STATE OF CONNECTICUT.

ANNUAL REPORT

OF

The Connecticut Agricultural

EXPERIMENT STATION

For 1884.

PRINTED BY ORDER OF THE GENERAL ASSEMBLY.

NEW HAVEN:
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1885.

OFFICERS

OF

The Connecticut Agricultural Experiment Station,

1884.

STATE BOARD OF CONTROL.

Ex-officio.

HIS EXC. THOMAS M. WALLER, *President.*

	Term expires
Appointed by Connecticut State Agricultural Society:	
HON. E. H. HYDE, Stafford, *Vice-President.*	July 1, 1885.
Appointed by Board of Trustees of Wesleyan University:	
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Ex-officio.	
S. W. JOHNSON, New Haven, *Director.*	

Chemists.

E. H. JENKINS, PH.D., *Vice Director.*
E. H. FARRINGTON, B.S.
A. L. WINTON, JR., Ph.B.

In charge of Buildings and Grounds.

CHARLES J. RICE.

ANNOUNCEMENT.

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION was established in accordance with an Act of the General Assembly, approved March 21, 1877, "for the purpose of promoting Agriculture by scientific investigation and experiment."

The Station is prepared to analyze and test fertilizers, cattle-food, seeds, soils, waters, milks, and other agricultural materials and products, to identify grasses, weeds, and useful or injurious insects, and to give information on the various subjects of Agricultural Science, for the use and advantage of the Citizens of Connecticut.

The Station makes analyses of Fertilizers, Seed-Tests, &c., &c., for the Citizens of Connecticut, *without charge*, provided—

1. That the results are of use to the public and are free to publish.
2. That the samples are taken by *consumers* from stock now in the market, and in accordance with the Station instructions for sampling.
3. That the samples are fully described on the Station "Forms for Description."

All other work proper to the Experiment Station that can be used for the public benefit will be made without charge. Work done for the use of individuals will be charged for at moderate rates. The Station will undertake no work, the results of which are not at its disposal to use or publish, if deemed advisable for the public good. See p. 17.

Results of analysis or investigation that are of general interest will be published in Bulletins, of which copies are sent to each Post Office in this State, and will be summed up in the Annual Reports made to the Legislature.

The officers of the Station will take pains to obtain for analysis samples of all the commercial fertilizers sold in Connecticut; but the organized coöperation of the farmers is essential for the full and timely protection of their interests. Farmers' Clubs and like Associations can efficiently work with the Station for this purpose, by sending in samples early during each season of trade.

It is the wish of the Board of Control to make the Station as widely useful as its resources will admit. Every Connecticut citizen who is concerned in agriculture, whether farmer, manufacturer, or dealer, has the right to apply to the Station for any assistance that comes within its province to render, and the Station will respond to all applications as far as lies in its power.

☞ Instructions and Forms for taking samples, and Terms for testing Fertilizers, Seeds, etc., for private parties, sent on application.

☞ Parcels by Express, to receive attention, should be prepaid, and all communications should be directed, not to individual officers, but simply to the

AGRICULTURAL EXPERIMENT STATION,
NEW HAVEN, CONN.

☞ Station Grounds, Laboratory and Office are on Suburban St., between Whitney Avenue and Prospect St., 1⅛ miles North of City Hall. Suburban St. may be reached by Whitney Lake Horse Cars, which leave corner of Chapel and Church Sts. each hour and half hour.

☞ The Station has Telephone connection and may be spoken from the Central Telephone Office, 346 State St., or from Peck & Bishop's Office in Union R. R. Depot.

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REPORT OF THE BOARD OF CONTROL.

To the General Assembly of the State of Connecticut:

The Board of Control of THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION herewith submits to your Honorable Body, the Annual Reports of the Director, the Treasurer, and Building Committee, made to the Board at its Annual Meeting at Hartford, January 20, 1885.

The buildings of the Station have been completed within the year, and the special appropriation made by the General Assembly in 1882, for the purpose of providing land and buildings for the Station, is expended. The report of the Building Committee gives the details regarding this expenditure. There has been no interruption in the work of the Station during the year.

The provisions of the new Fertilizer law have increased the income of the Station, and very materially increased its work in the direction of fertilizer analyses, their collection and oversight, and the correspondence incident to requirements of the law. As a knowledge of the Station and its work becomes more generally diffused among the people, there is a continually increasing demand for such help as the Station can give, and the sphere of its usefulness is enlarging from year to year.

By special resolution, the General Assembly has in preceding years ordered the printing of extra copies of this report, a large share of which have been distributed in advance of the regular edition. Such copies have cost less than ten cents each, and the demand for them makes similar action desirable this year.

HENRY B. HARRISON,
President.

WM. H. BREWER,
Secretary.

REPORT OF THE TREASURER.

WM. H. BREWER, *in account with the Connecticut Agricultural Experiment Station.*

RECEIPTS.

Balance from account of 1883	$3.44	
Analysis fees	3,845.00	
State Treasurer, Annual Appropriation	8,000.00	
Miscellaneous receipts	3.88	
		$11,852.32

PAYMENTS.

Salaries	$6,625.54	
Laboratory and Experiments	771.47	
Repairs and improvements on Laboratory and House	1,052.21	
The Grounds and Establishment	579.81	
Fuel	287.00	
Gas	285.34	
Water	132.00	
Insurance	54.00	
Collecting Fertilizers	88.83	
Traveling Expenses of the Board	38.20	
Printing	349.95	
Stationery	27.67	
Postage	139.79	
Telephone	100.10	
Library	292.35	
Miscellaneous Sundries	194.28	
Balance on hand	833.78	
		$11,852.32

There is due the Station $110 on analysis fees. The above account is for the State fiscal year ending November 30, 1884. The report of expenditures from the special appropriation for buying a lot and erecting buildings for the Station, may be found in the report of the building committee (see page 121).

WM. H. BREWER, *Treasurer.*

REPORT OF THE DIRECTOR.

The work of this Station has gone on without interruption since the time covered by the last report.

As usual, the analysis of fertilizers and fertilizing materials has occupied its working force through the greater part of the year, in order to meet the increased demand for such work. One hundred and seventeen different brands of fertilizers have been legally offered for sale in the State during the year, an increase of twenty-four over the preceding year. As required by law, one or more analyses of each of these brands has been made and published, except in the few cases where the goods were not found on sale in the State by the agents of the Station, and at the same time the manufacturer had failed to comply with the provision of the law, which requires that a sealed sample shall be deposited with the director of the Station. A considerable number of home-made fertilizers and waste products, used as manure, have also been examined, making the total number of fertilizer analyses two hundred and seventy-two, an increase of fifty-three over last year.

Twelve samples of feeding stuff have been analyzed, and in connection with this work all the analyses of American feeding stuffs published in this country during the year, which were accessible, have been incorporated in a table, giving the average composition of one hundred different materials, which will be found in the following pages.

Forty-five samples of seeds have been tested in the laboratory and garden.

Fifteen samples of milk have been examined, partly on behalf of creameries, partly with reference to the quality of the milk supply of our towns. Details are not necessary. The milk was good in every case.

Analyses of the ash of eight samples of tobacco and of one sample of tobacco stalks are given and discussed on subsequent pages.

Besides the above a large amount of work has been done which cannot well be classified or here recorded, in answer to the questions of correspondents, in testing analytical methods, in controlling the accuracy of the laboratory work, etc.

The Bulletins of the Station have been five in number, issued in April, May, July, September and October, making up in all sixty-two printed pages. The object of these Bulletins is to place in the hands of those concerned the results of the Station work as promptly as possible. During the year the demand for them has considerably increased.

As required by law, a package of each Bulletin is mailed to every post-office in the State. The package is directed to the postmaster, with a request to distribute to farmers.

The Bulletins are also regularly sent to every newspaper in the State and to the Secretary of each Agricultural society and Farmers' club.

The Bulletins will be regularly sent, also, on application, to any address in Connecticut.

To citizens of other States remitting fifty cents, the publications of the current year, including Bulletins and Annual Report, will be mailed as they appear.

The clerical work of the Station has included the writing of over nine hundred letters, besides one or more reports on each fertilizer and fodder analyzed, and the work incident to the compilation of the Bulletins and Reports.

THE CONNECTICUT FERTILIZER LAW.

The General Assembly at its session in 1882 passed a new Fertilizer Law, which went into effect September 1, 1882, and which repeals and takes the place of all previous legislation on this subject in this State.

Since a full understanding of the provisions and penalties of this law is important to all parties who buy or sell commercial fertilizers, attention is specially directed to the following points:

1. In case of fertilizers that retail at ten dollars or more per ton, the law holds the SELLER responsible for *affixing a correct label or statement* to every package or lot sold or offered, as well as for the *payment of an analysis fee* of ten dollars for each fertilizing ingredient which the fertilizer contains or is claimed to contain, *unless* the MANUFACTURER OR IMPORTER shall have provided labels or statements and shall have paid the fee. Sections 1 and 3.

2. The law also requires, in case of any fertilizer selling at ten dollars or more per ton, that a *certified statement* of composition. net weight in package, etc., shall be filed with the Director of the Experiment Station, and that a *sealed sample* shall be deposited with him by the MANUFACTURER OR IMPORTER. Section 2.

3. It is also provided that EVERY PERSON in the State, who sells *any commercial fertilizer of whatever kind or price* shall annually report certain facts to the Director of the Experiment Station, and on demand of the latter shall deliver a sample for analysis. Section 4.

4. All "CHEMICALS" that are applied to land, such as : Muriate of Potash, Kainite, Sulphate of Potash and Magnesia, Sulphate of Lime (Gypsum or Land Plaster), Sulphate of Ammonia, Nitrate of Potash, Nitrate of Soda, etc.—are considered to come under the law as "Commercial Fertilizers." Dealers in these chemicals must see that packages are suitably labeled. They must also report them to the Station, and see that the analysis fees are duly paid, in order that the Director may be able to discharge his duty as prescribed in Section 9 of the Act.

Here follows the full text of the law, with explanatory footnotes.

AN ACT CONCERNING COMMERCIAL FERTILIZERS.

GENERAL ASSEMBLY,
January Session, A. D. 1882.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. Every person or company who shall sell, offer, or expose for sale, in this State, any commercial fertilizer or manure, the retail price of which is ten dollars, or more than ten dollars per ton, shall affix conspicuously to every package thereof a plainly printed statement, clearly and truly certifying the number of net pounds of fertilizer in the package, the name, brand, or trade-mark under which the fertilizer is sold, the name and address of the manufacturer, the place of manufacture and the chemical composition of the fertilizer, expressed in the terms and manner approved and currently employed by the Connecticut Agricultural Experiment Station.*

Printed statement to be affixed to all packages and to go with all lots.

If any such fertilizer be sold in bulk, such printed statement shall accompany and go with every lot and parcel sold, offered, or exposed for sale.

SEC. 2. Before any commercial fertilizer, the retail price of which is ten dollars, or more than ten dollars per ton, is sold, offered, or exposed for sale, the manufacturer, importer, or party who causes it to be sold, or offered for sale, within the State of Connecticut, shall file with the Director of the Connecticut Agricultural Experiment Station two certified copies of the statement named in section one of this act, and shall deposit with said

Before sale *certified copies* of statement, and *Sealed Sample* to be deposited with Director.

* A statement of the per cents. of Nitrogen, Phosphoric Acid (P_2O_5) and Potash (K_2O), and of their several states or forms, will suffice in most cases. Other ingredients may be named if desired.

In all cases the per cent. of *nitrogen* must be stated. Ammonia may also be given when actually present in ammonia salts, and "ammonia equivalent to nitrogen" may likewise be stated.

The per cent. of soluble and reverted phosphoric acid may be given separately or together, and the term "available" may be used in addition to, but not instead of soluble and reverted.

Insoluble phosphoric acid may be stated or omitted.

In case of Bone, Fish, Tankage, Dried Meat, Dried Blood, etc., the chemical composition may take account of the two ingredients: Nitrogen, Phosphoric Acid.

For Potash Salts give always the per cent. of Potash (potassium oxide); that of Sulphate of Potash or Muriate of Potash may also be stated.

The chemical composition of other fertilizers may be given as found in the Station Reports.

director a sealed glass jar or bottle containing not less than one pound of the fertilizer, accompanied by an affidavit that it is a fair average sample thereof.*

SEC. 3. The manufacturer, importer, agent, or seller of any commercial fertilizer, the retail price of which is ten dollars or more than ten dollars per ton, shall pay on or before the first of May, annually, to the Director of the Connecticut Agricultural Experiment Station, an analysis fee of ten dollars for each of the fertilizing ingredients† contained or claimed to exist in said fertilizer: *provided*, that whenever the manufacturer or importer shall have paid the fee herein required for any persons acting as agents or sellers for such manufacturer or importer, such agents or sellers shall not be required to pay the fee named in this section.

Analysis Fee to be paid annually on or before May 1st.

SEC. 4. Every person in this State who sells, or acts as local agent for the sale of any commercial fertilizer of whatever kind or price, shall annually, or at the time of becoming such seller or agent, report to the Director of the Connecticut Agricultural Experiment Station his name, residence, and post-office address, and the name and brand of said fertilizer, with the name and address of the manufacturer, importer, or party from whom such fertilizer was obtained, and shall, on demand of the Director of the Connecticut Agricultural Experiment Station, deliver to said director a sample suitable for analysis of any such fertilizer or manure then and there sold or offered for sale by said seller or agent.‡

Yearly Report to Station of Dealers or Agents.

SEC. 5. No person or party shall sell, offer, or expose for sale, in the State of Connecticut, any pulverized leather, raw, steamed, roasted, or in any form, as a fertilizer or as an ingredient of any fertilizer or manure, without explicit printed certificate of the fact, such certificate to be conspicuously affixed to every package of such fertilizer or manure, and to accompany and go with every parcel or lot of the same.

Leather.

* The analysis of samples sent in accordance with section two is discretionary with the Station. Such samples are intended for preservation as manufacturers' standards.

† The Station understands "the fertilizing ingredients" to be those whose determination in an analysis is necessary for a valuation, viz: Nitrogen, Phosphoric acid and Potash. The analysis-fees in case of any fertilizer will therefore be ten, twenty or thirty dollars, according as one, two or three of these ingredients are contained or claimed to exist in the fertilizer.

On receipt of statements, samples and analysis-fees, the Station will issue Certificates of Compliance with the law.

‡ Blanks for Dealers' Reports will be mailed to applicants.

SEC. 6. Every manufacturer of fish guano, or fertilizers of which the principal ingredient is fish or fish-mass from which the oil has been extracted, shall, before manufacturing or heating the same, and within thirty-six hours from the time such fish or mass has been delivered to him, treat the same with sulphuric acid or other chemical, approved by the director of said experiment station, in such quantity as to arrest decomposition: *provided, however*, that in lieu of such treatment such manufacturers may provide a means for consuming all smoke and vapors arising from such fertilizers during the process of manufacture.

Fish-guano, &c.

Fines.

SEC. 7. Any person violating any provision of the foregoing sections of this act shall be fined one hundred dollars for the first offense, and two hundred dollars for each subsequent violation.

Fertilizers for private use.

SEC. 8. This act shall not affect parties manufacturing, importing, or purchasing fertilizers for their own private use, and not to sell in this State.

Director's duties and authority.

SEC. 9. The director of the Connecticut Agricultural Experiment Station shall pay the analysis-fees received by him into the treasury of the station, and shall cause one or more analysis of each fertilizer to be made and published annually. Said director is hereby authorized, in person or by deputy, to take samples for analysis from any lot or package of manure or fertilizer which may be in the possession of any dealer.

Bulletins.

SEC. 10. The director of the Connecticut Agricultural Station shall, from time to time, as bulletins of said station may be issued, mail or cause to be mailed two copies, at least, of such bulletins to each post-office in the State.

Repeal of former acts.

SEC. 11. Title sixteen, chapter fifteen, sections fifteen and sixteen, and title twenty, chapter twelve, section five of the general statutes, and chapter one hundred and twenty of the public acts of 1881, being an act concerning commercial fertilizers, are hereby repealed.

SEC. 12. This act shall take effect on the first day of September, 1882.

It will be noticed that the State exacts no license tax either for making or dealing in fertilizers. For the safety of consumers and the benefit of honest manufacturers and dealers, the State requires that it be known what is offered for sale, and whether fertilizers are what they purport to be. With this object in view the law provides, in section 9, that all fertilizers be analyzed and it requires the parties making or selling them to pay for these analyses in part; the State itself paying in part by maintaining the Experiment Station.

OBSERVANCE OF THE FERTILIZER LAW.

In the following list are given the names of those parties who have paid the analysis fees as required by the Fertilizer Law, and the brands on which analysis fees have been paid for the year ending April 30th, 1885.

Firm.	*Brand of Fertilizer.*
Anderson, W. H., Putnam, Conn.	Ground Bone.
Baker, H. J. & Bro., 215 Pearl St., New York.	Castor Pomace.
	"A. A." Ammoniated Superphosphate.
	Pelican Bone Phosphate.
	Special Corn Fertilizer.
	" Potato Fertilizer.
	" Oat Manure.
	" Tobacco Manure.
	" Grass "
Bennett, P. W., Rockfall, Conn.	Ground Bone.
Bosworth Bros., Putnam, Conn.	Superphosphate of Lime.
	Potato Phosphate.
	Ground Bone.
Bowker Fertilizer Co., 43 Chatham St., Boston, Mass.	Stockbridge Grain Manure.
	" Forage Crop Manure.
	" Vegetable Manure.
	Bowker's Hill and Drill Phosphate.
	" Fish and Potash.
	" Dissolved Bone.
	" Dry Fish.
	" Kainit.
Bradley Fertilizer Co., 27 Kilby St., Boston, Mass.	Bradley's Superphosphate.
	B. D. Sea-Fowl Guano.
	Original Coe's Superphosphate.
	Circle Brand Bone.
Brown, R. B., Oil Co., St. Louis, Mo.	I. X. L. Castor Pomace.
Coe, E. Frank, 16 Burling Slip, New York.	Ammoniated Bone Superphosphate.
	Alkaline Bone.
	Ground Bone.
Coe, Russel, Linden, N. J.	Ammoniated Bone Superphosphate.
	Fish and Potash.
	Special Favorite.
	Potato Manure.
Clark's Cove Guano Co., New Bedford. Mass.	Great Planet "A."
Collier White Lead & Oil Co.. St. Louis. Mo., by F. Ellsworth, Hartford.	Bay State Fertilizer.
	Castor Pomace.
Common Sense Fertilizer Mfg. Co., 42 Congress St., Boston, Mass.	Common Sense Fertilizer. No. 2.
Peter Cooper's Glue Factory, 17 Burling Slip, New York.	Bone Dust.
Crocker, L. L., Buffalo Fertilizer and Chemical Works, Buffalo, N. Y.	Ammoniated Bone Superphosphate.
	Potato, Hop and Tobacco Phosphate.
	Superphosphate, No. 2.
Curtis, J. G., Elliott, Conn.	Reliable Superphosphate.
Darling, L. B., Fertilizer Co., Pawtucket, R. I.	Animal Fertilizer.
Dickinson, David, Middle Haddam, Conn.	Ground Bone.
Glidden & Curtis, Boston, Mass.	Superphosphate of Lime.
	Soluble Pacific Guano.

