607	672,842	506,839	302,905	18,150
1855	2,667,702	248,906	536,123	....	437,241	14,570
1856	4,072,833	1,279,150	221,681	759,459	534,603	111,819
1857	3,437,957	650,754	866,311	706,375	204,236	114,795
1858	4,241,719	594,644	625,976	612,217	464,644	100,821
1859	4,000,922	36,906	771,713	385,460	377,199	6,721
1860	5,880,958	1,499,385	1,149 532	1,301,146	197,265	183,422
1861	6,912,815	2,507,744	1,027,733	1,041,461	339,811	549,525
1862	9,469,270	3,724,770	1,450,484	1,327,158	759,036	861,452
1863	5,622,501	2,008,708	1,017,807	1,046,378	535,290	483,230
Total...	49,737,904	12,968,574	8,340,202	7,186,493	4,152,230	2,444,505

Whilst these tables exhibit our supremacy in supplying the demand of Great Britain for wheat, it may be well to consider the causes which, in the future, may affect that supremacy. The most prominent now is the growth of Russia.

Competition from Russia.—Although the tables show that Prussia supplies Great Britain with a larger amount of wheat than Russia, yet the Prussian exports are grown chiefly in Russia; in its Polish provinces. These are regarded as the best wheat-producing regions in the world, and they lie in the west of Russia, near to Prussia.

Referring to these imports from Russia, the Mark Lane Express says:

"Russia has displayed a great tendency to increase; and probably, if the Russian Empire was in a more tranquil and satisfactory state, socially, financially, and politically, the strides made would be more rapid. Let the steam-plough once get to work, and the great plains of southern Russia must pour an immense quantity of cereals upon the European markets."

The "great plains" here alluded to are the Russian *steppes*, or prairies. A German writer, who has travelled through them, thus describes them:

"What a prospect! The sun's mighty ball had just appeared on the horizon, and the steppe extended, endless and immeasurable, in all directions."

And an English writer says:

"The whole of southern Russia, or, as it is more frequently called, New Russia—as it is the latest acquisition of the great Czaric empire—must have, once on a time, been one huge lake, whose eastern and western shores rose in the Hindukush mountains and the Carpathians. When this mighty mass of water broke its way out, it left behind a mass of slime, formed of decayed organisms, which now forms the celebrated Tchernozon—the inexhaustible black earth, which lies upon a mumular limestone at a depth varying from a few inches to fifteen feet. *It is this land which supplies the greater portion of Europe with cereals without any artificial help.*"

It is here that the steam-plough may be so advantageously introduced, for these vast fertile plains have neither tree, nor bush, nor rock to obstruct it. These plains, however, are subject to greater climatic extremes than our northwest—to more intense droughts in summer, and more terrible snow-storms in winter.

Heretofore Russia has made but little progress in agriculture, for its agricultural laborers were serfs. Of a population in 1858 of 61,129,480, twenty-two and a half millions, or nearly thirty-seven per cent., were serfs; and of these, 20,150,231 were attached to the land—that is, sold and transferred with it. There were but 106,897 proprietors of serfs, so that there were 211 serfs to each one of them. Progress in agriculture might as readily be found among the slaves of the south as among a people thus held in bondage. But about two years ago the present Emperor of Russia abolished serfdom, and gave power to the freed serfs to purchase and hold lands. The progress now making in Russian towns in the establishment of schools points to the coming changes in agriculture. And recently he has abolished it in the Polish provinces. On the 15th of April every peasant in them was not only freed, but made the owner of all lands, and buildings thereon, which he cultivated.

With these recently awakened motives to agricultural improvement, the vast and productive plains of southern Russia and the Polish provinces must commence that progress alluded to by the Mark Lane Express, by the introduction of improved common ploughs, harrows, and drills, of the steam-plough, the reaper, and the thresher; and by the gradual making of railroads, for in these plains there are no obstructions to render them costly. Doubtless it will be many years before this improvement can materially affect our exports of wheat to England, for, as stated in the last report, with regard to cotton, it is not production alone that gives a nation a foreign market, but its own ability to consume what that market may have to offer in payment. So long as the United States are superior as a consumer, it can regulate the conditions of mutual trade. But still Russian consumption, too, will increase with its progress in agriculture; and even as it now is, the tables of English imports of wheat show how great is the amount of wheat Russia, directly and indirectly, sends to Great Britain. Political convulsions may retard Russian progress, and general European wars may continue our supremacy, but an expectation of these should not divert our minds from the development of that market which is our best and most reliable one—the home market

Table No. 12.

Showing the amount and value of the exports to foreign countries of beef, pork, hams and bacon, lard, butter, and cheese, from the United States, for the year 1863, *and comparative quantities with* 1862 *and* 1861.

Year.	Great Britain.	Other ports in Europe.	Other foreign ports.	Total and price.	Value.
1863	77, 298 tierces of beef	1, 253 tierces of beef	199 tierces of beef	78, 750, at $26 00 per tierce	$2, 047, 500 00
1862	63, 511 tierces of beef	150 tierces of beef	296 tierces of beef	63, 957, at 22 00 per tierce	1, 407, 054 00
1861	51, 421 tierces of beef	145 tierces of beef	522 tierces of beef	52, 008, at 18 00 per tierce	937, 584 00
1863	5, 534 barrels of beef	6, 790 barrels of beef	41, 929 barrels of beef	54, 253, at 14 00 per barrel	759, 542 00
1862	1, 636 barrels of beef	4, 397 barrels of beef	40, 331 barrels of beef	46, 364, at 12 00 per barrel	556, 368 00
1861	5, 370 barrels of beef	2, 363 barrels of beef	31, 807 barrels of beef	39, 542, at 11 00 per barrel	434, 962 00
1863	2, 277 tierces of pork		23 tierces of pork	2, 300, at 30 00 per tierce	69, 000 00
1862	3, 758 tierces of pork	13 tierces of pork	51 tierces of pork	3, 822, at 27 00 per tierce	103, 194 00
1861	1, 582 tierces of pork		55 tierces of pork	1, 637, at 16 00 per tierce	26, 222 00
1863	37, 095 barrels of pork	13, 995 barrels of pork	209, 003 barrels of pork	260, 093, at 19 00 per barrel	4, 941, 767 00
1862	48, 010 barrels of pork	18, 816 barrels of pork	183, 210 barrels of pork	250, 036, at 15 00 per barrel	3, 750, 540 00
1861	24, 276 barrels of pork	1, 219 barrels of pork	148, 231 barrels of pork	173, 726, at 14 00 per barrel	2, 432, 164 00
1863	176, 180,700 pounds of hams and bacon	22, 860 200 pounds of hams and bacon	7, 859, 800 pounds of hams and bacon	206, 900, 700, at 8 per pound	16, 552, 056 00
1862	155, 462 500 pounds of hams and bacon	15, 111, 500 pounds of hams and bacon	7, 344, 500 pounds of hams and bacon	177, 918, 500, at 8½ per pound	14, 678, 276 00
1861	54, 382, 600 pounds of hams and bacon	858, 500 pounds of hams and bacon	6, 513, 700 pounds of hams and bacon	61, 754, 800, at 9 per pound	5, 557, 932 00
1863	55, 671, 900 pounds of lard	53, 814, 400 pounds of lard	24, 802, 900 pounds of lard	134, 289, 200, at 13 per pound	17, 457, 596 00
1862	62, 325, 300 pounds of lard	61, 149, 500 pounds of lard	27, 954, 700 pounds of lard	151, 429, 500, at 10 per pound	15, 142, 950 00
1861	36, 853, 200 pounds of lard	10, 699, 500 pounds of lard	18, 891, 600 pounds of lard	66, 444, 400, at 9 per pound	5, 979, 996 00
1863	21, 610, 300 pounds of butter	2, 675, 600 pounds of butter	5, 616, 800 pounds of butter	29, 902, 700, at 24 per pound	7, 176, 648 00
1862	29, 241, 000 pounds of butter	1, 108, 600 pounds of butter	5, 484, 700 pounds of butter	35, 834, 300, at 17 per pound	6, 091, 831 00
1861	21, 865, 200 pounds of butter	1, 264, 300 pounds of butter	4, 808, 800 pounds of butter	27, 938, 300, at 15 per pound	4, 190, 745 00
1863	39, 075, 400 pounds of cheese	1, 085, 400 pounds of cheese	2, 946, 500 pounds of cheese	43, 106, 800, at 13 per pound	5, 603, 884 00
1862	38, 722, 000 pounds of cheese	1, 037, 000 pounds of cheese	2, 730, 900 pounds of cheese	42, 489, 900, at 11 per pound	4, 673, 889 00
1861	41, 937, 900 pounds of cheese	1, 557, 100 pounds of cheese	1, 950, 300 pounds of cheese	45, 445, 300, at 7 per pound	3, 181, 171 00

RECAPITULATION.

Value in 1863	$54, 607, 993
Value in 1862	46, 404, 102
Value in 1861	22, 740, 776
Value in 1860	15, 336, 187

TABLE No. 13.

Receipts, exports, and prices of produce at New York.

Month.	FLOUR.			WHEAT.		
	Receipts.	Exports.	Price.	Receipts.	Exports.	Price.
1863.	*Barrels.*	*Barrels.*	*Best.*	*Bushels.*	*Bushels.*	*Mil. Cl'b.*
May	454,363	198,614	$6 10	1,789,952	848,967	$1 37½
June	636,501	246,610	4 65	2,853,755	1,779,362	1 38½
July	451,004	260,805	5 26	2,409,184	2,453,995	1 22½
August	298,097	259,189	4 90	1,989,839	1,658,009	1 05
September	319,923	278,196	5 00	1,132,588	1,665,698	1 11
October	451,762	233,376	5 95	3,051,968	1,510,205	1 34
November	530,096	127,263	6 25	3,164,759	516,233	1 41
December	429,641	214,530	6 52	1,396,608	1,239,011	1 42
1864.						
January	266,240	241,064	6 95	10,244	1,237,138	1 53½
February	233,822	204,826	6 70	45,283	1,490,427	1 59½
March	190,785	152,173	6 81	108,407	915,499	1 64
April	218,181	155,198	7 55	166,506	508,292	1 71
Total	4,480,415	2,571,844		18,119,093	15,842,836	

Month.	CORN, (MIXED.)			OATS.		
	Receipts.	Exports.	Price.	Receipts.	Exports.	Price.
1863.	*Bushels.*	*Bushels.*		*Bushels.*	*Bushels.*	
May	1,904,490	949,619	$0 76½	808,338	....	$0 74½
June	2,262,825	1,605,352	75½	1,442,979	....	78½
July	3,049,126	1,541,601	68	849,831	....	76
August	2,343,899	588,170	69	1,097,223	....	57
September	2,196,157	254,751	78	307,025	....	68
October	1,205,793	70,072	98	1,319,985	....	80
November	295,938	54,150	1 12	2,189,719	....	85
December	135,907	25,844	1 26	1,882,344	....	90
1864.						
January	145,557	394,754	1 26½	305,690	....	91½
February	108,751	21,225	1 27½	209,080	....	90
March	259,547	43,230	1 32½	258,685	....	89½
April	120,272	28,004	1 33	238,344	....	88
Total	14,028,262	5,576,772		10,909,238		

Month.	BEEF, (MESS.)			PORK, (MESS.)		
	Receipts.	Exports.	Price.	Receipts.	Exports.	Price.
1863.	*Barrels.*	*Packages.*	*Per bbl.*	*Barrels.*	*Barrels.*	*Per bbl.*
May	9,428	5,337	$12 75	119,302	20,728	$11 87½
June	2,386	3,432	10 62½	112,343	16,981	11 50
July	1,285	3,245	11 00	10,155	14,558	11 75
August	892	3,721	11 87½	6,879	14,698	11 75
September	718	3,601	11 87½	7,115	16,653	11 87½
October	7,420	5,303	12 25	6,921	12,412	14 00

TABLE No. 13—Continued.

Month.	BEEF, (MESS.)			PORK, (MESS.)		
	Receipts.	Exports.	Price.	Receipts.	Exports.	Price.
1863.	*Barrels.*	*Packages.*	*Per bbl.*	*Barrels.*	*Barrels.*	*Per bbl.*
November	68,591	12,837	12 75	6,916	17,340	16 25
December	74,031	27,842	13 06¼	21,864	16,926	17 75
1864.						
January	22,988	18,127	13 25	39,364	15,368	19 00
February	6,558	2,853	13 25	32,144	12,821	20 00
March	4,319	16,283	14 06¼	33,687	17,054	22 00
April	4,654	10,420	15 87½	12,346	14,190	24 75
Total	202,270	113,061		399,036	189,757	

Month.	LARD.			HOGS.	
	Receipts.	Exports.	Price.	Receipts, dressed.	Receipts, live.
1863.	*Pounds.*	*Pounds.*		*Number.*	*Number.*
May	14,996,600	12,439,700	$0 9¾	....	39,305
June	7,596,600	8,690,300	9¾	....	56,612
July	1,539,600	6,711,300	9¾	....	40,706
August	378,400	5,215,200	9¾	....	38,065
September	523,300	6,204,500	10½	....	67,306
October	3,512,800	11,657,400	11⅝	881	112,257
November	3,599,700	6,877,300	11¼	755	183,359
December	3,137,500	3,450,900	12	21,208	191,641
1864.					
January	2,514,500	14,872,600	13⅛	48,276	29,596
February	4,324,500	3,709,200	13¾	59,894	35,073
March	8,312,200	4,416,400	13½	4,400	32,506
April	9,049,600	8,538,700	13¾	67	47,963
Total	69,000,900	92,783,500		135,481	874,389

Month.	COTTON.			WHISKEY.		
	Receipts.	Exports.	Price, midl'g.	Receipts.	Exports.	Price.
1863.	*Bales.*	*Bales.*	*Pounds.*	*Barrels.*	*Barrels.*	
May	8,193	2,748	$0 55¾	21,838	....	$0 44¼
June	16,299	5,532	60¾	26,925	....	44½
July	13,080	1,112	63¼	19,627	....	45¼
August	11,043	120	66½	18,083	....	45¾
September	12,874	454	70¼	15,781	....	51
October	19,332	2,941	86	17,656	....	59
November	26,902	675	84¾	20,098	....	65½
December	24,870	210	80½	39,594	....	86¼
1864.						
January	22,010	461	82¼	32,346	....	91¼
February	28,242	267	81⅓	34,475	....	87
March	39,302	6,200	75¾	35,575	....	86
April	33,538	6,841	77½	22,873	....	1 13¼
Total	265,685	27,561	....	304,871		

CHICAGO AND NORTHWESTERN AGRICULTURE.

One of the wonders, even in this age, when progress has outstripped the anticipations of the most sanguine, is the growth of Chicago. It is not a representative of manufactures, nor of a foreign commerce, but solely of agriculture and the commerce created by it. Situated at a point of lake navigation which makes it the receptacle of an immense and fertile agricultural region, seeking its markets in the eastern States and in Europe through Chicago, the growth of the city has kept pace with the progress of that region, and therefore it is the representative of that progress as well as of its own.

Its more rapid advancement, however, since 1860, is not an indication of a corresponding development of the agricultural resources of the country, whose trade it has always enjoyed, or of more remote places added to it by new railroad communication, but of that disturbing influence upon commerce caused by the war. The navigation of the Mississippi having been closed in 1861, the products of the upper parts of that river, and beyond it, in Iowa and Missouri, as well as the more southern portions of Illinois, had to seek a new transit to the eastern markets. They therefore centred in Chicago instead of in St. Louis, and other minor places.

With this explanation we republish the following table of shipments of breadstuffs from Chicago for the last twenty-six years, which we take from the report of the Chicago Board of Trade. How much of successful energy and toil, of increased wealth and of comfort, and of home happiness in the country life, is embraced in a single glance over these tables!

TABLE No. 14.

Shipments of flour (reduced to wheat) and grain from Chicago for twenty-six years.

Years.	Wheat.	Corn.	Oats.	Rye.	Barley.	Total.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1838	78					78
1839	3,678					3,678
1840	10,000					10,000
1841	40,000					40,000
1842	586,907					586,907
1843	688,907					688,907
1844	923,494					923,494
1845	1,024,620					1,024,620
1846	1,599,619					1,599,819
1847	2,136,994	67,135	38,892			2,243,201
1848	2,286,000	566,460	65,280			3,001,740
1849	2,192,809	644,848	26,849	31,453		2,769,111
1850	1,387,989	262,013	186,054	22,872		1,830,939
1851	799,380	3,221,317	605,827	19,997		4,446,291
1852	941,470	2,757,011	2,030,317	127,028	17,315	5,873,141
1853	1,680,998	2,780,253	1,748,493	120,275	82,162	6,412,181
1854	2,744,860	6,837,899	3,239,987	148,421	41,153	12,932,320
1855	7,110,270	7,547,678	1,888,533	92,032	20,132	10,633,700
1856	9,419,365	11,129,658	1,014,547	19,051	590	21,583,221
1857	10,783,292	6,814,615	316,778	17,993		18,032,678
1858	10,909,243	7,493,212	1,498,134	127,008	7,569	20,035,166
1859	10,759,359	4,217,654	1,174,177	478,162	131,449	16,753,795
1860	16,054,379	13,743,172	1,039,779	129,156	290,211	31,256,697
1861	22,913,830	24,186,382	1,665,384	422,492	185,293	49,363,380
1862	22,902,765	29,451,610	3,112,666	871,796	532,195	56,477,111
1863	17,925,336	24,444,147	7,574,994	835,133	668,735	50,548,345

TABLE No. 15.

PORK AND CATTLE TRADE OF CHICAGO.

The pork trade of Chicago has assumed a magnitude that places this city at the head of this business. Cincinnati long led all other cities in it, and acquired the name of Porkopolis, but it must now yield to Chicago. In 1862–'63 Cincinnati packed 608,457 head of hogs, and in 1863–'64 370,623; whilst Chicago, as will be seen from the following table, packed in 1862–'63 970,264 head, and in 1863–'64 904,659 head.

Pork trade of Chicago.

Years.	Received.	Forwarded.	Years.	Packed.
1858	540,486	192,013	1858–'59	179,684
1859	271,204	110,246	1859–'60	151,339
1860	392,864	227,164	1860–'61	271,805
1861	675,902	289,094	1861–'62	505,691
1862	1,348,890	491,135	1862–'63	970,264
1863	1,677,757	856,485	1863–'64	904,659

Cattle trade of Chicago.

Years.	Received.	Forwarded.	Packed.
1858	140,534	42,638	45,503
1859	111,694	37,584	51,606
1860	177,101	97,474	34,623
1861	204,579	124,146	53,754
1862	209,655	112,745	59,687
1863	300,622	187,068	70,086

TABLE No. 16.

Prices in Chicago.

Date.	WHEAT, BUSHEL.		CORN, BUSHEL.		OATS, BUSHEL.	
	No. 1.	No. 2.	No. 1.	No. 2.	No. 1.	No. 2.
1862–'63.						
September 26	....	....	....	....	33½	....
March 26	....	....	....	....	54½	52
1863–'64.						
September 26	$1 08	$1 04	76	73½	54	52
March 26	1 40 *a* 1 45	1 11	90	84	65⅛	63¼
July 1	2 00 *a* 2 05	1 95 *a* 2 00	$1 30	$1 28	84	80

TABLE No. 16—Continued.

Date.	RYE, BUSHEL.		BARLEY, BUSH.		Date.	Wool, lb.
	No. 1.	No. 2.	No. 1.	No. 2.		
1862–'63.					1863.	
September 26	$0 40	....	$0 75	....	June	25 a 50
March 26	76	....	1 37	$1 12	August	45 a 50
1863–'64.						
September 26	82	$0 80	1 17	1 13	June	50 a 55
March 26	1 03	1 01	1 35	1 23½	August	55 a 62½
July 1	1 50	1 40	1 40	1 35	....	....

Date.	HOGS, 100 LBS.		CATTLE, 100 LBS.
	Live.	Dressed.	Live.
1862–'63.			
September 26	$2 80 a 3 40	....	$1 50 a 3 20
December 26	3 10 a 3 50	$2 80 a 4 10	2 60 a 3 80
January 30	3 30 a 4 17½	4 10 a 5 00	2 00 a 3 75
March 26	2 00 a 6 80	....	2 50 a 5 00
1863–'64.			
September 26	3 75 a 4 80	....	1 75 a 4 25
December 26	4 00 a 6 15	4 50 a 7 00	2 00 a 5 00
January 30	4 50 a 6 65	6 50 a 7 75	2 50 a 5 35
March 26	5 75 a 7 75	7 50 a 8 50	2 50 a 7 00
July 1	8 00 a 9 50	....	3 00 a 8 50

Date.	HOG PRODUCT.					
	Mess, bbl.	Prime, bbl.	Lard, lb.	Hams, lb.	Sides, lb.	Shoulders, lb.
1863–'64.						
September 26	$13 12 a 13 25	....	10	......	......	......
December 26	18 00 a 18 50	$14 50 a 15 00	12	9	8¼	6
January 30	18 00 a 19 00	16 00 a 16 50	12	10	9	7
March 26	22 00	20 00 a 20 50	12	11¾	9½	8
July 1	39 00 a 40 00	37 00 a 38 00	17	19	......	15

Date.	BEEF PRODUCT.		
	Mess, bbl.	Beef ham, bbl.	Prime tallow, lb.
1863–'64.			
September 26	$11 00 a 12 00	....	10
December 26	10 00	$14 00	11
January 30	11 50 a 12 00	17 00	11
March 26	14 00 a 14 50	20 50	11
July 1	16 00 a 17 00	25 00	15

THE PORK-PACKING OF THE WEST.

The Cincinnati Price Current of April 6 contains the full returns of the pork packed in the west during the past season. The hog product is an interest of so great magnitude that we give room for the summary statement of these returns.

Referring to the progress made in the raising of hogs, as evidenced by the number packed, the Price Current says:

"Previous to 1861 the crop did not vary over four or five hundred thousand hogs, being sometimes one or two hundred thousand above, and then the same amounts below *two* millions; but in 1862 the packing run up to nearly *three* millions; in 1863 to over *four* millions, and this season it has fallen off over *three-quarters* of a million."

These "rapid and extensive changes" it attributes to the effects of civil war upon commerce; to the rapid increase of settlements in the west, especially in Iowa, Illinois, and Missouri. We think there are other causes showing that the *aggregate increase* in the production of hogs is not as great as here intimated—a fact not to be lost sight of in determining the future condition of this crop. Why should this great increase have manifested itself in 1862, when the price of pork was so ruinously low in 1861–'62? In these years, when hogs were sold by the farmers, there were no evidences of improvement to encourage the increased production of them. The prices of mess pork in New York averaged, during the year, as follows: 1859, $16 38 per barrel; 1860, $17 98; 1861, $15 89; 1862, $12 28; and 1863, $14 40. The price during 1860 was very encouraging, and as the increase of horses and cattle had tended to over-production, the direction of stock increase turned to hogs. Hence a large increase was made in 1860 and 1861. In the fall of the last of these years stock hogs in September were worth, in the west, about *one-third* what they were in September, 1860. This was the result of the war chiefly, and partly from too great an increase. Many hogs were held over, which swelled the number in 1862. And *those packed* were increased by the fact that the heavy trade in live hogs to the south from Kentucky, into which State they were taken from western States, was entirely stopped by the war. These causes greatly increased the ratio of the number packed over that of production in 1862 and 1863, when compared with that of former years. The falling off, therefore, in the past season was not due to the want of corn alone, as intimated by the Price Current, when it says:

"Were it not for the bad failure of the corn crop last year, consequent upon the cold, ungenial summer, and the killing frost of July and August, there can be no doubt the pork crop the past season would have *exceeded that of any previous season by half a million of hogs.*"

On the contrary, we think that with ordinary good crops of corn, there would have been a *falling off*. The returns of the correspondents of this department exhibit the fact that the number in January last was 911,323 less than in 1859 in the loyal States. The number of fatted hogs last fall and winter *brought to the packing houses* was not much diminished by the want of corn, *as now appears*, for these returns of our correspondents indicate that no great number of hogs have been kept over. The Price Current very correctly remarks that "farmers, owing to the high price of corn, sold off all the hogs they had which were in a condition fit to be disposed of, and the high prices tempted them to sell even those they intended for home use, to a very great extent, supposing that they would be able to buy the cured pork cheaper afterward, no doubt."

It is essential to understand the causes of the decrease of last season, and, as seen here, they show that under the most favorable conditions of the corn crop, hogs will be very scarce next season. Should peace return, and the southern demand for live and packed hogs be resumed next year, or the year following, there will be no more profitable stock than hogs.

The following are the tables from the Price Current:

Summary of hogs packed in the west.

States.	1862–'63.	1863–'64.
Ohio	991,183	648,836
Iowa	404,861	313,331
Indiana	585,428	394,217
Illinois	1,472,834	1,273,390
Kentucky	130,920	126,019
Wisconsin	201,745	164,576
Missouri	297,611	370,736
	4,084,582	3,291,105
Decrease	793,477	

But this decrease does not show the entire decrease in the hog crop of the west. The shipments to the east must be taken into consideration also. The returns of these are yet imperfect. We have not yet got, says the Price Current, the shipments through Canada, nor by the way of Buffalo, but those by the way of Pittsburg and Dunkirk compare as follows, from November 1 to February 1, each season:

	1862–'63.	1863–'64.
New York and Erie	136,007	64,181
Pennsylvania Central	171,496	34,141
	307,503	98,322

Here is a falling off of 209,181, and added to the decreased number packed, make the total decrease 997,658. The decrease in the average weight and yield of lard is as follows:

States.	Average weight per hog.		Yield of lard per hog.	
	1862–'63.	1863–'64.	1862–'63.	1863–'64.
	lbs.	*lbs.*	*lbs.*	*lbs.*
Ohio	$223\frac{1}{2}$	$196\frac{26}{29}$	27	$22\frac{1}{2}$
Indiana	209	$182\frac{18}{39}$	27	$19\frac{1}{8}$
Illinois	$217\frac{1}{2}$	$189\frac{1}{5}$	28	$21\frac{1}{8}$
Kentucky	204	182	31	21
Missouri	220	$188\frac{3}{4}$	29	23
Iowa	$209\frac{1}{2}$	$188\frac{5}{14}$	$26\frac{1}{2}$	$22\frac{5}{8}$
Wisconsin	224	202	$33\frac{1}{2}$	23

The Price Current says: "We find that the average weight for the entire packing is $188\frac{26}{29}$ pounds, and the average yield of lard, per hog, $22\frac{1}{7}$ pounds. The decrease in the average weight is about 26 pounds per hog, as compared with last season, in round numbers; but the accurate per cent. of decrease we find as follows:

"The aggregate weights of similar numbers of hogs, this season and last, packed at points from whence the averages were furnished, compare as follows:

"1862–'63, pounds	782, 601, 236
"1863–'64, pounds	684, 775, 632
"Decrease	97, 825, 604

"This is equal to about $12\frac{1}{2}$ per cent., which, added to the decrease in the number packed in the west, is as follows:

"Per cent. of decrease in number	$19\frac{1}{5}$
"Per cent. of decrease in weight	$12\frac{1}{2}$
	$31\frac{7}{10}$"

If to the decrease in the number packed in the west we add that of the number shipped by Pittsburg and Dunkirk, the entire decrease in number would be about $22\frac{8}{10}$ per cent.

