pursuing of this practice, my experience justifies me in uniting my testimony to theirs on this point."

It is believed that in the West and Northwest, at least, *clover*, which runs its *roots deep* into the mellow ground, should enter more largely into these soiling rotations; it brings more of the fertilizing substances of the earth from *below*, by its long penetrating roots, than any of the others named; it absorbs faster the moisture of the air and the dews; it acknowledges more readily the manures furnished to it, and most kindly accepts the rankest sorts; while it is more easily and vigorously stimulated by plaster, or ashes, or lime, or other light top-dressings, and grows faster than almost any other vegetable; and, unlike most others, it does not have to be sown every season; then it does not appear to be affected or stinted so much by frequent cuttings; and, finally, is more pleasant for plowing under, when desired, than any other, its vast amount of large leaves, stems, and blossoms enabling it to consume from the air a larger and richer quantity of those fertilizers or nutriments, with which the atmosphere is bountifully charged, than many persons seem to be aware of; which, altogether, renders *clover* almost inestimable, not only for "soiling," but for its worth in farming generally, when fairly appreciated and employed; while very few things are better relished by all farm animals, if well and early cured, free from dust or "sun-burnt;" and farmers would find their account in making more general use of it; certainly in the newer States.

Buckwheat is also a good crop to soil with; for, if cut while young, it makes a very palatable food, and will quickly "sprout up" a little, and afford an excellent "green manure" for plowing under, on which to sow a crop of winter rye or wheat. This manuring with green crops turned under, is fast becoming deservedly popular where known.

Peas, also, would make a valuable addition to the above series of "soiling" plants in almost any region of country. They admit of being sown very early—it should be done broadcast, at the rate of two to three bushels per acre—as early as any of the spring crops, and then they grow quickly for green feed, and can be readily gathered into rows or bunches by either hand or horse rakes; then they contain, both the peas and haulm, a large quantity of nutriment, and are much relished by both cattle and hogs; and, when ripe, peas are among the very best feed for work-horses and fattening hogs, when ground or cracked. Then they come off early, leaving the ground in clean, handsome condition for a final crop of turnips or rutabagas. The same may be said of *beans*, as a soiling crop; though few animals, except sheep, will eat them when ripe, unless they are cooked, then they are much liked by different animals, and are exceedingly nutritious, particularly for sheep, poultry, and for fattening hogs.

These are the principal crops which can be used to advantage for "soiling" and rotation. But, doubtless, in different localities, various operators will find still other crops which may be found useful, possibly preferable, in this system, to some named above; and the more, if variety is secured, the better for the success of the operation.

From these considerations, with others which might be realized by a more extended practice. *soiling stock* will, unquestionably, prove to be one of the most efficient, as it will be one of the most pleasing, measures for not only enlarging the profits of agriculture, but for MAINTAINING, as well as increasing, the PRODUCTIVE POWERS of the EARTH; and that the time for the realization of a consummation so desirable is no further distant than the time when the process shall receive that just attention which shall make it properly understood and adequately appreciated. Then the lion and the leopard, emblems of man's destructive passions, shall lie down with, that is, be in useful harmony with the domestic animals, emblems of the productive faculties of man; and a child, that is, innocence and truth, shall lead them all through the world of peace and prosperity.

AGRICULTURAL SCHOOLS OF PRUSSIA.

LEGATION OF THE UNITED STATES,
Berlin, May 15, 1859.

SIR: I send you herewith a communication from the minister of agriculture on the subject of the agricultural schools of Prussia.

As applications are constantly made to me for information concerning the agricultural schools of Germany, I hope you may find this communication worthy of publication. In a few days I hope to be able to forward you a list of seeds, &c., in order to have your opinion as to the proper articles to forward you this fall from this city.*

"The Prussian agricultural schools are, some of them, public, and others are private establishments, but all receive governmental support, and, as has been indicated, are generally under governmental control. In the first place there are *four* public AGRICULTURAL ACADEMIES, the purpose of which is to instruct *young farmers, who have already a preparatory knowledge*, in the physical sciences, and their bearing upon agriculture, and in agriculture itself, with its associated branches of industry. They are each provided with a chemical laboratory, a library, collections of natural history and natural philosophy, and a building for the practical purposes of husbandry, in connection with a larger or smaller quantity of land. This land is intended not only to afford instruction, but also in time to yield a harvest of benefit from the experiments carried on upon it, with the aid, where necessary, of the laboratory, and including the culture of new plants and varieties, the results derived from different manures, the comparison of different methods in the culture of crops and in the feeding of stock—all conducted with the double object of advancing scientific truth and of improving actual practice.