Firm.	*Brand of Fertilizer.*
W. Burr Hall, Wallingford, Conn.	Ground Bone.
	Meat and Plaster.
Harris, Geo. H. & Son, Eagleville, Conn.	Pure Ground Bone.
	" Bone Phosphate.
Hurtado & Co., 16 and 18 Exchange Place, New York.	Peruvian Guano, Lobos.
	" " Guaranteed.
	" " Standard.
Judson & Sparrow, 38 South Market St., Boston, Mass.	Bone and Potash Phosphate.
Lister Brothers, Newark, N. J.	Standard Ammoniated Dissolved Bone.
	Special Potato Fertilizer.
	" Corn "
	Ground Bone.
	Standard Superphosphate.
Lombard & Mathewson, Warrenville, Conn.	Superphosphate.
McNamara, M., Trumbull, Conn.	Ground Bone.
Mapes' Formula and Peruvian Guano Co., 158 Front St., New York.	Ground Bone.
	The Mapes' Potato Manure.
	" Corn "
	" Complete " for Light Soil.
	" Tobacco " Conn. Brand.
	" Tobacco " for use with stems.
	" Grass and Grain, Spring Top Dressing.
	The Mapes' Complete Manure, "A" Brand.
	Plain Superphosphate, High Grade.
	Nitrate of Soda.
	Muriate of Potash.
G. W. Miles Co., Milford, Conn.	I. X. L. Bone Superphosphate.
	Fish and Potash Fertilizer.
Miller, G. W., Middlefield, Conn.	Raw Bone Phosphate.
	Ground Bone.
Mitchell, A., Linden, N. J.	Standard Superphosphate.
National Fertilizer Co., Bridgeport, Conn.	Chittenden's Complete Fertilizer for Roots.
	Chittenden's Complete Fertilizer for Grain.
	Chittenden's Complete Fertilizer for Tobacco.
	Chittenden's Fish and Potash.
	" Ammoniated Bone Superphosphate.
	Cooke's Blood Guano.
	" Dissolved Ground Bone.
New Haven Fertilizer Co., New Haven, Conn.	Standard Ammoniated Superphosphate.
Peck Bros., Northfield, Conn.	Pure Ground Bone.
Preston Fertilizer Co., Greenpoint, L. I.	Fish Guano.
	Ammoniated Superphosphate.
	Ground Bone.
Quinnipiac Fertilizer Co., New London, Conn.	Quinnipiac Phosphate.
	" Extra Phosphate.
	Dry Ground Fish.
	Fish and Potash, Crossed-fishes Brand.
	" " Plain Brand.
Read & Co., New York.	Matchless Tobacco Manure.
	Farmers' Friend Fertilizer.

Firm	*Brand of Fertilizer.*
Rogers & Hubbard Co., Middletown, Conn.	Pure Raw Knuckle Bone "A."
	" " "Meal."
	Ground Bone "A. X."
	Bone Sawdust.
Sanford, Charles, Redding Ridge, Conn.	Bone Superphosphate.
Shoemaker, M. L. & Co., Philadelphia, Pa., by F. Ellsworth, Hartford.	Swift Sure Superphosphate.
	" Bone Meal.
Slade, F. C., Oakville, Conn.	Ground Bone.
Smith, Edmund, South Canterbury, Conn.	Ground Bone.
Stearns & Co., 149 Front St., New York.	Eagle Brand Fish and Potash.
	Dry Ground Fish.
	Ammoniated Bone Superphosphate.
St. Louis Lead and Oil Co., St. Louis, Mo., by F. Ellsworth, Hartford.	Castor Pomace.
Thomson, Paul, Hartford, Conn.	Charter Oak Fertilizer.
Williams, Clark & Co., 101 Pearl St., New York.	Americus Superphosphate.
	Fish and Potash.
	Acorn Brand Kainite.
	" Muriate Potash.
Wilcox, L. & Co., Mystic Bridge, Conn.	Wilcox Prepared Fertilizer.
	Acidulated Fish Guano, Ground.
	Dry Ground Fish Guano.

Analyses of Fertilizers.*

In respect to its terms, the Station makes *two classes* of analyses of fertilizers and fertilizing materials: the first for the benefit of farmers, gardeners, and the public generally; the second for the private use of manufacturers and dealers. Analyses of the *first class* are made gratuitously, and the results are published as speedily and widely as possible for the guidance of purchasers and consumers. Those of the *second class* are charged for at moderate rates, and their results are not published in a way to interfere with their legitimate private use. The Station, however, distinctly reserves the liberty to use at discretion, for the public benefit, all results obtained in its laboratory, and in no case will enter into any privacy that will work against the public good.

During 1884, two hundred and seventy-two (272) samples of fertilizers have been analyzed. Of these, 59 were examined for private parties, and the remainder for the general use of the citizens of the State.

*The matter of this and several subsequent pages, explanatory of the sampling and valuation of fertilizers, is copied, with a few appropriate alterations, from the Report for 1883. This repetition appears to be necessary for the use of readers who have not seen former Reports.

Sixty-two samples analyzed for the public benefit have been sent in by purchasers and consumers. The rest have been supplied by agents of the Station who during the spring and early summer endeavored to visit all sections of the State, to take one or more samples from every brand of fertilizer offered for sale in the State, and to take them from the stock of dealers in remote places as well as from centers of trade.

The Station agents are instructed when drawing samples to open at least three packages of each brand of goods in every case, and if the number of packages is large, to take a portion from every tenth one, by means of a sampling tube, which withdraws a section or core through the entire length of the package.

The greatest care is necessary in sampling fertilizers that the small sample taken shall accurately represent the whole stock from which it is drawn. Otherwise serious injustice may be done.

During the year the Station has had to reject a number of samples sent in for analysis by purchasers on account of evident carelessness in drawing them.

The Station none the less desires the coöperation of farmers and Farmers' clubs in calling attention to new brands of fertilizers and in securing samples of all goods offered for sale. All such samples are understood to be taken in accordance with the printed instructions which the Station supplies to all applicants. Here follows a copy of these instructions.

THE CONNECTICUT

AGRICULTURAL EXPERIMENT STATION.

Instructions for Sampling Commercial Fertilizers.

The *valuation* of a high-priced Fertilizer requires the amounts *per cent.* of its principal fertilizing elements to be known. Chemical analysis of a small sample, so taken as to fairly represent a large lot, will show the composition of the lot. The subjoined instructions, if faithfully followed, will insure a fair sample. Especial care should be observed that the sample neither gains nor loses *moisture* during the sampling or sending, as may easily happen in extremes of weather, or from even a short exposure to sun and wind, or from keeping in a poorly closed vessel.

1. Provide a tea cup, some large papers, and for each sample a glass fruit-can or tin box, holding about *one quart*, that can be tightly closed—all to be clean and dry.

2. Weigh separately at least three (3) average packages (barrels or bags) of the fertilizer, and enter these *actual weights* in the "Form for description of Sample."

3. Open the packages that have been weighed, and mix well together the contents of each, down to one-half its depth, emptying out upon a clean floor if needful, and crushing any soft, moist lumps in order to facilitate mixture, but leaving hard, dry lumps unbroken, so that the sample shall exhibit the texture and mechanical condition of the fertilizer.

4. Take out five (5) equal cupfulls from different parts of the mixed portions of each package. Pour them (15 in all) one over another upon a paper, intermix again thoroughly but quickly to avoid loss or gain of moisture, fill a can or box from this mixture, close tightly, *label plainly*, and send, charges prepaid, to

The Conn. Agricultural Experiment Station,
New Haven, Conn.

The foregoing instructions may be over-nice in some cases, but they are not intended to take the place of good sense on the part of those who are interested in learning the true composition of a fertilizer. Any method of operating that will yield a *fair sample* is good enough.

In case of a fine, uniform and moist or coherent article, a butter-tryer or a tin-tube, like a dipper handle, put well down into the packages, in a good number of places, will give a fair sample with great ease. With dry, coarse articles, such as ground bone, there is liable to be a separation of coarse and fine parts on handling. Moist articles put up in bags or common barrels may become dry on the outside. It is in these cases absolutely necessary to mix thoroughly the coarse and fine, the dry and the moist portions before sampling. Otherwise the analysis will certainly misrepresent the article whose value it is intended to fix.

The quantity sent should not be too small. When the material is fine and uniform, and has been carefully sampled, a pint may be enough, but otherwise and especially in the case of ground bone, which must be mechanically analyzed, the sample should not be *less than one quart.*

It is also important that samples for analysis should be taken at the time when the fertilizer is purchased, and immediately dispatched to the Station. Moist fish, blood or cotton seed meal will soon decompose and lose ammonia, if bottled and kept in a warm place. Superphosphates containing much nitrogen will suffer reversion of their soluble phosphoric acid under similar circumstances. Most of the moist fertilizers will lose water unless tightly bottled, but some of the grades of potash salts will gather moisture from the air and become a slumpy mass if not thoroughly protected.

These changes in the composition of a sample not suitably preserved must invalidate any conclusions from its analysis, and work serious injustice either to the manufacturer or to the consumer.

It doubtless often happens that a purchaser on laying in a stock of fertilizers decides that he will not then trouble the Station to analyze the goods he has obtained, but will set aside samples which he can send for examination in case the crops report adversely as to their quality. It is always better to send all samples at once to the Station, where they can be directly analyzed or so prepared that they will keep without chemical change.

With the Instructions for Sampling, the Station furnishes a blank form for Description of Sample, a copy of which is here given.

THE CONNECTICUT

AGRICULTURAL EXPERIMENT STATION,

NEW HAVEN, CONN.

FORM FOR DESCRIPTION OF SAMPLE.

Station No.----------Rec'd at Station,----------18

Each sample of Fertilizer sent for gratuitous analysis must be accompanied by one of these Forms, with the blanks *below* filled out fully and legibly.

The filled out Form, if wrapped up with the sample, will serve as a label.

Send with each sample a specimen of any printed circular, pamphlet, analysis or statement that accompanies the fertilizer or is used in its sale.

Brand of Fertilizer,----------

Name and address of Manufacturer,----------

Name and address of Dealer from whose stock this sample is taken,----------

Date of taking this sample,----------

Selling price per ton or hundred, bag or barrel,----------

Selling weight claimed for each package weighed,----------

Actual weight of packages opened,----------

Here write a copy of any analysis or guaranteed composition that is fixed to the packages.

Signature and P. O. address of person taking and sending the sample.

On receipt of any sample of fertilizer from the open market, the filled out "Form for Description" which accompanies it is filed in the Station's Record of Analyses, and remains there as a voucher for the authenticity of the sample and for the fact that it has been taken fairly, or, at least, under suitable instructions. It is thus sought to insure that manufacturers and dealers shall not suffer from the publication of analyses made on material that does not correctly represent what they have put upon the market.

The "Form for Description," when properly filled out, also, contains all the data of cost, weight, etc., of a fertilizer which are necessary for making, with help of the analysis, a valuation of its fertilizing elements, and estimating the fairness of its selling price. Neglect to give full particulars occasions the Station much trouble, and it is evident that want of accuracy in writing up the description may work injustice to the manufacturers or dealers, as well as mislead consumers. It is especially important that the *brand* of a fertilizer and its *selling price* shall be correctly given. The price should be that actually charged by the dealer of whom it is bought, and if the article be purchased in New York or other distant market, that fact should be stated, and the cost at the nearest point to the consumer, on rail or boat, should be reported also.

In all cases, when possible, *ton prices* should be given, and if the sale of an article is only by smaller quantities, that fact should be distinctly mentioned.

Samples are analyzed as promptly as possible in the order in which they are received. As soon as an analysis is completed a copy of it is sent to the party who furnished the sample and also to the manufacturer, in order that there may be opportunity for explanation or protest, if desirable, before the results are published in the Bulletin.

With the analysis there is sent to the party furnishing the sample a printed page of "Explanations," intended to embody the principles and data upon which the valuation of fertilizers is based.

These Explanations are essential to a correct understanding of the analyses that are given on subsequent pages, and are, therefore, reproduced here, as follows:

Explanations Concerning the Analysis of Fertilizers and the Valuation of their Active Ingredients.

Revised.

Nitrogen is commercially the most valuable fertilizing element. *Organic nitrogen* is the nitrogen of animal and vegetable matters. Some forms of organic nitrogen, as those of blood and meat, are highly active as fertilizers; others, as found in leather and peat, are comparatively slow in their effect on vegetation, unless these matters are chemically disintegrated. *Ammonia* and *nitric acid* are results of the decay of *organic nitrogen* in the soil and manure heap, and are the most active forms of Nitrogen. They occur in commerce—the former in sulphate of ammonia, the latter in nitrate of soda. 17 parts of ammonia or 66 parts of pure sulphate of ammonia contain 14 parts of nitrogen. 85 parts of pure nitrate of soda also contain 14 parts of nitrogen.

Soluble Phosphoric acid implies phosphoric acid or phosphates that are freely soluble in water. It is the characteristic ingredient of Superphosphates, in which it is produced, by acting on "insoluble" or "reverted" phosphates, with oil of vitriol. Once well incorporated with the soil it gradually becomes reverted phosphoric acid.

Reverted (reduced or precipitated) Phosphoric acid means strictly, phosphoric acid that was once easily soluble in water, but from chemical change has become insoluble in that liquid. In present usage the term signifies the phosphoric acid (of various phosphates) that is freely taken up by strong solution of ammonium citrate, which is therefore used in analysis to determine its quantity. "Reverted phosphoric acid" implies phosphates that are readily assimilated by crops.

Recent investigation tends to show that soluble and reverted phosphoric acid are on the whole about equally valuable as plant-food and of nearly equal commercial value. In some cases, indeed, the soluble gives better results on crops, in others the reverted is superior. In most instances there is probably little to choose between them.

Insoluble Phosphoric acid implies various phosphates not soluble in water or ammonium citrate. In some cases the phosphoric acid is too insoluble to be readily available as plant food. This is especially true of Canada Apatite. Bone black, bone-ash, South Carolina Rock and Navassa Phosphate when in coarse powder are commonly of little repute as fertilizers though good results are occasionally reported from their use. When *very finely pulverized* ("floats") they more often act well, especially in connection with abundance of decaying vegetable matters. The phosphate of raw bones is nearly insoluble, because of the animal matter of the bones, which envelopes it; but when the latter decays in the soil, the phosphate remains in essentially the "reverted" form.

Potash signifies the substance known in chemistry as potassium oxide, which is the valuable fertilizing ingredient of "potashes" and "potash salts." It should be soluble in water and is most costly in the form of sulphate, and cheapest in the shape of muriate (potassium chloride).

The Valuation of a Fertilizer, as practised at this Station, signifies finding *the worth in money or trade-value, of its fertilizing ingredients.* This value, it should be remembered, is *not necessarily proportional to its fertilizing effects* in any special case.

Plaster, lime, stable manure and nearly all of the less expensive fertilizers have variable prices, which bear no close relation to their chemical composition, but guanos, superphosphates and similar articles, for which $30 to $60 per ton are paid, depend chiefly for their trade-value on the three substances, *nitrogen*, *phosphoric acid* and *potash*, which are comparatively costly and steady in price. The money-value per pound of these ingredients is reckoned from the current market prices of the standard articles which furnish them to commerce.

The consumer, in estimating the reasonable price to pay for high-grade fertilizers, should add to the *Trade Value of the above-named Ingredients*, a suitable margin for the expenses of manufacture, etc., and for the convenience or other advantage incidental to their use.

The average Trade-values or cost in market, per pound, of the ordinarily occurring forms of nitrogen, phosphoric acid and potash, as recently found in the New England, New York and New Jersey markets, are as follows:—

These Trade-values have been agreed upon by the Experiment Stations of Connecticut, New Jersey and Massachusetts for use in their several states.

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS FOR 1884.

	Cents per lb.
Nitrogen in ammonia salts,	22
" in nitrates,	18
Organic nitrogen in dried and fine ground fish,	20
" " in guanos, dried and fine ground blood and meat,	18
" " in cotton seed, linseed meal and in castor pomace,	18
" " in fine ground bone,	18
" " in fine medium bone,	16
" " in medium bone,	14
" " in coarse medium bone,	12
" " in coarse bone, horn shavings, hair and fish scrap,	10
Phosphoric acid, soluble in water,	10
" " soluble in ammonium citrate,*	9
" " insoluble, in dry fine ground fish and in fine bone,	6
" " " in fine medium bone,	5½
" " " in medium bone,	5
" " " in coarse medium bone,	4½
" " " in coarse bone,	4
" " " in fine ground rock phosphate,	2½
Potash as high grade sulphate,	7½
" kainite,	4½
" muriate,	4½

The above trade-values are the figures at which on March 1st the respective ingredients could be bought at retail for cash, in our markets, in the *raw materials* which are the regular source of supply. They also correspond to the average wholesale prices for the six months ending March 1st, plus about 20 per cent. in case of goods for which we have wholesale quotations. The valuations obtained by use of the above figures will be found to agree fairly with the *reasonable retail price* in case of standard raw materials such as:—

* Dissolved from 2 grams of the unground Phosphate previously extracted with pure water, by 100 c.c. neutral solution of Ammonium Citrate, sp. gr. 1.09, in 30 minutes, at 40° C., with agitation once in five minutes. Commonly called "reverted" or "backgone" Phosphoric Acid.

Sulphate of Ammonia,	Azotin,
Nitrate of Soda,	Dry Ground Fish,
Muriate of Potash,	Cotton Seed,
Sulphate of Potash,	Castor Pomace,
Dried Blood,	Bone,
Plain Superphosphate.	Ground So. Car. Rock.

Trade Values in Superphosphates, Special Manures, and Mixed Fertilizers of High Grades.

The Organic Nitrogen in these classes of goods will be reckoned at the highest figure laid down in the Trade-Values of Fertilizing Ingredients in Raw Materials, namely, 20 cents per pound, it being assumed that the organic nitrogen is derived from the best sources, viz: bone, blood, animal matter, Peruvian guano or other equally good form and not from leather, shoddy, hair or any low-priced inferior forms of vegetable matter, unless the contrary is ascertained.

Insoluble Phosphoric acid will be reckoned at 4½ cents, it being assumed that it is from bone or similar source and not from rock phosphate, unless found otherwise. In this latter form the insoluble phosphoric acid would be worth commercially only 2¼ cents per pound or but one-half as much as if from fine bone. Potash will be rated at 4½ cents, if sufficient chlorine is present in the fertilizer to combine with it to make muriate. If there is more Potash present than will combine with the chlorine, then this excess of Potash is reckoned as sulphate.

In most cases the valuation of the Ingredients in Superphosphates and Specials will fall considerably below the retail price of these goods. The difference between the two figures, represents the manufacturer's charges for converting raw materials into manufactured articles. These charges are for grinding and mixing, bagging or barreling, storage and transportation, commission to agents or dealers, long credits, interest on investment, bad debts, and finally, profits.

In 1883, the selling price of superphosphates and specials in Connecticut was, on the average, 18 per cent. greater than the Station valuations, or 38 per cent. in advance of the wholesale cost of the fertilizing elements in the raw materials.