The percentage decrease of *lard* is as follows:

1862–'63, pounds	118, 016, 080
1863–'64, pounds	72, 874, 468
Decrease in weight	45, 141, 612

Being a fraction over 38 per cent. The head and gut lard is not included in this estimate. This was about 8 pounds per hog this season, and 12 pounds last. The decrease, then, is as follows:

In number, per cent	$22\frac{8}{10}$
In weight, per cent	$12\frac{1}{2}$
In lard, per cent	38

It may be proper to add that the above table of the number packed does not indicate the number raised in a State. Indiana is the greatest hog-growing State, Illinois second, Ohio third, Kentucky fourth, Iowa fifth, and Missouri sixth, at this time. In 1859 Indiana was the first, Missouri second, Kentucky third, Illinois fourth, Ohio fifth, and Pennsylvania *sixth.*

PRICE OF HOGS AT CINCINNATI.

The following table shows the *average* price per 100 pounds of hogs at Cincinnati for the last ten years:

1854–'55	$4 $45\frac{3}{4}$	1859–'60	$6 $21\frac{1}{2}$
1855–'56	6 $04\frac{3}{4}$	1860–'61	5 97
1856–'57	6 $23\frac{3}{4}$	1861–'62	3 $28\frac{5}{8}$
1857–'58	5 $16\frac{1}{2}$	1862–'63	4 45
1858–'59	6 $58\frac{1}{3}$	1863–'64	7 $00\frac{1}{2}$

METEOROLOGY OF 1863.

FROM THE SMITHSONIAN INSTITUTION.

THE publication of meteorological tables in the monthly and bi-monthly reports of the Department of Agriculture having excited considerable interest, and gratified a useful curiosity in the minds of many farmers and other business men, we are induced to complete tables for the entire year 1863, and publish them in this more permanent form for future and more general reference. By their aid any one may ascertain the precise average amount of rain, in inches and tenths, or the mean degree of heat and cold, for any month of several given years in the section or State where he resides, and compare the same with the fall of rain or mean temperature of surrounding sections for the same months and years. Thus, if disposed to emigrate to some other section or State, by the aid of these tables he may select for examination such regions as best compare with his present location in climate and general characteristics of weather; or, should the interests, health, or comfort of his family suffer where he now resides, by long periods of severe heat or cold, or by droughts, or by deep-lying snows or heavy rains, at particular seasons, these tables will aid him in selecting a residence more desirable in temperature or in its amounts of snow or rain at those seasons.

Other uses of these tables will be suggested as the inquiring mind consults them on these familiar topics, and their continuation in the bi-monthly reports on the crops, and republication in annual reports of the Department of Agriculture, will expand the field for observation and comparison as the inquiries are thus increased and extended.

With these brief reasons for publishing these tables, we will direct those not familiar with them in the reports on crops.

HOW TO USE THEM.

There are two tables for each month—one of the current weather of the month in 1863 at each place named; the other of averages and means of temperature and rain for the same month in several years in the States and Territories named.

The first table for each month exhibits the greatest heat and cold, or highest and lowest range of the thermometer, with the dates prefixed when it occurred; the mean temperature of the month, and the amount of rain, (or snow computed as melted,) in inches and tenths, falling in said month at the places named, as given by each observer. Daily observations were made at the hours of 7 a. m., and 2 and 9 p. m., and the rain and melted snow measured carefully.

The second table for each month shows the average mean temperature, and average depth of rain and melted snow, in each State and Territory named, for the years 1855, 1856, 1857, 1858, and 1859; also for these five years collectively, and for the year 1863. The first column of this table gives the average number of places in each State and Territory in which the observations were made that have been used by us in calculating the averages and means of the table.

We may further remark that blanks in the tables signify that no observations were reported. Cyphers (0) denote the zero of Fahrenheit's thermometer, or that no rain or snow fell, and a dash (—) signifies that the number of the degrees following it was below zero.

I. JANUARY, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MAINE.				°		°	°	In.
Perry	Washington	Wm. D. Dana	16	55	9	—4	26.0	6.71
Dexter	Penobscot	B. F. Wilbur	5	54	9	—2	24.5	4.75
Belfast	Waldo	Geo. E. Brackett	16	50	9	—5	23.7	4.40
Gardiner	Kennebec	R. H. Gardiner	16	48	9	—4	25.6	4.42
Lisbon	Androscoggin	Asa P. Moore	26, 30, 31	43	9	—6	25.4	4.98
NEW HAMPSHIRE.								
Stratford	Coos	Branch Brown	4	48	18	—18	22.0	4.06
Barnstead	Belknap	Charles H. Pitman	3	56	8	4	30.2	2.00
Claremont	Sullivan	Arthur Chase	5	46	18	—2	27.0	3.67
VERMONT.								
Lunenburg	Essex	H. A. Cutting	15, 16	46	18	—15	23.1	5.60
Craftsbury	Orleans	James A. Paddock	3	50	18	—13	22.4	4.35
Montpelier	Washington	Dr. M. M. Marsh	6	49	18	—12	23.9	......
Burlington	Chittenden	Rev. McK. Petty	4	51	18	—15	23.9	3.47
Brandon	Rutland	David Buckland	4	57	18	—6	26.9	4.76
MASSACHUSETTS.								
New Bedford	Bristol	Samuel Rodman	3, 16	52	8, 18	10	35.5	2.63
Mendon	Worcester	J. G. Metcalf	16	52	18	6	30.9	3.90
Amherst	Hampshire	Prof. E. S. Snell	16	52	18	5	29.1	5.05
Westfield	Hampden	Rev. E. Davis	16	49	8, 18	5	27.8	5.87
Richmond	Berkshire	Wm. Bacon	15	58	18	2	29.3	9.25
RHODE ISLAND.								
Providence	Providence	H. C. Sheldon	16	54	18	9	33.2	3.57
Do	do	Prof. A. Caswell	16	54	18	8	32.2	3.61
CONNECTICUT.								
Pomfret	Windham	Rev. D. Hunt	16	56	18	5	29.1	4.44
Columbia	Tolland	Wm. H. Yeomans	5	70	18	10	34.3	......
Middletown	Middlesex	Prof. Jno. Johnston	16	57	4	6	30.8	4.64
New Haven	New Haven	D. C. Leavenworth	16	53	7, 18	11	31.2	......
Plymouth	Litchfield	D. W. Learned	16	53	8, 18	4	28.7	4.56
NEW YORK.								
Deaf & Dumb Ins't	New York	Prof. O. W. Morris	16	56	18	15	37.2	5.55
Fishkill Landing	Dutchess	Wm. H. Denning	16	56	18	9	31.4	5.30
White Plains	Westchester	O. R. Willis	16	55	18	11	33.6	......
Gouverneur	St. Lawrence	C. H. Russell	3	56	18	—18	26.0	3.03
Clinton	Oneida	Dr. H. M. Paine	4	59	18	3	31.9	5.49
Oneida	Madison	Dr. S. Spooner	4	54	18	—5	29.1	3.48
Theresa	Jefferson	S. O. Gregory	3	53	18	—17	24.9	2.89

I. JANUARY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
NEW YORK—Cont'd.								
				°		°	°	*In.*
Oswego	Oswego	Wm. S. Malcolm	4	54	18	3	32.3	3.61
Skaneateles	Onondaga	W. M. Beauchamp	4	53	18	4	30.7	......
Auburn	Cayuga	John B. Dill	4	52	18	5	29.4	......
Nichols	Tioga	Robert Howell	5, 25	50	2	—2	29.4	......
Rochester	Monroe	Dr. M. M. Mathews	3	55	17	—2	30.5	2.23
Wilson	Niagara	Dr. E. S. Holmes	4	57	17, 18	8	31.7	......
NEW JERSEY.								
Newark	Essex	W. A. Whitehead	16	58	18	11	33.0	4.27
Mount Holly	Burlington	Dr. M. J. Rhees	4	59	18	16	37.2	......
PENNSYLVANIA.								
North Whitehall	Lehigh	Edward Kohler	16	51	3	5	32.0	......
Philadelphia	Philadelphia	J. A. Kirkpatrick, A M	15	61	18	15	37.2	4.70
West Haverford	Delaware	Dr. Paul Swift	15	63	18	12	36.5	4.75
Fallsington	Bucks	Eben'r Hance	15	63	18	13	36.3	4.10
Mount Joy	Lancaster	J. R. Hoffer	27	55	18	12	35.3	4.05
Harrisburg	Dauphin	Dr. John Heisely	16	51	18, 19	18	34.9	5.22
Gettysburg	Adams	M. and H. E. Jacobs	5	54	18	6	32.5	4.52
Fleming	Center	Samuel Brugger	25	54	2	0	29.2	3.78
Blairsville	Indiana	W. R. Boyas	4	41	17	5	21.0	......
Altoona	Blair	Thos. H. Savery	5	51	18	2	30.8	......
Connellsville	Fayette	John Taylor	26	58	18	3	32.6	......
Canonsburg	Washington	Rev. W. Smith, D.D.	3	55	18	4	31.8	3.86
MARYLAND.								
Chestertown	Kent	Prof. J. R. Dutton	15	63	18	17	38.5	3.49
St. Mary's	St. Mary's	Rev. J. Stephenson	15	63	18	20	40.2	3.24
Sykesville	Carroll	Miss H. M. Baer	15	61	18	8	32.8	5.20
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Inst'n	25	64	2	8	41.7	2.68
TENNESSEE.								
Clarksville	Montgomery	Wm. M. Stewart	12, 13	67	16	15	40.9	8.58
KENTUCKY.								
Louisville	Jefferson	Mrs. L. Young	13	65	18	9	38.9	7.33
OHIO.								
Austinburg	Ashtabula	Dole & Griffing	14	49	18	—4	30.3	6.28
East Fairfield	Columbiana	S. B. McMillan	14	49	1	1	31.4	6.10
New Lisbon	....do	J. F. Benner	14	52	1	—3	31.6	7.20
Welshfield	Geauga	B. F. Abell, A. M	14	51	18	5	31.2	6.[illegible]

I. JANUARY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
OHIO—Continued.				°		°	°	In.
Milnersville	Guernsey	Rev. D. Thompson	13, 14, 24	50	1, 19	10	31.8	7.61
Cleveland	Cuyahoga	Mr. & Mrs. G. A. Hyde	14	55	18	7	34.1	3.87
Kelley's Island	Erie	Geo. C. Huntington	5, 14	47	17	11	32.4	3.04
Norwalk	Huron	Rev. A. Newton	13, 14	54	18	4	33.0	6.07
Newark	Licking	Israel Dille	3	56	18	—5	33.3	4.00
Westerville	Franklin	Prof. Jno. Haywood	13	58	18	—3	33.8	7.12
Toledo	Lucas	Dr. J. B. Trembley	4	54	18	9	34.1	3.88
Bowling Green	Wood	Dr. W. R. Peck	13	55	16	10	35.8	3.29
Urbana	Champaign	Pf. M. G. Williams	13	56	1	1	32.7	6.36
Bethel	Clermont	George W. Crane	4	53	18	6	33.7	7.00
Do	Hamilton	R. C. Phillips	12, 13	60	17, 18	10	38.7	6.28
Cincinnati	....do	Geo. W. Harper	20	58	17	11	36.5	5.55
MICHIGAN.								
Monroe	Monroe	Miss F. E. Whelpley	4, 5	50	16	3	32.0	2.51
Ypsilanti	Washtenaw	C. S. Woodard	4	51	16	—1	25.8	1.26
Traverse City	Leelenaw	"Herald"	3	50	16	7	30.0	......
Holland	Ottawa	L. H. Streng	13	51	16	8	70.6	3.75
Clifton	Keweenaw	Wm. Van Orden, jr.	16	42	9	—8	24.9	......
Marquette	Marquette	F. M. Bacon	3	44	17	2	18.9	1.96
INDIANA.								
Richmond	Wayne	Edward B. Rambo	13	56	17	0	33.9	5.75
Cadiz	Henry	Wm. Dawson	13	55	18	7	32.2	......
South Bend	St. Joseph	James H. Dayton	13	56	17	8	32.8	3.21
Rockville	Park	Misses F. and M. Anderson.	13	57	7, 16, 17	10	31.5	3.50
Logansport	Cass	Isaac Bartlett	13	56	7	9	33.6	5.55
New Harmony	Posey	Jno. Chappellsmith	12	64	17	13	38.9	4.85
ILLINOIS.								
Chicago	Cook	Samuel Brooks	3	56	16	—4	27.9	......
Riley	McHenry	E. Babcock	3	53	7	—2	28.2	2.65
Sandwich	De Kalb	N. E. Ballou, M. D.	3	60	6, 7	7	31.7	4.45
Ottawa	La Salle	Miss E. H. Merwin	3	60	6	8	31.6	3.51
Winnebago	Winnebago	Jas. W. Tolman	31	58	7	—6	28.0	2.86
Pekin	Tazewell	J. H. Riblett	3	57	6, 16	6	31.0	3.25
Peoria	Peoria	Frederick Brendel	3	58	6, 16	10	33.7	2.83
Waverly	Morgan	Timothy Dudley	3	62	16	6	34.2	2.57
Highland	Madison	Ad. F. Bandelier	3	59	16	12	35.3	3.93
Galesburg	Knox	Prof. W. Livingston	3, 13	54	6	6	29.4	2.65
Manchester	Scott	J. and Miss E. Grant	3	61	17	7	34.3	2.89
Augusta	Hancock	S. B. Mead, M. D.	13	60	6, 7, 15	9	31.7	2.80
WISCONSIN.								
Manitowoc	Manitowoc	Jacob Lüps	3	48	9	2	29.2	2.84
Milwaukie	Milwaukie	Carl Winkler	2	47	6	8	29.5	3.88

I. JANUARY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
WISCONSIN—Cont'd.				°		°	°	In.
Weyauwega	Waupacca	Wm. Woods	3	50	17	—6	26.0	......
Rocky River	Columbia	W. W. Curtis	3	49	7	1	27.5	1.52
Beloit	Rock	Henry S. Kelsey	3	56	7	—4	30.6	2.65
Madison	Dane	Prof. J. W. Sterling	3	48	7, 16	4	25.8	......
Odanah	Ashland	Edwin Ellis	2	34	8	—14	12.2	......
Superior	Douglas	Wm. Mann	1	44	16	—12	20.0	......
MINNESOTA.								
Beaver Bay	Lake	C. Wieland	3	39	16	—17	18.8	1.20
Itasca	Anoka	O. H. Kelley	2	50	16	—14	18.6	1.23
St. Paul	Ramsey	Rev. A. B. Paterson	1, 2	40	16	—14	20.0	1.12
Forest City	Meeker	Henry L. Smith	1, 2	46	16	—30	19.6	......
IOWA.								
Lyons	Clinton	Dr. P. J. Farnsworth	3	54	6, 7	5	29.3	2.75
Dubuque	Dubuque	Dr. Asa Horr	13	51	6, 7, 16	4	28.7	2.80
Independence	Buchanan	A. C. Wheaton	13	54	16	0	27.8	3.70
Iowa City	Johnson	Theo. S. Parvin, A.M.	13	59	16	0	26.0	3.39
Fort Madison	Lee	Daniel McCready	13	58	16	7	34.0	2.30
Waterloo	Black Hawk	L. H. Doyle	13	53	16	—5	24.8	......
Algona	Kossuth	Dr. & Miss L. McCoy	2, 3	46	16	—13	23.6	1.66
Pleasant Plain	Jefferson	T. M'Connel	13	62	16	4	29.9	1.40
MISSOURI.								
St. Louis	St. Louis	Dr. Geo. Engelman	12	65	17	12	37.4	4.11
Athens	Clark	J. T. Caldwell	26	90	22	40	59.9	......
Canton	Lewis	George P. Ray	13	63	15	7	31.3	3.66
KANSAS.								
Lawrence	Douglas	A. N. Fuller	13	63	27	16	....	......
Manhattan	Riley	J. T. Goodnow	11	69	16	—4	36.1	0.66
Fort Riley	Davis	Dr. F. I. Drew	11	68	16	—2	36.3	0.48
NEBRASKA TER.								
Elkhorn City	Washington	Miss A. M. J. Bowen	2	51	16	—9	28.6	......
Bellevue	Sarpy	Rev. Wm. Hamilton	4	59	16	—6	31.0	0.75
DAKOTA TER.								
Yankton	Yankton	H. G. Williams	4	49	15	—15	19.8	1.10
WASHINGTON TER.								
Neeah Bay	Clallam	James G. Swan	14	56	24	37	44.8	1..6
CALIFORNIA.								
Silver Creek	Plumas	M. D. Smith	5, 9, 31	52	30	5	34.3	7.08
Marysville	Yuba	W. C. Belcher	30	62	17	33	47.3	1.98
Sacramento	Sacramento	Dr. Thos. M. Logan	6	58	22	34	46.7	1.73
San Francisco	San Francisco	Dr. W. O. Ayros	8	61	14, 18, 27	40	49.3	3.35

II. JANUARY—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean. temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	5	24.3	4.83	12.6	2.46	11.9	7.81	22.6	3.81	17.7	4.81	17.8	4.74	25.0	5.05
New Hampshire	4	25.8	5.65	15.8	2.95	10.4	3.34	25.1	2.46	16.1	3.82	18.6	3.64	26.4	3.24
Vermont	4	25.3	1.95	11.4	1.48	8.2	2.57	22.7	1.68	18.1	2.63	17.1	2.10	24.0	4.45
Massachusetts	12	29.1	4.88	18.0	3.24	16.0	5.06	31.2	3.20	26.0	7.04	24.1	4.68	30.5	5.34
Rhode Island	1	30.0	6.45	18.6	5.25	16.3	5.50	33.1	3.33	29.3	5.75	25.5	5.26	32.7	3.59
Connecticut	4	29.6	5.40	20.3	4.61	15.8	4.32	32.4	3.03	25.8	7.53	24.8	4.98	30.8	4.41
New York	19	27.7	3.36	16.9	2.82	13.9	3.04	31.0	2.25	26.4	3.52	23.2	3.00	30.6	3.95
New Jersey	5	32.4	3.37	20.6	3.67	19.6	4.43	87.2	3.58	31.7	5.47	28.3	4.10	35.1	4.27
Pennsylvania	19	30.0	2.72	18.6	2 54	18.4	2.69	36.3	2.15	30.5	3.52	26.8	2.72	32.5	4.37
Delaware	1	......	....	21.1	....	20.2	....	40.7	1.18	......	4.84	27.0	2.51	37.2	3.98
Maryland	5	33.8	3.28	21.9	3.59	21.9	2.88	38.6	1.67	34.2	4.69	30.1	3.22	37.2	3.98
District of Columbia	1	35.1	....	21.6	4.00	21.8	0.89	40.2	1.62	36.3	4.54	31.0	2.76	41.7	2.68
South Carolina	....	......	....	......	....	......	....	......	....	......	....	......	....	......	....
Tennessee	2	39.6	3.64	25.6	1.38	26.9	2.16	45.8	4.56	39.6	3.31	35.5	3.01	40.9	8.58
Kentucky	4	38.7	3.32	20.9	1.80	24.7	1.53	42.1	2.66	34.0	3.05	32.1	2.47	38.9	7.33
Ohio	19	31.4	2.73	17.4	1.69	16.8	1.39	37.3	1.72	30.5	2.42	26.7	1.99	33.4	5.60
Michigan	7	25.8	3.50	13.3	1,24	11.3	2.70	31.7	4.01	25.5	2.70	21.5	2.83	33.7	2.39
Indiana	4	33.6	4.66	21.5	0.80	16.9	1.01	38.5	2.64	31.8	2.29	28.5	2.28	33.8	4.57
Illinois	12	28.2	9.24	14.4	0.96	11.7	0.72	34.5	1.82	26.2	1.78	23.0	2.90	31,4	3.13
Wisconsin	9	21.2	2.60	9.7	8.56	6.9	1.12	29.7	2.07	19.7	1.21	17.4	3.11	25.1	2.72
Minnesota	3	0.8	....	0.9	2.35	6.0	0.91	20.9	2.51	11.1	0.98	7.9	1.69	19.3	1.18
Iowa	7	23.5	2.08	9.3	1.04	5.7	0.77	32.0	2.03	22.9	1.05	18.7	1.39	27.5	2.57
Missouri	2	33.8	4.66	20.1	1.03	19.3	0.41	39.6	2.85	33.4	2.32	29.2	2.25	42.9	3.88
Kansas	2	......	....	......	....	......	....	37.7	1.79	30.8	1.43	34.2	1.61	36.2	0.57
Nebraska Territory	1	......	....	......	....	......	....	32.9	1.82	22.4	0.94	27.6	1.38	29.8	0.75
California	2	44.4	2.67	65.2	4.57	50.1	1.49	46.7	2.50	45.6	1.41	50.4	2.53	44.2	3.54

I. FEBRUARY, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain and melted snow
MAINE.				°		°	°	*In.*
Perry	Washington	Wm. D. Dana	20	43	4	—17	21.7	3.33
Dexter	Penobscot	B. F. Wilbur	20	44	4, 5	—14	21.6	1.50
Belfast	Waldo	George E. Brackett	20, 26	40	4	—23	20.9	3.65
Gardiner	Kennebec	R. H. Gardiner	20	44	5	—23	22.5	4.40
Lisbon	Androscoggin	Asa P. Moore	20	48	5	—23	24.3	4.55
Cornishville	York	G. W. Guptill	27	44	4	—16	22.1	3.60
NEW HAMPSHIRE.								
Exeter Centre	Rockingham	Elias Nason	20	50	5	—15	26.7	......
Stratford	Coos	Branch Brown	15	40	4	—32	17.0	2.34
Barnstead	Belknap	Charles H. Pitman	27	49	4, 5	—20	25.8	......
London Ridge	Merrimack	Dr. Isaac S. French	25, 27	62	4	—12	35.1	4.50
Claremont	Sullivan	Arthur Chase	15	46	5	—23	22.0	3.12
VERMONT.								
Lunenburg	Essex	H. A. Cutting	6, 27	40	4	—32	19.2	1.40
Craftsbury	Orleans	James A. Paddock	15	42	4	—28	16.7	2.10
Brookfield	Orange	T. F. Pollard	15	42	4	—33	16.5	2.17
Montpelier	Washington	Dr. M. M. Marsh	15	45	5	—25	18.0	......
Calais	....do	Jas. K. Tobey	15	40	4	—32	17.1	4.10
Burlington	Chittenden	Rev. McK. Petty	19, 27	40	4	—29	17.6	1.98
Brandon	Rutland	David Buckland	15	46	4	—22	23.2	1.99
MASSACHUSETTS.								
New Bedford	Bristol	Samuel Rodman	10	51	4	—4	31.6	4.03
Worcester	Worcester	H. C. Prentiss	27	53	4	—6	....	3.42
Mendon	....do	John G. Metcalf	27	50	4	—8	26.7	......
Amherst	Hampshire	Prof. E. S. Snell	27	45	5	—9	26.3	4.43
Westfield	Hampden	Rev. E. Davis	27	48	5	—10	25.5	5.03
Richmond	Berkshire	Wm. Bacon	6	48	4	—14	24.3	9.81
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	19	50	4	—5	28.9	4.04
Do	....do	H. C. Sheldon	27	51	4	—4	30.0	3.53
CONNECTICUT.								
Pomfret	Windham	Rev. D. Hunt	6	48	4	—8	21.2	3.58
Columbia	Tolland	Wm. H. Yeomans	8, 27	48	4	—9	29.5	......
Middletown	Middlesex	Prof. John Johnston	27	51	5	—7	28.1	5.11
New Haven	New Haven	D. C. Leavenworth	20	50	5	—6	31.0	......
Plymouth	Litchfield	D. W. Learned	27	48	4	—10	25.1	4.60
Colebrook	....do	Charlotte Rockwell	6	47	4	—16	25.0	......
NEW YORK.								
Fishkill Landing	Dutchess	Wm. H. Denning	27	49	4	—8	27.5	4.65
White Plains	Westchester	Oliver R. Willis	27	51	4	—2	31.0	......
Deaf and Dumb Inst.	New York city	Prof. O. W. Morris	10	50	4	6	33.9	7.04
Gouverneur	St. Lawrence	C. H. Russell	18	41	4	—24	19.4	3.89
Clinton	Oneida	Dr. H. M Paine	15	50	4	—20	25.8	2.62