"The laboratory thus subserves an important purpose in the development of such experiments, while it is also essential for the chemical studies and analytical problems which form a part of the student's pursuits, and should therefore be located in a room adjoining the one occupied for chemical lectures. The other apparatus, particularly such instruments as the microscope, are also of use in conducting ex-

* As this communication had already appeared in the Country Gentleman, (No. 1, vol. xiv., July 7, 1859,) it was deemed advisable to insert it as therein translated.

periments, and solving the resultant inquiries, and both teachers and pupils have the use of the library, the collections, models, &c.

"The oldest of the four institutions, to which this general outline applies, is that at *Eldena*, in New Citerior, Pomerania. It was established in 1834, upon an estate of the same name, belonging to the dotation of the University of Greifswalde, as a branch of the university. Originally its main object was the instruction in this department of national economy, of young men destined in after life to serve as public officers, and its discipline still continues such as it is supposed will best answer this particular end.

"As I understand the division of the 1,650 Prussian acres,* composing this estate, 1,200 are devoted to the practical agriculture of the farm, 314 are in meadow, 40 in pasture land, 19 in gardens and hops, 6 under water, (for ponds,) 17 in an experimental field, 2 or 3 in nursery, while the remaining 50 are rented. The soil is pretty fertile, and the ground quite even. A stock is kept of 25 horses, 21 oxen, 50 cows, 2 bulls, 20 young cattle, 884 sheep, and 71 swine. From 1,500 to 1,800 cwt. of malt, it is stated, are worked up annually in the great beer brewery; 350,000 bricks and tile for various purposes, and 300,000 draining tile are burnt in the kilns, and there is a small distillery—this last, however, merely for the instruction of the pupils. The faculty includes a director, (now Mr. BAUMSTARK,) who also teaches the economical and statistical branches; a teacher of agriculture, including the structure of vegetables, general farm management, and account keeping, and the history of agriculture; a teacher of chemistry, physics, the structure of the soil, and technology; and the administrator of the farm, who instructs in practical husbandry and in the associated arts, including particularly the care and breeding of sheep and cattle, the culture of meadows and of farm crops. There is also a teacher of botany, zoology, and the physiology of plants; an assistant teacher in veterinary science, the physiology of animals, and the breeding of horses; another in the cultivation and care of wood lands; a third in architecture; a fourth in mathematics and surveying; and a fifth on law as connected with agriculture. The number of students here last winter was 54, and a boarding-house was occupied by them in the village of Eldena.

"The second of the academies occupies nearly 4,100 acres on a public domain called *Proskau*, and includes two estates, one bearing this name, and the other called *Schimnitz*, in Upper Silesia—having, out of the above area, 466 acres in meadow, 33 in pasture, 25 now designed for an experimental field, and about 20 in nurseries and gardens, while some parts are let to private persons. The necessary buildings were provided in 1851 and 1852. The soil is argillaceous, with some sand and lime, and is rendered wet by springs, to obviate which some attempts have been made at drainage. The climate suffers from the vicinage of mountains. The stock kept includes 2,600 sheep, 20 hogs, 27 cows, and 138 other cattle, young and old, 51 horses, and 9 foals. Brewing and distilling are not done largely, but brickmaking is extensively carried on. The teachers include Mr. HEINRICH, the

*The Prussian acre, I think, is very nearly equivalent to our own.

director, and others similar to those at Eldena, and are 10 in number. There are here 77 students.

"Near Bonn is situated the academy of *Poppelsdorf*, the third on our list, and differing considerably from the other two, mainly in the smaller scale on which its farm operations are conducted. The estate, whose name it bears, belongs to the University of Bonn, and is leased to the ministry of agriculture, under whose supervision lectures were commenced in the fall of 1847. The farm contains 126 acres, of which 17 are employed in experiments, a botanical garden, and a vineyard. Its soil is of that most fertile and friable kind which characterizes the Valley of the Rhine, and it enjoys the climate of Southern Germany. Among its crops tobacco is cultivated, but the technical professions are not carried on, and the stock only numbers 25 cattle of all ages, and 3 horses, with apparently neither a sheep nor a hog. There are 70 students, and 6 teachers, including Mr. HARTSTEIN, the director, together with four assistant teachers. The courses of study appear very similar to those already described. I notice, however, that instruction is given in the care of silk-worms and bees, and in 'hunting and fishery.'

"Two miles from Königsberg, in the province of Prussia, there was opened in the fall of 1858, the fourth of the agricultural academies, which derives its name, like Proskau, from the public domain on which it is located—that of *Waldau*—a domain covering nearly 2,000 acres, including 430 of meadow, 335 of pasture, and 15 of garden land. The pasture is swampy and difficult to drain; the meadow, although good, is not yet protected from the inundations of the Pregel, on which river it lies; the soil is generally clayey, and the climate that of Northern Europe. The stock number 60 horses, young and old, the same number of cattle, 700 sheep, and 30 swine. Mr. SETTEGAST is director, and with four other teachers and one assistant, during the sessions of the past winter (1858–59) has had nearly 50 students, instructing them with especial reference to the husbandry of Northern Germany and the keeping of sheep.