The average cost of Ammoniated Superphosphates and Guanos was about $41.50, the average valuation was $35, and the difference $6.50—an advance of 18.6 per cent. on the valuation.

In case of Specials the average cost was $50, the average valuation, $42.50, and the difference $7.50, or 17.6 per cent. advance on the valuation.

To obtain the Valuation of a Fertilizer (i. e. the money-worth of its fertilizing ingredients), we multiply the pounds per ton of Nitrogen, etc., by the trade-value per pound. We thus get the values per ton of the several ingredients, and adding them together we obtain the total valuation per ton.

In case of *Ground Bone*, the fineness of the sample is graded by sifting, and we separately compute the nitrogen-value of each grade of bone which the sample contains, by multiplying the pounds of nitrogen per ton in the sample, by the per cent. of each grade, taking $\frac{1}{100}$th of that product, multiplying it by the trade-value per pound of nitrogen in that grade, and taking this final product as the result in cents. Summing up the separate values of each grade, thus obtained, together with the values of each grade for phosphoric acid, similarly computed, the total is the Valuation of the sample of bone.

The uses of the "Valuation" are twofold:

1, To show whether a given lot or brand of fertilizer is worth, as a commodity of trade, what it costs. If the selling price is not higher than the valuation, the purchaser may be quite sure that the price is reasonable. If the selling price is several dollars per ton more than the valuation, it may still be a fair price; but in proportion as the cost per ton exceeds the valuation there is reason to doubt the economy of its purchase.

2, Comparisons of the valuations and selling prices of a number of similar fertilizers will generally indicate fairly which is the best for the money.

But the valuation is not to be too literally construed, for analysis cannot always decide accurately what is the *form* of nitrogen, etc., while the mechanical condition of a fertilizer is an item whose influence cannot always be rightly expressed or appreciated.

For the above first-named purpose of valuation, the trade-values of the fertilizing elements which are employed in the computations should be as exact as possible, and should be frequently corrected to follow the changes of the market.

For the second-named use of valuation, frequent changes of the trade-values are disadvantageous, because two fertilizers cannot be compared as to their relative money-worth, when their valuations are deduced from different data.

Experience leads to the conclusion that the trade-values adopted at the beginning of a year should be adhered to as nearly as possible throughout the year, notice being taken of considerable changes in the market, in order that due allowance may be made therefor.

The Agricultural value of a fertilizer is measured by the benefit received from its use, and depends upon its fertilizing effect, or crop-producing power. As a broad, general rule, it is true that Peruvian guano, superphosphates, fish-scraps, dried blood, potash salts, plaster, etc., have a high agricultural value which is related to their trade value, and to a degree determines the latter value. But the rule has many exceptions, and in particular instances the trade-value cannot always be expected to fix or even to indicate the agricultural value. Fertilizing effect depends largely upon soil, crop and weather, and as these vary from place to place, and from year to year, it cannot be foretold or estimated except by the results of past experience, and then only in a general and probable manner.

Classification of the Fertilizers Analyzed.

The fertilizers and manurial waste products analyzed at the Station laboratory from November 1st, 1883 to November 1st, 1884, were as follows:

Phosphate Rock,	6
Phosphatic Guanos,	3
Bone Black,	1
Bone Ash,	2
"Phosphoral,"	1
Superphosphates, (plain)	24
Superphosphates [ammoniated] and Guanos,	105
Superphosphates and other fertilizers, home made,	7
Special Manures,	24
Bone Manures,	35
Dry Ground Fish,	11
Blood and Tankage,	2
Nitrates,	5
Sulphate of Ammonia,	3
Cotton Seed, Linseed, and Castor Pomace,	6
Meat and Plaster,	1
Potash Salts,	11
Cotton Hull Ashes,	6
House Ashes,	2
Brick-kiln Ashes,	1
Hen Manure,	1
Elephants' Dung,	1
Damaged Grain,	1
Paper Mill Waste,	1
Marine Mud,	1
Swamp Muck or Peat,	2
Marl,	1
Sewage Filters,	2
Plaster,	2
"Fertilizer,"	1
Pollard's Fertilizers	4
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Of these, 59 were samples analyzed for private parties and are not further noticed in these pages. The remaining analyses are given in detail, with such discussion as may make them more serviceable.

Phosphate Rock.

Of the six samples analyzed, three were from small lots used in laboratory experiments.

The other three were as follows:

1245. Crude Fine Ground Navassa Rock.

1262. Crude Fine Ground Navassa Rock.

1263. Crude Fine Ground Red Navassa.

They were purchased of John Reed, 12 Cliff Street, N. Y., and sampled and sent by J. M. Milbank, Greenfield Hill.

Analyses.

	1245	1262	1263
Total phosphoric acid	16.69	16.86	25.01
Of which, soluble in ammonium citrate at 40°		1.13	1.08
" " " " " 65°		1.61	1.66
Cost per ton,	$17.00	$17.00	$14.00
Phosphoric acid cost per 100 lbs.,	5.09	5.04	2.79

All the samples had a reddish brown color, **1263** being much darker than the others. The material was fine, passing easily $\frac{1}{50}$ inch mesh, and contained carbonates in considerable quantity. A sample of the same brand of goods from the same firm, analyzed last year showed 29.90 per cent. of phosphoric acid.

The price and quality of **1245** and **1262** make them much less desirable than **1263,** which furnishes phosphoric acid, in as available a form presumably, for little more than half the price.

The raw phosphates, South Carolina and Navassa, and the phosphatic guanos have been used by some of our farmers instead of superphosphates with satisfactory results. While on the one hand the acid phosphates are more quickly available, on the other hand much more phosphoric acid can be applied to land for the same money in the form of raw phosphate, which latter advantage may make the raw material *in some cases* the more economical as in seeding down to grass or preparing land for fruit trees. In the seven plain superphosphates described further on, phosphoric acid has cost about $8.50 per 100 lbs. If it can be bought in raw phosphate at $3.00 per 100 lbs., then 283 lbs. of phosphoric acid can be applied in raw phosphate at the same cost as 100 lbs. in acid phosphate.

Phosphatic Guano.

1091. Penguin Island Guano. Stock of Charles Spear, Jr., 85 West street, N. Y. Sampled and sent by C. H. Cables, Thomaston.

Analysis.

Phosphoric acid soluble in ammonium citrate,	6.41
Phosphoric acid insoluble in ammonium citrate,	16.49
Nitrogen,	.20

The cost of this article was $25.00 in New York. Reckoning the so-called reverted phosphoric acid* at 9 cents, the insoluble phosphoric acid at 4½ cents, and the nitrogen at 20 cents per pound, the valuation of this guano would be $27.17.

* For the meaning of "phosphoric acid in soluble ammonium citrate," otherwise called "reverted phosphoric acid," see Explanations, p. 23.

Plain (Non-nitrogenous) Superphosphates.

In the following table (page 33) are given the analyses and valuations of ten samples which have general interest.

Two samples **1190** and **1170** are made from the spent bone black of sugar refineries. They are almost identical in composition and practically all of the phosphoric acid which they contain (over 17 per cent.), is soluble in water.

1165 and **1172** are called Dissolved Bone. **1172** contains .25 per cent. of nitrogen, which proves the presence of a small amount of organic matter in the goods, presumably from bone. Such superphosphates are prepared from bone which has been boiled or steamed for the extraction of animal matters in the glue factories. This process leaves it dry and brittle without grease and with little nitrogenous matter to interfere with the action of an acid. When raw bone is treated with acid theoretically sufficient to make the phosphoric acid soluble, the grease, animal matter and acid together form a smeary sticky mass, which cannot be handled or spread. Not more than one-third of the phosphoric acid of raw bones can be dissolved with acid practically, without making the product too sticky for convenience.

It should be said that **1172** was sold at a reduced price by the manufacturer, being an odd lot not of the usual composition.

It furnishes however, about 17 per cent. of available phosphoric acid at a low price.

1134 is a sample drawn from a bag of superphosphate, given to this Station by the North Carolina Department of Agriculture, which was made from the phosphate rock lately discovered in that State. It contains as much soluble phosphoric acid as a good deal of the acid phosphate made from South Carolina rock, but less reverted and insoluble phosphoric acid. The development of the North Carolina phosphate deposits as well as those of Alabama, will be watched with interest. As yet their products have not entered the market.

Allowing 9 cents per pound for reverted phosphoric acid, and 2¼ cents per pound for insoluble phosphoric acid, the soluble phosphoric acid in these goods has cost from 7½ to 10½ cents per pound, or on the average 9⅓ cents.

Making no allowance for the reverted or insoluble acid, soluble phosphoric acid has cost from 7½ to 11½ cents per pound, or, on the average 10¼ cents.

Plain (Non-Nitrogenous) Superphosphates.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1190	Dissolved Bone Black.	Geo. B. Forrester, N. Y. City.	Manufacturer.	M. S. Baldwin, Naugatuck.
1172	Pure Dissolved Bone.	H. J. Baker & Bros., N. Y. City.	"	J. J. Webb, Hamden.
1180	Mapes' High Grade Superphosphate.	Mapes' Formula and Peruvian Guano Co., 158 Front St., N.Y.	----------	Station Agent.
1256	Plain Superphosphate.	Nat. Fertilizer Co., Bridgeport.	Manufacturer.	R. A. Moore, Kensington.
1243	Navassa Superphosphate.	John Reed, 12 Cliff St., N. Y.	----------	J. M. Milbank, Greenfield Hill.
1184	Bowker's Acid Phosphate.	Bowker Fertilizer Co., Boston and New York.	Usher & Tinker, Plainville.	Station Agent.
1170	Bradley's Dissolved Bone Black.	Bradley Fertilizer Co., 27 Kilby St., Boston, Mass.	Manufacturer.	C. H. Cables, Thomaston.
1165	Baker's Pure Dissolved Bone.	H. J. Baker & Bros., 215 Pearl St.. New York.	D. H. Van Hoosear, Wilton.	D. H. Van Hoosear, Wilton.
1134	North Carolina Acid Phosphate.	----------	----------	N. C. Dep't Agriculture.
1331	Acid Navassa Phosphate.	John Reed, 55 Cliff St., New York.	----------	From bag purchased by Station.

Plain (Non-Nitrogenous) Superphosphates.

Station No.	Name or Brand.	Phosphoric Acid.							Cost per Ton.	Valuation per Ton.	Valuation Exceeds Cost.
		Soluble.	Reverted.	Insoluble.	Total Phos. Acid.	Phos. Acid Guaranteed.	Available. Found.	Available. Guaranteed.			
1190	Forrester's Dissolved Bone Black	17.29	.00	.11	17.40	----	----	----	$26.00	$34.63	$8.63
1172	Baker's Pure Dissolved Bone	9.82	7.11	3.93	20.86	----	----	----	28.00	35.97	7.97
1180	Mapes' High Grade Superphosphate	32.64	1.38	.64	34.66	----	----	----	65.00	68.34	3.34
1256	Chittenden's Plain Superphosphate	8.04	1.66	3.48	13.18	----	----	----	18.00	20.64	2.64
1243	Navassa Superphosphate	10.97	.52	2.67	14.16	----	----	----	23.00	24.08	1.08
1184	Bowker's Acid Phosphate	10.82	1.11	3.13	15.06	----	----	----	25.00	25.05	.05
1170	Bradley's Dissolved Bone Black	17.13	.00	.09	17.22	----	----	----	34.50	34.30	Cost Exceeds Valuation. $0.20
1165	Baker's Pure Dissolved Bone	13.91	.24	.35	14.50	----	----	----	30.00	28.57	1.43
1134	North Carolina Acid Phosphate	10.85	.52	.47	11.84	----	----	----	----	----	----
1331	Acid Navassa Phosphate	----	----	----	----	----	----	----	----	----	----

Nitrogenous Superphosphates, Fish and Potash and Guanos.

(See pages 37 to 44.)

In this class are included all superphosphates containing nitrogen, (which with a few exceptions also contain potash), except such as are claimed to be specially adapted to the wants of some particular crop or class of crops; also Peruvian guano, crude or manipulated, and the fish fertilizers which have been treated with acid or mixed with potash salts. The analyses of dry ground fish are tabulated by themselves further on.

Of the nitrogenous superphosphates here described 4 are guanos, 26 are called "Superphosphates" or "Ammoniated Superphosphates," 8 "Fish and Potash," 6 "Dissolved Bone," 2 "Complete Manures," 2 "Animal Fertilizers," and the rest are "Acid Fish Guano," "Sea Fowl Guano," "Soluble Pacific Guano," "Blood Guano," "Pelican Bone," "Prepared Fertilizer," "Swift-Sure Phosphate," "Reliable Phosphate," "Special Favorite," "Common Sense Fertilizer," "Bone and Potash Phosphate."

Samples **1320, 1313, 1198, 1316, 1311, 1314, 1317** and **1329** are "Manufacturers' Samples," deposited by the manufacturers with the director of the station in compliance with Section 2 of the fertilizer law. The station agents who visited different parts of the state to draw samples did not find those brands for sale at any of the points visited. It therefore became necessary for the station, in order to do its part under the provisions of the law, to analyze these samples, although as a rule it prefers to analyze only those goods which are procured from stock offered for sale in the state.

1254. Miller's Raw Bone Phosphate is different in composition from samples of the same goods previously analyzed, owing to a change in the formula, as we are advised by the manufacturer.

The three brands of Peruvian Guano offered for sale by Hurtado & Co., Seth Chapman's Sons and possibly other New York dealers, are compared in the following table:

Peruvian Guano.

	Standard.	Guaranteed.	Lobos.	
	1100	**1220**	**1099**	**1098**
Nitrogen as nitrates,	.22	.26	.29	.22
" of ammonia salts,	7.35	6.37	5.78	3.75
" of organic matter,	.48	.90	.59	.87
Soluble phosphoric acid,	2.54	2.16	2.00	4.04
Reverted phosphoric acid,	3.72	4.68	4.98	4.38
Insoluble phosphoric acid,	8.60	9.06	10.89	8.76
Potash,	2.48	2.72	3.06	3.46
Cost,	$67.00	67.00	56.00	52.00
Valuation,	57.21	55.77	54.63	47.20
Nitrogen found,	8.05	7.53	6.66	4.84
" *guaranteed,**	*7.41*	*7.41*	*5.35*	*4.12*
Phosphoric acid found,	14.86	15.90	17.87	17.18
" " *guaranteed,*	*13.00*	*13.00*	*17.00*	*15.00*
Potash found,	2.48	2.72	3.06	3.46
" *guaranteed,*	*2.00*	*2.00*	*3.00*	*2.00*

The average cost of the 52 superphosphates and guanos, whose cost could be ascertained, is $40.73, and the average valuation $33.13 per ton, a difference of $7.60 or about 22.9 per cent. of the valuation. In only one case was the cost less than the valuation. As has been fully explained on page 26 the valuation is intended to represent the retail cost in the Connecticut market of the *raw materials* of which the mixed goods are composed. The 22.9 per cent. of this retail cost (or $7.60 per ton on the average in the case of superphosphates) represents the manufacturer's expenses and profits in mixing, packing and selling the goods.

Last year the average cost of the superphosphates was $41.42 and the average difference between cost and valuation $6.50, or 18.6 per cent. of the valuation.

31 of the superphosphates were up to their guaranteed composition or above it, 15 were below guarantee in respect to one ingredient, 5 were below in respect to two ingredients and 1 was below guarantee in all particulars. The purchaser has the right to insist that the goods he buys shall be essentially up to guarantee.

* Here and in the following pages wherever the guarantee is stated it is the manufacturer's *minimum* figure. Thus if the guarantee is "Ammonia 3–5," it is given in this report as "Nitrogen 2.47," which is the equivalent of ammonia 3 per cent.; 17 parts of ammonia containing 14 parts of nitrogen.

Goods made with reasonable care will show certain variations in composition which cannot be avoided and it may well happen that an article will be above guarantee on one ingredient and a little below it on another. Such differences may be overlooked, the larger amount on the one hand offsetting the deficiency on the other; but a serious deficiency in any one ingredient or a general deficiency in all should be made good by the seller.

The brand "Fish and Potash" has been a favorite one in this State and is now offered by a number of manufacturers. A comparison of the different articles of this name is given in the following table:

Fish and Potash.

	Williams, Clark & Co.	Quinnipiac Co., Plain.	Miles Co.	Chittenden's.	Quinnipiac Crossed-Fishes.	Bowker.	Russell Coe. (Davidge.)	Stearns'.
	1213	**1204**	**1162**	**1221**	**1132**	**1211**	**1291**	**1289**
Nitrogen of Nitrates	.09	----	----	----	----	----	----	----
Nitrogen of Ammon.	.31	.41	----	.11	.66	----	----	.45
Nitrogen of Organic Matters	3.70	2.11	2.21	2.94	3.26	2.00	3.07	1.97
Soluble Phos. Acid	.24	.32	4.33	.64	2.05	3.59	1.99	1.51
Reverted Phos. Acid	3.22	4.25	1.67	2.00	2.49	2.09	3.30	2.39
Insoluble Phos. Acid	3.01	4.08	2.27	4.33	1.28	2.95	1.78	1.65
Potash	5.15	4.44	6.27	6.38	3.52	4.41	4.81	4.62
Cost	$34.00	33.00	36.00	35.00	38.00	35.00	40.00	40.00
Valuation	$29.66	25.97	27.88	26.44	28.66	25.34	27.89	22.60
Nitrogen Found	4.10	2.52	2.21	3.05	3.92	2.00	3.07	2.42
*Nitrogen Guaranteed**	*3.29*	*2.00*	----	*2.88*	*3.25*	*2.25*	*2.88*	*2.47*
Phos. Acid Found	6.47	8.65	8.27	6.97	5.82	8.63	7.07	5.55
Phos. Acid Guaranteed	*3.00*	*6.00*	----	*6.00*	*5.00*	*8.00*	*5.00*	*6.00*
Potash Found	5.15	4.44	6.27	6.38	3.52	4.41	4.81	4.62
Potash Guaranteed	*3.00*	*4.00*	----	*5.00*	*3.00*	*4.00*	*4.00*	*4.00*

* See foot-note, page 35.

In the table, on pages 45 and 46, is given a comparison of the analyses of different brands of superphosphates, which have been executed at this station since its establishment.

It serves to show the variations in the quality of the goods, or any changes made by the manufacturers in the formula by which they are compounded.