I. FEBRUARY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date	Minimum temperature.	Mean temperature.	Rain and melted snow.
NEW YORK—Cont'd.				°		°	°	In.
Oneida	Madison	Dr. S. Spooner	26	46	4	—25	21.9	2.25
Theresa	Jefferson	O. S. Gregory	19	43	4	—26	17.9	3.40
Oswego	Oswego	Wm. S. Malcolm	26	44	4	—14	24.0	2.80
Skaneateles	Onondaga	W. M. Beauchamp	15	46	4	—20	24.8	......
Auburn	Cayuga	John B. Dill	15	44	4	—20	24.7	......
Nichols	Tioga	Robert Howell	19	49	4	—13	26.3	......
Seneca Falls	Seneca	Philo Cowing	8	44	4	—13	25.1	......
Rochester	Monroe	Dr. M. M. Mathews	26	48	4	—6	26.2	2.44
Wilson	Niagara	Dr. E. S. Holmes	26	44	4	—4	25.7	2.02
NEW JERSEY.								
Newark	Essex	W. A. Whitehead	10	51	5	—3	31.4	4.25
Mount Holly	Burlington	Dr. M. J. Rhees	19	53	5	7	33.8	......
PENNSYLVANIA.								
North Whitehall	Lehigh	Edward Kohler	12, 27	47	5	—2	30.3	......
Philadelphia	Philadelphia	J.A.Kirkpatrick, A.M	10, 27	51	5	7	34.1	3.82
W. Haverford	Delaware	Dr. Paul Swift	20, 27	51	4, 5	8	34.7	5.26
Fallsington	Bucks	Eben'r Hance	9	52	5	4	32.3	4.40
Mount Joy	Lancaster	J. R. Hoffer	20	46	24	—1	31.8	3.15
Harrisburg	Dauphin	Dr. John Heisely	27	47	5	7	31.2	3.68
Gettysburg	Adams	M. & H. E. Jacobs	27	53	4, 25	—1	29.7	4.20
Fleming	Center	Samuel Brugger	9, 15	48	4	—6	28.6	3.73
Altoona	Blair	Thomas H. Savery	15	50	3, 4	5	29.3	......
Connellsville	Fayette	John Taylor	26	62	4	—4	32.3	......
Canonsburg	Washington	Rev. W. Smith, D. D.	26	53	4	—2	30.4	4.14
MARYLAND.								
Chestertown	Kent	Prof. J. R. Dutton	27	58	4, 5	12	35.4	4.49
St. Mary's	St. Mary's	Rev. J. Stephenson	27	62	4	13	38.0	5.14
Sykesville	Carroll	Miss H. M. Baer	27	53	4	2	32.2	3.37
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Instit'n.	28	57	18	5	36.3	0.36
TENNESSEE.								
Clarksville	Montgomery	Wm. M. Stewart	11	68	6	9	41.6	6.46
KENTUCKY.								
Louisville	Jefferson	Mrs. L. Young	26	61	3	7	34.9	4.12
OHIO.								
Austinburg	Ashtabula	Dole & Griffing	26	46	23	—2	27.0	3.64
East Fairfield	Columbiana	S. B. McMillan	26	56	4	0	30.4	2.50

I. FEBRUARY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain and melted snow.
OHIO—Continued.				°		°	°	In.
New Lisbon	Columbiana	J. F. Benner	19	49	4	0	30.9	2.41
Welshfield	Geauga	B. F. Abell, A. M.	26	49	3	4	28.7	4.85
Milnersville	Guernsey	Rev. D. Thompson	26	58	7	0	32.3	3.06
Cleveland	Cuyahoga	Mr. and Mrs. Hyde	9, 26	49	3	8	31.0	2.87
Kelley's Island	Erie	Geo. C. Huntington	26	46	3	2	29.0	2.62
Norwalk	Huron	Rev. A. Newton	26	56	4	6	30.5	2.58
Newark	Licking	Israel Dille	26	57	4	6	33.1	3.40
Toledo	Lucas	Dr. J. B. Trembley	26	54	3	6	31.2	3.56
Bowling Green	Wood	Dr. W. R. Peck	26	62	3, 4	9	31.8	3.06
Urbana	Champaign	Prof. M. G. Williams	26	60	3	5	33.0	3.13
Bethel	Clermont	George W. Crane.	14	53	3	8	32.1	3.87
Cincinnati	Hamilton	George W. Harper	26	60	3	7	36.0	3.05
Do	....do	R. C. Phillips	14, 26	58	3	12	38.4	3.85
MICHIGAN.								
Monroe City	Monroe	Miss F. E. Whelpley	26	48	3	2	29.1	2.03
Ypsilanti	Washtenaw	C. S. Woodard	26	52	3	0	27.3	3.21
Holland	Ottawa	L. H. Streng	14	54	3, 4	3	26.1	1.89
Clifton	Kewenaw	Wm. Van Orden, jr.	20, 24	48	12	—20	19.4	......
Marquette	Marquette	Frank M. Bacon	18	43	3	—14	19.9	1.65
INDIANA.								
Richmond	Wayne	Edward B. Rambo	26	56	3, 23	2	32.9	3.16
Cadiz	Henry	William Dawson	26	55	3, 22	0	30.1	1.42
New Castle	....do	T. B. Redding, A. M.	26	60	3	2	34.6	......
South Bend	St. Joseph	Jas. H. Dayton	17	48	23	4	29.2	2.73
Logansport	Cass	Thos. B. Helm	25	56	3	—3	31.1	1.73
New Harmony	Posey	John Chappellsmith	9	59	6	3	39.7	2.14
ILLINOIS.								
Chicago	Cook	Samuel Brookes	28	42	3	—12	22.6	......
Riley	McHenry	E. Babcock	14	45	3	—14	24.7	3.88
Marengo	....do	O. P. & J. S. Rogers	14, 17	46	3	—9	25.8	1.59
Sandwich	De Kalb	N. E. Ballou, M. D.	27	52	3	—10	28.2	2.30
Ottawa	La Salle	Mrs. E. H. Merwin	25	47	3	—12	30.4	3.29
Winnebago	Winnebago	James W. Tolman	17	47	3	—12	24.7	1.98
Pekin	Tazewell	J. H. Riblett	17	48	3	—10	28.8	3.24
Peoria	Peoria	Frederick Brendel	17	51	3	—4	31.5	3.20
Waverley	Morgan	Timothy Dudley	14, 15	57	3	—6	31.1	2.15
Highland	Madison	Ad. F. Bandelier	14	58	3	1	33.7	4.21
Galesburg	Knox	Prof. W. Livingston	17	47	3	—8	26.5	2.06
Manchester	Scott	Dr. J. & Miss Grant	14	54	3	—5	31.8	4.01
Augusta	Hancock	S. B. Mead, M. D.	17	49	3	—10	28.8	3.89
WISCONSIN.								
Manitowoc	Manitowoc	Jacob Lüps	18	45	3	—13	26.2	1.52
Milwaukie	Milwaukie	Carl Winkler	14	42	3	—11	26.3	1.99
Do	....do	I. A. Lapham, LL.D.	28	47	3	—12	26.5	1.85

I. FEBRUARY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain and melted snow.
WISCONSIN—Cont'd.				°		°	°	*In.*
Weyauwega	Waupaca	Wm. Woods	......	......	3	—22	......	......
Rocky Run	Columbia	W. W. Curtis	28	44	3	—15	24.4	2.41
Madison	Dane	Prof. J. W. Sterling	28	43	3	—14	21.6	......
Beloit College	Rock	Prof. H. S. Kelsey	17	49	3	—10	27.3	1.30
Odanah	Ashland	Edwin Ellis	18	38	3	—32	7.3	......
Superior	Douglas	Wm. Mann	18	42	3	—26	13.4	......
MINNESOTA.								
Beaver Bay	Lake	C. Wieland	18	40	2	—24	14.5	1.02
Itasca	Anoka	O. H. Kelley	18	48	3	—35	16.6	1.60
St. Paul	Ramsey	Rev. A. B. Paterson	17	40	3	—31	15.3	0.93
IOWA.								
Lyons	Clinton	Dr. P. J. Farnsworth	17	48	3	—10	25.9	3.10
Dubuque	Dubuque	Dr. Asa Horr	17	48	3	—12	23.6	1.66
Independence	Buchanan	A. C. Wheaton	17	52	3	—10	26.2	3.00
Iowa City	Johnson	T. S. Parvin, A. M.	27	44	3	—17	23.4	2.00
Fort Madison	Leo	Daniel McCready	18	50	3	—12	28.5	3.66
Pleasant Plain	Jefferson	T. McConnel	17	53	3	—12	26.8	1.70
Algona	Kossuth	Dr. & Miss L. McCoy	14	49	3	—21	19.6	0.93
MISSOURI.								
St. Louis	St. Louis	Dr. Geo. Engelman	14	63	3	2	35.8	3.99
Athens	Clark	J. T. Caldwell	24	100	9	42	61.4	......
Canton	Lewis	George P. Ray	17	52	3	10	28.6	2.95
KANSAS.								
Lawrence	Douglas	Arthur N. Fuller	18	55	3	—7	30.6	1.31
Manhattan	Riley	Isaac T. Goodnow	15, 18	53	3	—4	30.1	2.30
Fort Riley	Davis	Dr. Fred. P. Drew	18	52	3	—2	29.8	......
NEBRASKA TER.								
Elkhorn City	Washington	Miss A. M. J. Bowen	27	46	2	—6	23.5	0.90
Bellevue	Sarpy	Rev. Wm. Hamilton	18	50	1, 2	2	26.3	0.56
WASHINGTON TER.								
Neeah Bay	Clallam	James G. Swan	19, 28	50	8	24	39.7	14.2
UTAH TERRITORY.								
G. Salt Lake City	G. Salt Lake	W. W. Phelps	11, 12	40	4, 14	12	27.8	3.74
St. George	Washington	H. Pearce	12	59	6	20	39.0	0.90
CALIFORNIA.								
Silver Creek	Plumas	M. D. Smith	28	60	20	5	35.3	9.60
Marysville	Yuba	W. C. Beecher	28	69	10	32	48.2	2.43
Sacramento	Sacramento	Dr. Thos. M. Logan	28	62	10	36	46.5	2.75
San Francisco	San Francisco	Dr. W. O. Ayres	27	61	9	38	48.6	3.26
Benicia Barracks	Sonoma	Dr. W. W. Hays	27	70	9	34	48.2	3.26

II. FEBRUARY—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	5	16.2	7.25	17.2	1.94	26.4	7.88	15.4	2.04	21.9	3.73	19.4	4.57	22.2	3.51
New Hampshire	4	18.8	5.64	17.5	1.53	28.8	2.52	16.6	1.60	23.7	2.26	21.1	2.71	25.3	3.32
Vermont	4	17.7	0.98	14.9	0.94	27.8	3.04	14.1	1.20	22.8	1.54	19.5	1.54	18.3	2.29
Massachusetts	12	21.2	3.38	20.8	1.09	32.6	2.51	22.4	1.68	28.3	4.17	25.1	2.57	26.9	5.34
Rhode Island	1	22.1	4.05	18.7	0.80	32.7	3.26	24.5	2.80	36.6	1.85	26.9	2.55	29.5	3.78
Connecticut	4	19.7	4.10	23.0	1.32	32.8	1.45	23.3	2.16	29.3	3.80	25.6	2.57	26.7	4.43
New York	18	18.0	1.83	15.6	8.82	32.7	2.45	21.5	2.00	29.8	2.41	25.5	3.50	25.3	3.46
New Jersey	4	25.1	3.26	23.7	0.84	37.1	1.77	26.4	2.51	33.4	3.48	29.1	2.37	32.6	4.25
Pennsylvania	19	23.0	2.59	22.2	1.14	36.4	1.54	25.6	1.90	33.6	3.13	28.2	2.06	31.3	4.05
Delaware	1	......	....	25.1	....	39.5	....	32.5	1.68	......	4.38	32.4	3.03	......	....
Maryland	5	26.2	2.07	26.1	0.84	40.4	0.68	27.7	1.64	36.9	3.49	31.5	1.74	35 2	4.33
District of Columbia	1	27.0	....	27.0	0.64	42.0	0.65	31.0	1.67	39.4	3.54	33.3	1.30	36.3	0.36
South Carolina	6	44.2	1.46	45.9	2.06	57.4	1,01	46.3	6.60	51.4	3.92	49.0	3.01	......	....
Tennessee	2	35.4	1.30	33.3	2.90	52.5	2.65	36.8	3.21	46.7	7.66	40.9	3.54	41.6	6.46
Kentucky	4	30.5	0.86	28.2	2.08	46.5	3.14	30.2	3.06	40.0	7.56	35.1	3.34	34.9	4.12
Ohio	19	23.7	1.70	23.2	1.92	39.8	2.50	24.5	2.30	34.0	4.21	29.0	2.53	31.7	3.23
Michigan	7	17.0	1.59	14.2	1.17	27.6	4.26	19.0	2.17	27.7	1.69	21.1	2.18	24.4	2.19
Indiana	4	27.6	0.75	24.2	0.77	41.9	4.60	25.8	2.00	37.0	5.16	31.3	2.66	32.9	2.24
Illinois	13	22.7	0.82	21.3	1.48	34.0	5.18	19.6	1.76	29.7	2.10	25.5	2.27	28.4	2.98
Wisconsin	9	13.1	1.23	15.4	0.40	25.8	2.77	16.0	0.89	23.3	1.44	18.7	1.35	21.6	1.81
Minnesota	3	7.7	....	12.1	....	10.7	3.30	10.1	0.70	14.6	0.58	11.0	1.33	15.5	1.18
Iowa	8	18.3	1.71	16.1	1.33	27.2	5.30	16.5	1.64	26.4	1.92	20.9	2.38	25.0	2.30
Missouri	2	29.9	0.63	26.0	3.64	42.1	6.29	29.2	1.81	36.9	5.35	32.8	3.54	41.9	3.47
Kansas	3	......	....	......	....	29.6	3.60	25.2	0.51	34.6	0.42	29.8	1.51	30.2	1.80
Nebraska Territory	3	......	....	......	....	......	....	17.3	0.80	23.8	0.68	20.5	0.74	24.9	0.73
California	2	52.7	2.67	52.2	0.44	50.4	4.87	53.9	2.01	51.0	4.58	52.0	2.91	45.4	4.26

I. MARCH, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain and snow.
MAINE.				°		°	°	*In.*
Perry	Washington	Wm. D. Dana	26	45	13	—7	22.5	3.70
Dexter	Penobscot	B. F. Wilbur	22	46	14	—6	23.9	3.70
Belfast	Waldo	G. E. Brackett	25, 26	45	13	—9	23.0	4.15
Vassalboro'	Kennebec	Jas. Van Blarcom	25	50	14	—5	24.5	5.90
Gardiner	....do	R. H. Gardiner	25, 26	46	14	—12	24.0	4.32
Lisbon	Androscoggin	Asa P. Moore	22	50	14	—14	24.6	4.45
Cornishville	York	G. W. Guptill	22	44	5, 13	—4	23.2	6.52
NEW HAMPSHIRE.								
Exeter Center	Rockingham	Elias Nason	22	52	14	—10	28.5	......
Shelburn	Coos	Fletcher Odell	22	49	13	—16	20.3	2.70
Stratford	....do	Branch Brown	24, 25	42	5, 13	—20	17.8	......
Littleton	Grafton	Rob't C. Whiting	25	48	13	—22	20.6	3.00
Barnstead	Belknap	Charles H. Pitman	22, 23	45	14	0	26.5	3.80
Claremont	Sullivan	Arthur Chase	26	48	13	—18	24.0	4.72
VERMONT.								
Lunenburg	Essex	Hiram A. Cutting	25	46	5	—27	19.5	4.75
Craftsbury	Orleans	Jas. A. Paddock	25	42	13	—13	19.0	3.65
Brookfield	Orange	T. F. Pollard	26	45	13	—27	18.6	3.98
Montpelier	Washington	Dr. M. M. Marsh	26	47	13	—17	20.0	......
Burlington	Chittenden	Rev. McK. Petty	25	47	5	—18	20.3	2.75
Brandon	Rutland	David Buckland	25	46	13	—21	22.1	3.47
MASSACHUSETTS.								
Falmouth	Barnstable	Dr. N. Barrows	22	51	13	8	30.9	3.89
New Bedford	Bristol	Samuel Rodman	26	56	5, 15	8	31.5	3.99
Worcester	Worcester	Henry C. Prentiss	25, 26	47	13	—1	27.9	5.78
Mendon	....do	Jno. G. Metcalf	26	48	13	—6	26.1	......
Amherst	Hampshire	Prof. E. S. Snell	25	47	13	—6	26.1	5.60
Westfield	Hampden	Rev. E. Davis	26	45	13	—5	26.2	6.17
Richmond	Berkshire	Wm. Bacon	23	49	14	—8	25.0	9.25
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	24, 30	47	2	19	33.4	4.12
Do	....do	H. C. Sheldon	26	51	13	4	30.0	4.79
CONNECTICUT.								
Pomfret	Windham	Rev. D. Hunt	25	50	5	1	27.0	7.00
Columbia	Tolland	Wm. H. Yeomans	22	54	13	6	30.9	......
Middletown	Middlesex	Prof. Jno. Johnson	25	54	13	—1	28.1	4.73
New Haven	New Haven	D. C. Leavenworth	25	52	13	7	31.0	......
Plymouth	Litchfield	D. W. Learned	25	49	13	—5	25.5	5.76
NEW YORK.								
Fishkill Landing	Dutchess	Wm. H. Denning	25	58	15	5	28.2	5.70
White Plains	Westchestor	Oliver R. Willis	25	54	13	9	32.1	......
Deaf & Dumb Inst.	New York city	Prof. O. W. Morris	26	55	15	14	35.4	......
Gouverneur	St. Lawronce	C. H. Russell	25	54	5	—15	22.1	2.60

I. MARCH, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain and snow.
NEW YORK—Cont'd.				°		°	°	In.
Clinton	Oneida	Dr. H. M. Paine	25	50	15	—5	27.8	2.84
Oneida	Madison	Dr. S. Spooner	24, 25	46	20	—9	23.8	3.70
Theresa	Jefferson	S. O. Gregory	25	48	5	—20	20.8	2.99
Oswego	Oswego	Wm. S. Malcolm	25	47	13, 15	4	28.0	2.82
Skaneateles	Onondaga	W. M. Beauchamp	25	55	15	—5	26.9	......
Marathon	Cortland	Lewis Swift	11	50	15	—7	26.0	......
Auburn	Cayuga	John B. Dill	25	56	15	—2	28.0	......
Nichols	Tioga	Robert Howell	25	56	13, 15	6	29.5	......
Seneca Falls	Seneca	Philo Cowing	25	52	15	0	28.3	......
Rochester	Monroe	Dr. M. M. Mathews	24	45	5	3	28.4	3.49
Do	....do	Prof. C. Dewey	24	46	5	2	28.3	......
Wilson	Niagara	Dr. E. S. Holmes	24	47	5	7	29.0	......
NEW JERSEY.								
Newark	Essex	W. A. Whitehead	25	51	15	12	32.5	5.25
New Brunswick	Middlesex	Geo. W. Thompson	25	64	13	14	33.8	......
Mount Holly	Burlington	Dr. M. J. Rhees	25	58	14	18	36.1	......
PENNSYLVANIA.								
North Whitehall	Lehigh	Edward Kohler	25	62	13	6	34.0	2.13
Philadelphia	Philadelphia	J. A. Kirkpatrick, A. M	25	63	5	17	36.4	6.38
Fallsington	Bucks	Eben'r Hance	25	62	5	17	36.0	4.20
West Haverford	Delaware	Dr. Paul Swift	25	63	5	12	35.5	5.69
Mount Joy	Lancaster	J. R. Hoffer	25	68	17	11	35.4	4.70
Harrisburg	Dauphin	Dr. Jno. Heisely	25	58	17	16	34.7	6.60
Do	....do	W. O. Hickok	25	56	5, 17	18	39.1	7.25
Gettysburg	Adams	M. & H. E. Jacobs	22	58	5	13	34.2	5.64
Connellsville	Fayette	John Taylor	22	55	5	6	32.5	......
Fleming	Center	Sam'l Brugger	17	53	14	11	29.6	4.10
Altoona	Blair	Thos. A. Savery	2	52	5, 12, 13	16	32.8	1.50
Canonsburg	Washington	Rev. W. Smith, D. D	22	59	5	11	33.3	3.16
MARYLAND.								
St. Mary's City	St. Mary's	Rev. J. Stephenson	25	68	13	22	41.0	5.42
Sykesville	Carroll	Miss H. M. Baer	25	63	5	12	34.2	5.50
DIST. OF COLUMBIA.								
Washington city	Washington	Smithsonian Institu'n	13	55	21	22	40.5	6.04
TENNESSEE.								
Clarksville	Montgomery	Wm. M. Stewart	17	74	4	28	47.4	5.03
KENTUCKY.								
Louisville	Jefferson	Mrs. L. Young	17	73	13	23	43.0	4.13
OHIO.								
Austinburg	Ashtabula	Dole & Griffing	22	58	13	8	30.2	4.68
New Lisbon	Columbiana	J. F. Benner	22	63	13	14	34.1	3.18
East Fairfield	....do	S. B. McMillan	22	56	13	14	33.6	2.77

I. MARCH, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain and snow.
OHIO—Continued.				°		°	°	In.
Welshfield	Geauga	B. F. Abell, A. M	22	58	13	9	31.6	3.82
Milnersville	Guernsey	Rev. D. Thompson	23	70	13	8	34.2	......
Cleveland	Cuyahoga	Mr. & Mrs. G. A. Hyde	23	62	13	15	34.2	2.85
Kelly's Island	Erie	Geo. C. Huntington	17	51	13	17	32.0	1.51
Norwalk	Huron	Rev. A. Newton	22	66	13	12	33.7	1.46
Newark	Licking	Israel Dille	23	74	13	12	32.1	2.57
Westerville	Franklin	Prof. Jno. Haywood	22, 23	66	13	18	36.5	2.09
Toledo	Lucas	Dr. J. B. Trembly	17	63	13	16	35.2	2.44
Bowling Green	Wood	Dr. W. R. Peek	23	68	4	13	36.2	2.70
Urbana	Champaign	Pf. M. J. Williams	23	70	4, 13	18	36.2	2.50
Bethel	Clermont	Geo. W. Crane	15, 23	66	5, 13	18	36.3	4.63
Cincinnati	Hamilton	G. W. Harper	17, 23	71	13	20	40.0	4.37
MICHIGAN.								
Monroe City	Monroe	Miss F. E. Whelpley	17	64	4	17	34.0	2.15
Ypsilanti	Washtenaw	C. S. Woodard	17	61	4	11	31.1	2.17
Holland	Ottawa	L. H. Streng	22	45	4	13	30.5	3.71
Marquette	Marquette	F. M. Bacon	27	43	11	3	23.6	1.88
INDIANA.								
New Castle	Henry	T. B. Redding, A. M.	22	69	13	15	39.0	......
South Bend	St. Joseph	Jas. H. Dayton	23	62	9	18	34.9	4.49
Logansport	Cass	Thos. B. Helm	22	76	9	15	36.9	4.32
New Harmony	Posey	Jno. Chappellsmith	15	74	4, 9	26	44.1	2.55
ILLINOIS.								
Chicago	Cook	Sam'l Brookes	22, 23, 27	48	9, 12	12	30.3	......
Riley	McHenry	E. Babcock	15	50	9, 12	14	30.1	2.84
Marengo	....do	O. P. & J. S. Rogers	16	50	12	11	31.3	2.01
Sandwich	De Kalb	N. E. Ballou, M. D.	15	58	9	15	35.1	4.44
Ottawa	La Salle	Mrs. E. H. Merwin	14, 15, 22	58	9	16	34.9	3.04
Winnebago	Winnebago	Jas. W. Tolman	16	52	12	15	33.2	1.65
Pekin	Tazewell	J. H. Riblett	15, 22	60	4	13	35.6	2.56
Peoria	Peoria	Fred'k Brendel	15, 17	63	4	17	38.4	2.60
Waverley	Morgan	Timothy Dudley	17	76	4, 9	19	39.3	3.15
Highland	Madison	Ad. F. Baudelier	17	70	4	24	41.5	2.50
Galesburg	Knox	Prof. W. Livingston	22	57	4	13	34.4	1.80
Manchester	Scott	Dr. & Miss E. Grant	17	74	4	16	38.7	3.77
Augusta	Hancock	S. B. Mead, M. D	17	68	4	15	37.4	2.21
WISCONSIN.								
Manitowoc	Manitowoc	Jacob Lüps	24	47	4	11	31.6	1.25
Milwaukie	Milwaukie	Carl Winkler	24	49	4	14	31.6	2.70
Do	....do	I. A. Lapham, LL.D	24	47	4	11	....	2.48
Weyauwega	Waupaca	Wm. Woods	16, 31	50	4	10	30.6	......
Rocky Run	Columbia	W. W. Curtis	16, 17	50	4	9	30.5	1.75
Madison	Dane	Prof. J. W. Sterling	....	......	8	11	....	......
Beloit	Rock	Prof. H. S. Kelsey	16	53	3	17	32.6	2.00
Superior	Douglas	Wm. Mann	16	45	4	—8	24.3	......

