Agricultural.

T. H. HOSKINS, Newport, Vt., Editor,

More Light on Fertilizers.

Those of our readers who were pushing us, a few months ago, to write up the fertilizer business, cannot complain of us now, and we do not grudge our work, for indeed there is nothing like "keeping it before the people." By our doing so, many are led to study and enquire, and to get clearer ideas of the composition, power and use, not only of artificial fertilizers, but of home-made manures. Our old friend and correspondent, Z. E. Jameson of Irasburgh, Vermont, writes: "I think you have done some excellent work in the columns of THE WATCHMAN in putting your own views, and those of A. H. Ward, in so many ways before the farmers. It is this repetition of the terms-'Ammonia or Nitrogen,' 'Phosphoric Acid or Phosphate of Lime,' 'Alkali or Potash'-the three elements of plant food hidden, the first in chemicals that look like salt, or in cotton-seed; the second in bones or phosphate rock; the third in ashes or German potash saltsthat fixes it in the mind, for it is difficult for farmers to become perfectly familiar with them." Mr. Jameson adds: "It is much easier to buy a barrel of mixed-up stuff called 'superphosphate,' than it is to follow the doctrines of Mr. Ward and yourself and buy nitrogenous, phosphatic and potassic materials called by other names, and mix them ourselves. If fertilization is founded upon nitrogen, phosphoric acid and potash let the repetition and instruction continue until every farmer will easily in common conversation speak untrippingly of these elements, as they are in combination in all manures."

The difficulty of which Mr. Jameson speaks has been constantly before us in writing upon these subjects. It is true, unfortunately, that our common schools do not teach even the simple elements of chemistry, and that though we are all the time using chemical substances, they are not used understandingly. The women do not understand the chemistry of cooking or washing, of dyeing, of housecleaning, warming and ventilation, of diet, or of health, but have to get along as well as they can without the light of scientific discovery by which the best, easiest and cheapest ways of doing common things is made known. And it is just so with men on the farm. The chemistry of manure and of plant-feeding (as well as of cattle-feeding), is a sealed book to them, and although it is really a very simple and easy thing to learn, yet the "hard words" (hard only because unfamiliar) look discouraging. And yet every woman who makes bread, washes clothes, makes soap, or cleans house, is doing chemical work which they could do better, cheaper and more easily if they understood the science of it; and every man who handles manure, or uses mixed feed for his stock, or grows crops, is doing the same thing, with the same costly unfamiliarity with the reason of it, which is all there is to science-for "science" is only another word for "knowledge."

It is a fact that on worn-out or partially worn-out soils something is gone that was once there, and which made the crops grow and yield well. What these things are (for there are more than one), has been found out by the study and experiments of agricultural chemists. This knowledge is in the hands of the fertilizer makers, but not yet to any great extent in the hands of the farmers. We have set ourself the task (or rather it has been set for us) to bring this knowledge to our readers. To those who in school got a little insight into chemistry it is very easy to understand all the facts in the case. The chemists have found out and proved that in all ordinary soils the only kinds of plant-food likely to be used up by over-cropping can easily be replaced, and the land be made as productive as before. The farmers long ago learned that this could be done by applying the dung of animals, decayed vegetable and animal matter, ashes, soap-suds, muck, and various other things, to the soil. Later it was found out that vast piles of bird dung, called "guano" (which is the Spanish for "dung"), was a very strong manure. Still later it was found that bones, when finely ground, were also powerful as a fertilizer. Later still, rocks were found which are in composition the same as bones (except the animal matter), and these, when ground, have proved good for plant-food. And still later, potash has been found in Germany in inexhaustible quantities, buried in the earth. Two kinds of saltpeter (potash saltpeter and soda saltpeter) have been found to exist in abundance in the soil of some countries.