NITROGENOUS SUPERPHOSPHATES AND GUANOS.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1287	Wilcox Acidulated Fish Guano.	L. Wilcox & Co., Mystic Bridge.	J. A. Lewis, Willimantic.	Station Agent.
1214	Wilcox Prepared Fertilizer.	" "	"	"
1099	Guaranteed Peruvian Guano.	---------- ----------	Seth Chapman's Son & Co., 170 Front St., New York.	C. H. Cables, Thomaston.
1319	Shoemaker's Swift Sure Superphosphate.	M. L. Shoemaker, Philadelphia, Penn.	Manufacturer.	Manufacturer.
1218	Bosworth Bro's Superphosphate of Lime.	Bosworth Bros., Putnam.	J. A. Paine, Danielsonville.	Station Agent.
1128	Mapes' Complete Manure, "A" Brand.	Mapes, F. & P. G. Co., 158 Front St., New York City.	R. B. Bradley & Co., New Haven.	"
1129	Sanford's Bone Superphosphate.	Chas. Sanford, Redding Ridge.	Manufacturer.	Wm. H. Burr, Redding Ridge.
1144	Lister's Ammoniated Dissolved Bone Phosphate.	Lister Bros., Newark, N. J.	R. B. Bradley & Co., New Haven.	Station Agent.
1236	Darling's Animal Fertilizer.	L. B. Darling & Co., Pawtucket, R. I.	T. Pease & Son's Co., Windsor Locks.	Fred. B. Hathaway, Suffield.
1213	Williams, Clark & Co's Fish and Potash.	Williams, Clark & Co., 109 Pearl St. New York City.	J. A. Lewis, Willimantic.	Station Agent.
1143	Mapes' Complete Manure for light soils.	Mapes, F. & P. G. Co., 158 Front St., New York City.	Birdsey & Forster, Meriden.	"
1310	G. H. Harris & Son's Superphosphate.	G. H. Harris & Son, Fagleville.	Manufacturer.	Manufacturer.
1098	Peruvian Guano Lobos.	---------- ----------	Seth Chapman's Son & Co., 170 Front St., New York.	C. H. Cables, Thomaston.
1235	H. J. Baker's A. A. Ammoniated Superphosphate.	H. J. Baker & Bro., 215 Pearl St., New York City.	W. W. Cooper, Suffield.	Fred. D. Hathaway, Suffield.
1140	E. Frank Coe's Ammoniated Bone Superphosphate.	E. Frank Coe, Burling Slip, New York.	R. B. Bradley & Co., New Haven.	Station Agent.

NITROGENOUS SUPERPHOSPHATES AND GUANOS.—*Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1207	Baker's Pelican Bone Fertilizer.	H. J. Baker & Bro., 215 Pearl St., New York City.	Cochrane Bros., West Cornwall.	Station Agent.
1206	Baker's "A. A." Ammoniated Superphosphate.	H. J. Baker & Bro., 215 Pearl St., New York City.	J. H. Ives, Danbury.	"
1264	Baker's "A. A." Ammoniated Superphosphate.	H. J. Baker & Bro., New York.	J. E. Andrews, Mt. Carmel.	S. A. Smith, Cheshire.
1254	G. W. Miller's Raw Bone Phosphate.	G. W. Miller, Middlefield.	Manufacturer.	Manufacturer.
1215	Preston's Ammoniated Bone Superphosphate.	H. Preston & Sons, Greenpoint, L. I.	J. B. Merrow & Sons, Merrow.	Station Agent.
1177	Bradley's Superphosphate.	Bradley Fertilizer Co., 27 Kilby St., Boston, Mass.	Peck Brothers, Northfield.	C. H. Cables, Thomaston.
1204	Quinnipiac Fish and Potash, Plain Brand.	Quinnipiac Fertilizer Co., New London.	Usher & Tinker, Plainville.	Station Agent.
1202	Universal Ammoniated Dissolved Bone.	Williams, Clark & Co., 109 Pearl St., New York.	" " "	"
1110	Dickinson's Ammoniated Bone Phosphate.	David Dickinson, Middle Haddam.	Manufacturer.	A. H. Worthington, Middle Haddam.
1216	Darling's Animal Fertilizer.	L. B. Darling & Co., Pawtucket, R. I.	J. B. Barstow, Norwich.	Station Agent.
1292	The Common Sense Fertilizer, No. 2.	Common Sense Fertilizer Co., 42 Congress St., Boston, Mass.	Quinebaug Store, Danielsonville.	"
1288	Lombard & Mathewson's Superphosphate.	Lombard & Mathewson, Warrenville.	Buck, Durkee & Stiles, Willimantic.	"
1186	Miller's Raw Bone Phosphate.	G. W. Miller, Middlefield.	G. W. Miller, Middlefield.	M. W. Terrill, Middlefield.
1130	Quinnipiac Phosphate.	Quinnipiac Fertilizer Co., New London.	Olds & Whipple, Hartford.	Station Agent.
1162	Miles Co's Fish and Potash.	G. W. Miles Co., Milford.	Manufacturer.	G. L. Fox, New Haven.

NITROGENOUS SUPERPHOSPHATES AND GUANOS.—*Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1222	Bay State Fertilizer.	Clark's Cove Guano Co., New Bedford, Mass.	J. E. Leonard, Jewett City.	Station Agent.
1282	Farmer's Friend Ammoniated Dissolved Bone.	Read & Co., New York.	M. V. B. Lamb, Norwich.	"
1221	Chittenden's Fish and Potash.	National Fertilizer Co., Bridgeport.	Southmayd & Gardiner, Middletown.	"
1137	Bradley's Patent Superphosphate of Lime.	Bradley Fertilizer Co, Boston, Mass.	A. C. Sternberg, Hartford.	"
1203	Americus Brand Ammoniated Bone Superphosphate.	Williams, Clark & Co., 109 Pearl St, New York.	Usher & Tinker, Plainville.	"
1301	Bowker's Dissolved Bone.	Bowker Fertilizer Co., Boston, Mass.	Coburn & Gale, Hartford.	"
1132	Quinnipiac Fish and Potash, Crossed-fishes Brand.	Quinnipiac Fertilizer Co., New London.	Olds & Whipple, Hartford.	"
1211	Bowker's Fish and Potash.	Bowker Fertilizer Co., 43 Chatham St., Boston, Mass.	Usher & Tinker, Plainville.	"
1100	Standard Peruvian Guano.	----------	Seth Chapman's Son & Co., 170 Front St., New York.	C. H. Cables, Thomaston.
1209	Original Coe's Superphosphate.	Wm. L. Bradley, Boston, Mass.	Smith & Sons, West Cornwall.	Station Agent.
1157	Buffalo Ammoniated Bone Superphosphate.	Buffalo Fertilizer Co. and Chemical Works, Buffalo, N. Y.	S. J. Hall, Meriden.	"
1141	Bowker's Hill and Drill Phosphate.	Bowker Fertilizer Co., Boston and New York.	Coburn & Gale, Hartford.	"
1220	Standard Peruvian Guano.	Hobson, Hurtado & Co., 63 Pine St., New York, Importers.	Southmayd & Gardiner, Middletown.	"
1272	Baker's Dissolved Bone.	Baker Fertilizer Co., N. Y. City.	Hubbell & Bradley, Saugatuck.	S. B. Wakeman, Saugatuck.
1205	Potato, Hop and Tobacco Phosphate.	Buffalo Fertilizer and Chemical Works, Buffalo, N. Y.	W. W. Foote, Danbury.	Station Agent.

Nitrogenous Superphosphates and Guanos.—*Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1291	Davidge's Fish and Potash.	Russel Coe, Linden, N. J.	Smith & Sons, West Cornwall.	Station Agent.
1293	Davidge's Special Favorite.	" " "	" " "	"
1210	Russel Coe's Ammoniated Bone Superphosphate.	" " "	" " "	"
1305	Soluble Pacific Guano.	Glidden & Curtis, Boston, Mass.	H. A. Stillman, Hartford.	"
1223	Mitchell's Standard Superphosphate.	A. Mitchell, Linden, N. J.	John A. Paine, Danielsonville.	"
1289	Stearns', No. 1, Eagle Brand Fish and Potash.	Stearns & Co., New York and Fall River, Mass.	A. S. Russell & Co., Meriden.	"
1208	Cooke's Blood Guano.	Nat. Fertilizer Co., Bridgeport.	Burtis & Mead, New Canaan.	"
1320	Bradley's B. D. Sea Fowl Guano.	Bradley Fertilizer Co., Boston, Mass.	Manufacturer.	Manufacturer.
1313	Buffalo Superphosphate, No. 2.	Buffalo Fertilizer and Chemical Works, Buffalo, N. Y.	"	"
1198	Curtis' Reliable Phosphate.	J. G. Curtis, Elliotts.	"	"
1228	N. H. Fertilizer Co.'s Standard Superphosphate.	N. H. Fertilizer Co., New Haven.	"	Station Agent.
1316	Sparrow's Bone and Potash Phosphate.	Judson & Sparrow, 38 South Market St., Boston, Mass.	"	Manufacturer.
1311	Lister Bro's Standard Phosphate.	Lister Bros., Newark, N. J.	"	"
1314	Cooke's Dissolved Ground Bone.	Nat. Fertilizer Co., Bridgeport.	"	"
1317	Quinnipiac Extra Superphosphate.	Quinnipiac Fertilizer Co., New London.	"	"
1329	Stearns' Ammoniated Bone Superphosphate.	Stearns & Co., 149 Front St., New York.	"	"
1332	Paul Thomson's Charter Oak Fertilizer.	Paul Thomson, Hartford.	"	"

Nitrogenous Superphosphates and Guanos.

Station No.	Name or Brand.	Nitrogen.					Phosphoric Acid.							Potash.		Cost per Ton.	Valuation per Ton.	Cost Exceeds Valuation.
		From Nitrates.	From Ammonia.	From Organic Matters.	Total Nitrogen Found.	Nitrogen Guaranteed.	Soluble in Water.	Reverted.	Insoluble.	Total Phos. Acid Found.	Phos. Acid Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.			
1287	Wilcox Acidulated Fish Guano	----	----	6.06	6.06	*3.29*	1.47	4.47	.26	6.20	*2.3*	----	----	----	----	$27.50	$35.54	*$8.04
1214	Wilcox Prepared Fertilizer	----	.83	3.05	3.88	*3.29*	3.89	2.87	3.03	9.79	-- -	6.76	*5.50*	5.06	*5.50*	36.00	35.80	.20
1099	Guaranteed Peruvian Guano	.29	5 78	.59	6.66	*5.35*	2.00	4.98	10.89	17.87	*17.00*	6.98	----	3.06	*3 00*	56.00	54.63	1.37
1319	Swift Sure Superphosphate	.42	----	2.94	3.36	*2.47*	8.78	2.88	1.86	13.52	*14.00*	11.66	*9.00*	3.99	*4.00*	43.00	41.07	1.93
1218	Bosworth Bros'. Superphosphate of Lime	----	1.00	1.14	2.14	*2.00*	4.64	5.52	5.20	15.36	*14.00*	10.16	*8.50*	2.32	*2.00*	38.00	34.83	3.17
1128	Mapes' Complete Manure, "A" Brand	.80	.70	1.07	2.57	*2.47*	8.98	2.74	3.64	15.36	*10.00*	11.72	*8.00*	2.74	*2.50*	42.00	38.73	3.27
1129	Sanford's Bone Superphos.	----	----	1.58	1.58	*1.58*	5.38	3.91	6.04	15.33	*15.33*	9.29	*9.29*	2.39	*2.39*	35.00	31.59	3.41
1144	Lister's Ammoniated Dissolved Bone Phosphate	----	.56	1.48	2.04	*1.65*	8.24	1.60	1.61	11.45	*10.00*	9 84	*8.00*	1.89	*1.50*	35.00	30.80	4.20
1236	Darling's Animal Fertilizer	----	----	3.91	3.91	*4.00*	.75	6.79	8.42	15.96	*10.00*	7.54	----	4.47	*5.00*	45.00	40.74	4.26
1213	Williams, Clark & Co's Fish and Potash	.09	.31	3.70	4.10	*3.29*	.24	3.22	3.01	6.47	*3.00*	3 46	----	5.15	*3.00*	34.00	29.66	4.34
1143	Mapes' Complete Manure for Light Soils	.84	2.89	2.17	5.90	*5.00*	6.15	1.33	1.86	9.34	*7.00*	7.48	----	8.04	*6.00*	52.00	47.61	4.39
1310	G. H. Harris & Son's Superphosphate	----	---	2.76	2.76	----	2.89	5.25	4.57	12.71	----	8.14	----	----	----	35.00	30.38	4.62
1098	Peruvian Guano Lobos	.22	3.75	.87	4.84	*4.12*	4.04	4.38	8.76	17.18	*15.00*	8.42	----	3.46	*2.00*	52.00	47.20	4.80
1235	Baker's A. A. Ammoniated Superphosphate	----	1.62	1.26	2.88	*2.47*	9.33	.85	.49	10.67	----	9 82	*10.00*	2.66	*2.00*	40.00	35.06	4.94
1140	E. Frank Coe's Ammoniated Bone Superphos.	----	----	2.17	2.17	*2.06*	7.73	1.42	2.89	12.04	*11.00*	9.15	*9.00*	0.46	----	35.00	29.30	5.70

* Valuation exceeds cost.

NITROGENOUS SUPERPHOSPHATES AND GUANOS.—*Continued.*

Station No.	Name or Brand.	Nitrogen.					Phosphoric Acid.							Potash.		Cost per Ton.	Valuation per Ton.	Cost Exceeds Valuation.
		From Nitrates.	From Ammonia.	From Organic Matters.	Total Nitrogen Found.	Nitrogen Guaranteed.	Soluble in Water.	Reverted.	Insoluble.	Total Phos. Acid Found.	Phos. Acid Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.			
1207	Pelican Bone Fertilizer	....	1.54	.65	2.19	*1.86*	8.30	.23	36	8.89	....	8.53	*8.00*	2.82	*2.00*	$35.00	$29.11	$5.89
1206	"A. A." Ammoniated Superphosphate	....	1.63	.90	2.53	*2.47*	9.29	1.01	.55	10.85	....	10.30	*10.00*	2.83	*2.00*	40.00	34.07	5.93
1264	"A. A." Ammoniated Superphosphate	....	1.98	.46	2.44	*2.47*	8.85	1.32	.78	10.95	....	10.17	*10.00*	3.00	*2.00*	40.00	33.88	6.12
1254	G. W. Miller's Raw Bone Phosphate	....	....	4.28	4.28	....	3.93	3.12	1.42	8.47	....	7.05	....	5.86	....	43.00	36.86	6.14
1215	Preston's Ammon. Bone Superphosphate	....	.24	2.02	2.26	*2.06*	7.14	1.34	3.29	11.77	....	8.48	*9.00*	....	....	35.00	28.79	6.21
1177	Bradley's Superphosphate	.05	.98	1.61	2.64	*2.27*	8.14	1.37	3.22	12.73	*11.00*	9.51	*9.00*	3.09	*1.50*	42.00	35.05	6.95
1204	Quinnipiac Fish and Potash, Plain Brand	....	.41	2.11	2.52	*2.00*	.32	4.25	4.08	8.65	*6.00*	4.57	*4.00*	4.44	*4.00*	33.00	25.97	7.03
1202	Universal Ammon. Dissolved Bone	....	....	1.82	1.82	*1.65*	6.91	3.58	1.57	12.06	*10.00*	10.49	*9.00*	....	....	36.00	28.95	7.05
1110	Dickinson's Ammon. Bone Phosphate	....	....	4.30	4.30	....	4.41	4.20	4.76	13.37	....	8.61	....	....	....	45.00	37.87	7.13
1216	Darling's Animal Fertilizer	....	.39	3.00	3.39	*4.00*	.67	6.58	7.57	14.82	*10.00*	8.24	....	4.35	*5.00*	45.00	37.77	7.23
1292	The Common Sense Fertilizer, No. 2	.03	.75	1.58	2.36	*2.00*	.44	6.86	1.12	8.42	*4.00*	7.30	....	3.78	*3.00*	35.00	27.76	7.24
1288	Lombard & Mathewson's Superphosphate	....	....	2.66	2.66	....	3.32	5.50	3.61	12.43	....	8.82	....	.17	....	38.00	30.43	7.57
1186	Miller's Raw Bone Phosphate	....	....	1.86	1.86	....	5.21	5.59	2.46	13.66	....	10.80	....	6.04	....	43.00	35.26	7.74
1130	Quinnipiac Phosphate	....	.43	2.43	2.86	*2.47*	7.52	1.32	.90	9.74	*9.00*	8.84	*8.00*	2.62	*2.00*	40.00	32.07	7.93
1162	Miles Co's Fish and Potash	....	....	2.21	2.21	....	4.33	1.67	2.27	8.27	....	6.00	....	6.27	....	36.00	27.88	8.12

NITROGENOUS SUPERPHOSPHATES AND GUANOS.—*Continued.*

Station No.	Name or Brand.	Nitrogen.					Phosphoric Acid.							Potash.		Cost per Ton.	Valuation per Ton.	Cost Exceeds Valuation.
		From Nitrates.	From Ammonia.	From Organic Matters.	Total Nitrogen Found.	Nitrogen Guaranteed.	Soluble in Water.	Reverted.	Insoluble.	Total Phos. Acid Found.	Phos. Acid Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.			
1222	Bay State Fertilizer	.58	.56	1.77	2.91	*2.10*	7.76	1.24	1.99	10.99	*9.50*	9.00	*8.00*	3.17	*2.00*	$42.00	$33.86	$8.14
1282	Farmer's Friend Ammon. Dissolved Bone	.65	.88	.42	1.95	*1.86*	4.77	4.23	2.58	11.58	*8.00*	9.00	....	1.62	*2.00*	37.00	28.74	8.26
1221	Chittenden's Fish and Potash	....	.11	2.94	3.05	*2.88*	.64	2.00	4.33	6.97	*6.00*	2.64	....	6.38	*5.00*	35.00	26.44	8.56
1137	Bradley's Patent Superphosphate of Lime	....	....	2.32	2.32	*2.26*	8.53	1.39	2.88	12.80	*11.00*	9.92	*9.00*	2.08	*1.50*	42 00	33.20	8.80
1203	Americus Brand Ammon. Bone Superphosphate	.11	....	2.12	2.23	*1.65*	6.93	2.38	1.11	10.42	*10.00*	9.31	*9.00*	1.16	*1.00*	38.00	29.01	8.99
1301	Bowker's Dissolved Bone	....	....	1.51	1.51	*1.65*	7.70	1.16	.99	9.85	*8.00*	8.86	*5.00*	1.77	*2.00*	35.00	25.92	9.08
1132	Fish and Potash, Crossed-fish Brand	....	.66	3.26	3.92	*3.25*	2.05	2.49	1.28	5.82	*5.00*	4.54	*3.00*	3.52	*3.00*	38.00	28.66	9.34
1211	Bowker's Fish and Potash	....	....	2.00	2.00	*2.25*	3.59	2.09	2.95	8.63	*8.00*	5.68	....	4.41	*4.00*	35.00	25.34	9.66
1100	Standard Peruvian Guano	.22	7.35	.48	8.05	*7.41*	2.54	3.72	8.60	14.86	*13.00*	6.26	....	2.48	*2.00*	67.00	57.21	9.79
1209	Original Coe's Superphos.	....	....	2.31	2.31	*2.06*	7.31	1.75	3.52	12.58	*11.00*	9.06	*9.00*	....	....	40.00	30.18	9.82
1157	Buffalo Ammoniated Bone Superphosphate	....	.32	3.08	3.40	*2.50*	7.06	.91	2.20	10.17	*9.00*	7.97	*8.00*	1.32	*2.00*	43.00	32.59	10.41
1141	Bowker's Hill and Drill Phosphate	....	.79	1.47	2.26	*1.65*	7.62	.97	.96	9.55	*10.00*	8.59	*8.00*	2.29	*2.00*	40.00	29.16	10.84
1220	Standard Peruvian Guano	.26	6.37	.90	7.53	*7.41*	2.16	4.68	9.06	15.90	*13.00*	6.84	....	2.72	*2.00*	67.00	55.77	11.23
1272	Baker's Dissolved Bone	....	....	1.42	1.42	*1.65*	7.60	.52	1.33	9.45	....	8.12	*5.00*	1.66	*2.00*	36.00	24.43	11.57
1205	Potato, Hop and Tobacco Phosphate	....	....	3.10	3.10	*2.00*	6.60	.61	2.16	9.37	*9.00*	7.21	*8.00*	4.76	*6.00*	45.00	33.31	11.69
1291	Davidge's Fish and Potash	....	....	3.07	3.07	*2.88*	1.99	3.30	1.78	7.07	*5.00*	5.29	....	4.81	*4.00*	40.00	27.89	12.11
1293	" Special Favorite	....	....	2.22	2.22	*1.24*	4.22	3.16	2.61	9.99	*11.00*	7.38	*8.00*	1.81	*1.50*	40.00	26.90	13.10