"There are, moreover, two private agricultural academies receiving State support, but of quite limited means—one at *Mögelin*, in the province of Brandenburg, under the direction of the son of the celebrated THAER, and the other at *Regenwalde*, Pomerania, until the recent death of Dr. SPRENGEL, under his supervision.

"Then come what are termed 'private' agricultural schools, for the purpose of exercising the young peasants in the best ways of performing their labors, and to show them also WHY *one way is better than another*—to lead them to *think*. Consequently, the instruction given must be adapted to the faculties of its recipients, while the number of them varies according to the extent of the estate and the views of the owner. The products of their labor go to the benefit of the farm, and the crops are are either used in the institution or disposed of towards its support. The conditions on which students are received vary widely, like the branches in which they must be taught, with the different localities where the establishments are situated; usually the State contracts with the proprietor for the instruction of the student, during even as long a

period as ten years, and it also appoints one or more officials, as may be necessary, in the carrying on of the school.

"Of these schools I will not copy the list; it includes no less than 18, generally with from 6 to 18 students each; and situated four in the province of Prussia, three each in Posen and the Rhenish province, two each in Brandenburg, Saxony, and Westphalia, and one each in Pomerania and Silesia. One of those in Saxony, that at *Badersleben*, is in a district where the peasants are of a more wealthy class, and it has taken a character intermediate between the academies and the schools, having from 60 to 80 students, and over 1,300 acres of land. There is one in the Rhenish province which has 30 students, and another with 25. The aggregate of all these schools is over 300.

"In special branches of farming there is a school at *Treves* for the culture of meadows; one at *Eichsfeld*, on a small scale, for flaxdressers, and a well established garden school at Sansouci, near Potsdam, with 12 or 14 scholars.

"And to conclude with the lands devoted to experimental purposes, it has been already indicated that some experiments are constantly going on in connection with the four agricultural academies, under the general inspection of their directors, but having also a special manager, who is assisted by a chemist. In addition to these, at the large sheep establishment at *Frankenfelde*, in Brandenburg, where the principal object is to preserve a pure race, and where also young shepherds receive instruction, 40 acres are devoted to the purpose of particular experiments, while the whole 1,700 can indirectly be employed for larger trials. Some of the agricultural societies have given lands, erected laboratories, and appointed chemists, quite recently however, and the State is aiding their efforts with some money, but only for a few years, in order to test the results accomplished. Establishments of this kind have been instituted to the number of six, respectively by the societies of Lithuania, Pomerania, Silesia, Upper Lusatia, Brandenburg, and the Rhenish province. The investigations thus instituted are not regulated by any general system of coöperation, and their results appear from time to time in pamphlets and in the agricultural journals."

METEOROLOGY.

METEOROLOGY IN ITS CONNECTION WITH AGRICULTURE.

BY PROFESSOR JOSEPH HENRY, SECRETARY OF THE SMITHSONIAN INSTITUTION.

ATMOSPHERIC ELECTRICITY.

In this report, we intend to give a sketch of the general principles of atmospheric electricity, a branch of meteorology which has attracted in all ages more attention and has been regarded with more interest than perhaps any other.

The vast accumulation of electricity in the thunder cloud, and the energy exhibited in its mechanical, chemical, and physical effects, have impressed the popular mind with the idea of the great efficiency of this agent in producing atmospheric changes, and have led to views of its character not warranted by cautious induction. It is frequently considered sufficient in the explanation of an unusual phenomenon to refer it simply to electricity. References, however, of this kind, are by no means satisfactory, since the scientific explanation of a phenomenon consists in the logical reference of it to a general law; or, in clearly exhibiting the steps by which it can be deduced from an established principle. Electricity is subject to laws as definite and invariable as those which govern the mechanical motion of the planetary system. Indeed, there is a great similarity between them, and it will be seen in the discussion of electrical phenomena, that these are referable to forces similar to that of gravitation, and that the mathematical propositions which were demonstrated by Newton in regard to the latter, have been applied with admirable precision to represent those of the former.

In giving a general exposition of a subject of this kind, two plans may be adopted: either a series of facts may be stated, and from these a theory gradually developed by a careful induction, or we may begin with the general principles or laws which have been discovered, and from these deduce the facts in a series of logical consequences. The first method is called induction, the second deduction, and they are sometimes known by the more scholastic names of analysis and synthesis. The first method may perhaps be considered the more rigid, and, where a systematic treatise on a subject is intended, and ample space allowed for its full discussion, it might be preferred; but where the object is to give the greatest amount of information in the shortest time, to put the reader in possession of the means through