When the chemists began to study this things found to be useful in promoting the growth of vegetation-they went to work and took all these substances apart (that is, they analyzed them), to find compounds. They found that animal worn soils, contains chiefly three things, called PHOSPHORUS, POTASSIUM and NI-TROGEN. The first we have all become familiar with, because it is used to top matches. When pure, it is a white, waxylooking substance, which is so inflammable that it has to be kept under water. When phosphorus burns, there arises from it a thick, white smoke. This smoke is really a fine, white powder, and is called PHOS PHORIC ACID. Phosphoric acid, if it is placed in contact with lime, will unite form three different compounds with lime, pound, the slower it will dissolve in water. I tilizers on the list.

These are the three kinds about which so much is said in connection with fertilizers-" acid" phosphate, containing but little lime, "reverted" phosphate, containing more lime, and "bone" phosphate, containing still more lime, and called made of it. None of these is really insoluble in the soil, but only more or less soluble.

Now for the second fertilizing material found in the complete fertilizer, dung. phosphoric soid from twelve and one-half This is POTASSIUM. It is a metal looking cents a pound to ten cents, while it like silver, but soft as wax, and nearly as inflammable as phosphorus. It will burn a metal, it is light enough to float, and a piece of it thrown into a dish of water tains twelve and one-half cents as his will swim around on the top of it, flaming brilliantly until it is all burnt up. Where did it go to? Taste of the water it was burnt on, and you will find it has a queer taste. Boil the water down until it is all evaporated, and when you "sugar it off" actly what you get when you boil down lye made from wood-ashes--POTASH. The third fertilizing element in dung

gen is a gas, and in this pure form it con-

stitutes about four-fifths of the air we breathe. In this pure form it affects but one of our senses. We can feel the wind, but cannot see, taste or smell it, unless it | culated at the same price. is tainted with something else. But when nitrogen becomes combined with other substances it becomes pungent enough, and noticeable by all our senses. When nitrogen gas and hydrogen gas unite, they form a gas which is called ammonia (sometimes called hartshorn). This is always found when dung "heats," and is one of the commonest smells of a dungheap. When nitrogen combines with oxygen gas in due proportion, they form together a white liquid that looks as innocent as water, but is really one of the strongest and most corrosive of acids, called nitric acid, or " aqua-fortis." Our readers will have noticed that when writing of fertilizers we often speak of "combined nitrogen." By this convenient expression we cover all those combinations of nitrogen found in dung or other fertilizers, including ammonia and its salts, and nitric acid and its salts. "What are salts?" the enquirer will ask. You see that Mr. Jameson speaks of "chemicals that look like salt." Our common salt used on food is a "salt," but there are It is too high, not alone in the estimate lots of other "salts." Some are very familiar, like "Epsom salts," which is of nitrogen. Dr. Cutting estimates all sulphate of magnesia. The nitrogen salts the nitrogen (as well as phosphoric acid) are quite numerous, and among those used in fertilizers are the salts of ammonia, and the salts of nitric acid. Of the first, the sulphate of ammonia is most commonly used, and looks almost exactly like common salt. The two common nitric acid salts are the two saltpeters, "nitrate of potash" (common saltpeter) and "nitrate of soda," or "soda saltpeter." The latter, being cheaper, is the one most commonly used in fertilizers. But besides the nitrogen "salts," com-

bined nitrogen is found in other forms equally useful for plant food. Flesh and blood are both rich in these "nitrogensubstances, and so are fish, cottonseed, etc. There is also from three to four per cent of combined nitrogen in raw bone. It is this fact which makes ground raw bone worth more as a fertilizer than the South Carolina rock. There is as much phosphoric acid in the South Caroling rock as in bone, but not a mite of nitrogen. So by mixing ground bone and ashes together you have a "complete fertilizer," that is, a fertilizer like dung, good for all crops. But if you use the South Carolina rock to furnish phosphoric acid, you must get your combined nitrogen and your potash from other things if you want a complete fertilizer, and you valuation : will take your choice from among them all according to their cheapness. For potash you may use either ashes or German potash salts. For nitrogen you can take your pick among sulphate of ammonia, nitrate of soda, dried blood, dried fish, cotton-seed meal, etc.