I. MARCH, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain and snow.
MINNESOTA.				°		°	°	In.
Beaver Bay	Lake	C. Wieland	21, 30	44	12	—9	22.1	0.66
Itasca	Onoka	O. H. Kelley	16, 27	50	7, 9	0	26.7	0.60
Forest City	Meeker	Henry L. Smith	29	58	9	—6	29.0	......
IOWA.								
Lyons	Clinton	Dr. P. J. Farnsworth	16	55	9	14	30.9	2.25
Dubuque	Dubuque	Dr. Asa Horr	16	54	9	15	33.2	2.81
Independence	Buchanan	A. C. Wheaton	14	59	3, 8	13	33.0	1.50
Iowa City	Johnson	T. S. Parvin, A. M.	22	57	9	12	31.9	2.58
Fort Madison	Lee	Daniel McCready	22	65	9	14	36.2	0.91
Pleasant Plain	Jefferson	T. McConnell	22	72	8	10	35.9	1.39
Algona	Kossuth	Dr. & Miss E. M'Coy	14	64	8	5	30.8	......
MISSOURI.								
St. Louis	St. Louis	Dr. Geo. Engelmann	17	76	4	23	43.7	3.02
Athens	Clark	J. T. Caldwell	9, 10	65	22, 23, 24	30	47.8	......
Canton	Lewis	Geo. P. Ray	17	77	4	14	38.0	3.32
Harrisonville	Cass	John Christian	17	81	....	......	....	......
KANSAS.								
Lawrence	Douglas	Arthur N. Fuller	17, 21, 22	85	8	16	44.1	......
Manhattan	Riley	J. T. Goodnow	21	86	4	20	47.0	......
Fort Riley	Davis	Dr. Fred. P. Drew	14	84	4	20	46.1	......
NEBRASKA TER.								
Elkhorn City	Washington	Miss A. M. J. Bowen	21	68	4	3	35.2	......
Bellevue	Sarpy	Rev. W. Hamilton	21	70	4	7	37.0	0.50
WASHINGTON TER.								
Neeah Bay	Clallam	James G. Swan	23	56	9	30	44.6	11.80
CALIFORNIA.								
Silver Creek	Plumas	M. D. Smith	29, 30, 31	72	10	16	44.4	6.35
Marysville	Yuba	W. C. Belcher	31	81	9	37	56.3	0.17
Sacramento	Sacramento	T. M. Logan, M. D.	31	75	10	41	59.4	2.36
San Francisco	San Francisco	W. O. Ayres, M. D.	31	72	10	42	53.6	2.51

II. MARCH—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	7	27.6	1.20	24.6	1.67	28.3	7.17	28.2	2.66	32.4	9.68	28.2	4.48	23.7	4.68
New Hampshire	4	30.9	6.36	25.3	1.19	30.7	2.06	29.5	1.22	32.5	6.51	29.8	3.47	23.0	3.50
Vermont	6	28.4	0.72	22.2	1.27	27.0	2.24	26.5	1.43	33.8	4.18	27.6	1.97	19.8	3.72
Massachusetts	9	32.1	1.69	26.4	1.46	31.3	2.61	32.1	1.81	38.4	5.99	32.1	2.71	27.7	5.78
Rhode Island	1	32.6	0.86	29.2	1.55	32.2	3.35	32.8	2.05	40.6	8.00	33.5	3.16	31.7	4.45
Connecticut	4	33.4	0.96	28.3	1.47	32.2	2.66	31.9	2.20	39.6	8.31	33.1	3.12	28.5	5.83
New York	12	30.5	1.53	25.7	1.82	31.0	2.57	32.3	1.18	39.3	5.00	31.8	2.42	27.7	3.45
New Jersey	6	36.8	1.83	30.6	1.74	35.9	3.12	37.4	1.40	45.8	6.40	37.3	2.90	34.1	5.25
Pennsylvania	7	34.6	2.04	29.2	1.73	35.2	1.63	37.1	0.95	44.5	5.59	36.1	2.39	34.5	4.67
Delaware	1	......	....	29.4	....	35.6	....	45.7	0.37	......	7.05	36.9	3.71	......	....
Maryland	3	39.0	3.62	33.5	1.78	38.4	1.62	39.2	0.85	48.8	5.42	39.8	2.66	37.6	3.64
District of Columbia	1	41.6	....	35.4	1.79	39.1	1.91	41.9	1.03	49.6	3.80	41.5	2.14	40.5	6.04
South Carolina	1	53.3	3.75	51.2	5.88	51.1	2.64	59.9	1.97	57.5	4.51	54.6	3.75	......	....
Tennessee	2	44.9	3.23	41.3	1.67	46.9	0.74	51.3	4.38	54.3	5.24	47.7	3.05	47.4	5.03
Kentucky	1	40.2	5.22	36.0	1.01	39.9	0.56	44.1	1.30	51.2	3.96	42.3	2.41	43.0	4.13
Ohio	15	35.4	2.80	29.8	1.92	34.5	1.21	37.4	1.36	45.9	4.30	36.6	2.32	34.4	2.97
Michigan	7	30.3	2.32	22.1	0.99	27.7	1.23	34.8	3.31	38.0	4.07	30.6	2.38	29.8	2.48
Indiana	6	37.0	4.40	34.3	0.58	37.1	1.25	42.2	2.04	47.2	4.06	39.6	2.47	38.7	3.79
Illinois	13	34.8	2.66	31.7	0.59	32.1	2.42	40.3	2.85	42.2	4.94	36.2	2.69	35.4	2.71
Wisconsin	10	27.5	1.83	24.8	0.32	27.5	1.04	34.7	1.81	35.2	4.26	29.9	1.85	30.2	2.04
Minnesota	2	25.6	....	21.1	....	22.9	1.00	33.7	1.16	30.2	3.03	26.7	1.73	28.9	0.63
Iowa	10	30.9	1.45	26.3	0.93	29.6	2.11	40.1	2.06	40.6	4.45	33.5	2.20	33.1	1.91
Missouri	4	39.4	2.45	37.4	1.06	39.5	1.80	48.2	3.53	48.4	7.32	42.4	3.23	43.2	3.17
Kansas	2	......	....	......	....	37.2	2.60	48.0	2.58	46.6	2.78	43.9	2.65	44.4	....
Nebraska Territory	2	......	....	......	....	......	....	44.7	1.80	39.8	1.73	42.2	1.76	36.1	0.50
California	2	56.3	4.26	57.5	1.10	56.3	0.74	54.4	3.25	51.6	2.35	55.2	2.34	53.4	2.85

I. APRIL, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.								
				°		°	°	*In.*
Perry	Washington	Wm. D. Dana	23	66	2	12	38.3	5.14
Steuben	....do	J. D. Parker	23	68	2	17	39.8	4.35
Dexter	Penobscot	B. F. Wilbur	23, 28	67	2	13	40.5	4.75
Belfast	Waldo	George E. Brackett	23	65	2	16	41.0	4.73
Vassalboro'	Kennebec	Jas. Van Blarcom	28	70	1, 2	17	41.4	......
Gardiner	....do	R. H. Gardiner	23	72	1	18	41.7	3.98
Lisbon	Androscoggin	Asa P. Moore	23	67	2	21	42.7	4.29
Cornishville	York	G. W. Guptill	28	69	1	14	40.9	6.58
NEW HAMPSHIRE.								
Shelburn	Coos	F. Odell	23	72	1	17	....	......
Stratford	..do	Branch Brown	28	68	1	3	38.5	6.10
Littleton	Grafton	Robert C. Whiting	29	70	1	7	40.8	1.47
Barnstead	Belknap	Chas. H. Pitman	28	74	1	16	44.9	......
Claremont	Sullivan	Arthur Chase	28	78	1	16	45.0	1.92
VERMONT.								
Lunenburg	Essex	Hiram A. Cutting	18, 29, 30	64	3, 4	10	40.3	2.80
Craftsbury	Orleans	Jas. A. Paddock	24	70	1	8	38.8	1.35
Brookfield	Orange	T. F. Pollard	28	69	1	7	38.5	2.86
Montpelier	Washington	Dr. M. M. Marsh	23	78	1	14	41.0	......
Burlington	Chittenden	Rev. M'K. Petty	24	67	1	11	39.4	1.55
Brandon	Rutland	David Buckland	28	79	4	20	43.3	1.23
MASSACHUSETTS.								
Sandwich	Barnstable	N. Barrows, M. D.	22	68	1	28	43.7	4.48
New Bedford	Bristol	Sam'l Rodman	27, 28	67	8	25	45.6	4.06
Worcester	Worcester	Henry C. Prentiss	28	73	8	23	....	5.28
Mendon	....do	Jno. G. Metcalf	23	69	8	22	44.6	4.54
Amherst	Hampshire	Prof. E. S. Snell	28	77	1	21	45.5	2.33
Westfield	Hampden	Rev. E. Davis	28	75	1	20	45.0	3.86
Richmond	Berkshire	Wm. Bacon	23	73	1, 4	14	44.1	5.00
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	28	75	1	25	44.4	5.52
Do	....do	H. C. Sheldon	28	76	1	24	46.1	5.48
CONNECTICUT.								
Pomfret	Windham	Rev. D. Hunt	28	72	8	21	43.3	1.85
Columbia	Tolland	Wm. H. Yeomans	28	72	4	28	47.2	......
Middletown	Middlesex	Prof. Jno. Johnston	28	75	1	20	46.1	4.26
New Haven	New Haven	D. C. Leavenworth	28	70	1, 4	28	47.3	......
Plymouth	Litchfield	D. W. Learned	28	71	1	17	43.4	3.82
Colebrook	....do	Charlotte Rockwell	23	74	1	19	44.6	......

I. APRIL, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
NEW YORK.				°		°	°	*In.*
Deaf and Dumb Inst.	New York city	Prof. O. W. Morris	28	72	4	30	49.0	5.69
White Plains	Westchester	Oliver R. Willis	27	73	4	28	47.8	......
Gouverneur	St. Lawrence	C. H. Russell	23	68	1	15	41.6	1.66
Clinton	Oneida	Dr. H. M. Paine	11	75	1	16	47.5	1.07
Oneida	Madison	Dr. S. Spooner	23, 28	72	1	16	44.3	3.37
Theresa	Jefferson	S. O. Gregory	23	66	1	8	40.9	2.59
Oswego	Oswego	Wm. S. Malcolm	11	64	1	16	41.7	6.25
Skaneateles	Onondaga	W. M. Beauchamp	28	72	1	17	43.4	......
Marathon	Cortland	Lewis Swift	28	78	1	16	41.8	......
Auburn	Cayuga	John B. Dill	28	72	1	10	42.5	......
Nichols	Tioga	Robert Howell	28	80	1	20	43.6	......
Rochester	Monroe	Dr. M. M Mathews	11	73	1	15	43.0	2.79
Do	....do	Prof. C. Dewey	11	75	1	16	43.2	2.79
Wilson	Niagara	Dr. E. S. Holmes	11	74	1	13	43.2	......
NEW JERSEY.								
Newark	Essex	W. A. Whitehead	28	71	4	28	47.3	5.84
New Brunswick	Middlesex	Geo. W. Thompson	12	74	1, 4	30	46.7	......
Mount Holly	Burlington	Dr. M. J. Rhees	12	72	1, 4	31	48.7	......
Progress	....do	Thos. J. Beans	12	74	4	31	50.2	......
PENNSYLVANIA.								
North Whitehall	Lehigh	Edward Kohler	28	77	7	17	46.5	......
Philadelphia	Philadelphia	J. A. Kirkpatrick, A. M	12	70	4	31	48.6	7.29
Fallsington	Bucks	Eben'r Hance	12	72	4	30	49.0	8.00
West Haverford	Delaware	Dr. Paul Smith	12	73	4	28	47.4	7.43
Mount Joy	Lancaster	J. R. Hoffer	11	77	4	29	48.8	5.30
Silver Spring	....do	H. G. Bruckhart	11	77	4	29	48.0	......
Harrisburg	Dauphin	Dr. John Heisely	11	70	4	30	49.0	4.17
Do	....do	Wm. O. Hickok	11	74	4	30	49.4	5.51
Gettysburg	Adams	M. & H. E. Jacobs	11	73	1, 4	26	43.6	4.28
Connellsville	Fayette	John Taylor	11	70	1, 4	18	44.0	......
Fleming	Center	Samuel Brugger	27	74	1	22	46.3	5.07
Blairsville	Indiana	W. R. Boyers	25	49	1	19	34.5	14.00
Altoona	Blair	Thos. H. Savery	11	72	1	21	46.6	12.50
Canonsburg	Washington	Rev. W. Smith, D.D.	11	72	1	18	46.3	2.47
MARYLAND.								
St. Mary's city	St. Mary's	Rev. J. Stephenson	29	69	4	34	49.0	3.50
Sykesville	Carroll	Miss H. M. Baer	11	73	1, 4	27	46.5	6.75
IST. OF COLUMBIA.								
Washington	Washington	Smithsonian Instit'n	27	72	2, 4	36	49.6	6.82
TENNESSEE.								
Clarksville	Montgomery	Wm. M. Stewart	18	85	1	32	57.7	3.27
KENTUCKY.								
Louisville	Jefferson	Mrs. L. Young	10	79	1	23	54.8	3.39

I. APRIL, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
OHIO.				°		°	°	In.
Austinburg	Ashtabula	Dole & Griffing	11	76	1	18	44.5	1.78
New Lisbon	Columbiana	J. F. Benner	11, 30	72	1	20	47.2	0.88
East Fairfield	...do	S. B. McMillan	19	71	1	19	46.3	1.30
Welshfield	Geauga	B. F. Abell, A. M	19	75	1	17	......	......
Milnersville	Guernsey	Rev. D. Thompson	27	76	1	19	45.1	2.24
Cleveland	Cuyahoga	Mr. & Mrs. G. A. Hyde	11	76	1	20	45.7	0.98
Kelley's Island	Erie	Geo. C. Huntington	27	64	1	17	43.0	1.98
Norwalk	Huron	Rev. A. Newton	11	73	1	13	46.2	1.38
Newark	Licking	Israel Dille	19	78	1	18	48.2	1.94
Westerville	Franklin	Prof. Jno. Haywood	11	74	1	18	48.6	1.81
Portsmouth	Scioto	L. Engelbrecht	21	77	1	27	53.9	1.40
Toledo	Lucas	Dr. J. B. Trembly	11	73	1	14	48.6	1.80
Bowling Green	Wood	Dr. W. R. Peck	24	74	1	16	47.2	2.05
Urbana	Champaign	Prof. M. G. Williams	11	76	1	28	50.6	1.69
Bethel	Clermont	Geo. W. Crane	18	81	1	21	49.8	2.13
Cincinnati	Hamilton	Geo. W. Harper	27	86	1	24	53.4	2.13
Do	...do	R. C. Phillips	11	80	1	29	55.1	2.27
MICHIGAN.								
Monroe City	Monroe	Miss F. E. Whelpley	11	65	1, 3, 4	28	45.7	1.80
Ypsilanti	Washtenaw	C. S. Woodward	11	74	3, 4	26	46.0	1.13
Holland	Ottawa	L. H. Streng	18	75	1	16	46.0	2.18
Marquette	Marquette	Frank M. Bacon	18	68	8	18	41.2	2.52
INDIANA.								
Richmond	Wayne	John Haines	27	74	1	22	51.4	......
New Castle	Henry	T. B. Redding, A. M.	18	78	1	18	52.7	......
South Bend	St. Joseph	Reuben Burroughs	18	77	1	26	50.0	1.88
Logansport	Cass	Thos. B. Helm	18	85	1	22	51.9	3.69
Rockville	Parke	Miss M. A. Anderson	18	82	1	22	57.0	2.88
New Harmony	Posey	Jno. Chappellsmith	18	84	1	33	56.4	2.05
ILLINOIS.								
Chicago	Cook	Samuel Brookes	18	68	1	20	42.7	......
Riley	McHenry	E. Babcock	17	70	3	26	......	3.15
Sandwich	De Kalb	Dr. N. E. Ballou	18	75	1	29	51.4	3.10
Ottawa	La Salle	Mrs. E. H. Merwin	18	80	7	28	48.4	3.26
Winnebago	Winnebago	Jas. W. Tolman	18	80	8	27	48.4	0.56
Elmira	Stark	O. A. Blanchard	17	78	8	28	51.2	2.88
Pekin City	Tazewell	J. H. Riblett	18	82	8	25	57.6	1.78
Peoria	Peoria	Frederick Brendel	18	82	8	30	54.0	1.52
Waverly	Morgan	Timothy Dudley	17	82	1	30	52.2	0.55
Highland	Madison	Ad. F. Bandelier	18	80	1	31	54.0	1.82
Galesburg	Knox	Prof. W. Livingston	17	76	8	28	50.9	0.86
Manchester	Scott	Dr. & Miss E. Grant	17	79	8	30	59.0	1.09

I. APRIL, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
WISCONSIN.				°		°	°	*In.*
Manitowoc	Manitowoc	Jacob Lüps	27	64	7	28	44.7	2.39
Milwaukie	Milwaukie	I. A. Lapham, LL.D.	24	67	1	22	....	1.04
Do	....do	Carl Winkler	24	62	1, 7	29	44.4	1.30
Weyauwega	Waupaca	Wm. Woods	24	81	8	22	48.2	......
Rocky Run	Columbia	W. W. Curtis	18	81	7	26	48.1	1.44
Madison	Dane	Prof. J. W. Sterling	18	78	3, 7	27	42.5	......
Beloit	Rock	Henry D. Porter	18	82	6	28	48.8	0.97
Superior	Douglas	Wm. Mann	30	70	3	20	38.4	0.10
MINNESOTA.								
Beaver Bay	Lake	C. Wieland	27	69	3	16	39.6	0.71
Saint Paul	Ramsey	Rev. A. B. Paterson	17	76	3	21	48.4	0.80
Tamarac	Hennepin	Mary A. Grave	17	76	3	20	49.4	......
Forest City	Meeker	Henry L. Smith	17	80	11	36	51.2	......
IOWA.								
Lyons	Clinton	Dr. P. J. Farnsworth	18	75	13	28	49.1	0.90
Dubuque	Dubuque	Dr. Asa Horr	24	75	8	32	51.8	0.25
Independence	Buchanan	A. C. Wheaton	17	80	3	30	51.7	2.40
Iowa City	Johnson	T. S. Parvin, A. M.	17	82	3, 8	26	47.3	0.55
Fort Madison	Lee	Daniel McCready	15	81	1	27	51.7	1.78
Algona	Kossuth	Dr. & Miss L. McCoy	17	84	11	28	49.4	0.56
MISSOURI.								
St. Louis	St. Louis	Augs. Fendler	17, 18	83	1	33	54.9	1.56
Do	....do	Dr. Geo. Engelman	18	83	1	33	56.5	1.55
Athens	Clark	I. T. Caldwell	11	50	17	28	34.1	......
Canton	Lewis	George P. Ray	30	79	1	27	51.6	1.25
Harrisonville	Cass	John Christian	17	88	4	38	60.2	......
KANSAS.								
Lawrence	Douglas	Arthur N. Fuller	17	86	3	39	58.5	0.07
Manhattan	Riley	Isaac T. Goodnow	17	93	29	39	61.2	9.12
Fort Riley	Davis	Dr. Fred. P. Drew	17	89	12	44	58.2	2.03
NEBRASKA TER.								
Elkhorn City	Washington	Miss A. M. J. Bowen	17	88	3	27	53.8	......
Bellevue	Sarpy	Rev. Wm. Hamilton	17	80	3	31	52.3	0.75
WASHINGTON TER.								
Neeah Bay	Clallam	James G. Swan	11	60	7, 14	36	47.3	4.7
CALIFORNIA.								
Silver Creek	Plumas	M. D. Smith	2, 29, 30	76	18	32	46.7	5.60
Marysville	Yuba	Wm. C. Belcher	30	86	10	42	58.7	1.26
Sacramento	Sacramento	T. M. Logan, M. D.	2	80	1	49	59.5	1.6[illegible]
San Francisco	San Francisco	U. O. Ayres, M. D.	1	74	23	47	51.2	2.[illegible]

II. APRIL—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean. temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	6	38.4	6.38	42.6	2.78	39.0	6.65	39.7	4.15	38.6	3.36	39.7	4.66	40.8	4.83
New Hampshire	4	42.2	4.73	44.3	2.20	39.9	6.22	41.0	2.94	36.1	2.73	40.7*	3.76	42.3	3.16
Vermont	4	40.5	1.61	44.2	1.20	38.7	4.96	40.9	2.23	38.2	2.30	40.5	2.46	40.2	1.96
Massachusetts	12	43.6	4.95	45.4	3.23	41.8	7.25	45.1	3.29	42.9	3.46	43.7	4.44	44.8	4.22
Rhode Island	1	44.1	2.50	48.8	2.80	41.0	6.29	46.2	3.63	44.2	2.28	44.9	3.50	45.2	5.50
Connecticut	4	44.2	3.31	47.2	3.99	41.1	6.65	44.9	3.75	44.1	3.18	44.3	4.17	45.3	3.31
New York	18	44.4	2.78	47.2	2.39	39.1	5.88	45.8	3.26	43.3	4.97	44.0	3.86	43.8	3.28
New Jersey	4	49.1	1.85	50.4	2.60	42.8	6.94	48.9	3.95	46.9	5.00	47.6	4.07	48.2	5.84
Pennsylvania	19	49.7	2.29	50.2	3.51	41.3	4.13	49.2	3.73	48.4	5.36	47.8	3.81	46.3	6.91
Delaware	1	......	....	52.1	....	50.1	....	58.4	3.93	......	3.93	53.5	3.93	......	....
Maryland	4	54.7	1.32	52.9	2.90	47.5	3.12	50.9	3.82	50.8	5.11	51.3	3.26	47.7	5.13
District of Columbia	1	55.7	....	54.7	2.68	45.3	2.40	53.4	3.66	52.2	4.69	52.3	3.36	49.6	6.82
South Carolina	5	64.9	0.89	64.6	0.63	56.5	2.92	64.2	2.59	62.9	2.48	62.6	1.90	......	....
Tennessee	2	64.9	3.25	59.4	4.18	49.7	5.72	60.1	4.86	57.9	5.79	58.4	4.76	57.7	3.27
Kentucky	4	60.6	1.63	58.8	1.63	42.2	4.46	56.5	4.72	54.2	5.93	54.4	3.68	54.8	3.38
Ohio	20	55.9	2.30	53.2	1.67	40.1	3.01	51.0	4.80	47.8	5.65	49.6	3.49	48.3	1.74
Michigan	7	49.2	4.78	45.0	1.87	35.4	2.96	44.7	3.99	40.9	3.47	43.0	3.41	44.7	1.91
Indiana	5	57.1	5.02	56.5	0.81	42.1	2.15	53.9	5.19	49.6	5.13	51.9	3.66	53.2	2.63
Illinois	13	58.6	2.16	54.8	1.93	38.7	1.56	49.8	5.17	44.9	3.55	49.4	2.87	51.8	1.87
Wisconsin	9	50.2	2.03	45.7	3.04	35.4	2.45	42.6	4.32	36.0	4.28	42.0	3.22	45.0	1.21
Minnesota	3	51.9	....	41.4	4.77	29.8	2.68	39.4	2.92	34.8	2.28	39.5	2.53	47.2	0.75
Iowa	8	55.6	2.27	51.7	3.33	36.8	1.35	46.5	5.48	37.7	3.34	45.7	3.16	50.2	1.07
Missouri	2	62.2	1.79	60.1	6.35	43.5	1.72	56.2	4.67	51.9	4.89	54.8	3.88	51.5	1.45
Kansas	3	......	....	......	....	41.6	0.33	52.5	3.49	50.3	2.67	48.1	2.17	59.3	3.74
Nebraska Territory	2	......	....	......	....	......	....	48.2	5.05	41.4	1.64	44.8	3.34	53.1	0.75
California	3	......	....	58.5	1.19	61.0	0.00	59.7	0.96	55.4	2.49	58.6	1.16	54.8	2.66

I. MAY, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.				°		°	°	*In.*
Steuben	Washington	J. D. Parker	22	89	8, 15	37	51.0	4.00
Foxcroft	Piscataquis	Mark Pitman	30	85	15	34	54.3	......
Belfast	Waldo	Geo. E. Brackett	22	87	7	33	54.9	3.4
Lisbon	Androscoggin	Asa P. Moore	22	92	7	38	55.9	2.22
Cornishville	York	G. W. Guptill	22	92	7	34	56.6	2.13
NEW HAMPSHIRE.								
Littleton	Grafton	Robt. C. Whiting	23	89	3	30	55.8	4.5
VERMONT.								
Lunenburg	Essex	Hiram A. Cutting	21	88	6	40	57.1	3.52
Craftsbury	Orleans	James A. Paddock	23	84	3, 5	32	53.4	4.33
Burlington	Chittenden	Rev. McK. Petty	23	82	3	32	55.2	6.88
Brandon	Rutland	Daniel Buckland	21, 23	88	3	33	56.7	7.56
MASSACHUSETTS.								
Sandwich	Barnstable	N. Barrows, M. D.	22	83	7	38	53.7	3.62
New Bedford	Bristol	Samuel Rodman	22	83	8	42	57.1	3.52
Mendon	Worcester	Jno. Geo. Metcalf	22	90	7	36	57.5	2.10
Amherst	Hampshire	Prof. E. S. Snell	22	88	7	38	58.9	3.59
Richmond	Berkshire	William Bacon	22, 23	90	7	36	60.7	......
CONNECTICUT.								
Pomfret	Windham	Rev. D. Hunt	22	86½	7	35	56.3	2.15
Middletown	Middlesex	Prof. Jno. Johnston.	22	91½	7	38	59.9	1.74
New Haven	New Haven	D. C. Leavenworth.	22	87	7	39	59.0	......
Plymouth	Litchfield	Dwight W. Learned.	23	87	7	34	57.8	6.10
NEW YORK.								
Fishkill Landing	Dutchess	W. H. Denning	21	86	7	38	57.2	3.32
Deaf and Dumb Asy	New York city	Prof. O. W. Morris	23	88½	5	41	63.0	4.57
Gouverneur	St. Lawrence	C. H. Russell	22	82	5	34	56.0	2.13
Clinton	Oneida	H. M. Paine, M. D.	29	88	7	39	61.4	2.97
Theresa	Jefferson	S. O. Gregory	30	83	3	35	55.8	2.65
Oswego	Oswego	Wm. S. Malcolm	29	76	6	38	54.9	5.00
Skaneateles	Onondaga	W. M. Beauchamp	22	85	6	36	54.2	......
Nichols	Tioga	Robert Howell	29	90	6, 7	39	59.7	......
Rochester	Monroe	M. M. Mathews, M. D	22	85	6	36	57.7	1.83
Wilson	Niagara	E. S. Holmes, D.D.S	22	85	4, 5, 6, 7	39	60.5	......
NEW JERSEY.								
Newark	Essex	W. A. Whitehead	22	87½	7	38	60.5	4.49
New Brunswick	Middlesex	Geo. W. Thompson.	23	92	6	40	60.4	......
Progress	Burlington	Thos. J. Beans	23	95	6, 7, 8	45	65.9	.97

I. MAY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
PENNSYLVANIA.				°		°	°	*In.*
Philadelphia	Philadelphia	J. A. Kirkpatrick, A. M	23	89	6, 7	41	64. 6	4. 79
Harrisburg	Dauphin	Heisely & Hickok	23	89	7	42	66. 0	3. 38
Blairsville	Indiana	W. R. Boyers	27	74	12	34	51. 0	1. 10
Fleming	Center	Samuel Brugger	24	92	6	42	62. 0	2. 02
Canonsburg	Washington	Rev. W. Smith, D. D	21	82	7, 9	40	60. 2	0. 99
MARYLAND.								
Chestertown	Kent	Prof. J. R. Dutton	23	88	6, 7	43	63. 9	4. 09
Schellman's Hills	Carroll	Harriott M. Baer	23, 24	85	6, 7	40	63. 1	4. 50
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Inst	24	88	7	44	64. 9	3. 79
OHIO.								
Austinburg	Ashtabula	Dole & Griffing	23, 29	88	7	38	59. 2	2. 15
New Lisbon	Columbiana	J. F. Benner	23	92	1, 7	42	61. 5	1. 41
Welshfield	Geauga	B. T. Abell, A. M	22, 23	86	6, 7	41	62. 1	3. 25
Kelly's Island	Erie	Geo. O. Huntington	22	84	5	40	59. 9	2. 12
Westerville	Franklin	Prof. Jno. Haywood	22, 23	85	6	42½	63. 5	2. 62
Portsmouth	Sciota	L. Englebrecht	23	83	7, 8	48	60. 5	0. 80
Toledo	Lucas	J. B. Trembly, M. D	22, 23	92	6	41	63. 4	2. 44
Bowling Green	Wood	W. R. Peck, M. D	23	92	5, 6	42	63. 5	1. 92
Troy	Miami	Charles L. McClung	23	90	7	42	65. 7	3. 85
Cincinnati	Hamilton	Geo. W. Harper	28	91	7	44	67. 0	2. 84
MICHIGAN.								
Monroe	Monroe	Flor. E. Whelpley	11	86	5	38	63. 2	......
Ypsilanti	Washtenaw	C. S. Woodard	22	88	5	35	60. 3	......
INDIANA.								
New Albany	Floyd	E. S. Crozier, M. D	22, 23	87	7	48	66. 8	......
South Bend	St. Joseph	Reuben Burroughs	21	88	5	37	61. 5	3. 99
Rockville	Park	Miss M. A. Anderson	10, 21, 22	82	6	38	63. 6	3. 75
New Harmony	Posey	Jno. Chappellsmith	21	87	6	41	66. 3	1. 35
ILLINOIS.								
Chicago	Cook	Samuel Brooks	22	86	5, 6	34	54. 7	......
Riley	McHenry	E. Babcock	20, 21	80	5, 6	34	58. 2	6. 20
Ottawa	La Salle	Emily H. Merwin	22	88	6	37	52. 7	3. 64
Winnebago	Winnebago	James W. Tolman	22	84	5	37	60. 5	4. 97
Peoria	Peoria	Frederick Brendel	11, 24	87	5	39	65. 7	2. 97
Waverley	Morgan	Timothy Dudley	10, 21	85	6	36	63. 2	1. 15
Lombard University	Knox	Prof. W. Livingston	21	82	5	40	63. 9	3. 62
Manchester	Scott	Dr. & Miss E. Grant	10	86	5	36	61. 0	1. 80
Augusta	Hancock	S. B. Mead, M. D	10	86	5	39	62. 9	2. 81