Nitrogenous Superphosphates and Guanos.—*Continued.*

Station No.	Name or Brand.	Nitrogen. From Nitrates.	Nitrogen. From Ammonia.	Nitrogen. From Organic Matters.	Nitrogen. Total Nitrogen Found.	Nitrogen. Nitrogen Guaranteed.	Phosphoric Acid. Soluble in Water.	Phosphoric Acid. Reverted.	Phosphoric Acid. Insoluble.	Phosphoric Acid. Total Phos. Acid Found.	Phosphoric Acid. Phos. Acid Guaranteed.	Phosphoric Acid. Available. Found.	Phosphoric Acid. Available. Guaranteed.	Potash. Found.	Potash. Guaranteed.	Cost per Ton.	Valuation per Ton.	Cost Exceeds Valuation.
1210	Russel Coe's Ammoniated Bone Superphosphate	----	---	2.21	2.21	*1.86*	5.54	1.15	3.48	10.17	*11.00*	6.69	*10.00*	1.76	*1.50*	$40.00	$26.62	$13.38
1305	Soluble Pacific Guano	---	----	2.37	2.37	*2.00*	6.48	1.50	4.17	12.15	*10.00*	7.98	*8.00*	3.16	*2.00*	45.00	31.58	13.42
1223	Mitchell's Standard Superphosphate	----	.14	1.73	1.87	*2.06*	3.64	2.09	4.50	10.23	*10.00*	5.73	*8.00*	1.69	*3.00*	38.00	24.07	13.93
1289	Stearns' No. 1 Eagle Brand Fish and Potash	---	.45	1.97	2.42	*2.47*	1.51	2.39	1.65	5.55	*6.00*	3.90	*3.00*	4.62	*4.00*	40.00	22.60	17.40
1208	Cooke's Blood Guano	.07	----	1.66	1.73	*1.65*	4.85	1.30	4.49	10.64	*10.00*	6.15	*7.00*	3.10	----	45.00	25.58	19.42
1320	B. D. Sea Fowl Guano	.28	----	2.70	2.98	*2.50*	7.70	1.43	2.51	11.64	*11 00*	9.13	*9.00*	3.14	*2.00*	----	34.71	----
1313	Buffalo Superphos., No. 2	----	----	----	----	----	6.97	3.97	2.03	12.97	*13.00*	9.00	*11.00*	1.02	*2.50*	----	23.79	----
1198	J. G. Curtis' Reliable Phosphate	----	----	1.60	1.60	*1.60*	2.69	1.80	3.06	7.55	*7.55*	4.49	*4.49*	----	----	----	17.77	----
1228	N. H. Fertilizer Co.'s Superphosphate	1.91	----	1.25	3.16	----	3.63	1.22	4.78	9.63	----	4.85	----	2.87	----	----	29.22	----
1316	Sparrow's Bone and Potash Phosphate	----	1.06	1.94	3.00	*2.50*	10.55	1.78	.40	12.73	----	12.33	*9.00*	4.32	*4.00*	----	40.75	----
1311	Lister Bros.' Stand. Phosphate	----	----	2.47	2.47	*2.34*	9.40	2.07	.31	11.78	*12.00*	11.47	*10.00*	2.53	*1.50*	----	36.89	----
1314	Cooke's Dissolved Ground Bone	----	----	1.10	1.10	----	4.14	1.88	7.42	13.44	*11.40*	6.02	----	3.77	----	----	21.94	----
1317	Quinnipiac Extra Superphosphate	----	.56	1.99	2.55	*1.75*	3.92	3.84	2.47	10.23	*10.00*	7.76	*8.00*	2.59	*2.00*	----	29.59	----
1329	Stearns' Ammoniated Bone Superphosphate	----	.43	2.48	2.91	*2.47*	7.19	2.76	1.39	11.34	*9.00*	9.95	*8.00*	2.91	*2.00*	----	34.88	---
1332	Thomson's Charter Oak Fertilizer	----	.64	1.30	1.94	----	.21	.63	.11	.95	----	.84	----	2.89	----	----	12.13	----

Comparison of Superphosphates of the same Brand.

NAME.	No. of Analyses.	Year when Analyzed.	Nitrogen.	Phos. Acid. Available.	Phos. Acid. Total.	Potash.
Baker's, H. J., A. A. Superphosphate	3	1882	3.03	9.59	10.16	2.82
	3	1883	2.61	9.55	10.04	2.74
	3	1884	2.62	10.09	10.82	2.83
Bosworth Bros' Superphosphate	1	1882	2.10	10.11	14.28	2.23
	1	1883	1.83	8.51	16.41	2.23
	1	1884	2.14	10.16	15.36	2.32
Bowker's Fish and Potash	1	1882	2.18	5.30	7.46	5.44
	1	1884	2.00	5.68	8.63	4.41
Bowker's Hill and Drill Phosphate	1	1881	2.40	7.56	12.16	2.49
	1	1883	1.81	7.17	10.75	1.59
	1	1884	2.26	8.59	9.55	2.29
Bradley Fertilizer Co's Superphos.	1	1878	2.51	7.22	7.65	----
	1	1880	3.06	8.35	9.60	1.46
	1	1882	2.67	9.71	11.46	1.74
	2	1883	2.78	9.34	11.84	1.93
	2	1884	2.48	9.71	12.76	2.58
Coe, E. F., Superphosphate	7	1878	2.36	8.84	11.92	----
	2	1879	2.52	10.61	12.11	----
	1	1880	2.61	9.69	11.75	----
	1	1881	2.34	9.60	12.29	----
	1	1882	2.63	9.45	12.25	----
	1	1883	2.19	9.53	13.26	----
	1	1884	2.17	9.15	12.04	----
Coe, Russel, Superphosphate	3	1878	1.86	6.48	15.27	----
	1	1879	1.99	9.76	13.22	----
	2	1880	.99	5.73	14.18	1.35
	1	1882	2.10	9.96	11.78	1.41
	2	1883	2.30	7.63	9.08	1.24
	1	1884	2.21	6.69	10.17	1.76
Cooke's Blood Guano	1	1881	2.49	8.13	13.27	2.26
	1	1882	1.88	6.94	11.21	1.54
	1	1883	1.79	7.40	8.31	1.48
	1	1884	1.73	6.15	10.64	3.10
Darling's Animal Fertilizer	1	1881	4.09	6.47	13.61	6.47
	1	1882	4.20	8.16	13.27	5.95
	1	1883	3.91	6.45	15.16	4.68
	2	1884	3.65	7.89	15.39	4.41
Dickinson's Phosphate	5	1881	3.47	13.71	17.01	.34
	1	1884	4.30	8.61	13.37	----
Glidden & Curtis' Sol. Pacific Guano	2	1877	2.41	----	12.53	1.26
	2	1878	2.18	7.21	11.22	4.23
	1	1880	3.28	8.07	10.79	3.98
	2	1881	2.48	8.03	11.77	2.02

NAME.	No. of Analyses.	Year when Analyzed.	Nitrogen.	Phos. Acid.		Potash.
				Available.	Total.	
Glidden & Curtis' Sol. Pacific Guano	1	1882	2.31	8.10	12.98	3.11
	1	1883	2.60	6.81	12.47	2.54
	1	1884	2.37	7.98	12.15	3.16
Harris' Phosphate	1	1881	2.93	11.95	14.67	----
	1	1882	3.08	10.69	14.50	.35
	1	1883	2.92	8.73	14.46	----
	1	1884	2.76	8.14	12.71	----
Lister Bros' Superphosphate	1	1880	2.20	8.59	11.03	----
	1	1883	1.69	10.74	11.68	1.89
	1	1884	2.47	11.47	11.78	2.53
Lombard & Mathewson's Superphos.	1	1878	1.59	7.45	8.35	----
	2	1879	3.12	12.23	17.08	----
	1	1880	3.61	13.25	16.22	----
	1	1881	2.91	9.69	15.39	----
	1	1882	2.46	12.43	13.11	.26
	1	1884	2.66	8.82	12.43	----
Mapes' Complete "A" Brand	2	1880	2.78	9.80	13.30	3.22
	1	1881	2.30	10.93	13.20	3.25
	1	1883	2.68	10.49	13.71	2.89
	1	1884	2.57	11.72	15.36	2.74
Mapes' Complete, for sandy soils	1	1881	5.36	5.82	7.83	6.68
	1	1883	5.29	7.84	8.96	6.61
	1	1884	5.90	7.48	9.34	8.04
Miles, G. W. Co., Superphosphate	1	1880	1.90	7.70	13.95	1.76
	1	1881	2.20	7.56	9.70	3.46
	1	1882	1.70	8.60	10.79	1.90
	3	1883	2.11	8.15	11.44	1.70
Miller, G. W., Raw Bone Phosphate	1	1880	3.41	9.19	12.80	5.09
	3	1883	2.92	6.29	9.90	5.64
	2	1884	3.07	8.92	11.06	5.95
Quinnipiac Fertilizer Co's Phosphate	2	1878	3.05	7.21	9.79	2.24
	2	1880	3.26	8.49	13.61	2.41
	2	1881	2.64	10.16	11.42	2.21
	1	1882	3.00	8.19	11.10	2.35
	5	1883	3.14	8.39	10.74	2.50
	1	1884	2.86	8.84	9.74	2.62
Quinnipiac Fertilizer Co's Fish and Potash.	2	1880	4.38	4.78	6.15	3.29
	1	1881	3.56	3.71	6.87	3.20
	2	1882	3.80	4.23	8.08	4.08
	2	1883	4.19	5.16	8.48	4.55
	1	1884	3.92	4.54	5.82	3.52

Home-Made Phosphates.

During the last two or three years a number of farmers have purchased fertilizing chemicals in the New York or Connecticut market and compounded them to suit their own purposes. Seven samples of such home-made, or more properly speaking home-mixed, fertilizers have been examined during this year.

The analyses are given in the following table :

	Webb.		Augur.	Hathaway.	Pinney	Mason.	Baldwin.
	1188	**1248**	**1111**	**1124**	**1101**	**1267**	**1191**
Nitrogen of nitrates,							3.79
Nitrogen of ammonia,	3.70	3.52					
Nitrogen of organic matter,			2.04	3.81	4.09	4.42	2.86
Soluble phosphoric acid	6.57	9.21	7.34	none	none	none	7.06
Reverted phosphoric acid	4.96	2.44	3.41	3.54	3.68	2.68	.65
Insoluble phosphoric acid,	2.55	1.02	4.10	.54	3.06	.99	.05
Potash soluble in water	9.29	9.58		8.05	*7.24	†7.13	9.92
Cost per ton,	$36.20	36.20		25.63		33.70	50.00
Valuation per ton	$48.54	47.36	32.67	33.77	36.21	31.96	53.95

* Potash insoluble in water but soluble in acids, 1.74.

† " " " " " " " " .25

Nos. **1188** and **1248** were made and sent to the station by J. J. Webb, of Hamden.

In the *N. E. Homestead* of June 21 of this year, Mr. Webb says in substance with regard to them:

"For several years I have bought chemicals and mixed them myself and always, I think, with profitable results.

This year I sent the chemicals to the state experiment station for analyses and also the mixed phosphate. My mixed phosphate cost me, including the freight to New Haven and the labor of mixing, $36.20 per ton, and the station valuation was $48.54, or about 34 per cent. above cost.

I bought four tons of pure dissolved bone, 17 to 18 per cent. phosphoric acid, at $26.50 per ton; one ton of muriate of potash, 80 per cent. of muriate guaranteed, at $35, and one ton of sulphate of ammonia at $62.50. Thus the total cash cost of the six tons of chemicals was $203.50 or $33.92 per ton. The freight to New Haven and labor of mixing brought the cost up to $36.50.

The acid phosphate came in bags of 200 lbs. each, and was mixed by emptying one bag upon the barn floor and breaking the lumps as fine as we could with a shovel, then adding 100 lbs. of

muriate of potash, also pulverized, then another bag of phosphate, covering with 100 lbs. of sulphate of ammonia and mixing all as well as we could conveniently with shovels. The mass was sifted through a coarse sieve. The lumps were thrown aside for further pulverization, after which they were returned. The prepared fertilizer was put in barrels, about 200 lbs. each, and set aside until wanted for use. This was done at an expense of 50 to 75 cents per ton. The goods were in better order for sowing than any phosphate I have ever bought."

Under date of Nov. 17 Mr. Webb writes to the station: "I was better satisfied with the mixture than with any prepared fertilizer I ever bought. My men used it on their gardens without any manure and had good crops and were highly pleased with it."

Mr. Webb adds in his published article: "We want the goods, and from my experience I think I cannot afford to do without them. But are the manufacturers doing the best they can afford by us? Are we not paying more than our share for long credits on goods sold at the South? Is it not more profitable for us to take the amount needed from the savings bank, if necessary, where it is drawing but 4 to 6 per cent. and pay cash for the goods, and save, say 20 per cent. or more?"

No. **1111** was made by C. P. Augur, of Whitneyville, but particulars with regard to its manufacture and cost have not been received.

Nos. **1124, 1101** and **1267** are tobacco fertilizers; the first from F. B. Hathaway, the second from R. E. Pinney, both of Suffield, and the last from John Mason, of Warehouse Point. Probably all were compounded by the same formula and at about the same cost. With regard to **1124**, Mr. Hathaway writes:

"The fertilizer in question has given good satisfaction here.

"It is composed of:

1,000 pounds cotton seed meal, costing	$13.63
500 pounds potash, costing	9.75
500 pounds lime, costing	2.25
	$25.63

"This is what it cost us in car-load lots last spring.

"It should be well mixed and put up in 100 pound bags.

"The expense of mixing won't exceed 50 cents per ton.

"The potash used was same as sample (No. **1149**) analyzed for me at Station last spring. The cotton seed and lime should both be the best that can be had and the fertilizers thus mixed should

be applied to tobacco at the rate of two tons per acre. This makes a fertilizer analyzing about 30 per cent. more than the leading tobacco fertilizers and costing about the same per acre."

The "Potash" of Mr. Hathaway's formula is cotton hull ashes (see page 70). In this fertilizer there is no chlorine.

1191 is a sample of phosphate mixed for a potato fertilizer by M. S. Baldwin of Naugatuck.

Under date of Feb. 11 Mr. Baldwin writes: "The subject of chemical fertilizers has been discussed by our club and they wish me to ask you in what materials or in what form it is cheapest or most economical to buy nitrogen and phosphoric acid so that they will be in the most available form for crops to take up. To obtain potash is high grade muriate potash salts the best?"

To Mr. Baldwin was replied as follows: "The cost of nitrogen in nitrate of soda, dried blood and ammonia salts is about the same at present, rather higher in ammonia salts than in the others.

"Available phosphoric acid is cheapest in the high grade plain superphosphates, containing from 13–15 per cent. of phosphoric acid soluble in water. For most crops potash can be most cheaply supplied in high grade muriate of potash. We would suggest that you inquire of wholesale dealers as to their prices of nitrate of soda, guaranteed 95 per cent.; sulphate of ammonia, guaranteed 95 per cent.; dried blood, asking for nitrogen, guaranteed; plain superphosphate, guaranteed 13 to 15 per cent. water-soluble phosphoric acid, and muriate of potash, guaranteed 80 per cent. The goods to be in packages, delivered free on board in New York. You can then, knowing the freight rates, figure exactly what the things will cost you in Naugatuck."

Mr. Baldwin seems to have figured on the cost of fertilizing chemicals to good purpose. With regard to his home-mixed potato fertilizer he writes:

"I have used ——— and ——— potato fertilizer for raising my crop of potatoes each year for the last eight or ten years till this season, when I used that of which you analyzed a sample (**1191**). I have this season the best crop that I ever raised."

The average cost of the five fertilizers whose costs and valuations are given is $36.34, the average valuation $43.12, the difference $6.78, or 15.7 per cent. of the valuation. With only one exception the valuation of these goods is considerably above their cost.

The mechanical condition of the goods was in all cases unexceptionable. They were fine and dry.

Special Manures.

[See pages 54–57.]

Under this head are included all those fertilizers which are sold with a claim, tacit or expressed, that they are compounded with special reference to the wants of particular crops, and are specially adapted to feed such crops. In the opinion of the Director of this Station, "Special Fertilization" by the use of such fertilizers, implies a uniformity of soil that is not commonly met with in this State, and a greater knowledge of the characters of the soil and the laws of vegetable nutrition than we now possess.

The matter has been fully discussed in preceding reports, and needs no further mention here.

The special manures themselves are, however, good fertilizers, and on the average during this year have furnished plant food in a somewhat more concentrated form than other superphosphates and at a considerably cheaper rate, although their average ton-cost has been higher. This will appear from the following comparison:

	Average Cost.	Average Valuation.	Difference.	Percentage difference reckoned on Valuation.
Superphosphates (52),	$40.73	33.13	7.60	22.90
Special manures (20),	49.95	44.20	5.75	13.00

The question arises, Why should the difference between cost and valuation be less in the case of special manures than in other superphosphates? It might be answered that the special manures are compounded mostly by those who manufacture on a large scale and are thus enabled to do the work of compounding more cheaply than smaller operators. If this is the explanation, then the superphosphates which are not specials, made by those same firms ought to show about the same percentage difference between cost and valuation that their specials show. But they do not. The average cost of all the nitrogenous superphosphates made by the same firms whose special manures are here tabulated, is $38.80, average valuation $32.28, average difference between cost and valuation $6.52, which is 20.2 per cent. of the valuation as against 22.9 per cent., the average in the case of *all* nitrogenous superphosphates.

Probably this difference is partly explained by the fact that the specials, almost without exception, have contained very considerable amounts of ammonia salts. Nitrogen in form of ammonia has been valued by the Station at 22 cents per pound, as agreed

by the Directors of the Massachusetts, New Jersey and Connecticut Stations last spring. It is now seen that this valuation was too high, and 18 or 19 cents would have been fairer. Nitrogen in form of sulphate of ammonia has been bought by farmers in this State in ton lots as low as 16 cents per pound during the last season.