Now it seems to us that in this article we have made this matter of making artificial dung (for that is what it amounts to) "as plain as plain can be." But we know how difficult it is to learn new things, and retain them in mind. So we say to those who wish to understand the subject well, cut out this article and study it, and if you find anything in it that is blind, or needs more explanation, write to us your questions, and we will spare no pains to make all plain.

Sabin's and Cutting's Reports on Commercial Fertilizers.

Secretary Cutting has published, with emarks, Chemist Sabin's report of analyses made of the fertilizers sold in this state. It appeared on the last page of subject of plant-food-that is, of the the issue of The WATCHMAN of April Professor Sabin analyzed only a part of the samples, being prevented from finishing his task by sickness in his family and increased work. He estimates what they were made of, for they were all the nitrogen by a method which does not give the nitrogen present as nitrates, aldung, which is a complete restorative of though this must be unfair to those makers who use nitrate of soda as the source, in full or in part, of the nitrogen in their fertilizers. Professor Sabin says this is "the common method." It certainly is not the method of the Connecticut Experiment Station, which in its report for 1883 gives in separate columns Nitrogen of Nitrates," Nitrogen of Ammonia Salts," and "Nitrogen of Organic ting uses them, because "guarantees mean Matters;" and this is the way it should be dose. In the Quinnipiac Fertilizer Company's Fish and Potash (Crossed Fishes with the lime, and form a compound brand) a considerable portion (1.38 per called phosphate of lime. In fact, it will cent) exists as nitrates, and the same is true of the Mapes Complete Manure for and the more lime there is in the com- light or sandy soil, and several other fer-

But if Professor Sabin is unfair to the makers in this respect, Secretary Cutting a good deal more than makes it up to them in his standard of "comparative values," and in taking for comparison the lowest figures in the manufacturer's statebone phosphate because bones are mostly ment of composition instead of the average, or the selling price. The Connecticut Station has in its last report reduced its "trade value" standard of soluble shows that even on the small scale of private experiment the farmer can prepare when it is thrown upon water. Though soluble phosphoric acid for less than eight cents a pound. But Dr. Cutting main-"standard." The Connecticut Station estimates "reverted" phosphoric soid in superphosphates at eight cents a pound. Dr. Cutting says: "Some figure soluble phosphoric acid at twelve and one-half cents and reverted at eight cents, but as I you will find that you have got just ex- believe that the reverted is as valuable as the soluble, I see no reason to reduce the price of it." That, certainly, is one way to look at it; but we think the farmer was found to be NITROGEN. Pure nitrowho buys fertilizers will be apt to say: "If soluble phosphoric acid is worth no more than reverted, and if the reverted in superphosphates is valued at eight cents a pound, then the soluble ought to be cal-

By these two ways of reckoning-taking the lowest figures of the guarantee, instead of the selling price for comparison, and calculating both soluble and reverted phosphoric scid at the very highest rate ever taken for soluble alone, Secretary Cutting is able to make a far better showing for the fertilizer makers than is made anywhere else, and ought to be proportionally entitled to their gratitude. We fear it will look a little inconsistent to those who have heard Dr. Cutting's lectures on fertilizers (in which he has undertaken to show them that a fertilizer as good as Bradley's XL can be made for about \$15 a ton by the farmer, on a small scale), to be now shown by Dr. Cutting's own figures that the Bradley fertilizer is actually worth \$41.87 per ton ! As for ourself, we are satisfied that the first estimate was too low, and that a ton made by Dr. Cutting's formula is not nearly so good as a ton of Bradley's XL. We are equally satisfied that his present estimate of the Bradley is far too high. of phosphoric acid, but in the estimate at a very high rate, twenty-four cents being allowed for all the nitrogen in the fertilizers reported on: The Connecticut Station now allows twenty-two cents for nitrogen in ammonia salts, only twenty cents for nitrogen in nitrates, seventeen cents for nitrogen in fine ground bone, and eighteen cents for nitrogen and fine dry and fine ground blood, meat and fish. The queerest thing of all in this connection is that Dr. Cutting estimates "ammonia" at twentysix cents, although nitrogen is the valuable element of ammonia, and seventeen parts of ammonia contain but fourteen parts of nitrogen, so that the value of ammonia is really but fourteen-seven-