I. MAY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
WISCONSIN.				°		°	°	*In.*
Milwaukie	Milwaukie	I. A. Lapham, LL.D	20	84	5	32	58.8	5.21
Bloomfield	Walworth	Wm. H. Whiting	21	84	5, 7	33	57.1	......
Madison	Dane	Pf. Jno. W. Sterling.	22	81	5	38	58.0	......
Superior	Douglas	William Mann	20	90	6	33	52.1	2.67
MINNESOTA.								
Beaver Bay	Lake	C. Weiland	20	84	2	33	52.0	1.01
St. Paul	Ramsay	Rev. A. B. Paterson.	20	86	5	39	59.9	2.87
Forest City	Meeker	Henry L. Smith	19	90	5, 7, 9	40	59.9	......
IOWA.								
Dubuque	Dubuque	Asa Horr, M. D	20	86	5	42	63.0	1.73
Byron township	Buchanan	A. C. Wheaton	20, 21	85	6	40½	62.5	7.50
Iowa City	Johnson	T. S. Parvin, A. M.	20	80	7	36	58.7	4.56
Fort Madison	Lee	Daniel McCready	20, 24	85	5, 6	40	64.5	1.35
Pleasant Plain	Jefferson	T. McConnell	21	92	5, 7	38	65.0	1.93
Algona	Kossuth	Dr. & Miss McCoy.	20	88	5	40	62.3	4.21
MISSOURI.								
St. Louis	St. Louis	Aug. Fendler	28	88	6	40	64.9	2.45
Athens	Clark	I. T. Caldwell	29	41	7, 11	32	36.3	......
Canton	Lewis	George P. Ray	10, 21	90	6	41	64.7	2.36
KANSAS.								
Lawrence	Douglas	Arthur N. Fuller	24	90	6	46	69.5	4.87
NEBRASKA.								
Elkhorn City	Washington	Miss A. M. J. Bowen	19, 20	86	5	45	63.8	......
Bellevue	Sarpy	Rev. Wm. Hamilton.	15	87	6, 23	40	63.0	3.88

II. MAY—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	6	49.7	3.4	49.6	5.7	51.7	4.1	50.1	3.5	54.7	3.5	51.1	4.1	54.5	2.99
New Hampshire	3	54.7	1.1	52.4	4.6	54.5	6.0	51.7	3.6	51.2	2.2	52.9	3.5	55.8	4.50
Vermont	4	54.2	0.2	51.7	3.0	52.1	4.8	52.3	3.3	57.9	1.8	53.8	2.6	55.6	5.57
Massachusetts	12	55.1	2.9	52.4	6.3	54.6	5.2	52.8	3.1	57.6	4.8	54.5	4.5	57.6	3.21
Connecticut	4	55.3	2.2	53.1	5.5	54.1	5.2	53.1	2.8	57.5	4.0	54.6	4.0	58.2	3.66
New York	17	56.7	2.8	54.0	3.3	53.9	4.6	54.1	4.4	61.5	2.8	56.0	3.6	58.0	3.66
New Jersey	4	60.2	2.7	57.3	4.0	56.6	8.1	55.4	4.7	60.6	1.8	58.0	4.2	61.3	2.73
Pennsylvania	19	61.1	3.0	58.5	2.8	57.7	6.6	57.8	7.4	64.3	2.1	59.9	4.4	60.8	2.46
Delaware	1	......	....	57.8	....	60.2	....	61.7	4.86	......	3.40	62.9	4.13	......	....
Maryland	4	64.0	2.6	62.1	3.5	61.8	6.3	59.0	6.7	64.1	3.5	62.2	4.5	63.5	4.30
District of Columbia	1	64.2	1.4	55.3	4.2	61.3	5.7	60.9	7.3	64.8	3.9	61.3	4.5	60.0	3.79
South Carolina	6	72.7	4.30	70.8	4.20	69.5	2.42	72.2	2.80	70.2	2.52	71.1	3.25	......	....
Tennessee	2	67.5	3.90	63.7	6.30	64.0	5.39	67.4	6.07	69.2	2.46	66.4	4.82	......	....
Kentucky	4	66.2	3.07	64.1	2.54	59.3	6.23	64.4	6.35	69.0	1.72	64.6	3.98	......	....
Ohio	20	62.4	3.8	60.3	2.9	55.3	5.0	58.8	7.3	65.5	2.6	60.4	4.3	62.6	2.34
Michigan	7	59.1	1.5	52.9	3.9	52.1	3.3	52.3	6.1	56.9	2.9	54.6	3.5	61.8	....
Indiana	5	64.5	3.5	61.9	3.0	57.4	4.4	60.7	8.9	67.1	2.2	62.3	4.4	64.5	3.03
Illinois	13	64.1	5.1	61.0	4.4	56.5	2.9	58.2	8.1	63.3	4.3	60.6	5.9	59.1	3.40
Wisconsin	6	60.3	3.1	55.0	3.5	50.4	4.1	52.1	6.8	56.8	4.3	54.9	4.5	56.7	3.94
Minnesota	3	60.9	....	58.9	4.2	52.4	2.8	51.7	2.8	53.5	5.6	55.5	3.8	57.3	1.94
Iowa	9	62.9	3.2	60.8	3.5	56.2	7.3	55.7	7.3	63.2	5.4	59.8	5.3	62.7	3.55
Missouri	2	66.8	7.2	62.1	3.0	59.2	3.1	64.0	10.6	68.2	6.6	64.1	5.4	55.3	2.41
Kansas	3	......	....	......	....	55.8	2.7	61.7	5.2	66.6	8 0	60.7	5.2	69.5	4.87
Nebraska Territory	3	......	....	......	....	......	....	53.1	4.4	64.6	5.6	58.6	5.0	63.4	....
California	2	......	....	61.9	1.9	63.6	....	62.3	0.2	63 0	1.3	62.7	1.1	......	....

I. JUNE, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.				°		°	°	*In.*
Dexter	Penobscot	B. F. Wilbur	29	86	21	49	60.81	3.00
Lisbon	Androscoggin	Asa P. Moore	28	87	5	50	62.58	1.38
Cornish	York	Silas West	28	87	21	46	56.00	......
Cornishville	...do	G. W. Guptill	28	85	8	50	62.88	1.91
NEW HAMPSHIRE.								
Stratford	Coos	Branch Brown	29	84	7	43	58.66	2.70
Barnstead	Belknap	Charles H. Pitman	28	87	9	50	63.20	......
VERMONT.								
Lunenburg	Essex	H. A. Cutting	28	93	4	40	61.70	1.47
Craftsbury	Orleans	James A. Paddock	27	83	16	44	58.02	2.83
Burlington	Chittenden	Rev. McK. Petty	28	79	8	49	61.08	1.95
Brandon	Rutland	David Buckland	29	86	7	48	64.53	1.89
MASSACHUSETTS.								
Sandwich	Barnstable	N. Barrows, M. D	30	78	17	53	61.01	2.30
Topsfield	Essex	John H. Caldwell	15	87	10	50	62.36	1.50
New Bedford	Bristol	Samuel Rodman	15	81	8	53	62.45	2.49
Worcester	Worcester	Henry C. Prentiss	15	85½	20	51	64.01	1.80
Mendon	...do	John Geo. Metcalf	15	86	13	52	63.12	.90
Baldwinsville	...do	Rev. E. Dewhurst	28	82	17	50	57.10	......
CONNECTICUT.								
Canton	Hartford	Jarvis Case	15	62	29	46	52.26	......
Colebrook	Litchfield	Charlotte Rockwell	15	83	9	50	62.37	......
NEW YORK.								
Fishkill Landing	Dutchess	Wm. H. Denning	15	89	4	53	62.27	1.91
Garrison's P. O	Putnam	Thomas B. Arden	15	85	7	54	64.00	......
New York	New York	Prof. O. W. Morris	15	90	7	56	69.37	1.43
Gouverneur	St. Lawrence	C. H. Russell	28	86	6	48	62.75	1.28
Oneida	Madison	Dr. Stillman Spooner	28	84	17	46	62.43	3.18
Theresa	Jefferson	S. O. Gregory	27	85	6	48	61.99	2.38
Palermo	Oswego	E. B. Bartlett	28	84	3	48	62.43	......
Baldwinsville	Onondaga	John Bowman	28	80	4	48	62.00	......
Skaneateles	...do	W. M. Beauchamp	15	82	3	47	61.30	......
Marathon	Cortland	Lewis Swift	11	85	4	41	57.51	......
Nichols	Tioga	Robert Howell	15	90	8	51	58.30	......
Rochester	Monroe	Prof. Chester Dewey	15	86	7	48	65.58	1.37
Buffalo	Erie	Wm. Ives	29	90	1	49	62.00	1.42
NEW JERSEY.								
Newark	Essex	W. A. Whitehead	15	87	4	50	65.00	10.45
Mount Holly	Burlington	M. J. Rhees, M. D	15	87	14	57	67.16	......

I. JUNE, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
PENNSYLVANIA.				°		°	°	*In.*
Byberry	Philadelphia	Isaac C. Martindale	15	86	7	53	66.75	3.93
Susquehanna Depot	Susquehanna	H. H. Atwater	15	92	8	53	68.20	1.38
Fallsington	Bucks	Ebenezer Hance	15	88	7	57	66.66	2.70
Haverford	Delaware	Paul Swift, M. D	17	84	8	50	66.24	3.02
Silver Spring	Lancaster	H. G. Bruckhart	17	93	7	56	66.00	......
Berwick	Columbia	J. E. Berwick	17	89	4	50	68.33	......
Harrisburg	Dauphin	John Heisely	17	92	7	59	64.38	2.95
Blairsville	Indiana	W. R. Boyers	15	74	8	39	49.20	9.08
Canonsburg	Washington	Rev. W. Smith, D. D	15	88	4	46	63.66	2.78
MARYLAND.								
Chestertown	Kent	Prof. J. R. Dutton	17	89	8	57	70.02	1.91
Schellman's Hills	Carroll	Harriott M. Baer	17	88	8	56	65.20	3.50
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Institu'n	18	94	8	55	70.36	2.55
OHIO.								
Austinburg	Ashtabula	Dole & Griffing	17	89	6	49	63.03	.08
New Lisbon	Columbiana	J. F. Benner	17	90	4	40	66.47	2.98
Welshfield	Geauga	B. F. Abell, A. M	17	90	7	52	65.16	2.80
Milnersville	Guernsey	Rev. D. Thompson	17	93	8	39	66.08	1.25
Hudson	Summit	Prof. C. A. Young	17	90	6	51	63.07	1.52
Kelly's Island	Erie	Geo. C. Huntington	17	86	6	52	66.51	3.10
Norwalk	Huron	Rev. A. Newton	17	91	8	50	64.88	.97
Newark	Licking	Israel Dille	17	94	8	40	68.10	1.43
Westerville	Franklin	Prof. Jno. Haywood	17	91	7	50	63.08	2.53
Toledo	Lucas	J. B. Trembly, M. D	17	95	6	48	75.00	2.05
Urbana University	Champaign	Prof. M. G. Williams	17	92	8	53	68.15	2.63
Bethel	Clermont	Geo. W. Crane	17	91	7	51	64.10	2.10
Cincinnati	Hamilton	R. C. Phillips	17	90	9	58	71.00	1.75
MICHIGAN.								
Monroe	Monroe	F. E. Whelpley	17	93	5	48	66.21	19.70
Marquette	Marquette	Frank M. Bacon	14	94	5	42	59.27	2.40
INDIANA.								
South Bend	St. Joseph	Reuben Burroughs	28	92	8	49	65.50	.28
Rockville	Park	Miss M. A. Anderson	16	92	3	46	64.13	.58
New Harmony	Posey	John Chappellsmith	17	90	4	58	70.03	6.99
ILLINOIS.								
Riley	McHenry	E. Babcock	16	93	1	49	64.36	1.40
Sandwich	De Kalb	N. E. Ballou	15	92	7	50	67.63	1.26
Elmira	Stark	O. A. Blanchard	16	95	7	50	69.38	.20

I. JUNE, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain
ILLINOIS—Cont'd.				°		°	°	*In.*
Dixon	Lee	J. Thomas Little	15	94	7	44	63. 10	7. 03
Peoria	Peoria	Frederick Brendell	17	93	2	52	70. 50	.45
Waverly	Morgan	Timothy Dudley	15	96	8	51	68. 05	.25
Galesburg	Knox	Wm. Livingston	16	91	7	49	69. 06	......
Manchester	Scott	John and Ellen Grant	16	92	3	48	67. 10	.80
Augusta	Hancock	S. B. Mead	16	90	21	50	67. 20	.26
WISCONSIN.								
Manitowoc	Manitowoc	Jacob Lüps	14	92	3	50	62. 44	1. 67
Milwaukie	Milwaukie	Carl Winkler	14	90	6	47	62. 20	0. 87
Bloomfield	Walworth	W. H. Whitney	16	92	3	50	61. 80	......
Rocky Run	Columbia	W. W. Curtis	20	84	6	40	59. 21	......
MINNESOTA.								
Forest City	Meeker	Henry L. Smith	14	94	2	48	61. 09	.27
IOWA.								
Lyons	Clinton	P.J.Farnsworth,M.D	14	94	7	46	68. 00	1. 30
Byron	Buchanan	Alex.Camp Wheaton	16	94	7	52	68. 74	.12
Fort Madison	Lee	Daniel McCready	15	94	3	52	70. 80	2. 50
Algona	Kossuth	Dr. F. & Miss McCoy	12	94	5	48	67. 02	2. 25
MISSOURI.								
Athens	Clark	J. T. Caldwell	14	92	7	54	76. 09	......
Canton	Lewis	George P. Ray	16	100	7	50	70. 80	.65
Harrisonville	Cass	John Christian	27	82	8	56	71. 29	......
KANSAS.								
Manhattan	Riley	Isaac T. Goodnow	27	92	22	53	70. 17	5. 95
Fort Riley	Davis	W. F. McAlister	27	94	9	57	72. 84	4. 96
NEBRASKA.								
Richland	Washington	Miss A. M. J. Bowen	27	96	21	52	67. 89	......
Bellevue	Sarpy	Rev. Wm. Hamilton	27	90	20	48	67. 50	2. 84

II. JUNE—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	6	61.7	6.1	63.8	2.9	59.3	3.7	63.3	2.1	60.3	7.2	61.7	4.4	60.57	2.29
New Hampshire	4	63.9	3.8	67.2	2.0	61.8	3.3	67.4	2.3	53.7	5.1	62.8	3.3	60.93	2.70
Vermont	5	60.7	8.4	66.3	2.5	61.2	4.9	67.6	3.8	62.0	4.0	63.6	4.7	61.33	2.14
Massachusetts	12	54.3	4.0	66.6	3.0	62.5	2.5	66.9	4.7	63.6	6.5	62.8	4.1	61.67	1.80
Connecticut	4	64.8	4.1	67.4	2.7	62.1	3.1	62.1	3.9	62.9	7.3	63.9	4.3	57.63	....
New York	17	63.2	5.5	68.3	3.1	63.4	6.8	69.7	4.1	62.9	4.0	65.5	4.7	62.46	1.85
New Jersey	4	68.8	5.5	72.2	2.8	67.0	6.6	72.8	4.2	67.3	3.5	69.6	4.5	66.16	10.45
Pennsylvania	19	67.3	8.2	72.5	2.9	67.4	7.4	73.6	4.4	67.7	3.7	69.7	5.3	63.49	3.56
Delaware	1	68.9	....	......	....	69.9	....	76.4	2.25	......	7.38	71.7	4.81	......	....
Maryland	5	70.8	5.7	75.0	3.0	72.4	8.3	73.8	3.8	69.7	3.6	72.3	4.9	67.61	2.70
District of Columbia	1	71.2	5.6	74.7	5.9	71.6	6.5	76.4	1.4	71.4	5.0	73.0	4.9	70.20	2.55
South Carolina	6	75.5	5.77	79.7	3.99	78.1	2.57	78.4	2.21	76.6	4.55	77.7	3.82	......	....
Tennessee	2	71.0	5.07	77.6	1.23	73.9	3.60	75.1	5.67	72.2	4.38	74.0	3.99	......	....
Kentucky	4	70.8	6.14	76.7	2.81	69.7	4.93	74.8	4.06	72.0	3.28	73.0	4.24	......	....
Ohio	19	68.5	8.5	73.0	3.4	67.5	5.2	72.9	5.2	66.8	4.4	69.7	5.4	61.51	1.94
Michigan	7	63.5	8.4	68.8	4.6	63.4	3.7	70.1	3.9	61.3	3.3	65.4	4.9	62.74	10.78
Indiana	5	68.6	5.2	76.5	2.1	68.0	4.7	73.5	5.6	69.9	4.7	71.3	4.5	66.55	2.62
Illinois	14	67.8	2.8	75.1	2.6	62.6	3.9	72.8	5.8	66.6	2.9	69.0	3.6	67.30	1.45
Wisconsin	9	63.7	3.9	64.5	4.1	62.1	4.5	69.0	5.3	62.3	5.1	64.3	4.6	61.41	1.22
Minnesota	3	66.7	5.0	67.4	2.8	64.5	4.1	67.7	2.8	59.8	6.5	65.2	4.2	61.90	.27
Iowa	8	68.4	5.0	73.5	1.9	68.3	1.8	72.2	6.4	66.2	5.6	69.7	4.1	68.64	1.54
Missouri	2	71.6	4.3	79.5	1.1	70.6	2.6	76.5	6.7	72.5	11.0	60.1	5.2	72.72	.65
Kansas	3	......	....	......	....	72.1	1.1	74.9	8.3	73.2	5.8	73.4	5.1	71.50	5.91
Nebraska Territory	2	......	....	......	....	70.6	3.3	74.5	7.1	71.0	2.8	70.9	4.3	67.69	2.84
California	2	......	....	69.3	0.0	66.5	0.2	68.1	0.1	72.4	1.3	69.1	0.4	......	....

I. JULY, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.				°		°	°	*In.*
Steuben	Washington	J. D. Parker	6	80	14	52	69.0	7.10
Foxcroft	Piscataquis	W. M. Pitman	7	88	14	51	67.3	6.24
Gardiner	Kennebec	R. H. Gardiner	29	90	14, 15, 23	59	75.9	6.45
Cornishville	York	G. W. Guptill	7	88	14, 23	58	70.3	7.10
NEW HAMPSHIRE.								
Stratford	Coos	Branch Brown	7	88	22	51	67.0	8.98
Claremont	Sullivan	Arthur Chase	1, 2, 7	88	21	58	71.0	6.56
VERMONT.								
Lunenburg	Essex	H. A. Cutting	1, 2	92	22	53	70.3	8.60
Craftsbury	Orleans	James A. Paddock	7	86	23	51	66.2	6.60
Burlington	Chittenden	Rev. McK. Petty	7	82	18	55	68.3	5.76
Brandon	Rutland	David Buckland	2	91	17, 18, 22	58	71.9	10.12
MASSACHUSETTS.								
Topsfield	Essex	John H. Caldwell	8	90	10	60	70.3	15.68
New Bedford	Bristol	Samuel Rodman	26	83	10, 22	62	71.3	4.05
Mendon	Worcester	Jno. G. Metcalf	28	88	10	61	71.6	12.00
Amherst	Hampshire	Prof. E. S. Snell	27	85½	23	55	70.9	8.64
Westfield	Hampden	Rev. E. Davis	27	85	22, 23, 24	58	71.7	10.31
Williamstown	Berkshire	Prof. A. Hopkins	7	83½	22, 23	58	69.1	9.87
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	8, 26	85	1, 24	57	69.6	9.42
CONNECTICUT.								
Pomfret	Windham	Rev. D. Hunt	7	81	24	59	69.0	11.79
Middletown	Middlesex	Prof. John Johnston	7	87	23	60½	71.8	11.14
NEW YORK.								
Fishkill Landing	Dutchess	Wm. H. Denning	27	89	18	60	70.6	9.11
Garrison's	Putnam	Thomas B. Arden	3, 9, 26	80	17, 18, 21	61	75.0	6.81
Deaf and Dumb Inst.	New York city	Prof. O. W. Morris	16, 27, 28	87	14, 22	67	77.5	8.60
Gouverneur	St. Lawrence	C. H. Russell	7	87	17	50	69.5	2.84
Clinton	Oneida	H. M. Paine, M. D.	3	93	16	58	74.6	5.46
Oneida	Madison	S. Spooner, M. D.	2	90	16, 17, 22, 23	60	71.6	8.88
Theresa	Jefferson	S. O. Gregory	7	87	17	50	71.5	1.28
Oswego	Oswego	Wm. S. Malcolm	1	82	17	56	69.1	4.35
Rochester	Monroe	Dr. M. M. Mathews	2	89	16, 17	58	76.9	5.03
Wilson	Niagara	Dr. E. S. Holmes	4	92	17	54	71.7	......
Buffalo	Erie	William Ives	2, 7	93	16	54	70.6	4.37

I. JULY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
NEW JERSEY.								
				°		°	°	In.
Newark	Essex	W. A. Whitehead	....	......	22, 23	60	72.9	5.96
Progress	Burlington	Thomas J. Beans	3	96	17	68	78.8	5.99
PENNSYLVANIA.								
Philadelphia	Philadelphia	J. A. Kirkpatrick, A. M.	15	87	17, 18	69	77.0	5.69
Susquehanna Depot.	Susquehanna	H. H. Atwater	3	100	17, 22	61	77.3	6.41
Mount Joy	Lancaster	J. R. Hoffer	25	99	17	63	....	3.70
Harrisburg	Dauphin	John Heisely, M. D.	25	89	17	64	77.1	13.58
Tioga	Tioga	E. T. Bentley	11	96	22, 23	54	73.4	......
Fleming	Center	Samuel Brugger	11	92	21, 22	58	73.7	2.80
Blairsville	Indiana	W. R. Boyes	8, 24, 27, 31	92	2, 12, 13 to 16	50	67.0	5.62
Canonsburg	Washington	Rev. W. Smith, D. D.	5, 8, 23, 29	84	18	52	70.6	3.10
MARYLAND.								
Chestertown	Kent	Prof. J. R. Dutton	28	89	18, 22	67	77.3	5.56
St. Mary's	St. Mary's	Rev. J. Stephenson.	11	86	17	66	77.5	5.49
Sykesville	Carroll	Miss H. M. Baer	25, 26	82	17	62	75.4	13.10
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Inst'n	3	88	22	63½	76.4	8.37
OHIO.								
Austinburg	Ashtabula	Dole & Griffing	1, 3	89	17, 18	52	69.7	6.00
New Lisbon	Columbiana	J. F. Benner	3	96	17	52	72.9	2.15
Welshfield	Geauga	B. F. Abell, A. M.	1, 3	90	16	52	71.1	2.47
Cleveland	Cuyahoga	G. A. Hyde	3	84	17	57	72.2	1.65
Kelley's Island	Erie	Geo. C. Huntington	3	88	16	56	71.4	1.43
Newark	Licking	Israel Dille	24	97	17	46	74.9	2.18
Westerville	Franklin	Prof. Jno. Haywood.	3	92	17	52	72.9	1.45
Portsmouth	Sciota	L. Englebrecht	2	89	17	59	75.6	4.05
Toledo	Lucas	J. B. Trembly, M. D.	2	93	18	51	74.5	3.44
Bowling Green	Wood	W. R. Peck, M. D.	1	88	16	32	70.6	2.75
Urbana University	Champaign	Prof. M. G. Williams	3, 24	92	16	56	74.0	2.10
Cincinnati	Hamilton	George W. Harper	2, 24	96	17	61	77.4	3.21
MICHIGAN.								
Monroe	Monroe	Flor. E. Whelpley	6	91	15, 16	50	71.0	1.42
Marquette	Marquette	Frank M. Bacon	7	83	15	44	60.3	4.24
INDIANA.								
New Castle	Henry	T. B. Redding, A. M.	3	95	16	39	73.8	......
New Albany	Floyd	Dr. E. S. Crozier	1, 3, 20	91	17	58	76.1	2.32
South Bend	St. Joseph	Reuben Burroughs	8	91	15	50	69.8	5.37