A further explanation of the more favorable relation of valuation to cost in the case of the special manures, is that pound for pound they contain more valuable material. The cost of mixing and selling a high grade article can hardly be greater than that of a lower grade. But in the first case, this cost of the preparation of the goods *goes further* with the farmer than in the latter case. To illustrate: suppose we have two lots of fertilizers unmixed. One contains 250 pounds of muriate of potash, 250 pounds of nitrate of potash and 600 pounds of plain superphosphate, with as much more moisture, sand, peat or plaster, so that the total weight is 2,200 pounds. Its cost is $19. This we propose to mix and apply to an acre of land. The other lot contains 500 pounds of muriate, 500 pounds of nitrate and 1,200 pounds of superphosphate, without any "ballast." It also weighs 2,200 pounds and costs $38. To sift, pulverize and mix thoroughly the raw materials in each lot we will assume costs $6. Since the weight of the two lots is the same, the labor of handling and mixing will not be very unlike.

When the fertilizers are spread on the land the first lot covers one acre and costs $19 plus $6=$25. The second lot covers two acres and costs $38 plus $6=$44, or $22 per single acre. Here, then, is a saving of $3 per acre, and a saving it is to be noticed, made by buying the highest priced fertilizer instead of the low priced one. The $25 goods are the more expensive, the $44 goods are the cheaper, if both are rationally used. We are not now arguing for specials as against other superphosphates, but for high grade goods, whether specials or not, as against the more expensive low grade goods.

Nine of the specials were up to their guarantees in all respects; in nine, one ingredient was not up to the guarantee, and two were deficient in respect to two ingredients.

In the following table are given all the analyses of various brands of special manures which have been made since the establishment of the Station in 1877, and which serve to show any changes in the formulas as well as the variations in the quality of the goods.

Comparison of Special Manures of the same Brand.

NAME.	No. of Analyses.	Year.	Nitrogen.	Phos. Acid.		Potash.
				Available.	Total.	
Baker's Potato Manure	2	1882	3.83	4.95	5.03	9.68
	1	1883	3.26	7.54	7.97	9.76
	1	1884	3.46	5.88	6.55	9.79
Baker's Oat Manure	1	1881	4.41	5.43	7.51	11.12
	1	1884	4.42	5.24	5.38	10.13
Baker's Tobacco Manure	1	1881	4.43	5.16	6.44	11.98
	1	1882	4.76	2.66	2.68	8.56
	1	1883	4.85	4.93	5.32	9.03
	1	1884	5.01	5.18	5.53	9.47
Baker's Corn Manure	3	1882	4.52	5.61	5.88	8.49
	1	1883	4.15	6.50	7.28	7.91
	1	1884	3.63	6.41	6.96	7.70
Baker's Grass Manure	1	1883	4.87	5.29	6.51	8.19
	1	1884	4.64	5.40	6.44	7.95
Chittenden's Complete Manure for Grain.	1	1883	4.24	8.25	9.09	5.37
	1	1884	3.51	7.03	8.93	6.49
Chittenden's Root Fertilizer	2	1883	3.98	7.84	8.79	5.78
	1	1884	4.22	7.67	9.02	5.56
Forrester's Special Potato Fertilizer	1	1878	5.65	7.57	7.65	11.42
	2	1879	4.69	5.39	7.10	9.68
	1	1880	4.76	5.44	7.53	11.33
	1	1881	3.38	5.44	5.72	9.50
	1	1882	3.78	6.91	7.22	10.27
	1	1884	4.68	7.87	8.55	9.83
Forrester's Special Grass Fertilizer	1	1878	5.56	4.08	5.12	12.11
	1	1880	5.44	2.12	3.07	7.45
Forrester's Special Onion Fertilizer	1	1879	7.36	4.49	4.84	7.39
	1	1880	7.40	4.63	5.63	7.25
	2	1881	5.24	5.16	5.41	6.53
	1	1882	5.53	6.23	6.63	5.69
	1	1884	5.58	9.45	9.45	7.58
Forrester's Special Cabbage Fertilizer	1	1879	6.27	6.06	6.51	7.44
	1	1880	5.62	6.26	6.82	8.16
Forrester's Special Corn Fertilizer	1	1879	7.91	4.20	4.49	8.30
	1	1880	4.86	6.07	7.08	14.56
	2	1881	5.04	6.79	7.20	7.65
	1	1882	5.30	7.78	8.56	8.06
	1	1884	4.71	9.18	9.89	7.84
Forrester's Special Oat Manure	1	1880	6.62	4.96	5.94	9.18
	1	1881	4.79	5.99	6.32	8.61
Lister's Potato Fertilizer	1	1883	3.79	8.13	8.87	8.43
	1	1884	3.74	9.13	9.27	6.72
Mapes' Grass and Grain Top Dressing	1	1879	4.28	5.99	7.31	3.65
	1	1880	4.74	7.49	8.79	6.61
	1	1883	4.11	7.09	9.76	5.98

Special Manures.— *Continued.*

NAME.	No. of Analyses.	Year.	Nitrogen.	Phos. Acid.		Potash.
				Available.	Total.	
Mapes' Potato Fertilizer	1	1878	3.67	4.55	6.04	14.82
	1	1880	3.67	9.44	10.94	6.35
	1	1882	3.94	7.86	10.04	6.10
	2	1883	4.22	7.98	11.83	6.55
	1	1884	4.27	8.92	12.66	6.82
Mapes' Corn Manure	1	1880	3.67	10.20	11.86	7.21
	1	1881	3.63	9.44	12.04	5.67
	2	1882	3.77	10.63	12.32	7.04
	1	1884	4.04	8.80	12.51	6.82
Mapes' Tobacco Manure, Ct. Brand	1	1881	4.86	5.61	7.46	7.42
	1	1882	3.62	7.77	9.41	9.03
	1	1883	6.41	7.64	8.84	6.70
	1	1884	5.26	7.65	10.09	7.44
Mapes' Tobacco Manure, for use with Stems.	2	1882	5.73	7.54	9.74	4.36
	1	1883	5.31	9.60	10.91	4.35
	1	1884	6.09	11.24	13.67	3.70
Stockbridge Grain Manure	2	1878	6.06	5.51	6.33	6.87
	1	1880	4.71	6.00	6.42	6.75
	1	1881	4.04	6.81	8.78	5.29
	2	1882	3.83	6.89	8.78	5.25
	1	1883	3.83	7.12	5.36	3.93
Stockbridge Vegetable Manure	1	1878	3.49	6.39	6.57	10.22
	-	1879	3.82	7.02	7.21	8.84
	2	1881	3.12	6.81	7.99	4.89
	2	1882	3.40	7.47	9.95	4.90
	1	1883	2.94	6.65	8.48	6.10
	1	1884	3.35	6.72	8.76	10.12
Stockbridge Kitchen Garden Manure	1	1878	4.57	5.62	5.79	7.22
Stockbridge Squash, Cucumber and Tomato Manure.	1	1878	5.06	4.05	4.05	7.66
Stockbridge Grass Top Dressing	1	1878	8.68	2.11	2.11	10.38
	1	1879	6.10	4.09	4.45	7.52
	1	1882	4.05	6.72	9.49	3.69
Stockbridge Top Dressing and Forage Crop.	1	1883	4.04	6.40	7.89	4.05
	1	1883	3.29	7.25	10.86	4.06
	1	1884	3.81	7.01	8.75	3.60
Stockbridge Lawn Dressing	1	1878	7.99	5.17	5.17	6.35
Stockbridge Grain Manure	1	1881	3.20	7.46	7.59	5.89
	1	1882	3.48	6.57	9.14	6.83
	1	1883	3.39	7.42	10.81	5.31
	1	1884	2.91	7.98	9.10	5.51
Stockbridge Onion Manure	1	1879	3.91	6.36	6.49	8.32
	1	1880	3.10	5.34	5.79	7.94
Stockbridge Tobacco Manure	1	1879	5.70	1.43	1.70	7.36
	1	1880	6.11	6.09	6.29	5.62
Stockbridge Root Manure	2	1880	3.95	5.53	6.20	7.02
Stockbridge Seeding Down Manure	1	1883	3.37	7.46	10.92	5.88

Special Manures.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1303	Mapes' Tobacco Manure, for use with stems.	Mapes' Formula and Peruvian Guano Co., New York.	Mapes' Conn. Valley Branch, Hartford.	Station Agent.
1271	Forrester's Onion Manure.	G. B. Forrester, 169 Front St., New York.	Manufacturer.	S. B. Wakeman, Saugatuck.
1212	Baker's Special Tobacco Manure.	H. J. Baker & Bro., 215 Pearl St., New York.	Southmayd & Gardiner, Middletown.	Station Agent.
1304	Mapes' Tobacco Manure, Ct. Brand.	Mapes' Formula and Peruvian Guano Co., New York.	Mapes' Conn. Valley Branch.	"
1283	Bosworth's Potato Phosphate.	Bosworth Bros., Putnam.	John A. Paine, Danielsonville.	"
1274	Forrester's Corn Manure.	G. B. Forrester, 169 Front St., New York.	Manufacturer.	S. B. Wakeman, Saugatuck.
1275	" Potato Manure.	G. B. Forrester, 169 Front St., New York.	"	"
1302	Baker's Special Oat Manure.	H. J. Baker & Bro., 215 Pearl St., New York.	Tolles & McEwen, Naugatuck.	Station Agent.
1318	Read & Co's Matchless Tobacco Manure.	Read & Co., New York City.	A. C. Sternberg, Hartford.	Manufacturer.
1138	Mapes' Potato Manure.	Mapes' Formula and Peruvian Guano Co., 158 Front St., N. Y.	R. B. Bradley & Co., New Haven.	Station Agent.

Special Manures.—*Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1160	Bowker's Vegetable Manure.	Bowker Fertilizer Co., 43 Chatham St., Boston.	Coburn & Gale, Hartford.	Station Agent.
1226	Chittenden's Complete Root Fertilizer.	National Fertilizer Co., Bridgeport.	Manufacturer.	Josiah Hawkins, Southport.
1131	Mapes' Corn Manure.	Mapes' Formula and Peruvian Guano Co., New York.	R. B. Bradley & Co., New Haven.	Station Agent.
1300	Baker's Complete Grass Manure.	H. J. Baker & Bro., 215 Pearl St., New York City.	"	"
1142	Lister Bros' Potato Manure.	Lister Bros., Newark, N. J.	"	"
1307	Chittenden's Complete Fertilizer for Grain.	National Fertilizer Co., Bridgeport.	E. A. Watrous, Meriden.	"
1155	Bowker's Corn and Grain Manure.	Bowker Fertilizer Co., 43 Chatham St., Boston.	Coburn & Gale, Hartford.	"
1136	Baker's Special Corn Manure.	H. J. Baker & Bro., 215 Pearl St., New York City.	R. B. Bradley & Co., New Haven.	"
1139	Baker's Complete Potato Manure.	H. J. Baker & Bro., 215 Pearl St., New York City.	"	"
1286	Stockbridge Forage Crop Manure.	Bowker Fertilizer Co., New York and Boston.	Coburn & Gale, Hartford.	"

Special Manures—Analyses and Valuations.

Station No.	Name or Brand.	Nitrogen.					Phosphoric Acid.							Potash.		Cost per Ton.	Valuation per Ton.	Valuation Exceeds Cost.
		From Nitrates.	From Ammonia.	From Organic Matters.	Total Nitrogen Found.	Nitrogen Guaranteed.	Soluble.	Reverted.	Insoluble.	Total Phos. Acid Found.	Phos. Acid Guaranteed.	Available.		Found.	Guaranteed.			
												Found.	Guaranteed.					
1303	Mapes' Tobacco Manure for use with stems	.81	3.34	1.94	6.09	*5.35*	7.85	3.39	2.43	13.67	*10.50*	11.24	----	3.70	*3.50*	$52.00	$54.61	$2.61
1271	Forrester's Onion Manure	----	5.58	----	5.58	*5.35*	9.05	.40	tr'ce	9.45	----	9.45	*3 50*	7.58	*7.00*	48.50	50.83	2.33
1212	Baker's Special Tobacco Manure	---	4.34	.67	5.01	*4.54*	3.91	1.27	.35	5.53	----	5.18	*4.00*	9.47	*8.00*	47.50	45.94	Cost Exceeds Valuation. 1.56
1304	Mapes' Tobacco Manure, Conn. Brand	.84	3.97	.45	5.26	*4.74*	5.42	2.23	2.44	10.09	*7.75*	7.65	----	7.44	*7.75*	52.00	50.13	1.87
1283	Bosworth's Potato Phosphate	----	2.17	.60	2.77	*2.50*	5.87	3.33	2.24	11.44	*10.00*	9.20	----	7.89	*7.50*	42.00	39.98	2.02
1274	Forrester's Corn Manure	----	4.71	----	4.71	*3.91*	8.73	.45	.71	9.89	----	9.18	*6.50*	7.84	*8.00*	49.50	46.47	3.03
1275	" Potato Manure	----	4.68	----	4.68	*3.70*	7.06	.81	.68	8.55	----	7.87	*5.25*	9.83	*10.00*	49.50	46.35	3.15
1302	Baker's Special Oat Manure	3.61	----	.81	4.42	*4.12*	4.86	.38	.14	5.38	----	5.24	*5.00*	10.13	*9.00*	47.00	43.12	3.88
1318	Read & Co's Matchless Tobacco Manure	----	4.85	----	4.85	*5.35*	5.74	1.20	.92	7.86	*9.00*	6.66	----	4.59	*4.50*	46.00	41.40	4.60

Special Manures.—*Continued.*

Station No.	Name or Brand.	Nitrogen.					Phosphoric Acid.							Potash.		Cost per Ton.	Valuation per Ton.	Cost Exceeds Valuation.
		From Nitrates.	From Ammonia.	From Organic Matters.	Total Nitrogen Found.	Nitrogen Guaranteed.	Soluble.	Reverted.	Insoluble.	Total Phos. Acid Found.	Phos. Acid Guaranteed.	Available.		Found.	Guaranteed.			
												Found.	Guaranteed.					
1138	Mapes' Potato Manure	.91	1.96	1.40	4.27	*3.70*	5.85	3.07	3 74	12.66	*8.00*	8.92	----	6.82	*6.00*	$51.00	$44.96	$6.04
1160	Stockbridge Potato Manure	----	1.09	2.16	3.25	*3.25*	6 21	.51	2.04	8.76	*8.00*	6.72	*8.00*	10.12	*7.00*	45.00	38.68	6.32
1226	Chittenden's Complete Root Fertilizer	.77	2.37	1.08	4.22	*3.29*	6.54	1.13	1.35	9.02	*8.00*	7.67	*6.00*	5.56	*6.00*	45.00	38.57	6.43
1131	Mapes' Corn Manure	.87	2.16	1.01	4.04	*3.70*	6.07	2.73	3.71	12.51	*10.00*	8.80	----	6.82	*6.00*	*50.00	42.86	7.14
1300	Baker's Complete Grass Manure	.94	3.12	.58	4.64	*3.70*	4.72	.68	1.04	6.44	*5.00*	5.40	----	7.95	*7.50*	45.00	37.77	7.23
1142	Lister Bros' Potato Manure	----	2.69	1.05	3.74	*3.29*	8.88	.25	.14	9.27	----	9.13	*8.00*	6.72	*7.00*	50.00	40.93	9.07
1307	Chittenden's Complete Fertilizer for Grain	----	----	3.51	3.51	*3.70*	5.08	2.55	1.30	8.93	*8.00*	7.63	*6.00*	6.49	*5.00*	45.00	35.48	9.52
1155	Stockbridge Grain Manure	----	1.55	1.76	3.31	*3.29*	7.58	.40	1.12	9.10	*7.00*	7.98	*6.00*	5.51	*4.00*	45 00	35.43	9.57
1136	Baker's Special Corn Manure	---	3.08	.55	3.63	*4.12*	5.95	.46	.55	6 96	----	6.41	*6.25*	7.70	*7.00*	*50.00	35.53	14.47
1139	Baker's Complete Potato Manure	----	2.82	.54	3.36	*3.29*	5.30	.58	.67	6.55	----	5.88	*5.00*	9.79	*10.00*	47.50	35.34	12.16
1286	Stockbridge Forage Crop Manure	1 12	1.03	1.66	3.81	*4.12*	6.14	.87	1.74	8.75	*7.00*	7.01	*6.00*	3.60	*4 00*	50.00	33.68	16.32

* Reckoned from cost per bag (200 lbs.).

Bone Manures.

In the following tables are given analyses of 31 articles of this class. In a number of cases to meet the requirement of the law, manufacturers' samples have been analyzed, because the goods were not found in market by the station agents.

The prices of bone ground in this State, given in the table, are mostly the prices asked at the factories, delivered on board.

The samples analyzed this year vary greatly in quality. Hard, firm bones contain more nitrogen and phosphoric acid than the softer ones, which are often wet or greasy. "Kitchen Bone," and all bone gathered by pickers is apt to have some sand or earth adhering to it or lodged in the cavities of the bone. For these reasons "pure ground bone," so called, is not a thing of very definite composition.

Some manufacturers of bone black have left after picking out what is suitable for that purpose, a quantity of damp, soft bone, which is mixed with a dryer or preservative, plaster or salt cake, and sold as a fertilizer.

1145, 1284, and **1290** are examples of bone which is "ballasted" with drying or preservative material. **1290** also contains 2.00 per cent. of potash. These articles are sold as "ground bone," but their guarantee indicates that they are not offered as *pure* bone.

The low valuation of Quinnipiac Bone No. **1158** is due both to the small amount of nitrogen and phosphoric acid in it and also to its mechanical condition. More that $\frac{3}{5}$ of it by weight is in pieces that will not pass a $\frac{1}{6}$ in. mesh.

Nos. **1242, 1240, 1229** all contain very considerable amounts of sand and other worthless matter insoluble in strong acids. **1242** contains 7.07 per cent. insoluble, **1240** contains 10.98 per cent., and **1229** 33.49 per cent. "Kitchen Bones" gathered by bone-pickers would naturally have some sand adhering to them but when the ground bone contains over 5 per cent. of insoluble matter consisting of sand, soil, coal-ashes and like "dirt," or when the amount of phosphoric acid falls below 19 per cent., there is reason to complain of adulteration, unless the guarantee indicates that the article is not pure ground bone.