teenths of the value of nitrogen. To make this matter clearer we will give our estimation of the value of the Bradley XL fertilizer as analyzed by Professor Sabin and calculated upon Dr. Cutting's "values," and then, taking the same aualysis, give the Connecticut "values." It should be remembered that the latter "values" are still too high, and they are specially stated to be adopted not as true values, but as " a standard of comparison."

The following is Professor Sabin's analysis in percentages, with Dr. Cutting's

Sitrogen	2.7
soluble phosphoric acid	7.0
Reverted phosphoric acid	2.3
nsoluble phosphoric acid	2.8
Estimated value (per ton)	841.5

The following is our calculation, reducing the percentages to pounds and using the Connecticut valuation. According to the Connecticut analysis all but a small portion of the nitrogen of Bradley's phosphate (one-third of one per cent) is from organic matter, probably dried blood. None is from ammonia salts.

 54
 Ibs nitrogen from dry organic matter, at 18c.
 \$9.73

 140
 Ibs soluble phosphoric acid, at 10c.
 14.00

 47½
 Ibs reverted phosphoric acid, at 5c.
 3.56

 56
 Ibs insoluble phosphoric acid, at 4c.
 2.24

 42
 Ibs potash, at 4½c.
 1.79
 . \$31.56

Thus it is seen that by Dr. Cutting's method of figuring Bradley's XL superphosphate is made to appear worth \$10.31 per ton more than when calculated by the Connecticut standard, which is itself at least twenty per cent too high, taking the prices at which the same materials can be bought in other forms.

Dr. Cutting gives in a second column, not the selling price of the fertilizers examined, but what he figures them to be worth, taking their composition at the lowest figures on their lables. Thus on Bradley's XL label the figures are-

There is far too much variation here, much more than there usually is, indeed, in Bradley's fertilizers, but the figures are no doubt so made to cover any accidental and unintended variation that might occur in single packages. Professor Sabin's analysis shows that this fertilizer averages considerably better than the lowest figures given above, yet Dr. Cutonly the least"-a statement refuted by

his chemist's figures, all through. In the above remarks we have chosen to take Bradley's XL as a text, because it is the favorite fertilizer in this state, and in our opinion the most uniformly made of any that has been sold here

Cutting's high values he makes a good one quality it should be so." We do not showing for Crocker's Buffalo Phosphate | think, under the circumstances, that our and Potato Phosphate, and shows that the readers should form any unfavorable conlatter is really a special fertilizer, having clusions in regard to the Bowker fertilfor potatoes a larger excess of potash. The "Original Coe's" phosphate, made of the Connecticut and Vermont analyses by Bradley, the "Soluble Pacific Guano," alone, the Detroit "Sugar Phosphate," and the Dole "Common Sense" fertilizers are shown (by Dr. Cutting's "values") to analyze from \$8 to \$10 more than their lowest guarantee, but as the selling prices are not given we are left in the dark as to

how the analyses compare with them. For the first time we note a Vermont made fertilizer, the product of the "Slack Fertilizer Company" of Springfield, Vt. Two brands are reported-"Slack'e Bone Phosphate" and "Slack's Dissolved Bone." The lowest guarantee of the first is set down at \$25.50 and the value (at Dr. Cutting's rates) at \$58.92; of the second the lowest guarantee is \$33.30, and the value, at the same rates, \$54.60; but, as with all the rest, the selling prices are not given. We should like to know more of this article.

The Bowker fertilizers stand generally low in this report. At Dr. Cutting's values, "Hill and Drill" is set as worth \$38 44; "Bowker's Phosphate," \$33.49, and "Bowker's Dissolved Bone." \$34.02. Bowker's specials are not reported upon. Taking this report altogether, it seems to us far from satisfactory, and a long step backward (where perhaps a short one would have been wise) from Secretary Cutting's former position on the fertilizer

Railroad Injustice.