I. JULY, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
INDIANA—Cont'd.								
				°		°	°	*In.*
Rockville	Park	Miss M. A. Anderson	9	90	15, 16	57	73.4	4.13
New Harmony	Posey	Jno. Chappellsmith	3	91	16, 17	60	75.7	3.02
ILLINOIS.								
Chicago	Cook	Samuel Brookes	1	94	15	54	69.2	......
Peoria	Peoria	Frederick Brendel	4, 23	93	16	53	75.4	4.82
Pekin	Tazewell	J. H. Riblett	3, 9	94	14	51	72.4	3.30
Waverly	Morgan	Timothy Dudley	9	96	16	50	73.8	7.30
Galesburg	Knox	Prof. W. Livingston	31	92	12	53	71.8	1.48
Manchester	Scott	Dr. & Miss E. Grant	9	95	12	51	72.7	3.73
Augusta	Hancock	S. B. Mead, M. D.	8	93	16	53	72.9	2.62
WISCONSIN.								
Milwaukie	Milwaukie	I. A. Lapham, LL.D	....	......	....	......	....	2.40
Do	.... do	Carl Winkler	31	90	15	51	67.7	......
Weyauwega	Waupaca	W. Woods	7	96	15, 16, 17	49	69.4	......
MINNESOTA.								
St. Paul	Ramsey	Rev. A. B. Paterson	6	91	14, 15	48	68.5	0.63
IOWA.								
Lyons	Clinton	Dr. P. J. Farnsworth	8	98	15	55	72.2	5.55
Dubuque	Dubuque	Dr. Asa Horr	8	92	12, 16	53	71.8	3.93
Muscatine	Muscatine	Suel Foster	31	94	12	50	....	......
Independence	Buchanan	A. C. Wheaton	4	101	15	48	73.3	6.40
Port Madison	Lee	Daniel McCready	4, 5	95	13, 15, 16	53	74.3	1.71
Pleasant Plain	Jefferson	T. McConnel	5	104	15	56	77.1	0.50
Algona	Kossuth	Dr. & Miss L. McCoy	8	96	15	51	72.1	1.50
MISSOURI.								
Canton	Lewis	George P. Ray	2, 31	102	15	55	75.8	0.77
Harrisonville	Cass	John Christian	10	100	16	58	78.0	......
KANSAS.								
Lawrence	Douglas	Arthur N. Fuller	10	100	15, 16	60	76.5	0.11
Manhattan	Riley	H. L. Dennison	2, 9	92	15, 16	58	76.1	4.54
NEBRASKA.								
Elkhorn	Washington	Miss A. M. J. Bowen	9, 10	96	16	56	72.6	......
Bellevue	Sarpy	Rev. Wm. Hamilton	30	86	13	54	71.0	2.25

II. JULY—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg*	*In.*
Maine	6	67.9	2.6	69.3	4.4	67.2	3.6	65.7	6.6	67.3	2.4	67.5	3.9	69.7	6.82
New Hampshire	4	71.8	4.7	71.4	2.5	71.5	4.3	67.5	4.1	65.9	3.5	69.6	3.4	69.2	7.77
Vermont	4	69.6	6.2	71.2	3.1	70.7	5.0	67.8	4.9	66.5	1.6	69.1	4.2	69.2	7.77
Massachusetts	12	71.4	5.8	71.3	2.6	70.2	4.7	69.2	4.5	68.7	2.1	70.2	3.9	70.8	9.43
Rhode Island	1	72.9	3.25	72.1	4.20	69.9	3.45	69.8	4.90	69.2	1.14	70.7	3.65	69.6	9.42
Connecticut	4	71.8	5.8	72.7	2.7	69.7	6.8	69.5	3.5	68.1	2.0	70.4	4.2	70.4	11.16
New York	18	72.1	4.8	73.3	2.9	72.0	4.1	71.9	4.6	69.2	3.3	71.7	4.0	72.2	5.67
New Jersey	4	76.2	4.5	77.2	1.4	73.0	6.1	74.4	3.4	72.0	4.0	74.6	4.0	75.8	5.97
Pennsylvania	20	76.4	5.8	76.7	2.1	70.2	3.6	76.1	3.1	73.4	2.8	74.5	3.5	73.6	5.99
Delaware	1	......	....	......	....	75.6	3.95	80.4	1.27	......	2.76	78.0	2.66	......	....
Maryland	5	77.0	3.2	78.9	3.6	74.3	4.4	77.2	3.0	74.5	2.5	76.4	3.3	76.7	8.05
District of Columbia	1	79.0	4.1	79.1	3.9	74.7	5.4	78.3	5.0	76.1	1.6	77.4	4.0	76.4	8.37
South Carolina	6	81.2	4.23	81.6	3.42	77.4	7.90	80.1	6.63	78.8	6.23	79.8	5.68	......	....
Tennessee	2	77.5	5.84	78.8	1.86	73.1	4.61	79.0	6.88	79.5	1.34	77.6	4.11	......	....
Kentucky	4	78.1	3.0	79.4	2.4	73.6	4.7	78.5	5.0	78.2	2.3	77.5	3.4	......	....
Ohio	18	74.7	5.8	76.0	2.7	74.5	4.9	75.9	5.0	74.4	1.6	75.1	3.9	73.3	3.20
Michigan	8	76.1	8.8	72.3	2.3	71.6	2.9	72.9	3	70.7	1.8	72.7	3.6	65.6	2.83
Indiana	4	77.7	7.0	79.3	2.2	74.2	2.8	77.4	3.1	77.8	1.9	77.3	3.4	73.8	3.94
Illinois	13	76.3	6.2	77.3	3.6	76.3	2.1	75.3	5.9	75.8	1.7	76.2	3.9	72.6	3.87
Wisconsin	9	72.0	3.7	68.3	2.6	67.1	2.4	70.9	5.3	73.0	2.2	70.3	3.2	68.6	2.65
Minnesota	3	70.2	....	72.8	2.7	76.3	1.0	68.7	8.8	70.0	4.2	71.6	4.2	68.5	0.63
Iowa	8	74.3	4.8	75.6	3.8	63.6	2.9	73.9	8.3	75.7	4.3	72.6	4.8	72.5	3.44
Missouri	2	79.6	5.2	81.6	4.9	76.8	3.3	82.2	2.9	78.9	5.5	79.8	4.4	76.9	1.64
Kansas	4	......	....	......	....	81.2	3.2	80.6	6.0	80.6	3.7	80.8	4.3	76.3	2.33
Nebraska Territory	2	......	....	......	....	76.7	1.7	76.8	15.8	77.7	1.8	77.1	6.4	71.8	2.25
California	2	......	....	73.5	0.1	60.7	0.0	69.4	0.0	66.9	1.3	67.6	0.3	......	....

I. AUGUST, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.				°		°	°	In.
Steuben	Washington	J. D. Parker	10	85	31	48	65.0	2.30
Linneus	Aroostook	A. G. & Miss Young.	3	86	16	47	63.9	2.56
Foxcroft	Piscataquis	Mark Pitman	3, 11	83	30, 31	50	66.3	3.23
Cornishville	York	G. W. Guptill	3	88	30, 31	52	68.8	4.39
NEW HAMPSHIRE.								
Stratford	Coos	Branch Brown	9	83	27	42	63.7	3.04
Littleton	Grafton	Robert C. Whiting	5, 11	88	31	44	66.6	4.60
Plymouth	...do	J. S. Ryan	10	82	28	56	....	5.90
Claremont	Sullivan	Arthur Chase	3	92	31	45	69.0	5.78
VERMONT.								
Lunenburg	Essex	Hiram A. Cutting	11	98	31	39	70.0	2.90
Craftsbury	Orleans	James A. Paddock	9	81	31	44	62.9	1.66
Springfield	Windsor	Rev. J. H. Chickering	2, 10	92	31	46	70.0	5.92
Burlington	Chittenden	Rev. McK. Petty	11	82	31	47	65.6	2.41
Brandon	Rutland	David Buckland	2, 5, 6	88	31	48	69.7	7.28
MASSACHUSETTS.								
Topsfield	Essex	John H. Caldwell	3	92	31	53	70.3	4.97
New Bedford	Bristol	Samuel Rodman	3	90	31	56	72.5	2.42
Mendon	Worcester	Jno. George Metcalf.	3	90	30, 31	53	71.0	4.60
Baldwinsville	...do	Rev. E. Dewhurst	3, 10	86	31	49	65.9	5.00
Amherst	Hampshire	Prof. E. S. Snell	3	90	31	49	70.1	6.11
Williamstown	Berkshire	Prof. Albert Hopkins	11	88	31	45	69.1	5.24
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	9	89	18	51	70.3	4.59
CONNECTICUT.								
Pomfret	Windham	Rev. Daniel Hunt	3	87	30, 31	52	69.6	6.24
Middletown	Middlesex	Prof. John Johnston.	3	94	27	50	70.9	4.90
NEW YORK.								
South Hartford	Washington	G. M. Ingalsbe	2, 3, 6	88	31	48	71.0	10.12
Fishkill Landing	Dutchess	W. H. Denning	3	92	27, 31	54	71.3	3.86
Gouverneur	St. Lawrence	Cyrus H. Russell	11	91	18, 30, 31	46	68.3	1.75
Mohawk	Herkimer	James Lewis	11	88	31	46	70.9	......
Clinton	Oneida	H. M. Paine, M. D.	11	96	31	47	70.5	5.84
South Trenton	...do	Storrs Barrows	....	......	....	......	....	5.25
Oneida	Madison	S. Spooner, M. D.	11	92	30	46	69.3	12.73
Theresa	Jefferson	S. O. Gregory	11	93	26, 30	48	66.0	2.41
Oswego	Oswego	Wm. S. Malcolm	11	90	31	49	68.7	5.25
Rochester	Monroe	Dr. M. M. Mathews	11	90	30, 31	46	69.1	3.70
Wilson	Niagara	E. S. Holmes, D.D.S.	11	93	30, 31	47	71.1	......
Buffalo	Erie	William Ives	11	91	31	44	69.8	2.96

I. AUGUST, 1863—CURRENT WEATHER—Continued.

Place	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
NEW JERSEY.				°		°	°	In.
Newark	Essex	W. A. Whitehead	3	91	30	53	73.7	4.98
Janesburg	Middlesex	Rev. Wm. M. Wells	3	95	28	55	76.6	2.52
Progress	Burlington	Thomas J. Beans	3	101	31	56	79.4	4.91
PENNSYLVANIA.								
Philadelphia	Philadelphia	Pf. J. A. Kirkpatrick	3	94	30	60	*	4.29
Harrisburg	Dauphin	John Heisely, M. D.	10, 11	93	31	53	79.4	1.06
Tioga	Tioga	E. T. Bentley	10	96	31	40	70.7	......
Fleming	Center	Samuel Brugger	11	96	31	42	72.5	3.23
Canonsburg	Washington	Rev. W. Smith, D.D.	10, 11	91	30	41	71.8	1.85
MARYLAND.								
St. Mary's	St. Mary's	Rev. J. Stephenson	16	95	30	62	80.0	0.27
Sykesville	Carroll	Miss Harriet M. Baer	3, 10, 11, 14, 21	85	27	51	77.0	0.75
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Inst'n	11	93	31	54	78.2	0.86
OHIO.								
Austinburg	Ashtabula	Dolo and Griffing	2, 4	92	3, 31	41	70.1	3.11
New Lisbon	Columbiana	J. F. Benner	10	94	31	36	73.9	1.80
Welshfield	Geauga	B. F. Abell, A. M.	2, 20	90	30, 31	47	71.3	6.09
Cleveland	Cuyahoga	Mr. & Mrs. G. A. Hyde	5	92	31	49	73.3	2.06
Kelley's Island	Erie	Geo. Huntington	5	89	29, 30	52	72.2	1.74
Newark	Licking	Israel Dillé	4	97	30, 31	41	76.3	2.58
Westerville	Franklin	Prof. John Haywood	2	91	30	43	71.8	3.66
Portsmouth	Scioto	L. Engelbrecht	11	90	30	47	74.5	3.00
Toledo	Lucas	J. B. Trembly, M. D.	2	95	30	48	73.0	2.21
Bowling Green	Wood	W. R. Peck, M. D.	7	88	31	43	71.8	2.44
Urbana	Champaign	Prof. M. G. Williams	4, 15	93	30	41	72.6	1.66
Hillsborough	Highland	J. McD. Mathews	2	89	30	41	73.2	2.45
Cincinnati	Hamilton	G. W. Harper	24	94	30	45	72.0	2.99
College Hill	do	I. H. Wilson	2	88	30	40	73.9	1.29
MICHIGAN.								
Monroe	Monroe	Florence E. Whelpley	9	95	29, 30, 31	50	70.9	6.13
Ypsilanti	Washtenaw	C. S. Woodard	2	88	29	47	69.6	5.00
INDIANA.								
New Castle	Henry	T. B. Redding, A. M.	14, 15, 21	93	30	36	73.8	3.12
New Albany	Floyd	Dr. E. S. Crozier	15	93	30	45	75.0	2.27
South Bend	St. Joseph	Reuben Burroughs	2	94	29, 30	40	70.8	4.85
Rockville	Park	Miss M. A. Anderson	16	89	29	44	72.3	2.13
New Harmony	Posey	Jno. Chappellsmith	3, 4, 9, 10, 17, 22, 23	90	30	47	75.9	0.85

*Average mean for 12 years, 74.8.

I. AUGUST, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
ILLINOIS.				°		°	°	In.
Ottawa	La Salle	Emily H. Merwin	16	98	29	40	73. 0	3. 11
Winnebago	Winnebago	J. W. Tolman	16	98	29	41	70. 7	2. 24
Peoria	Peoria	Frederick Brendel	17	93	29	46	75. 2	2. 24
Waverley	Morgan	Timothy Dudley	16	95	29, 30	45	73. 2	4. 10
Upper Alton	Madison	Mrs. A. C. Trible	16, 19	88	30	42	....	1. 50
Galesburg	Knox	Prof. W. Livingston	16	93	29	46	73. 0	1. 30
Manchester	Scott	Dr. J. and Miss E. Grant	16, 23	92	29	44	72. 6	1. 97
Augusta	Hancock	S. B. Mead, M. D.	1, 16, 23	91	29, 30	43	72. 8	2. 45
WISCONSIN.								
Milwaukie	Milwaukie	I. A. Lapham, L.LD	1, 4, 8, 19	91	30	41	69. 0	2. 62
Beloit	Rock	Henry D. Porter	16	93	29	42	69. 5	3. 58
MINNESOTA.								
St. Paul	Ramsey	Rev. A. B. Paterson	18	91	29	39	67. 0	3. 19
IOWA.								
Lyons	Clinton	Dr. P. J. Farnsworth	16	95	30	40	73. 0	2. 65
Dubuque	Dubuque	Asa Horr, M. D	16	96	30	46	72. 3	3. 27
Muscatine	Muscatine	Suel Foster	17	96	29	41	....	3. 40
Independence	Buchanan	A. C. Wheaton	4	98	29	42	72. 4	9. 00
Iowa City	Johnson	Prof. T. S. Parvin	16, 17	94	29	36	76. 4	2. 44
Fort Madison	Lee	Daniel McCready	19	96	29	41	74. 5	5. 57
Pleasant Plain	Jefferson	T. McConnel	4	104	29	40	75. 5	5. 51
Algona	Kossuth	Dr. F. and Miss L. McCoy	7	95	30	43	69. 7	10. 06
MISSOURI.								
Canton	Lewis	George P. Ray	16	102	29	42	76. 9	3. 34
Harrisonville	Cass	John Christian	22	100	24	54	78. 4	......
KANSAS.								
Lawrence	Douglas	Arthur N. Fuller	5, 23	99	29	45	74. 7	2. 25
Manhattan	Riley	H. L. Dennison	20, 23	96	30	54	78. 6	6. 21
Fort Riley	Davis	Fred. P. Drew, M. D	23	99	24	54	80. 2	5. 71
NEBRASKA.								
Fontenelle	Washington	John Evans	16	96	29	35	72. 5	2. 70

II. AUGUST—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean. temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	6	62.4	3.9	63.8	8.2	64.2	5.6	63.6	4.6	66.9	2.5	64.2	4.9	66.8	3.31
New Hampshire	4	64.9	2.5	65.9	....	66.6	5.9	65.1	4.1	58.7	3.4	64.3	4.0	66.4	4.83
Vermont	4	62.4	2.9	64.8	8.4	64.9	5.9	65.5	3.6	66.5	2.4	64.8	4.7	67.6	4.63
Massachusetts	12	66.1	3.2	65.5	11.1	67.4	5.1	66.0	5.1	66.8	4.6	66.4	5.8	69.8	4.56
Rhode Island	1	67.9	2.0	69.8	5.6	66.8	4.8	66.4	8.2	69.2	3.7	68.0	4.9	70.3	4.59
Connecticut	4	67.4	2.0	67.6	10.7	68.6	5.0	66.5	4.4	67.3	7.0	67.5	5.8	70.3	5.57
New York	16	67.9	2.4	66.1	4.8	61.0	4.7	69.4	3.5	68.8	3.8	66.7	3.8	69.6	5.39
New Jersey	4	70.7	2.9	70.3	4.8	72.3	6.6	70.4	3.7	70.0	4.6	70.7	4.5	76.6	4.13
Pennsylvania	20	71.4	3.8	69.6	4.1	69.6	4.8	71.5	3.4	71.2	4.1	70.6	4.0	73.6	2.61
Delaware	1	......	....	......	....	74.8	6.43	77.3	4.30	......	5.48	76.0	5.40	......	....
Maryland	4	72.6	5.7	70.1	5.1	72.5	5.9	73.2	2.6	73.2	2.7	72.4	4.4	78.5	0.51
District of Columbia	1	74.9	2.9	72.6	4.2	73.5	10.2	74.7	4.8	74.2	3.2	74.0	5.1	78.2	0.86
South Carolina	6	80.7	4.38	78.6	7.71	79.3	4.91	80.3	4.73	75.9	7.58	79.0	5.86	......	....
Tennessee	2	76.4	4.56	73.0	3.95	73.2	5.08	76.3	2.53	75.3	4.57	74.8	4.14	......	....
Kentucky	3	75.4	4.4	72.6	3.5	73.3	3.2	75.6	2.3	72.6	6.4	73.9	4.0	......	....
Ohio	18	72.2	4.1	68.3	1.9	69.9	3.6	71.5	4.4	71.3	3.9	70.6	3.6	72.8	2.66
Michigan	9	68.5	2.3	65.0	1.4	66.7	4.5	69.2	4.0	69.0	2.6	67.7	3.0	70.3	5.57
Indiana	4	74.0	4.4	71.3	2.9	72.9	4.3	73.7	4.0	73.6	4.3	73.1	4.0	73.6	2.64
Illinois	14	71.7	4.1	70.4	2.8	72.7	4.5	72.5	3.0	72.2	2.5	71.9	3.4	72.9	2.37
Wisconsin	9	67.7	1.8	66.9	1.9	67.4	3.6	68.9	3.6	69.5	1.8	68.1	2.5	69.3	3.10
Minnesota	3	63.4	10.5	63.4	2.7	67.8	3.9	68.6	3.9	66.2	4.1	65.9	5.0	67.0	3.19
Iowa	8	68.6	3.3	67.8	1.6	71.0	5.8	71.9	3.3	72.5	1.8	70.4	3.2	74.9	5.24
Missouri	2	74.4	6.5	74.0	4.4	73.4	3.5	78.7	2.9	76.1	2.9	75.3	4.0	77.7	3.34
Kansas	3	......	....	......	....	75.8	3.9	75.9	4.0	75.9	5.6	75.9	4.5	77.8	4.72
Nebraska Territory	3	......	....	......	....	......	10.1	73.6	1.9	73.8	1.8	73.7	4.4	72.5	2.70
California	2	......	0.0	69.6	0.0	61.7	0.0	69.2	0.1	71.3	0.0	68.0	0.0	......	....

I. SEPTEMBER, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.				°		°	°	*In.*
Steuben	Washington	J. D. Parker	16	82	24	34	54.1	4.91
Foxcroft	Piscataquis	Mark Pitman	15	74	22	41	54.9	4.52
Williamsburg	....do	Edwin Pitman	16	87	23	31	53.6	......
West Waterville	Kennebec	B. F. Wilbur	......	......	......	......	......	2.85
Cornishville	York	G. W. Guptill	16	84	23	40	58.1	2.43
NEW HAMPSHIRE.								
Stratford	Coos	Branch Brown	16	82	28	29	53.3	2.88
Littleton	Grafton	Robert C. Whiting	16	88	23	31	56.4	1.80
VERMONT.								
Craftsbury	Orleans	James A. Paddock	16	83	23	31	52.9	2.96
Springfield	Windsor	Rev. J. W. Chickering	18	88	23	32	59.0	2.06
Burlington	Chittenden	Rev. McK. Petty	16	78	23	35	54.8	5.30
Brandon	Rutland	David Buckland	16	84	23	34	58.4	3.34
Rutland	....do	Stephen O. Mead	16	86	23	32	56.2	......
MASSACHUSETTS.								
Topsfield	Essex	John H. Caldwell	16	86	23	37	58.8	1.98
New Bedford	Bristol	Samuel Rodman	16	79	23	42	60.2	2.56
Mendon	Worcester	Jno. George Metcalf	16	82	23, 24	38	59.0	......
Amherst	Hampshire	Prof. E. S. Snell	16	80	23	32	57.4	2.16
Westfield	Hampden	Rev. Emerson Davis	16	83	23	36	57.0	2.82
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	16	82	23	37	57.8	1.74
CONNECTICUT.								
Pomfret	Windham	Rev. Daniel Hunt	15, 16	77	23	37	56.7	2.90
Middletown	Middlesex	Prof. John Johnston	16	84.5	23	34	59.6	1.73
NEW YORK.								
Theresa	Jefferson	S. O. Gregory	16	84	27	30	53.2	2.62
Skaneateles	Onondaga	W. M. Beauchamp	15, 16	82	22	37	57.0	......
Rochester	Monroe	Dr. M. M. Mathews	16, 17	85	27	34	57.7	1.51
Wilson	Niagara	E. S. Holmes, D.D.S	17	85	23	31	59.7	2.80
NEW JERSEY.								
Newark	Essex	W. A. Whitehead	17	78	23	39	60.0	1.30
PENNSYLVANIA.								
Nazareth	Northampton	L. E. Ricksecker	3, 4, 6	82	23	41	63.4	......
Philadelphia	Philadelphia	Pf. J. A. Kirkpatrick	7	81.5	27	41.5	65.6	0.98
Harrisburg	Dauphin	John Heisely, M. D.	8, 17	82	23	41	65.8	4.55

I. SEPTEMBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
PENN'A—Cont'd.				°		°	°	In.
Fleming	Center	Samuel Brugger	16	86	28	34	61.1	1.16
Oil City	Venango	James A. Weeks	17	86	27	30	59.3	......
Canonsburg	Washington	Rev. W. Smith, D. D	17	85	27	30	59.4	3.37
MARYLAND.								
Sykesville	Carroll	Miss Harriott M. Baer	8, 12	79	23, 26	43	61.1	......
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Inst'n	6, 9	80	28	43	63.3	3.09
OHIO.								
Austinburg	Ashtabula	Dole and Griffing	16	86.5	27	32	58.1	3.45
New Lisbon	Columbiana	J. F. Benner	17	83	20	30	60.7	2.44
Steubenville	Jefferson	Roswell Marsh	....	84	....	37	63.0	3.22
Welshfield	Geauga	B. F. Abell, A. M.	16	85	27	37	59.9	1.63
Cleveland	Cuyahoga	Mr. & Mrs. G. A. Hyde	16	86	27	41	62.5	2.63
Kelley's Island	Erie	Geo. Huntington	11, 16	85	26	42	62.4	1.29
Westerville	Franklin	Prof. Jno. Haywood	11	85	19, 25	37	61.0	0.93
Portsmouth	Sciota	L. Engelbrecht	17	84	27	39	65.2	1.20
Toledo	Lucas	J. B. Trembly, M. D.	16	88	26	32	61.6	1.62
Bowling Green	Wood	W. R. Peck, M. D	16	85	22	37	61.0	0.97
Urbana	Champaign	Prof. M. G. Williams	11	88	26	34	62.6	3.13
Hillsborough	Highland	J. McD. Mathews	8	82	26	36	63.8	2.72
Cincinnati	Hamilton	G. W. Harper	8	93	20	38	65.0	3.10
MICHIGAN.								
Monroe	Monroe	Flor. E. Whelpley	16, 29	80	22, 26	36	59.9	1.51
Ypsilanti	Washtenaw	C. S. Woodard	28	84	26	32	58.4	1.71
Lansing	Ingham	Prof. R. C. Kedzie	16, 28	83	26	27	58.6	0.89
Clifton	Kewenaw	Wm. Van Orden, jr	16	88	18	29	49.1	3.81
INDIANA.								
New Castle	Henry	T. B. Redding, A. M.	8	90	20	33	64.0	......
New Albany	Floyd	Dr. E. S. Crozier	8	91	20	38	65.4	2.56
South Bend	St. Joseph	Reuben Burroughs	16	88	26	35	61.6	1.45
Rockville	Park	Miss M. A. Anderson	8	90	19	38	64.8	......
New Harmony	Posey	Jno. Chappellsmith	8	89	19, 20	45	66.4	2.15
ILLINOIS.								
Ottawa	La Salle	Emily H. Merwin	16	89	18, 19	40	62.1	2.74
Winnebago	Winnebago	J. W. Tolman	15	89	19	32	60.8	3.26
Du Quoin	Perry	Charles Ziegler	8	92	20	30	64.7	3.00
Peoria	Peoria	Frederick Brendel	16	88	19	38	65.2	2.51
Wavorley	Morgan	Timothy Dudley	8	91	19	38	63.1	3.13

I. SEPTEMBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
ILLINOIS—Cont'd.				°		°	°	*In.*
Upper Alton	Madison	Mrs. A. C. Trible	7, 8	84	20	40	64.5	......
Galesburg	Knox	Prof. W. Livingston	27	86	19	38	61.3	3.70
Manchester	Scott	Dr. J. & Miss Grant	8	90	18, 19	40	64.2	2.79
Augusta	Hancock	S. B. Mead, M. D	7	88	18	38	63.2	3.43
WISCONSIN.								
Manitowoc	Manitowoc	Jacob Lüps	23	78	19	32	55.2	......
Madison	Dane	Prof. J. W. Sterling	15, 16	84	19	34	59.3	......
Beloit	Rock	Henry D. Porter	15	87	25	35	60.6	1.27
MINNESOTA.								
Forest City	Meeker	Henry L. Smith	28	94	18	38	59.1	1.87
IOWA.								
Lyons	Clinton	Dr. J. P. Farnsworth	27, 28	88	19	34	62.3	2.35
Dubuque	Dubuque	Asa Horr, M. D	16	89	19	39	63.3	2.16
Muscatine	Muscatine	Suel Foster	1	84	25	36	....	3.10
Independence	Buchanan	A. C. Wheaton	15	90	19	28	61.7	5.20
Iowa City	Johnson	Prof. T. S. Parvin	15	90	25	36	61.2	4.44
Fort Madison	Lee	Daniel McCready	15	89	19	35	63.3	......
Pleasant Plain	Jefferson	T. McConnell	7, 8	98	25	30	63.2	7.10
Algona	Kossuth	Dr. F. & Miss McCoy	14	95	19	34	60.4	1.19
MISSOURI.								
Canton	Lewis	George P. Ray	7	97	19	38	66.9	2.86
Harrisonville	Cass	John Christian	7, 14	98	20	46	71.1	......
KANSAS.								
Lawrence	Douglas	Arthur N. Fuller	7	98	18	39	72.0	0.37
Manhattan	Riley	H. L. Denison	7	95	18	39	73.2	0.73
NEBRASKA.								
Bellevue	Sarpy	Rev. Wm. Hamilton	14	93	18	37	65.6	1.75