1229 is a sample with regard to which conflicting statements have reached the Station. The sender claims to have sold to the grinder "7600 lbs. of pure raw Bone at one cent per lb., with the

Bone Manures.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1246	Peter Cooper's Ground Bone.	Peter Cooper's Glue Factory.	Manufacturer.	J. M. Milbank, Greenfield Hill.
1194	Rogers & Hubbard Co. Damp Bone Saw Dust.	Rogers & Hubbard Co., Middletown.	"	Manufacturer.
1237	Anderson's Ground Bone.	W. H. Anderson, Putnam.	"	"
1308	Bosworth Bros. Ground Bone.	Bosworth Bros., Putnam.	"	"
1146	Rogers & Hubbard Damp Bone Sawings.	Rogers & Hubbard Co., Middletown.	H. K. Brainard, Thompsonville.	Station Agent.
1273	Forrester's Pure Ground Bone.	Geo. B. Forrester, 159 Front St., New York City.	Manufacturer.	S. B. Wakeman. Saugatuck
1231	E. Smith's Ground Bone.	E. Smith, South Canterbury.	"	Manufacturer.
1197	Pure Ground Raw Knuckle Bone, "Grade A" Extra Fine.	Rogers & Hubbard Co., Middletown.	J. B. Barstow, Norwich.	Station Agent.
1266	F. C. Slade's Ground Bone.	F. C. Slade, Oakville.	Manufacturer.	"
1156	Shoemaker's Swift Sure Bone Meal	M. L. Shoemaker & Co., Philadelphia, Penn.	F. Ellsworth, Hartford.	"
1200	Peck Bros' Bone.	Peck Brothers, Northfield.	Manufacturer.	C. H. Cables, Thomaston.
1239	Peck Bros' Boiled Bone.	Peck Brothers, Northfield.	Manufacturer.	Manufacturer.
1195	Pure Ground Raw Knuckle Bone Grade "Meal."	Rogers & Hubbard Co., Middletown.	J. B. Barstow, Norwich.	Station Agent.
1265	G. W. Miller's Ground Bone	G. W. Miller, Middlefield.	Manufacturer.	"
1196	Rogers & Hubbard's Pure Ground Bone, Grade AX.	Rogers & Hubbard Co., Middletown.	Wilson & Burr, Middletown.	"

Bone Manures.— *Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1219	Darling's Fine Ground Bone.	L. B. Darling & Co., Pautucket, R. I.	J. B. Barstow & Co., Norwich.	Station Agent.
1230	P. W. Bennett's Ground Bone.	P. W. Bennett, Rock Fall.	Manufacturer.	Manufacturer.
1238	Peck Bros' Raw Kitchen Bone.	Peck Brothers, Northfield.	"	"
1199	Atwood Brothers' Bone.	Atwood Brothers, Oakville.	"	C. H. Cables, Thomaston.
1242	" " Ground Bone.	" " "	"	Station Agent.
1241	F. C. Slade's Bone.	F. C. Slade, Oakville.	"	C. C. Churchill, Torrington. Forwarded by Peck Bros.
1145	Lister Bros' Celebrated Ground Bone.	Lister Bros., Newark, N. J.	R. B. Bradley & Co., N. Haven.	Station Agent.
1158	Quinnipiac Bone.	Quinnipiac Co., Wallingford.	S. J. Hall, Meriden.	"
1284	Preston's Ground Bone.	H. Preston & Sons, Green Point, L. I.	J. B. Merrow & Sons, Merrow.	"
1240	Atwood Bros' Ground Bone.	Atwood Brothers, Oakville.	Atwood Bros., Oakville.	C. C. Churchill, Torrington. Forwarded by Peck Bros.
1290	E. Frank Coe's Ground Bone.	E. F. Coe, 16 Burling Slip, New York.	Buck, Durkee & Stiles, Willimantic.	Station Agent.
1229	Ground Bone.	----------	----------	----------
1185	Flour of Bone.	----------	----------	M. W. Terrill, Middlefield.
1309	G. H. Harris & Son's Ground Bone.	G. H. Harris & Son, Eagleville.	Manufacturer.	Manufacturer.
1127	Meat and Bone.	Adams & Thomas, Springfield, Mass.	Adams & Thomas.	Geo. Wilcox, Shaker Station.
1330	Buckhorn Sawings.	Rogers & Hubbard, Middletown.	----------	Chas. Fairchild, Middletown.

Bone Manures.—Analyses and Valuations.

Station No.	Name or Brand.	Nitrogen.	Phos. Acid.	Finer than $\frac{1}{50}$ inch.	Finer than $\frac{1}{25}$ inch.	Finer than $\frac{1}{12}$ inch.	Finer than $\frac{1}{6}$ inch.	Coarser than $\frac{1}{6}$ inch.	Cost per ton.	Valuation per ton.	Valuation exceeds cost.
1246	Peter Cooper's Ground Bone	1.48	31.65	50	15	24	11	-- -	$27.00	$39.71	$12.71
1194	Rogers & Hubbard's Damp Bone Saw Dust	2.49	17.09	93	6	1	----	----	25.00	29.23	4.23
1237	Anderson's Ground Bone	2.15	30.31	77	22	1	----	----	40.00	43.19	3.19
1308	Bosworth Bros' Ground Bone	4.09	21.95	36	32	29	3	----	35.00	37.26	2.26
1146	Rogers & Hubbard's Damp Bone Sawings	2.11	16.54	93	6	1	----	----	25.00	27.26	2.26
1273	Forrester's Pure Ground Bone	3.97	22.99	80	20	----	----	----	39.00	41.00	2.10
1197	Rogers & Hubbard Pure Raw Knuckle Bone "Gr. A," Ex. F.	4.12	24.19	30	23	47	----	----	38.00	39.10	1.10
1231	E. Smith's Ground Bone	3.93	20.59	32	38	24	6	----	34.00	35.08	1.08
1266	F. C. Slade's Ground Bone	4.15	21.59	29	36	14	10	11	35.00	35.57	.57
1156	Shoemaker's Swift Sure Bone Meal	6.62	19.82	59	31	10	----	----	45.00	45.23	.23 Cost exceeds valuation.
1200	Peck Brother's Bone	3.97	22.21	15	21	42	18	4	35.00	34.29	.70
1239	" Boiled Bones	4.15	22.46	14	15	30	35	6	35.00	33.95	1.05
1195	Rogers & Hubbard Pure Raw Knuckle Bone Grade "Meal"	4.02	23.64	34	34	32	----	----	40.00	38.94	1.06
1265	Miller's Ground Bone	4.17	21.10	26	23	32	19	----	36.00	34.90	1.10

Bone Manures.—*Continued.*

Station No.	Name or Brand.	Nitrogen.	Phos. Acid.	Finer than 1/50 inch.	Finer than 1/25 inch.	Finer than 1/12 inch.	Finer than 1/6 inch.	Coarser than 1/6 inch.	Cost per ton.	Valuation per ton.	Cost exceeds valuation.
1196	Roger's & Hubbard's Pure Ground Bone, Grade AX	4.04	21.27	26	23	37	14	----	$36.00	$34.87	$1.13
1219	Darling's Fine Ground Bone	3.51	22.98	77	16	7	----	----	42.00	39.10	2.90
1230	P. W. Bennett's Ground Bone	3.51	23.90	10	14	24	43	9	36.00	32.80	3.20
1238	Peck Bros' Raw Kitchen Bones	4.03	20.80	10	15	28	35	12	35.00	30.40	4.60
1199	Atwood Brothers' Bone	3.91	19.60	8	14	23	20	35	35.00	28.46	6.54
1242	" Ground Bone	3.74	18.59	12	20	26	24	18	35.00	28.58	6.42
1241	F. C. Slade's Bone	3.65	17.38	20	20	22	26	12	35.00	27.97	7.03
1145	Lister Bros' Celebrated Ground Bone	3.25	13.81	44	20	18	17	1	33.00	25.31	7.69
1158	Quinnipiac Bone	3.38	18.71	5	5	11	11	68	35.00	23.96	11.04
1284	Preston's Ground Bone	4.02	9.18	38	17	23	13	9	34.00	22.01	11.99
1240	Atwood Brothers' Ground Bone	3.17	15.81	9	12	22	22	35	35.00	22.95	12.05
1290	E. Frank Coe's Ground Bone	2.20	12.68	43	14	18	13	12	35.00	21.89	13.11
1229	Ground Bone	2.34	13.39	24	16	16	12	32	35.00	19.77	20.23
1185	Flour of Bone	1.50	30.03	87	13	----	----	----	----	40.97	----
1309	G. H. Harris & Son's Ground Bone	3.99	20.48	16	22	21	17	24	----	31.03	----
1127	Meat and Bone from Adams & Thomas	4.92	15.88	----	----	----	----	----	----	----	----
1330	Buckhorn Sawings	5.28	22.29	----	----	----	----	----	----	----	----

agreement that he would take 1000 lbs. of ground Bone as part payment, the balance to be cash." The sender writes that the grinder "makes it a part of his business to grind and sell Bone to the farmers of this vicinity." He also writes, "The price I paid ——— for the ground Bone was $35.00 per ton."

The grinder of this Bone, in verbal statement, was understood to say on the other hand, that he does "not sell bone but grinds bone for those who bring it," that "this bone was brought by and ground for the sender of the sample, and that it was so very sandy as to greatly injure the mill."

That Bones should carry so much as *one-third their weight* of sand, coal, and coal-ashes is difficult to understand. That various matters are often thrown into bone-mills to clear the grinding surfaces is well known. That the sample **1229** fairly represents the lot from which it was taken the Station cannot assert. Under these circumstances the results of the analysis are given but the names of the parties concerned are withheld.

1185, 1237, and **1246** are articles which have been boiled or steamed in the glue factory to remove their gelatine, etc. In consequence, the larger part of the nitrogen which they originally contained has been removed and the percentage amount of phosphoric acid is higher than in raw bone. The articles are fine and very dry. They are an excellent source of phosphoric acid in assimilable form. It is stated by the manufacturer that Nos. **1238** and **1239** are not brands entered for sale, but are ground and mixed to make the "Pure Ground Bone" No. **1200.**

Dry Ground Fish.

Five samples of Fish Scrap offered for sale in this State have been examined during the year. In all cases the goods have been considerably above their guarantee, and with one exception the valuation has been above the cost.

1217 was very wet, containing 27.71 per cent. of moisture. The "Manufacturer's Sample" of the same goods contained only 22.26 per cent. of water, and it is therefore possible that **1217** is damaged goods and does not fairly represent the brand.

The average cost of these five samples has been $39.00, and the average valuation $42.34.

Dry Ground Fish.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1159	Stearns' Dry Ground Fish Guano.	Stearns & Co., New York and Fall River, Mass.	A. S. Russell, Meriden.	Station Agent.
1285	Wilcox Fish Guano, Dry Ground.	L. Wilcox & Co., Mystic Bridge.	J. A. Lewis, Willimantic.	"
1201	Bowker's Dry Ground Fish.	Bowker Fertilizer Co., 43 Chatham St., Boston. Mass.	Usher & Tinker, Plainville.	"
1135	Quinnipiac Dry Ground Fish.	Quinnipiac Fertilizer Co., New London.	Olds & Whipple, Hartford.	"
1217	Preston's Dried and Ground Fish Guano.	H. Preston & Sons, Green Point, L. I.	Wilson & Burr, Middletown.	"

Dry Ground Fish—Analyses and Valuations.

Station No.	Name or Brand.	Nitrogen.				Phosphoric Acid.							Cost per Ton.	Valuation per Ton.	Valuation Exceeds Cost.
		From Ammonia.	From Organic Matter.	Total Nitrogen Found.	Nitrogen Guaranteed.	Soluble in Water.	Reverted.	Insoluble.	Total Phos. Acid Found.	Phos. Acid Guaranteed.	Available. Found.	Available. Guaranteed.			
1159	Stearns' Dry Ground Fish	.68	8.13	8.81	*7.40*	.80	4.79	2.89	8.48	*7.00*	5.59	....	$40.00	$48.33	$8.33
1285	Wilcox Fish Guano, Dry Ground	....	8.54	8.54	*7.40*	1.85	4.70	.53	7.08	...	6.55	....	40.00	46.80	6 80
1210	Bowker's Dry Ground Fish	....	8.44	8.44	*6.60*	.90	3.78	2.73	7.41	....	4.68	....	40.00	44.82	4.82
1135	Quinnipiac Dry Ground Fish	.46	7.79	8.25	*7.40*	1.22	3.37	1.97	6.56	*6.00*	4 59	*2.00*	40.00	43.46	3.46
1217	Preston's Dried and Ground Fish Guano	....	4.26	4.26	*4.12*	2.01	3.60	.85	6.46	*5.00*	5.61	....	35.00	28 30	Cost exceeds valuation. 6.70

Nitrate of Soda.

1244. Nitrate of Soda. Sold by H. J. Baker & Bro., New York City. Sampled and sent by J. M. Milbank, Greenfield Hill.

1192. Nitrate of Soda. Sold by Geo. B. Forrester, New York City. Sampled and sent by M. S. Baldwin, Naugatuck.

1182. Nitrate of Soda. Sold by Mapes F. & P. G. Co., New York. From stock bought by T. N. Bishop, Plainville. Sampled by Station Agent.

1176. Nitrate of Soda. Sold by Mapes F. & P. G. Co., New York. Sampled and sent by C. H. Cables, Thomaston.

	1244	1192	1182	1176
Nitrogen Guaranteed,		*16.1*	*15.6*	*15.8*
Nitrogen found,	16.13	16.02	15.90	15.95
Equivalent nitrate of soda,	97.93	97.30	96.55	96.84
Cost per ton,	$61.50	56.00	52.50	54.50
Nitrogen costs per lb.,	19.1 cts.	17.8 cts.	16½ cts.	17.1 cts.

Under date of January 17, 1884, Marshall Marsh, of New Milford, writes:

"I send you a sample of saltpetre bought of Martin Hungerford, Gaylordsville, Ct., which I wish you would please analyze and send me the result. This saltpetre was guaranteed to be pure and such as was used in the manufacture of powder. Cost 6½ cents per pound."

The sample, No. **1063**, had the following composition:

Moisture,	1.25
Soda,	45.84
Potash,	none
Chlorine,	37.96
Nitric acid,	23.22
Sulphuric acid,	trace
Other matters by difference,	.28
	108.55
Deduct oxygen equivalent to chlorine,	8.55
	100.00

Its proximate composition may be represented as follows:

Sodium nitrate (Chili saltpetre),	36.55
Sodium chloride (common salt),	61.92
Water,	1.25
Other matters,	.28
	100.00

To Mr. Marsh was written:

"The sample contains, as you see, no trace of saltpetre, 'such as is used in the manufacture of gunpowder,' that is, nitrate of potash. It is a mixture of a little more than one-third Chili saltpetre, or soda saltpetre, and nearly two-thirds common salt. Such a mixture could only be applied to land with great caution, on account of this large proportion of salt.

"With regard to its commercial value: Pure Chili saltpetre, nitrate of soda, can be bought in this State for $70.00 per ton, or 3½ cents per pound. This material is not worth as a fertilizer more than one-third to one-half as much."

Sulphate of Ammonia.

1257. Sulphate of Ammonia. Sold by National Fertilizer Company, Bridgeport. Sampled and sent by R. A. Moore, Kensington.

1173. Sulphate of Ammonia. From factory of E. H. Wardwell, in New Haven. Purchased in New York, sampled and sent by J. J. Webb, Hamden.

1102. Sulphate of Ammonia. From factory of E. H. Wardwell, in New Haven. Sampled by Station Agent.

	1257	1173	1102
Nitrogen,	20.63	20.37	20.22
Equivalent ammonia,	25.05	24.74	24.56
" sulphate ammonia,	97.26	96.03	95.32
Cost per ton,	$65.00	62.50	
Nitrogen costs per lb.,	16.3 cts.	15.3 cts.	

Meat and Plaster.

1312 is a sample of meat and plaster, made by W. Burr Hall, of Wallingford, and sent to the Station by him as manufacturer's sample. The analysis is as follows:

Nitrogen,	1.60
Phosphoric acid,	.77

The amount of plaster was not determined. The valuation is $6.68 per ton for the phosphoric acid and nitrogen.

Linseed Meal and Castor Pomace.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Sampled and sent by
1080	Castor Pomace.	H. J. Baker & Bro., 215 Pearl St., New York City.	Manufacturer.	Manufacturer.
1315	R. B. Brown Oil Co's Castor Pomace.	R. B. Brown Oil Co., St. Louis, Mo.	"	"
1154	Collier's Castor Pomace.	Collier White Lead and Oil Co., St. Louis, Mo.	Olds & Whipple, Hartford.	Station Agent.
1306	St. Louis Lead and Oil Co's Castor Pomace.	St. Louis Lead and Oil Co., St. Louis, Mo.	F. Ellsworth, Hartford.	"
1081	Linseed Meal. CLXXIV.	Same as fodder	Wilder & Puffer, Springfield, Mass.	H. H. Austin, Suffield.

Linseed Meal and Castor Pomace—Analyses and Valuations.

Station No.	Name or Brand.	Nitrogen.	Phos. Acid.	Potash.	Cost per Ton.	Valuation per Ton.
1080	H. J. Baker's Castor Pomace	5.33	1.68	1.06	----	$22.11
1315	R. B. Brown Oil Co's Castor Pomace	5.35	1.80	1.19	----	22.43
1154	Collier's Castor Pomace	5.68	1.99	1.16	$25.00	23.83
1306	St. Louis Lead and Oil Co's Castor Pomace	5.60	1.90	.94	24.00	23.24
1081	Linseed Meal	5.73	2.50	1.60	28.00	24.99

Potash Salts.

1189. Bisulphate of potash. Sold by Geo. B. Forrester, New York City. Sent by M. S. Baldwin, Naugatuck.

1181. Muriate of Potash. Sold by C. V. Mapes, New York. From stock purchased by C. H. Cables, Thomaston. Sampled by Station Agent.

1174. Muriate of Potash. From stock of H. J. Baker & Bro, New York. Sampled and sent by J. J. Webb, Hamden.

1326. Muriate of Potash. Stock of H. J. Baker & Bro. Sampled and sent by Dennis Fenn, Milford.

1255. Muriate of Potash. Stock of National Fertilizer Company, Bridgeport. Bought and sent by R. A. Moore, Kensington.

1247. Kainite. Stock of H. J. Baker & Bro. Bought and sent by J. M. Millbank, Greenfield Hill.

1183. Kainite. From Bowker Fertilizer Company, Boston, Mass. Stock of Usher & Tinker, Plainville. Purchased of them by T. N. Bishop, and sampled by Station Agent.

1187. Kainite. From H. J. Baker & Bro., New York. Stock of R. B. Bradley & Co., New Haven. Sampled by Station Agent.

1252. Kainite. From H. J. Baker & Bro., New York. Stock of R. B. Bradley & Co., New Haven. From one bag bought by the Station.

Potash Salts Analyses.

	1189	1181	1174	1326	1255	1247	1183	1187	1252
Potash guarant'd	*38.10*	----	----	*52.90*	*50.1*	----	*12.00*	----	----
Potash found	33.87	53.78	50.22	51.59	47.65	12.47	12.12	12.12	12.71
Equiv. Sulphate	62.60	----	----	----	----	23.06	22.40	22.40	23.50
Equiv. Muriate	----	85.18	79.54	81.60	75.47	----	----	----	----
Cost per Ton	*$52.50	*$37.50	36.50	40.00	37.00	*$10.50	15.00	----	----
Potash costs per 100 lbs.	$ 8.26	3.90	3.63	3.87	4.09	4.21	6.19	----	----

* In New York.

1189 is a sample of "bisulphate of potash," stated by the purchaser to have been guaranteed "70½ per cent. test," a guarantee ambiguous in the case of a bisulphate, but which may mean 70½ per cent. of either potassium sulphate or potassium bisulphate, equivalent to 38.1 or 24.4 per cent. of actual potash.

A letter from the seller makes it clear that the former figure was the one meant in the guarantee. New York analyses showed 36.65 per cent. of potash, equivalent to 67.76 per cent. of sulphate.