The Vermont railroads receive their vast chartered privileges from the people of Vermont, the great majority of whom earn their living by tilling the soil and are poor men. Compared with the mercantile class in the state the farmers are an overwhelming majority. Yet as the buyers and sellers handle produce and merchandise in larger quantities than farmers, the railroads are able, without technical injustice, to discriminate immensely in favor of merchants and against farmers. Nobody would complain at any thing that could be considered a fair and reasonable difference between what is called car-load rates of freight, and the rates for smaller quantities. But look at this, brother farmers. We have been interesting ourself to help our readers buy their fertilizers at rates that will enable them to make a fair profit on the use of them. We have induced several dealers to give tolerably reasonable rates for fertilizer materials, though strongly opposed in doing so by fertilizer manufacturers, who to a great extent are able to control these goods. And now, when we can get these materials at lower rates, we are met by the railroads on this "car-load" pretext with a discrimination almost prohibitory. A car-load of fertilizers (twenty-five thousand pounds) is brought from Boston to northern Vermont for \$42.50, or at the rate of \$3.40 per ton; but for a less quantity from six to eleven dollars per ton is charged to the buyer. The former price charged even when as much as e tons is shipped at once, and the latter by the barrel or bag.

The only possible excuse that the corporations can urge for this treatment of the farmers of the state is that it must be a good rule, for it works both ways. If one of us wants to send a barrel of apples, or a barrel of potatoes, or a bag of beans to a friend "down-country," we "are charged from \$1.25 to \$2.20 freight. If we want to send a calf twenty-five miles in a freight car, we are charged twice as much as a man pays to travel the same distance in a parlor car. These are practical experiences of our own, and we have no doubt that almost every reader can duplicate them.

Corporations have no bodies to be harmed and no souls to suffer, yet they are sensitive to public opinion when it rises in its strength and makes itself heard and obeyed in legislative bodies. Generally, legislatures are "managed" by the railroad "strikers" who are hired for the purpose, but a legislature fresh from an aroused people is a different thing. They are finding it out in New York just now, and next fall they ought to find it out in Vermont.

Bowker's Fertilizers.

We are in receipt of a letter from the president of the Bowker Fertilizer Company, in which he states that the Hill and Drill fertilizer is sent of the same quality into both Connecticut and Vermont. This refers to a supposition of ours, intended by us as explanatory of the difference between the analyses of these goods by the Connecticut Experiment Station and by Professor Sabin of Burlington. Mr. Bowker does not impugn either analysis, but believes the difference shown to have been due to some accidental variation in a single package. He tells us that he directed the firm in Connecticut, from whom the samples analyzed by the Connecticut Station were obtained, to send a sample to Professor Goessman, the Massachusetts inspector of fertilizers, and he forwards to us the professor's autograph report, as follows:

"Statement of analysis of sample of fertilizer received on 6 March, 1884, of Coburn & Gale of Hartford, Connecticut:

17.16 per cent 12.56 per cent 5.76 per cent 1.31 per cent 2.45 per cent 2.25 per cent . 37 per cent 1.27 per cent

(Signed) C. A. Andover, Massachusetts. C. A. GOESSMAN.

This analysis agrees closely with Professor Sabin's, and so far confirms the statement that the goods sold in both states are of identical composition. Mr. through a long series of years. With Dr. Bowker assures us that "as we have but

izer in consequence of this divergence

A Horticultural Society.

One of our postal card correspondents (and if you have no time to write more, your postals are always welcome), says, speaking of the proposal for a State Horticultural Society: "I hope we shall have one, for thousands of dollars are paid out in Vermont for worthless or unsuitable trees and plants which might be saved if one-tenth the money were spent in contributing to a society that would keep us posted." This is very true. Michigan as a fruit-growing state is an example of what a horticultural society can do for the people. Its orchardists, who formerly planted hit or miss in the selection of fruit, and filled up their ground with unprofitable varieties, now have the collected experience from all parts of the state as to what is best. The tree peddlars take vast sums of money out of Vermont that the farmers can ill spare, for worthless stock. In the village of Barton Landing, a few years of sorts that were practically worthless know the reason why."

for that section; yet near by there were nurseries where they could have got the best sorts for one quarter the money. Such instances are common, all over the state.