II. SEPTEMBER—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	6	56.4	1.8	58.8	3.5	57.8	1.6	58.8	3.5	55.9	4.0	57.6	2.9	55.9	3.68
New Hampshire	4	59.2	0.3	60.1	4.9	58.7	1.3	58.1	5.0	48.2	4.2	56.9	3.1	54.9	2.34
Vermont	4	58.1	4.5	58.3	4.0	57.8	1.8	59.0	3.8	56.0	4.2	57.8	3.7	56.3	3.42
Massachusetts	12	61.1	1.0	61.4	4.8	60.8	2.9	61.1	3.8	58.4	4.0	62.6	3.3	58.5	2.38
Rhode Island	1	61.9	0.3	62.2	5.1	60.3	2.3	62.2	3.1	59.6	3.7	61.5	2.9	57.8	1.74
Connecticut	4	62.4	0.5	63.4	4.1	61.5	3.0	61.4	4.9	59.1	4.0	61.6	3.3	58.1	2.31
New York	18	62.2	1.9	61.9	3.7	61.2	2.8	54.2	3.7	59.3	4.2	59.8	3.3	56.9	2.31
New Jersey	4	65.4	2.9	65.1	2.8	65.3	2.7	63.6	1.5	62.1	7.3	64.3	3.5	60.0	1.30
Pennsylvania	20	66.7	4.5	64.1	2.4	64.4	1.7	64.1	1.7	62.7	7.0	64.4	3.5	62.4	2.52
Delaware	1	66.5	....	......	....	68.4	2.54	71.8	2.68	......	4.79	68.9	3.34	......	....
Maryland	5	67.8	8.0	66.7	2.2	66.3	1.4	65.1	3.6	66.3	8.4	66.5	4.7	61.1	....
District of Columbia	1	70.1	2.9	67.4	1.9	......	1.6	66.5	2.9	67.2	5.8	67.8	3.0	63.3	3.09
South Carolina	6	78.2	2.98	72.6	2.09	75.2	1.38	72.0	5.98	74.1	5.13	74.4	3.51	......	....
Tennessee	2	73.8	7.30	65.1	1.41	70.2	1.38	69.7	1.76	69.4	3.44	69.6	3.06	......	....
Kentucky	3	74.5	4.7	64.8	1.4	69.1	2.3	67.3	2.8	67.4	3.2	68.6	2.9	......	....
Ohio	19	69.7	5.4	63.3	2.4	65.4	1.4	65.0	1.6	62.9	3.4	65.3	2.9	62.1	2.18
Michigan	8	65.0	6.0	57.8	3.1	61.6	2.6	60.3	3.1	63.5	3.3	61.6	3.6	56.5	1.98
Indiana	5	71.5	5.7	63.1	0.7	67.7	1.6	66.2	2.9	65.2	5.4	66.7	3.3	64.5	2.05
Illinois	13	69.9	2.6	63.3	3.0	66.4	2.2	65.1	3.7	62.3	3.0	65.4	2.9	63.2	3.07
Wisconsin	9	63.0	4.5	58.4	3.5	61.8	3.8	60.6	4.1	58.0	3.0	60.4	3.8	58.3	1.27
Minnesota	3	60.4	....	49.9	....	60.0	3.0	57.8	3.6	55.4	3.6	56.7	3.4	59.1	1.87
Iowa	8	67.1	4.7	61.5	2.9	65.2	2.4	63.7	3.7	61.6	2.9	63.8	3.3	62.2	3.65
Missouri	2	73.1	3.9	65.6	2.9	70.0	2.1	71.3	3.9	66.4	4.4	69.3	3.4	69.0	2.86
Kansas	4	......	....	......	....	70.6	....	69.8	2.5	68.3	1.9	69.5	2.2	72.6	0.55
Nebraska Territory	2	......	....	......	....	75.3	2.5	64.9	2.6	63.0	2.1	67.7	2.4	65.6	1.75
California	2	......	....	71.1	0.0	65.1	0.0	68.7	0.0	68.8	0.0	68.2	0.0	......	....

I. OCTOBER, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.				°		°	°	*In.*
Linneus	Aroostook	A. G. & Miss Young.	1	72	29	13	47.3	2.37
Williamsburg	Piscataquis	Edwin Pitman	1	74	26	25	48.6	6.18
Foxcroft	...do	Mark Pitman	1	72	29	24	47.4	6.46
Waterville	Kennebec	B. F. Wilbur	......	......	......	......	......	4.55
Cornishville	York	G. W. Guptill	1	72	27	23	49.4	4.12
NEW HAMPSHIRE.								
Stratford	Coos	Branch Brown	1, 19	69	27, 29	16	41.3	3.98
Littleton	Grafton	Robt. C. Whiting	19	72	29	18	47.5	2.43
North Littleton	...do	Rufus Smith	19	64	28	11	37.1	......
Plymouth	...do	Jabez S. Ryan	18	74	29	22	56.0	4.60
Claremont	Sullivan	Arthur Chase	19	72	29	21	49.0	3.95
VERMONT.								
Craftsbury	Orleans	James A. Paddock	1	70	27	18	44.4	2.90
Springfield	Windsor	Rev. J. W. Chickering	19	74	29	18	50.0	4.25
Wilmington	Windham	C. T. Alvord	......	79	......	41	55.9	5.38
Burlington	Chittenden	Rev. McK. Petty	18	68	27	21	46.7	3.90
Rutland	Rutland	Stephen O. Mead	4	80	27	18	49.4	......
Brandon	...do	David Buckland	18	76	28	21	50.6	2.88
MASSACHUSETTS.								
Topsfield	Essex	John H. Caldwell	1	72	29	30	52.3	3.07
New Bedford	Bristol	Samuel Rodman	1	73	29	33	54.8	1.09
Mendon	Worcester	Jno. Geo. Metcalf	18	72	27	28	53.1	3.10
Westfield	Hampden	Rev. Emerson Davis	......	......	......	......	48.9	5.26
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	1, 15	72	27, 29	29	51.4	2.97
CONNECTICUT.								
Pomfret	Windham	Rev. D. Hunt	1, 15	70	27	27	50.0	5.16
Middletown	Middlesex	Prof. Jno. Johnston.	18	75	29	23	51.0	3.34
NEW YORK.								
South Hartford	Washington	G. M. Ingalsbee	2	79	29	21	53.6	2.60
Fishkill Landing	Dutchess	W. H. Denning	15	72	29	26	50.6	4.36
Clinton	Oneida	Dr. H. M. Paine	18	79	28	22	51.1	2.97
Theresa	Jefferson	S. O. Gregory	18	76	28	19	45.9	3.87
Skaneateles	Onondaga	W. M. Beauchamp	1	74	28	21	46.1	......
Rochester	Monroe	M. M. Mathews, M. D	18	76	29	26	48.4	2.72
Wilson	Niagara	E. S. Holmes, D. D. S	18	69	26, 29	26	48.2	......
Buffalo	Erie	William Ives	1	76	26	25	48.0	4.00

I. OCTOBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
NEW JERSEY.				°		°	°	In.
Pasaic Valley	Pasaic	William Brooks	15, 18	72	29	24	51.9	7.65
Newark	Essex	W. A. Whitehead	1, 2, 3, 4	69	29	30	51.8	3.45
Somers' Point	Atlantic	Dr. & Mrs. Somers	4	79	27	31	58.5	2.46
PENNSYLVANIA.								
Nazareth	Northampton	L. E. Ricksecker	15	78	26, 28	31	54.4	......
Philadelphia	Philadelphia	J. A. Kirkpatrick, A. M	18	76	26, 27	34	55.3	2.66
Harrisburg	Dauphin	John Heisely, M. D.	15	72	29	34	51.1	5.60
Tioga	Tioga	E. T. Bentley	16, 18	76	29	17	47.7	......
Fleming	Center	Samuel Brugger	18	76	26, 28	22	49.2	6.63
Oil City	Venango	James A. Weeks	1	76	26, 28	23	46.8	......
MARYLAND.								
Chestertown	Kent	Prof. J. R. Dutton	18	76	27, 28 29	35	55.2	2.08
St. Inigoes	St. Mary's	Rev. J. Stephenson	18	76	27, 28	40	60.0	2.56
Sykesville	Carroll	Miss Harriet M. Baer	18	73	29	24	51.5	5.00
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Inst'n	21	72	28, 29	34	54.1	5.02
KENTUCKY.								
Louisville	Jefferson	(Louisville Journal)	16	75	25	27	51.0	5.89
OHIO.								
Austinburg	Ashtabula	Dole & Griffing	17	76	29	25	46.4	5.27
New Lisbon	Columbiana	J. F. Benner	1	78	12	26	47.7	2.98
Welshfield	Geauga	B. F. Abell, A. M	1	76	28	27	46.5	4.57
Cleveland	Cuyahoga	Mr. & Mrs. G. A. Hyde	17	74	28, 29	34	50.8	2.53
Kelley's Island	Erie	Geo. O. Huntington	17	70	24, 28	39	50.1	2.84
Westerville	Franklin	Pf. H. A. Thompson	15	73	29	24	46.4	3.03
Kingston	Ross	Prof. Jno. Haywood	17	76	28	26	45.2	1.58
Portsmouth	Scioto	L. Engelbrecht	15, 17	73	25. 28	32	52.4	2.93
Toledo	Lucas	J. B. Trembly, M. D.	17	76	26	31	44.9	3.13
Bowling Green	Wood	W. R. Peck, M. D	16	73	22, 28	30	48.5	3.10
Urbana	Champaign	Prof. M. G. Williams	17	80	24, 28	27	47.4	2.63
Hillsborough	Highland	J. McD. Mathews	15, 17	71	24, 28	28	48.7	2.87
Cincinnati	Hamilton	G. W. Harper	17	75	25	31	49.0	3.85
MICHIGAN.								
Monroe	Monroe	Florence E. Whelpley	17	74	26	30	46.9	3.11
Ypsilanti	Washtenaw	C. S. Woodard	17	72	26	28	44.7	2.87
Lansing	Ingham	Prof. R. C. Kedzie	16	72	26	17	45.2	1.04
INDIANA.								
Muncie	Delaware	E. J. Rice	16	78	24, 28	27	43.7	3.81
New Castle	Henry	T. B. Redding, A. M.	17	78	24	29	47.0	2.75
Spiceland	....do	William Dawson	16	77	24	28	46.0	3.00
New Albany	Floyd	Dr. E. S. Crozier	16	78	24, 28	32	50.7	5.97
South Bend	St. Joseph	Reuben Burroughs	16	75	24, 28	30	45.0	2.12

I. OCTOBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
INDIANA—Cont'd.				°		°	°	In.
Rockville	Park	Miss M. A. Anderson	16	75	24	27	47.6	5.00
New Harmony	Posey	Jno. Chappellsmith	16	73	25, 31	28	48.3	3.23
ILLINOIS.								
Ottawa	La Salle	Emily H. Merwin	16	75	31	24	43.7	4.23
Winnebago Depot	Winnebago	J. W. Tolman	16	71	31	14	42.3	3.49
Du Quoin	Perry	Charles Ziegler	16	74	24, 31	18	46.3	3.60
Peoria	Peoria	Frederick Brendel	16	74	31	21	46.6	3.92
Waverly	Morgan	Timothy Dudley	15, 16	74	31	13	44.5	3.30
Galesburg	Knox	Prof. W. Livingston	16	68	24	24	43.7	4.74
Manchester	Scott	Dr. J. & Ellen Grant	16	73	24	19	46.5	3.93
Augusta	Hancock	S. B. Mead, M. D.	16	68	31	16	43.2	3.08
WISCONSIN.								
Milwaukie	Milwaukie	I. A. Lapham, LL.D.	....	......	25	28	....	2.97
Madison	Dane	Prof. J. W. Sterling	16	65	24, 25, 31	29	41.0	3.25
Beloit	Rock	Henry D. Porter	16	69	31	18	45.0	2.04
MINNESOTA.								
St. Paul	Ramsey	Rev. A. B. Paterson	14	66	31	17	39.2	1.37
IOWA.								
Lyons	Clinton	Dr. P. J. Farnsworth	2, 9, 16	70	24	26	45.0	6.25
Muscatine	Muscatine	Suel Foster	15	70	31	14	41.7	4.20
Independence	Buchanan	A. C. Wheaton	16	72	31	4	42.3	3.60
Fort Madison	Lee	Daniel McCready	16	79	31	17	44.1	3.52
Pleasant Plain	Jefferson	T. McConnel	14, 15	66	31	15	42.4	3.50
Algona	Kossuth	Dr. & Miss L. McCoy	15	72	31	14	40.4	0.79
MISSOURI.								
St. Charles	St. Charles	J. H. Plexander	....	......	24	11	....	......
Canton	Lewis	George P. Ray	15	70	31	15	43.6	7.56
Harrisonville	Cass	John Christian	2, 8, 16	78	31	26	51.6	1.88
KANSAS.								
Lawrence	Douglas	Arthur N. Fuller	16	81	23	13	47.0	1.10
Manhattan	Riley	H. L. Dennison	15	79	23	11	48.5	2.40
Fort Riley	Davis	Elford E. Lee	16	85	30	18	51.7	0.67
NEBRASKA.								
Fontenelle	Washington	John Evans	14, 15, 16	70	23	4	36.6	0.50
Bellevue	Sarpy	Rev. Wm. Hamilton	6, 11	70	31	14	42.5	1.00

II. OCTOBER—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	6	48.4	7.0	48.0	4.9	47.0	6.8	47.0	4.7	42.4	1.9	46.6	5.1	48.2	4.74
New Hampshire	4	50.2	9.2	47.4	2.8	47.1	6.6	45.3	6.3	41.0	1.9	46.2	5.3	46.2	3.74
Vermont	4	46.7	6.0	46.0	2.1	45.6	5.2	47.6	4.1	41.2	1.7	45.4	3.8	49.5	3.86
Massachusetts	12	47.4	9.3	50.6	2.4	49.6	4.1	53.2	3.1	46.4	2.2	49.2	4.2	52.3	3.13
Rhode Island	1	......	....	......	....	50.5	2.9	54.2	2.8	48.0	2.6	50.9	2.8	51.4	2.97
Connecticut	5	52.3	10.0	50.9	1.8	51.3	5.0	53.3	3.0	46.8	1.4	50.9	4.1	50.7	4.25
New York	18	49.2	5.0	49.1	1.8	48.4	4.9	52.8	3.1	46.1	1.6	49.1	3.3	49.0	3.42
New Jersey	3	51.8	4.6	52.8	1.4	55.2	3.5	55.2	1.6	47.5	2.7	52.5	2.8	54.1	4.52
Pennsylvania	20	50.6	3.6	51.3	1.7	52.1	3.0	55.9	2.3	48.7	1.8	51.7	2.5	50.7	4.96
Delaware	1	51.7	....	......	....	56.3	3.79	62.2	2.55	......	3.33	56.7	3.22	......	....
Maryland	5	52.0	3.8	53.8	3.1	54.2	2.4	56.8	3.0	50.4	2.4	53.4	2.9	55.6	3.21
District of Columbia	1	53.9	3.5	54.8	1.8	54.6	1.9	58.4	2.5	51.7	2.5	54.7	2.5	54.1	5.02
South Carolina	6	62.6	0.75	62.1	2.33	61.9	1.52	68.0	1.55	66.9	0.62	64.3	1.36	......	....
Tennessee	2	54.7	1.40	58.5	2.53	56.9	2.24	62.2	2.25	55.7	1.23	57.6	1.93	......	....
Kentucky	4	53.2	1.2	56.6	1.8	53.5	3.0	59.0	3.5	52.9	1.6	55.1	2.2	51.0	5.89
Ohio	20	50.4	2.8	53.1	1.7	49.7	4.5	55.5	3.5	46.3	2.2	51.0	2.9	48.0	3.18
Michigan	8	46.4	3.5	48.5	2.6	46.2	2.1	51.1	3.1	45.5	2.8	47.5	2.8	45.6	2.34
Indiana	5	50.9	1.3	55.4	1.5	51.4	2.6	55.9	3.6	51.3	2.6	53.0	2.3	46.9	3.70
Illinois	12	51.2	2.8	55.7	3.0	50.5	2.2	53.4	3.6	48.9	1.7	51.9	1.6	44.6	3.79
Wisconsin	10	45.9	2.4	49.3	2.5	46.7	3.1	48.9	3.2	44.7	2.0	47.1	2.6	43.0	2.75
Minnesota	6	......	....	49.6	2.7	46.9	0.8	44.1	1.6	41.7	1.3	45.6	1.6	39.2	1.37
Iowa	8	47.7	3.1	53.2	6.6	49.2	2.2	51.2	4.6	48.4	0.8	50.0	3.4	42.7	3.66
Missouri	2	53.9	3.9	60.0	2.2	71.1	1.9	58.6	7.7	54.5	1.8	59.6	3.5	47.6	3.87
Kansas	4	......	....	......	....	54.3	....	56.9	6.6	54.3	0.5	55.2	3.6	49.1	1.39
Nebraska Territory	3	......	....	......	....	48.9	3.9	51.9	6.0	51.6	1.3	54.1	3.7	39.6	0.75
California	2	......	....	58.2	0.2	61.5	0.4	60.5	2.6	65.4	0.2	61.4	0.9	......	....

I. NOVEMBER, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.				°		°	°	*In.*
Steuben	Washington	J. D. Parker	17	56	30	9	39.5	5.90
Williamsburg	Piscataquis	Edwin Pitman	17, 19	52	30	10	36.6	5.20
West Waterville	Kennebec	B. F. Wilbur	......	......	......	......	......	3.95
Lisbon	Androscoggin	Asa P. Moore	3	60	30	17	42.7	8.09
Cornishville	York	G. W. Guptill	20	58	30	16	38.9	8.60
NEW HAMPSHIRE.								
Stratford	Coos	Branch Brown	18, 20	51	30	6	35.3	2.76
Littleton	Grafton	Robert C. Whiting	17	60	30	16	38.5	1.05
North Littleton	....do	Rufus Smith	17	54	30	4	30.1	......
Claremont	Sullivan	Arthur Chase	3	59	30	18	39.6	3.55
VERMONT.								
Lunenburg	Essex	Hiram A. Cutting	17	65	30	9	36.7	2.25
Craftsbury	Orleans	James A. Paddock	17	55	30	7	34.8	2.38
Springfield	Windsor	Rev. J. W. Chickering	5, 6, 18	60	30	16	41.0	3.30
Burlington	Chittenden	Rev. McK. Petty	5	53	30	12	37.5	2.27
Brandon	Rutland	David Buckland	5	58	30	15	40.5	2.33
Rutland	....do	Stephen O. Mead	5	64	30	16	......	......
MASSACHUSETTS.								
Sandwich	Barnstable	N. Barrows, M. D.	3	62	30	19	45.1	6.79
Topsfield	Essex	John H. Caldwell	20	65	30	21	4.41	5.14
New Bedford	Bristol	Samuel Rodman	12, 17	61	30	21	46.3	6.76
Mendon	Worcester	John G. Metcalf	17	62	30	16	42.4	6.18
Baldwinsville	....do	Rev. E. Dewhurst	17	60	......	......	......	5.51
Amherst	Hampshire	Prof. E. S. Snell	17	61	30	18	41.1	5.28
Westfield	Hampden	Rev. E. Davis	20	67	30	18	40.9	5.43
Williamstown	Berkshire	Prof. A. Hopkins	20	60	30	16	39.7	0.42
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	20	63	30	21	43.3	7.51
CONNECTICUT.								
Pomfret	Windham	Rev. Daniel Hunt	17	63	30	17	41.9	5.57
Middletown	Middlesex	Prof. John Johnston	20	66	30	20	43.3	5.02
New Haven	New Haven	D. C. Leavenworth	5	62	30	25	44.0	......
NEW YORK.								
Fort Ann	Washington	P. A. McMore	4	72	10	10	41.3	2.83
South Hartford	....do	G. M. Ingalsbee	5	62	30	18	41.4	2.08
Fishkill Landing	Dutchess	Wm. H. Denning	2	63	30	25	42.2	4.61
New York	New York	Prof. O. W. Morris	12	63	30	28	47.8	3.88
Gouverneur	St. Lawrence	C. H. Russell	19	54	30	21	38.0	3.75

I. NOVEMBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
NEW YORK—Cont'd.				°		°	°	In.
Clinton	Oneida	Dr. H. M. Paine	5	68	30	14	42.6	2.75
South Trenton	....do	Storrs Barrows	......	......	......	......	......	4.50
Theresa	Jefferson	S. O. Gregory	5	64	30	16	45.8	4.91
Oswego	Oswego	William S. Malcolm	14	59	30	20	40.9	8.40
Skaneateles	Onondaga	W. M. Beauchamp	5	64	30	14	38.7	......
Auburn	Cayuga	John B. Dill	5	70	30	22	40.3	......
Rochester	Monroe	Dr. M. M. Mathews	5	68	30	20	40.5	2.97
Wilson	Niagara	E. S. Holmes, D.D.S.	14	62	30	22	40.8	0.14
NEW JERSEY.								
Paterson	Passaic	William Brooks	5	65	30	23	43.4	2.92
Newark	Essex	W. A. Whitehead	5	65	30	25	44.3	2.61
Progress	Burlington	Thomas J. Beans	5	69	30	25	44.5	2.51
PENNSYLVANIA.								
Nazareth	Northampton	L. E. Ricksecker	3	70	30	23	45.0	......
Philadelphia	Philadelphia	Pf. J. A. Kirkpatrick	5	69	30	25	47.1	2.96
Harrisburg	Dauphin	John Heisely, M. D.	5	65	30	26	45.3	3.05
Fleming	Center	Samuel Brugger	5	72	23	22	41.2	2.25
Oil City	Venango	James A. Weeks	5	66	30	18	39.8	......
Canonsburg	Washington	Rev. W. Smith, D. D.	5	65	30	12	40.2	2.76
Pittsburg	Allegany	Prof. Dr. R. Mueller	5	81	30	15	46.3	7.06
MARYLAND.								
Chestertown	Kent	Prof. J. R. Dutton	5	68	30	25	48.1	1.66
St. Mary's City	St. Mary's	Rev. J. Stephenson	5	69	30	24	49.6	2.85
Sykesville	Carroll	Miss Harriet M. Baer	5	70	30	15	42.1	3.50
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Inst'n	5	67	30	22	47.0	1.73
SOUTH CAROLINA.								
Beaufort	Beaufort	Dr. and Mrs. Marsh	3, 6, 7, 8	84	30	29	59.0	......
KENTUCKY.								
Louisville	Jefferson	Mrs. L. Young	2	75	30	10	45.7	3.14
OHIO.								
Austinburg	Ashtabula	Dole and Griffing	2	63	30	16	39.8	5.43
New Lisbon	Columbiana	J. F. Benner	5	70	30	16	37.4	1.04
Welshfield	Geauga	B. F. Abell, A. M	2	61	30	12	40.3	4.62
Cleveland	Cuyahoga	Gustavus A. Hyde	2, 19	63	30	18	44.0	4.15
Kelley's Island	Erie	Geo. C. Huntington	4	59	30	19	43.1	3.51
Westerville	Franklin	Pf. H. A. Thompson	5	66	30	10	40.8	2.25

I. NOVEMBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
OHIO—Continued.				°		°	°	In.
Kingston	Ross	Prof. Jno. Haywood	2, 5	70	30	14	43.3	3.28
Portsmouth	Sciota	L. Engelbrecht	5	67	30	20	46.3	1.83
Toledo	Lucas	J. B. Trembly, M. D.	2	65	30	17	44.2	3.83
Bowling Green	Wood	W. R. Peck, M. D.	....	61	30	19	43.0	3.48
Urbana	Champaign	Prof. M. G. Williams.	2, 5	70	30	9	42.7	3.48
Hillsborough	Highland	J. McD. Mathews	5	69	30	12	42.7	2.83
Cincinnati	Hamilton	G. W. Harper	2, 5	75	30	12	43.5	2.05
College Hill	....do	John W. Hammitt	2	70	30	11	43.7	3.75
MICHIGAN.								
Monroe	Monroe	Florence E. Whelpley	4, 19	60	30	20	42.0	2.67
Ypsilanti	Washtenaw	C. S. Woodard	5	62	29	15	41.7	2.54
Lansing	Ingham	Prof. R. C. Kedzie	5, 13, 19	59	29	12	39.8	0.41
Clifton	Keweenaw	Wm. Van Orden, jr.	16	64	23, 28, 29	8	29.8	1.95
INDIANA.								
Muncie	Delaware	E. J. Rice	2	68	30	7	40.6	4.45
New Castle	Henry	T. B. Redding, A. M.	2	70	30	9	41.5	3.73
Spiceland	....do	William Dawson	2	70	30	7	40.9	4.53
New Albany	Floyd	Dr. E. S. Crozier	2	80	30	15	47.9	2.22
South Bend	St. Joseph	Reuben Burroughs	19	67	30	9	40.1	4.72
Rockville	Park	Miss M. A. Anderson	13	66	30	5	33.5	5.13
New Harmony	Posey	Jno. Chappellsmith	2	72	29	12	44.7	2.48
ILLINOIS.								
Ottawa	La Salle	Emily H. Merwin	4	65	29	0	37.0	1.85
Winnebago	Winnebago	J. W. Tolman	11, 12	60	29	— 1	35.1	2.50
Peoria	Peoria	Frederick Brendel	13	67	29	4	40.9	0.71
Pekin	Tazewell	J. H. Riblett	13	65	29	1	39.9	0.94
Waverly	Morgan	Timothy Dudley	4, 18	68	29	0	39.3	2.05
Upper Alton	Madison	Mrs. Anna C. Trible.	4	70	29	4	41.0	......
Galesburg	Knox	Prof. W. Livingston.	11	62	29	2	37.5	0.34
Manchester	Scott	Dr. J. & Ellen Grant	13, 18	68	29	0	38.9	1.78
Augusta	Hancock	S. B. Mead, M. D.	4	69	29	— 3	38.9	0.61
WISCONSIN.								
Manitowoc	Manitowoc	Jacob Lüps	2	56	29	6	35.9	3.69
Milwaukie	Milwaukie	I. A. Lapham, LL.D.	5	59	29	5	....	3.59
Beloit	Rock	Henry D. Porter	2, 18	57	29	0	34.8	4.71
Odanah	Ashland	Edwin Ellis	....	......	29	— 6	....	......
MINNESOTA.								
St. Paul	Ramsey	Rev. A. B. Paterson.	12	55	28	—11	30.1	0.29
Forest City	Meeker	H. L. Smith	11	57	28	— 8	31.0	0.20

I. NOVEMBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
IOWA.				°		°	°	In.
Lyons	Clinton	P. J. Farnsworth, M. D	11, 12	61	29	0	37.3	3.30
Dubuque	Dubuque	Asa Horr, M. D.	18	67	29	— 6	34.7	5.65
Muscatine	Muscatine	Suel Foster	4	62	30	— 1	33.6	1.50
Independence	Buchanan	A. C. Wheaton	12	63	29	— 3	33.8	4.10
Iowa City	Johnson	Pr. T. S. Parvin, A. M	12	61	28	0	33.8	3.87
Fort Madison	Lee	Daniel McCready	4	67	29	— 2	39.2	0.65
Pleasant Plain	Jefferson	T. McConnell	13	66	29	— 4	37.4	0.67
Iowa Falls	Hardin	Nathan Townsend	18	53	28	— 5	31.0	4.59
Algona	Kossuth	Dr. F. & Miss L. McCoy	12	62	28	— 7	32.4	1.69
MISSOURI.								
Canton	Lewis	George P. Ray	11	77	29	— 5	38.3	1.26
Harrisonville	Cass	John Christian	4	78	28, 29	6	41.8	......
KANSAS.								
Manhattan	Riley	H. L. Denison	18	68	28	1	38.2	2.48
Fort Riley	Davis	Elford E. Lee	18	74	29	— 4	42.9	1.24
NEBRASKA.								
Bellevue	Sarpy	Rev. Wm. Hamilton	6, 11, 12, 17, 18	60	28	— 3	35.7	1.65
Fontenelle	Washington	John Evans	6, 11, 12, 18	60	28	—15	32.9	2.35

II. NOVEMBER—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	6	37. 1	4. 95	35. 1	3. 10	37. 1	3. 29	30. 7	2. 07	35. 5	4. 68	35. 1	3. 62	39. 4	6. 35
New Hampshire	4	36. 4	3. 68	34. 5	2. 60	37. 5	2. 01	28. 1	3. 04	36. 4	3. 14	34. 6	2. 89	35. 9	2. 45
Vermont	5	34. 6	1. 28	33. 2	2. 28	35. 7	2. 24	30. 2	2. 88	35. 8	3. 17	33. 9	2. 37	38. 1	2. 51
Massachusetts	12	39. 5	4. 30	38. 5	2. 97	40. 6	2. 05	35. 3	2. 56	41. 3	2. 92	39. 1	2. 96	42. 8	5. 19
Rhode Island	1	42. 0	3. 75	39. 4	2. 00	42. 3	2. 40	37. 2	2. 40	43. 3	2. 27	40. 9	2. 56	43. 3	7. 51
Connecticut	5	42. 6	3. 34	40. 7	3. 49	40. 7	3. 01	35. 5	3. 17	41. 7	2. 61	40. 3	3. 12	43. 1	5. 30
New York	18	39. 8	1. 98	38. 9	2. 35	38. 2	3. 18	36. 0	4. 18	41. 4	2. 92	38. 9	2. 92	42. 0	3. 55
New Jersey	4	44. 7	2. 66	42. 3	4. 01	42. 3	1. 39	38. 7	4. 34	45. 3	3. 74	42. 7	3. 22	44. 1	2. 68
Pennsylvania	20	44. 3	3. 01	40. 5	2. 54	39. 7	1. 93	38. 4	1. 33	43. 2	2. 48	41. 2	2. 26	43. 6	3. 62
Delaware	1	44. 5	....	44. 7	....	47. 0	2. 39	44. 4	5. 09	......	3. 47	42. 7	3. 65	......	....
Maryland	5	46. 5	1. 49	43. 9	2. 33	42. 9	1. 47	40. 3	3. 79	45. 7	1. 65	43. 8	2. 14	46. 6	2. 67
District of Columbia	1	48. 3	1. 12	44. 0	2. 14	42. 3	1. 34	41. 5	4. 19	48. 1	1. 89	44. 8	2. 14	47. 0	1. 73
South Carolina	6	59. 9	1. 44	57. 2	3. 28	64. 8	2. 49	49. 3	2. 84	59. 6	2. 63	58. 2	2. 54	......	....
Tennessee	2	52. 9	4. 66	44. 3	6. 04	45. 6	5. 71	41. 6	2. 87	51. 7	4. 71	47. 2	4. 80	......	....
Kentucky	4	51. 4	3. 62	43. 5	4. 06	42. 2	2. 78	39. 9	2. 57	48. 8	3. 01	45. 1	3. 21	45. 7	3. 14
Ohio	21	45. 4	5. 23	40. 1	3 02	36. 1	5. 70	36. 9	3. 85	44. 0	4. 52	40. 5	4. 46	42. 4	3. 21
Michigan	8	39. 8	5. 24	34. 5	3. 14	31. 7	2. 91	35. 4	3. 73	38. 3	3. 83	35. 9	3. 77	38. 3	1. 89
Indiana	5	46. 2	3. 65	40. 9	2. 98	38. 9	5. 81	38. 8	3. 20	45. 7	4. 15	42. 1	3. 96	41. 3	3. 61
Illinois	14	41. 8	2. 81	35. 0	3. 62	33. 0	2. 67	34. 8	3. 76	40. 8	2. 90	37. 1	3. 16	38. 7	1. 35
Wisconsin	10	36. 7	2. 14	33. 7	3. 67	29. 5	1. 63	35. 5	2. 93	36. 4	2. 92	38. 0	2. 66	35. 4	4. 00
Minnesota	3	33. 1	1. 37	25. 3	1. 40	25. 2	2. 58	26. 8	1. 26	30. 0	2. 03	28. 1	1. 73	30. 5	0. 25
Iowa	8	36. 1	3. 09	33. 5	3. 51	30. 7	3. 53	31. 3	3. 74	38. 7	1. 98	34. 0	5. 17	34. 8	2. 89
Missouri	3	47. 1	5. 16	46. 2	4. 64	39. 1	5. 22	37. 6	4. 92	46. 8	5. 41	43. 4	5. 07	40. 1	1. 26
Kansas	3	......	....	......	....	35. 5	3. 61	34. 3	2. 19	45. 0	0. 74	38. 3	2. 18	40. 6	1. 86
Nebraska Territory	3	......	....	......	....	32. 1	1. 75	31. 0	0. 59	37. 3	1. 24	33. 4	1. 19	39. 3	2. 00
California	3	......	0. 00	52. 2	0. 65	54. 8	2. 31	55. 5	0. 40	53. 5	9. 03	54. 9	2. 48	......	....

I. DECEMBER, 1863—CURRENT WEATHER.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
MAINE.				°		°	°	*In.*
North Perry	Washington	Wm. D. Dana	13	56	11	—4	20.8	3.70
Steuben	....do	J. D. Parker	13	49	21	—2	22.5	4.81
Williamsburg	Piscataquis	Edwin Pitman	2, 14	42	11	—6	18.6	5.84
West Waterville	Kennebec	B. F. Wilbur	5	51	21	—2	22.7	0.12
Lisbon	Androscoggin	Asa P. Moore	4	48	22	—7	23.3	4.50
Cornishville	York	G. W. Guptill	5	47	22	—2	22.4	4.29
NEW HAMPSHIRE.								
Stratford	Coos	Branch Brown	14	46	11	—14	16.5	3.75
North Littleton	Grafton	Rufus Smith	14	39	11	—19	11.2	1.15
Littleton	....do	Rob't C. Whiting	14	46	11	—10	19.6	3.39
Plymouth	....do	Jabez S. Ryan	....	.....	22	—2	....	......
Claremont	Sullivan	Arthur Chase	4	48	10, 11	—2	22.0	5.75
VERMONT.								
Lunenburg	Essex	Hiram A. Cutting	14	48	11	—8	18.8	5.15
Craftsbury	Orleans	James A. Paddock	4	43	10	—8	17.0	3.70
Burlington	Chittenden	Rev. McK. Petty	4	45	10	—4	20.3	3.96
Rutland	Rutland	Stephen O. Mead	13	52	25	8	27.5	......
Brandon	....do	David Buckland	13, 14	49	11	2	23.9	3.84
MASSACHUSETTS.								
Sandwich	Barnstable	N. Barrows, M. D	18	56	10, 21	10	31.6	4.46
Topsfield	Essex	John G. Caldwell	13	54	21	6	29.3	3.85
New Bedford	Bristol	Samuel Rodman	14	55	11	10	31.9	5.57
Mendon	Worcester	John G. Metcalf	13	52	22	5	26.7	2.20
Baldwinsville	....do	Rev. E. Dewhurst	14	47	23	—6	22.8	3.66
Amherst	Hampshire	Prof. E. S. Snell	14	52	23	3	25.3	5.87
Springfield	Hampden	J. Weatherhead	4	52	11	1	25.5	4.43
Westfield	....do	Rev. Emerson Davis	4	50	23	4	25.3	5.83
Williamstown	Berkshire	Prof. A. Hopkins	13	49	11	1	24.5	4.13
RHODE ISLAND.								
Providence	Providence	Prof. A. Caswell	4	53	10, 22	8	28.5	5.66
CONNECTICUT.								
Pomfret	Windham	Rev. D. Hunt	13	52	11	3	26.6	5.10
New Haven	New Haven	D. C. Leavenworth	14	55	23	5	29.0	......
NEW YORK.								
South Hartford	Washington	G. M. Ingalsbee	13	47	10	—1	24.5	3.23
Fort Ann	....do	P. A. McMore	5	55	25	0	30.5	3.57
Fishkill Landing	Dutchess	Wm. H. Denning	13	55	23	8	28.4	3.98
Throg's Neck	Westchester	Francis M. Rogers	13	54	23	10	32.0	4.19
White Plains	....do	Oliver R. Willis	13, 14	54	23	8	30.0	......

I. DECEMBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
NEW YORK—Cont'd.				°		°	°	In.
Deaf & Dumb Asy..	New York	Prof. O. W. Morris	13	59	23	15	36.1	5.06
N. York Observatory	....do	Charles C. Wakeley	14	56	23	13	33.9	4.41
Gouverneur	St. Lawrence	C. H. Russell	14	52	10	—7	20.4	3.31
Clinton	Oneida	H. M. Paine, M. D	13, 14	51	22	—1	26.7	4.56
South Trenton	....do	Storrs Barrows	......	......	25	—20	......	2.25
Sackett's Harbor	Jefferson	Henry Metcalf	13, 14	51	10	2	26.2	4.50
Theresa	....do	S. O. Gregory	14	50	23, 25	—2	20.7	3.45
Oswego	Oswego	Wm. S. Malcolm	4	49	10	6	27.2	5.55
Skaneateles	Onondaga	W. M. Beauchamp	14	49	23	—1	26.2	......
Auburn	Cayuga	John B. Dill	4 14	46	23	2	27.2	......
Seneca Falls	Seneca	Philo Cowing	14	52	23	6	28.9	......
Rochester	Monroe	Prof. C. Dewey	4	53	25	7	28.7	1.98
Do	....do	M. M. Mathews, M. D	4	53	25	8	28.6	2.63
Charlotte	....do	Andrew Mulligan	4	55	25	9	30.2	1.78
Buffalo	Erie	William Ives	4	49	24	5	30.0	2.45
Do	....do	Edward Dorr	4	50	24	6	30.1	1.16
Fort Niagara	Niagara	L. Leffman	4	54	10	13	30.0	4.50
Fredonia	Chautauqua	Dan'l J. Pratt, A. M.	13	59	24	7	31.5	3.13
Jamestown	....do	Rev. S. W. Roe, M. D	8	74	24	1	33.6	6.38
NEW JERSEY.								
Passaic Valley	Passaic	Wm. Brooks	13	55	23	2	29.0	3.86
Newark	Essex	W. A. Whitehead	13	55	24	13	31.3	5.00
Mount Holly	Burlington	M. J. Rhees, M. D	13	60	23, 25	15	33.9	......
PENNSYLVANIA.								
Nazareth	Northampton	L. E. Ricksecker	13	57	23	10	33.1	......
Philadelphia	Philadelphia	J. A. Kirkpatrick, A. M	14	60	23	16	34.9	4.89
Silver Spring	Lancaster	H. G. Bruckhart	13	60	25	10	33.0	......
Berwick	Columbia	John Eggert	15	73	26, 28	31	49.5	2.91
Harrisburg	Dauphin	John Heisely, M. D.	13	55	23, 25	19	33.4	6.81
Tioga	Tioga	E. T. Bentley	13, 14	58	23, 24	8	30.3	......
Fleming	Center	Samuel Brugger	4	56	24	6	......	......
Oil City	Venango	James A. Weeks	4	51	24	4	31.7	......
Canonsburg	Washington	Rev. W. Smith, D. D	12	56	24	9	32.3	1.49
Pittsburg	Alleghany	Prof. Dr. R. Mueller.	12	59	24	6	34.0	6.06
MARYLAND.								
St. Mary's	St. Mary's	Rev. J. Stephenson	12, 13, 14	58	25	20	38.6	3.50
Sykesville	Carroll	Miss Harriet M. Baer.	13	60	25	8	32.0	5.30
DIST. OF COLUMBIA.								
Washington	Washington	Smithsonian Instit'n.	13	57	25, 26	18	35.4	3.71
SOUTH CAROLINA.								
Beaufort	Beaufort	M. M. Marsh, M. D.	17	66	20	28	48.0	......
KENTUCKY.								
Louisville	Jefferson	Mrs. L. Young	3, 4, 5	58	20	9	38.9	4.54

I. DECEMBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date	Minimum temperature.	Mean temperature.	Rain.
OHIO.				°		°	°	In.
Austinburg	Ashtabula	Dole & Griffing	4	55	24	—4	31.0	4.40
East Fairfield	Columbiana	S. B. McMillan	12, 13	53	24	8	32.8	5.06
New Lisbon	....do	J. F. Benner	12	68	24	10	34.0	4.21
Welshfield	Geauga	B. F. Abell, A. M.	4, 13	53	24	9	32.3	3.97
Rockport	Cayuhoga	Edward Colbrunn	4	55	19	19	36.0	......
Cleveland	....do	Mr. & Mrs. G. A. Hyde	13	57	24	13	36.0	2.24
Do	....do	Benj. A. Stanaul	4	58	24	9	33.7	3.71
Kelly's Island	Erie	Geo. C. Huntington	3	51	20	16	34.4	2.96
Westerville	Franklin	Pf. H. A. Thompson	12	56	24	4	33.5	3.11
Kingston	Ross	Prof. John Haywood	13	57	20	11	36.0	3.65
Portsmouth	Sciota	L. Engelbrecht	12, 13	59	20	18	39.3	3.32
Bowling Green	Wood	W. R. Peck, M. D	4	60	24	8	36.2	2.94
Urbana	Champaign	Pf. M. G. Williams	4, 13	55	20	3	32.9	4.55
Hillsborough	Highland	J. McD. Mathews	13	56	20	10	36.0	3.83
Eaton	Preble	Miss Ollitippa Sarsh.	13	56	20	3	32.3	......
Cincinnati	Hamilton	G. W. Harper	4, 13	58	20	10	37.0	3.80
College Hill	....do	John W. Hammitt	4	56	20	6	35.7	7.45
Do	....do	J. H. Wilson	4	56	20	6	36.6	8.00
MICHIGAN.								
Monroe City	Monroe	Flor. E. Whelpley	4	53	23	16	33.4	0.07
Do	....do	John Lane	3	55	24	9	32.3	2.20
Agricultural College	Ingham	Prof. R. C. Kedzie	4	49	6	10	30.3	2.19
Detroit	Wayne	C. P. Rabout	4	51	24	14	32.4	2.43
Tawas City	Iosco	Chas. H. Whittemore	4	43	24	5	27.7	3.02
Sugar Island	Chippewa	J. W. Church	1	40	20	—12	19.0	0.19
Ontonagon	Ontonagon	Henry Selby	1, 3	42	31	2	23.5	1.97
INDIANA.								
Muncie	Delaware	E. J. Rice	12, 13	56	20	—4	33.9	4.80
Spiceland	Henry	Wm. Dawson	4	55	20	1	33.3	2.71
New Castle	....do	T. B. Redding, A. M.	4	58	20	1	34.9	4.15
New Albany	Floyd	Dr. E. S. Crozier	5	61	19	14	38.6	5.19
South Bend	St. Joseph	Reuben Burroughs	3	60	20	—6	30.6	4.20
Rockville	Park	Miss M. A. Anderson	3	55	19	—2	34.8	2.30
New Harmony	Posey	Jno. Chappellsmith	4	59	31	5	38.1	3.10
ILLINOIS.								
Ottawa	La Salle	Emily H. Merwin	3	56	31	—12	27.1	2.20
Winnebago	Winnebago	Jas. W. Tolman	3	48	31	—10	25.8	5.97
Du Quoin	Perry	Charles Ziegler	4, 13	56	19	4	38.5	3.30
Tiskilwa	Bureau	Verry Aldrich	3, 8	54	31	—10	25.0	......
Peoria	Peoria	Frederick Brendel	3	59	19	—8	32.3	4.90
Pekin	Tazewell	J. H. Riblett	3	59	19, 31	—8	31.5	6.19
Waverley	Morgan	Timothy Dudley	3	58	31	—14	31.5	7.85
Upper Alton	Madison	Mrs. Anna C. Trible	4	57	31	—11	33.2	7.50
Galesburg	Knox	Prof. W. Livingston	3	57	31	—20	25.1	2.58
Augusta	Hancock	S. B. Mead, M. D	3	60	31	—18	28.5	9.03

I. DECEMBER, 1863—CURRENT WEATHER—Continued.

Place.	County.	Observer.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain.
WISCONSIN.				°		°	°	In.
Manitowoc	Manitowoc	Jacob Lüps	3	45	20	0	29.3	3.85
Milwaukie	Milwaukie	I. A. Lapham, LL. D	4	57	20	—2	29.2	6.25
Weyauwega	Waupaca	Wm. Woods	2	50	31	—5	25.3	2.85
Madison	Dane	Prof. J. W. Sterling	......	......	31	—15	......	......
Beloit	Rock	Henry D. Porter	3, 8	45	31	—7	26.5	5.38
Superior	Douglas	Eber H. Bly	1	43	15, 19	—15	20.0	1.37
MINNESOTA.								
St. Paul	Ramsey	Rev. A. B. Paterson	3	45	31	—28	20.6	1.31
IOWA.								
Lyons	Clinton	P. J. Farnsworth, M. D	4	50	31	—10	28.4	7.35
Dubuque	Dubuque	Asa Horr, M. D	3	46	19, 31	—13	24.9	6.56
Muscatine	Muscatine	J. P. Walton	3	55	31	—18	27.0	7.72
Do	....do	Suel Foster	3	48	31	—22	23.6	7.80
Independence	Buchanan	A. C. Wheaton	3	50	31	—20	23.7	5.27
Iowa City	Johnson	T. S. Parvin, A. M	3, 6	53	31	—23	27.0	2.50
Fort Madison	Lee	Daniel McCready	3	59	19, 31	—12	29.3	5.68
Pleasant Plain	Jefferson	T. McConnel	3	58	31	—20	27.0	3.80
Iowa Falls	Hardin	Nathan Townsend	4	42	31	—20	......	......
Algona	Kossuth	Dr. and Miss McCoy	2	46	31	—20	21.8	2.54
MISSOURI.								
St. Louis	St. Louis	A. Fendler	......	......	31	—4	......	......
Laborville	....do	......	4	55	31	—10	34.7	......
Canton	Lewis	George P. Ray	3	62	31	—17	28.7	5.34
Harrisonville	Cass	John Christian	1, 6	54	31	—14	29.9	......
KANSAS.								
Lawrence	Douglas	W. L. G. Soule	3	60	31	—16	29.1	5.58
Manhattan	Riley	H. L. Denison	6	57	31	—13	25.7	2.97
Fort Riley	Davis	Elford E. Lee	4	62	31	—12	28.6	3.42
NEBRASKA TER.								
Fontenelle	Washington	John Evans	3, 22	41	31	—28	18.4	2.90
Bellevue	Sarpy	Rev. Wm. Hamilton	6	53	31	—20	25.4	3.85
COLORADO TER.								
Montgomery	Park	James Luttrell	8	57	16, 30	—10	20.6	4.31

II. DECEMBER—AVERAGES.

States and Territories.	Av. number of places.	Averages. 1855.		Averages. 1856.		Averages. 1857.		Averages. 1858.		Averages. 1859.		Av. for five years.		Averages. 1863.	
		Mean temp.	Mean rain.	Mean. temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.	Mean temp.	Mean rain.
		Deg.	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*	*Deg.*	*In.*
Maine	6	25. 7	4. 50	20. 5	3. 80	26. 5	4. 55	19. 8	3. 10	16. 5	5. 87	21. 8	4. 36	21. 7	3. 88
New Hampshire	4	26. 8	5. 40	17. 7	3. 09	28. 7	4. 32	17. 7	2. 85	17. 7	4. 49	21. 7	4. 03	17. 3	3. 51
Vermont	4	24. 6	2. 50	16. 9	2. 31	27. 1	3. 35	19. 4	2. 40	16. 3	2. 92	20. 9	2. 70	21. 5	4. 16
Massachusetts	12	30. 3	5. 81	24. 6	4. 21	33. 0	5. 18	29. 1	3. 84	25. 1	4. 97	28. 4	4. 80	26. 9	4. 44
Rhode Island	1	32. 2	6. 10	25. 5	5. 80	34. 6	5. 20	32. 1	3. 45	28. 4	3. 45	30. 5	4. 80	28. 5	5. 66
Connecticut	5	32. 0	6. 33	26. 8	5. 90	38. 2	6. 81	29. 2	3. 70	25. 6	3. 48	30. 3	5. 24	27. 8	5. 10
New York	18	29. 1	3. 45	25. 1	3. 38	33. 1	3. 98	29. 2	3. 28	23. 5	3. 86	28. 0	3. 59	28. 7	3. 76
New Jersey	4	34. 3	5. 10	30. 9	3. 56	35. 9	5. 42	34. 0	4. 20	30. 8	4. 33	33. 1	4. 52	31. 4	4. 43
Pennsylvania	20	30. 7	4. 85	28. 4	2. 86	36. 6	4. 85	34. 8	1. 48	29. 1	3. 97	31. 9	3. 60	34. 7	4. 43
Delaware	1	......	....	34. 5	....	43. 7	4. 70	43. 0	6. 39	......	3. 61	40. 4	4. 90	......	....
Maryland	5	35. 4	1. 14	31. 2	2. 75	38. 8	5. 94	38. 1	3.95	33. 4	3. 69	35. 4	3. 49	35. 3	4. 40
District of Columbia	1	37. 1	3. 20	31. 8	2. 34	......	5. 54	39. 9	5. 79	34. 6	6. 22	35. 8	4. 62	35. 4	3. 71
South Carolina	6	49. 7	6. 05	46. 6	3. 40	54. 0	4. 71	54. 7	3. 42	49. 7	2. 58	50. 9	4. 04	......	....
Tennessee	2	38. 1	2. 27	34. 2	5. 07	46. 6	5. 28	46. 1	8. 47	35. 2	9. 91	40. 0	6. 20	......	....
Kentucky	4	36. 4	3. 29	30. 2	4. 45	42. 4	5. 75	43. 4	7. 87	30. 5	6. 64	36. 6	5. 60	38. 9	4. 54
Ohio	20	31. 6	3. 71	24. 7	3. 33	37. 1	3. 52	36. 7	5. 10	25. 6	4. 25	31. 1	3. 98	35. 0	4. 23
Michigan	8	25. 5	3. 49	21. 0	3. 28	31. 5	1. 65	30. 1	2. 14	20. 0	2. 53	25. 6	2. 61	31. 9	1. 13
Indiana	4	31. 7	2. 45	28. 8	3. 25	37. 4	2. 23	39. 2	5. 99	26. 8	4. 30	32. 8	3. 64	34. 9	3. 78
Illinois	14	26. 6	3. 64	22. 0	4. 19	34. 7	1. 42	30. 6	2. 98	18. 1	1. 58	26. 4	2. 76	29. 9	5. 50
Wisconsin	10	19. 5	2. 20	15. 6	4. 08	29. 9	2. 27	24. 0	2. 04	14. 0	0. 87	20. 6	2. 29	27. 6	4. 58
Minnesota	4	9. 9	1. 25	4. 9	....	23. 4	1. 44	14. 7	1. 34	5. 9	0. 64	11. 8	1. 17	20. 6	1. 31
Iowa	7	20. 2	2. 09	15. 2	4. 50	31. 4	1. 27	23. 9	1. 90	15. 2	0. 58	21. 2	2. 07	25. 9	5. 47
Missouri	3	32. 1	3. 10	29. 8	4. 29	40. 0	2. 58	38. 3	8. 52	24. 5	2. 42	32. 9	4. 18	31. 1	5. 34
Kansas	3	......	....	......	....	37. 8	0. 22	29. 9	1. 18	21. 9	0. 18	29. 9	0. 53	27. 8	3. 99
Nebraska Territory	3	......	....	......	....	32. 1	0. 80	20. 1	0. 89	15. 0	0. 46	22. 6	0. 72	21. 9	3. 37
California	3	......	0. 00	43. 9	2. 40	49. 6	2. 48	45. 6	5. 47	45. 8	2. 87	46. 2	2. 64	......	....

INDEX.

A.

D.

G.

H.

I.

J.

K.

L.

N.

O.

T.

List of things needed,

baking [illegible]	10
soda	10
soap	10
[illegible]rn starch	10
tea	20
[illegible] soap	25
[illegible] cake	10
comb	10
	$1.05

T C.

baking pwd.	10
soap	10
comb bot	10
[illegible]	20
	50

[illegible]	comb 10
[illegible]	15
[illegible]	10
[illegible] soap	25