THE protectionist cannot succeed in maintaining high duties without plenty of votes. But the votes of all the manufacturers and all their help are but a drop in the big bucket full of popular ballots. The farmers, trained by Horace Greeley, have heretofore been the bulwark of the protectionist vote, and have been poorly paid by a few low duties on agricultural products. The last congress threw the wool-growers overboard, and the present congress refuses to throw them a rope, showing that the politicians, whether calling themselves protectionists or revenue tariff men, have agreed that "raw materials" (that is, agricultural products) are to have no more protection. But taking off the tariff on raw products will in a very little time lose the manufacturers the agricultural vote, for if the "poor farmer" can live without protection the argument in favor of the "poor manufacturer" and the "poor operative" will lose all its weight. If American labor is to be "protected" everywhere else but on the farm, where most of it is to be found, ago, one peddlar took \$600 for apple trees | then "twenty million working men will

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is. It afflicts the buman family when the Spring medicine as much as adults. The weather grows warmer in the spring and early warm weather has upon them an equally immer, just as Nature, refreshed from her long winter's rest, is preparing to display her- hard study at school aggravate, making them self in new beauty and power. The contrast peryous, cross, and fretful. Pimples or scrof between the changing season, and the condition of the body at this time, makes one feel adding discomfort to depression. Hood's Sar The refreshing, toning, and invigorating in- boon and blessing to suffering children, exfluences which the system craves, will be pelling all trace of scrofula from the blood found in Hood's Sarsaparilla, the reliable toning up the body, and giving to the diges Spring medicine and blood purifier.

Everybody knows what "that tired feeling" | The children need the aid of a reliable depressing effect, which slight vexations and ulous humors are apt to manifest themselves, even more tired, despondent, and miserable. saparilla has in thousands of cases proved a tive organs healthy and regular action.

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"I regard Hood's Sarsaparilla as the most; "Last Spring my two children were vacci reliable and best Spring medicine. I had tried | nated. Soon after, they broke all out with run-Spring I take three bottles of Hood's Sarsaparilla, and know nothing of that terrible

"Hood's Sarsaparilla tones up my system, purifies my blood, and seems to make over." W. J. Blatt, Corning, N. Y.

many others without good results, until I gave ning sores, so dreadful I thought I should lose Hood's Sarsaparilla a fair trial, when I was them. Some one spoke to me about Hood's convinced it was superior to all others. Every Sarsaparilla as a purifier of the blood. I bought a bottle and gave it to the children. Soon as they began to take it, they began to languor so prevalent at that season of the get better, till it cured them completely; and MRS. J. M. CARTER, No. 26 Madison | they have remained so ever since." C. L. THOMPSON, West Warren, Mass.

Mr. J. N. Ketchum, of Barre, Vt., says that his boy had several very ugly scrofulous sores on his leg. Hood's Sarsaparilla cured him.

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't to all who need a building up and strengthening medicine." Josiah W. Cook, Presi- Hood's Sarsaparilla. I was all run down, had deut Mutual Fire Ins. Co., Cambridge, Mass.

"Rood's Sarsaparilla did me a great deal of

"About a year ago I commenced taking no appetite; my food would not digest, and "I have made it a rule for years to use a I was troubled with nervous debility. On a Spring medicine to cleanse my blood and taking Hood's Sarsaparilla I commenced to tone up my system. Last Spring Hood's Sar-feel the effects of it at once. Have now saparilla gave me a good appetite, and seemed taken four bottles and can say I feel like to build me over." E. M. Hale, Lima, Ohio. a new man." J. II. McCall, Rochester, N. Y.

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