In Bulletin No. 78, p. 7, an analysis of the article is given showing only 33.87 per cent. of potash, or 62.6 per cent. of sulphate. This discrepancy is accounted for by the fact that the Station only determines and takes account of potash which is freely soluble in boiling water, for the reason that the farmer in buying it requires that it should be in a readily available, hence a soluble form. This article contains a considerable amount of potash not readily soluble.

The full analysis is given below:

Insoluble in Acid	1.87
Iron Oxide	3.86
Lime	.37
Magnesia	.22
Potash	35.33
Soda	5.94
Sulphuric Acid	41.24
Chlorine	8.76
Water and Undetermined	2.41
	100.00

1287 and **1252** are samples of goods in stock of R. B. Bradley & Co., of New Haven, stated to have been bought of H. J. Baker & Bro. They were in bags plainly labeled "Double Sulphate of Potash and Magnesia; 48–52 per cent., Sulph. Pot., 32–36 per cent. Sulph. Magnesia." **1252** was bought by the Station for double sulphate of potash and magnesia and applied to a plot of land in the belief that it was true to the label. Subsequent examination proved that both samples were kainite and not what they were labeled. In the bill rendered the goods were properly charged, however, as kainite.

Potash in kainite costs considerably more than in high grade muriate, and in most cases probably the magnesia and soda salts in the kainite are of no special advantage. It is used by manufacturers as a source of potash in mixed goods intended to carry but little potash, and serves at the same time as a "make-weight" to bring the goods down to the quality of "cheapness" called for by customers. It is cheaper for them to use kainite, even though actual potash costs more in it than in muriate, than to use muriate and to be obliged to put in plaster or other ballast.

Cotton Hull Ashes.

Six samples of "Potash Fertilizers," in one case "said to be ashes of Cotton Seed Hulls," and in another called "Sulphate of Potash," but evidently also cotton hull ashes, have been analyzed for parties in Suffield and Warehouse Point. All of them were bought of R. E. Pinney, Suffield. The results are as follows:

	1087	1147	1112	1268	1088	1125
Soluble phosphoric acid	1.47	2.14	1.34	.73	.25	.94
Reverted " "	4.18	4.72	5.59	5.88	4.40	4.69
Insoluble " "	.52	2.77	3.13	3.34	.51	.45
Potash soluble in water,	32.52	27.73	23.80	19.13	21.87	17.81
Potash insoluble in water,		----	1.19	2.78		
Cost per ton,		$39.00	39.00	39.00		39.00
Valuation,	$58.08	55.34	50.07	42.79	40.59	36.54

This material, as the analyses show, is not uniform in composition. The phosphoric acid varies from 5.2 per cent. to 10.0, and the potash from 17.8 to 32.5 per cent. The samples which are dark in color, **1088, 1125** and **1268,** are inferior to those which are light gray.

The water-soluble potash is valued at $7\frac{1}{4}$ cents per lb. since chlorine is not present in any considerable quantity. The potash insoluble in water is disregarded in the valuation.

Phosphoric acid is valued at 10, 9 and $4\frac{1}{2}$ cents, as in superphosphates. These articles furnish potash in a cheap and desirable form for tobacco, and we understand they were used chiefly on tobacco land.

The ashes are obtained from cotton seed oil factories. The seed before pressing is hulled, and the hulls are used partly or entirely for fuel in the furnaces. The ashes are liable to be mixed with coal ashes.

Wood Ashes.

1166. Wood ashes from house fires. Sent by D. H. VanHoosear, Wilton.

1297. Ashes from Merwin's brick kilns, Berlin. Sampled and sent by R. A. Moore, Kensington.

Analyses.	1166	1297
Phosphoric acid,	1.98	.80
Potash soluble in water,	7.51	1.42
Matters insoluble in acid,		64.80
Cost per ton,		$4.00

The poor quality of the brick kiln ashes is due chiefly to the fact that they contain so large a proportion of brick dust and sand; besides this to the fact that chestnut wood is largely used in the kilns which seems to be poorer in potash than the harder kinds.

If the brick kiln ashes could be kept from large admixture of sand and brick dust, they would be valuable to farmers in the vicinity. Poor as they are now (three-fifths sand and brick dust) they would no doubt be beneficial on many soils, but the *profitableness* of their use at $4.00 a ton would largely depend upon the cost of transportation.

Hen Manure.

1167. Sampled and sent by D. H. VanHoosear, Wilton. The material was very dry and did not contain as large an admixture of earth as is frequently the case.

Analysis.	
Phosphoric acid,	2.43
Potash,	1.59
Nitrogen as ammonia,	.36
Nitrogen of organic matter,	2.45
Cost per ton,	$12.50

Reckoning nitrogen at 20 cents per lb., potash at $4\frac{1}{4}$ cents, and phosphoric acid at 6 cents, the valuation of this article would be $15.51.

Elephant's Dung.

1064. This article was sent by Bradley Nichols & Sons, of Bridgeport. It is purchased by them from the winter quarters of Barnum's circus in large quantities. It is understood to be the solid portion of the excrement, quite free from litter and containing probably little of the urine of the animals. For comparison are given analyses of stable manure from the stables of New York Street Railroad Companies, consisting of horse dung, urine

and litter, cow manure containing no litter, and well rotted yard manure in its usual condition. The last three analyses were made by the writer in 1873, and published in the Report of the Board of Agriculture for that year.

	Elephant's Dung. 1064		Fresh Horse Manure.		Fresh Cow Manure.		Old Yard Manure.	
Water		78.79		75.76		85.30		54.70
Organic and Volatile Matters		19.63		19.17		12.66		10.87
Containing Nitrogen:								
From Ammonia	.02		.26		.07		.03	
From Organic Matters	.20		.27		.31		.43	
Total Nitrogen	.22		.53		.38		.46	
Ash containing:								
Potash	.30		.51		.36		.16	
Soda	.08		.09		.04		.07	
Lime	.10		.30		.29		.47	
Magnesia	.06		.19		.19		.50	
Oxide of Iron and Alumina	.03	1.58	.19	5.07	.09	2.04	2.00	34.43
Sulphuric Acid	.05		.09		.04		.01	
Phosphoric Acid	.13		.41		.16		.72	
Chlorine	.02		.07		.07		trace	
Sand, Clay and Insoluble	.81		3.22		.80		30.50	
		100.00		100.00		100.00		100.00

The elephant's dung represented by this sample is quite inferior to either of the samples of stable manure. This may be largely due to the fact that only the solid excrement was taken for analysis. The solid portions represent what passes through the animal undigested; the urine represents what has been assimilated from the food and has served its purpose in the animal economy. When animals are kept on a "maintenance ration;" most that is valuable in the food either as nourishment or as manure is assimilated and passes off, not through the intestines but the kidneys. It is just this valuable portion of the manure that so often is allowed to run to waste in the stable or barn yard.

The quality of manure (liquid and solid) is directly dependent on the quality of the food, being best when the food is most nutritious, and it is probable that the food of the elephants during the winter is less nutritious than that of milk cows or hard-worked horses.

Damaged Grain.

1152. A sample of grain damaged by fire and water taken from the ruins of a mill was sent to the Station by Joseph Sellers, of Gildersleeve. The analysis is as follows:

Water,	51.10
Phosphoric acid,	1.82
Nitrogen,	1.69

Such material would answer for the compost heap, but with half its weight consisting of water, could not profitably be transported far. Compare analysis with those of Stable Manure above.

Paper Mill Waste.

1258. A sample of this material sent by Henry Barrows, of North Manchester, contained

Water,	5.40
Organic and volatile matter,	45.16
Ash,	49.44
	100.00

The organic matter contained 1.39 per cent. of nitrogen, and in the ash were .39 per cent. of phosphoric acid, and 41.84 per cent. of sand and earth. The material is probably the refuse removed from rags before pulping them for the paper manufacture.

Marine Mud.

A sample of Marine Mud, **1082,** sent to the Station in December last, by W. T. Foote, of Guilford has the composition given below. For comparison are given three other analyses. One of New Haven harbor mud, (1860), another of mud from Saybrook, (1879), and a third of mud from Guilford, (1882).

				1082.
	N. Haven Harbor.	Saybrook.	Guilford. 1882.	Guilford. 1883.
Water.	*Dry*	71.32	45.68	49.11
Organic and volatile matters,	10.56	2.79	4.54	3.20
Nitrogen,	(.52)	(.14)	.18	
Sand and insoluble,	77.63	20.82	40.97	33.90
Oxide of iron and alumina	7.36	2.62	6.14	3.75
Lime,	.73	.26	.90	3.62
Magnesia,	.73	.51	.05	.73
Potash,	.77	.17	.36	.34
Soda,	.80	.60	.56	.83
Sulphuric acid,	.96	.39	.79	.18
Phosphoric acid,	.03	trace	trace	.68
Chlorine,	.43	.51		.91
Carbonic acid				2.93

The analysis of New Haven harbor mud was made on a dry sample and is not directly comparable with the others.

Swamp Muck.

1295. Swamp Muck, taken two feet below the surface of the swamp, sun dried.

1296. Swamp Muck, taken from same swamp as **1295,** from surface and not over two inches below the top, sun dried.

These two samples were sent by Jas. N. Bishop, Plainville.

Analyses.

The fresh material contains:	1295	1296
Water,	58.75	38.11
Organic and volatile matter,*	37.13	31.00
Ash,	4.12	30.89
	100.00	100.00
*With nitrogen,	.81	1.06
The ash contains:		
Sand and soil,	1.67	22.06
Oxide of iron, and alumina,	.63	6.41
Lime,	1.06	.80
Magnesia,	.11	.42
Phosphoric acid,	.04	.32
The dry muck contains:		
Organic and volatile matter,	89.85	49.6
Nitrogen,	1.96	1.7
Sand and soil,	4.03	35·3
Oxide of iron and alumina,	1.52	10.3
Lime,	2.56	1.3
Magnesia,	.27	0.7
Phosphoric acid,	.09	0.5

The chief difference in these mucks is that the surface muck contains a good deal of sand and earth while the lower layers are comparatively free from it.

Marl.

1059 is a sample of "Marl" sent to the Station by L. S. Wells, of New Britain. He writes, "It was taken from a sewer ditch near the High School in New Britain. The formation is as follows: Surface filling 12 inches, next peat or muck 18 inches, and below this 3 feet or more of "marl." Underneath this there is probably gravel. Has it value as a fertilizer?"

The analysis is as follows:

Water,	9.88
Insoluble in acid,	59.05
Oxide of iron and alumina,	4.95
Lime,	9.81
Magnesia,	1.07
Phosphoric acid,	trace
Carbonic acid,	7.45
Other matters by difference,	7.79
	100.00

In the organic matter of the marl was .22 per cent. nitrogen. The material has very little value as a fertilizer, except what lies in its 18 per cent. of carbonates of lime and magnesia. These ingredients would make it a useful application to most of our soils.

Land Plaster.

1153. Cayuga Land Plaster. From stock of Cayuga Plaster Co., Union Springs, N. Y. Sampled by William A. Nettleton, Bridgeport, Ct. Cost $3.00 per ton in car lots.

1109. Onondaga Land Plaster. Stock of Wm. H. Earle & Co., Worcester, Mass. Sampled and sent by J. P. Barstow & Co., Norwich.

1153 contained 30.03 per cent. of sulphuric acid and 11.17 per cent. of insoluble matters.

1109 contained 34.46 per cent. of sulphuric acid and 6.05 per cent. of insoluble matters.

The composition of the samples is as follows:

	1153	1109
Hydrated sulphate of lime (gypsum),	74.09	64.56
Matters insoluble in acids,	6.05	11.17
Other matters, chiefly carbonate of lime,	19.86	24.27
	100.00	100.00

Pollard's Special Fertilizers.

Four samples of these special manures have been analyzed during the year.

They are not tabulated with the others on page 54, because any fertilizers bearing the name of Pollard have in this State a special savor of their own which forbids their being ranked with those of any other manufacturer.

The following with regard to him and them is reprinted from the last Station Bulletin:

The first work of this Station on its establishment in 1877 was to analyze two samples of Pollard's Fertilizers, sold by "H. M. Pollard, Agricultural Chemist," and made by "Pollard Bros." of New Haven, from harbor mud. The goods were a little more valuable agriculturally, and decidedly less valuable commercially than the barrels in which they were put up. The results of the analyses were published and Mr. Pollard went elsewhere.

In the Station Report for 1880, p. 26, is some further account of his operations and an analysis of "Pollard's Concentrated Privy Guano," brought to the Station by a person who gave his name and address as F. C. Cook, 119 Ellsworth ave., New Haven, but who probably was H. M. Pollard, and who said he had purchased ten tons of the material. A sample of it was made up of nitrates and phosphates of potash, soda and ammonia flavored with night soil. It could not be sold with any profit to the maker or compounder for much less than $130 per ton, but was said to have been bought for $65.00.

The right to manufacture this fertilizer was afterwards sold, or offered for sale, at several places in Pennsylvania for $500 by the enterprising originator. The analysis made at this Station was shown and it was asserted that this Concentrated Privy Guano could be made for $13.56 per ton.

Last August the Station analyzed four samples of "Pollard's Special Fertilizers," sent by the *New England Homestead*, being samples got by them of the Perry Oil Co., Pawtucket, R. I., with whom "Prof." H. M. Pollard, the "Agricultural Chemist," had an office at that time.

The analyses and valuations are as follows:

Pollard Special Fertilizers.

	Top Dressing.	For Corn.	For Potatoes.	For Cabbage.
Station No.	**1278**	**1279**	**1280**	**1281**
Nitrogen as ammonia,	3.11	2.71	2.16	3.03
Nitrogen of organic matter,	2.63			
Soluble phosphoric acid,	.96	.59	.35	.43
Reverted phosphoric acid,	3.03	4.09	4.02	3.85
Insoluble phosphoric acid,	2.31	6.07	6.57	5.41
Potash,	6.48	6.26	5.83	5.45
Cost,	$50.00	50.00	50.00	50.00
Valuation,	$39.15	31.24	28.31	30.60
The guarantees were:				
Ammonia,	3½	3½	3	4
Phosphoric acid,	5	8¾	7½	8¾
Potash,	4	5¼	8	5½

The cost of these goods was $50.00, the average valuation $32.32; difference $17.68 per ton, or 54.7 per cent. of the valuation.

This is more than double the average difference between the cost and valuation of the superphosphates analyzed this year, or four times the average difference between the cost and valuation of the special manures.

According to the *N. E. Homestead*, Pollard has been operating lately in Rhode Island and Southeastern Massachusetts; "analyzing" soils and prescribing for them at the very modest price of 50 cents per acre. The reason for again referring to the man is to warn Connecticut farmers against him. His effrontery is boundless and it would not be at all surprising if he should before a great while begin his swindling operations in this State again—and practice for a time successfully. "Prof." H. M. Pollard, "Dr." Pollard, or "Prof. Geo. H. Stockbridge," "Agricultural Chemist," "State Chemist to Rhode Island and afterwards to Massachusetts," "not Prof. Stockbridge of the Massachusetts Agricultural College," but "another Stockbridge," sometimes "a brother," sometimes "a nephew," but always the same ubiquitous Pollard, is described as a man "62 years old, 5 feet 7½ inches in height, weighs about 180 pounds, has a light complexion, light eyes, sandy gray whiskers and gray hair."

The *New England Homestead* of Sept. 6, 1884, contains a full and entertaining account of the operations of this persistent and picturesque swindler.

REVIEW OF THE FERTILIZER MARKET.

Organic Nitrogen.

In Dried Blood, at wholesale, nitrogen was quoted in the New York market during December, 1883, at about 14.4 cents per pound, which was the highest figure for the year. It fell in January of this year to 12.9 cents, rallied somewhat, and in May and June was quoted at 14 and 13.9 cents per pound. It again fell, selling in November at 12.4 cents.

In Azotin, at wholesale*, nitrogen was quoted in the New York market at 17.0 cents in December, 1883. It fell to 13.2 cents in January 1884, rose to 13.9 cents in May and fell steadily to 12.6 in November.

Dry Ground Fish Scrap, at wholesale, was quoted in New York at $25.50 per ton in December, 1883. It fell to $23.90 in March, rose to $24.75 in May, and since then has fallen quite steadily to $23.00 in November.

The average composition of Fish Scrap, as determined in nine analyses, made during the year in Massachusetts, New Jersey and Connecticut is, nitrogen 8.37 per cent., phosphoric acid 7.61 per cent. Now, if we take 4.8 cents per pound as the wholesale cost of phosphoric acid in fish (6 cents, the retail price, less 20 per cent.), we may reckon *approximately* the wholesale cost of nitrogen in Fish Scrap as follows:

10.8 cents per pound in December, 1883, falling to 9.9 cents in March, rising to 10.4 in May, and since then falling steadily to 9.3 in November.

The retail cost of organic nitrogen at New York and Philadelphia factories during the last season has been about as follows:†

In dried blood, 4 samples,	18.3 cents per lb.
In ammonite and tankage, 4 samples,	15.8 " "
In dry ground fish,‡ 2 samples,	12.5 " "
In castor pomace,‡ 1 sample,	20.2 " "

* Azotin and Ammonite are trade names for animal matter (meat scrap, cracklings) very dry and free from grease.

† Bull. N. J. Ag'l Exp't Station, XXXIV., p. 5.

‡ Valuing phosphoric acid at 6 cents per pound.

The retail cost in the Connecticut market during the season has been:

In dry ground fish,† 4 samples,	18.3 cents per lb.
In castor pomace,† 2 samples,	19.7 " "

The average *wholesale* cost of nitrogen in dried blood, azotin, and fish scrap, for the last year, has been about 12.4 cents per pound in New York.

The average *retail* cost of nitrogen in the same goods at New York and Philadelphia, has probably been about 16.2 cents or 30 per cent. above the wholesale rates.

The average *wholesale* cost of nitrogen in blood and azotin alone has been 13.6 cents; average *retail* cost of same 17 cents, or 25 per cent. advance on wholesale rates.

Nitrogen of Ammonia Salts.

At wholesale in New York, nitrogen was quoted at 16.4 cents per pound in December and January last, which were the highest figures for the year. It fell to 14.6 cents in April, rallied to 15.3 cents in May, and did not vary much from 14.8 cents till November, when it was quoted at 15.2.

At retail the average price of nitrogen in New York and Philadelphia appears to have been about 17.1 cents per pound during the season, varying from 19.2 cents to 15.5 cents.*

In the Connecticut market it has sold for 15.8 cents per pound, being the cheapest form of available nitrogen for sale in this State during the season.

The average wholesale cost of nitrogen in sulphate of ammonia for the last twelve months has been about 15 cents per pound.

The average retail cost has been about 16.8 cents per pound or 12 per cent. advance on the wholesale price.

* Bull. N. J. Ag'l Exp't Station, XXXIV., p. 5.

† Valuing phosphoric acid at 6 cents per pound.

Nitrogen of Nitrate of Soda.

At wholesale in New York nitrogen was quoted in December, 1883, at 15.2 cents per pound. It fell in January to 14.8 cents, in February to 14.3 cents, and has not varied very much from that figure through the year.

At retail, in New York and Philadelphia markets during the season it has sold for from 18.9 cents to 15.5 cents; average 16.9 cents per pound.

At retail in this State, nitrogen of nitrate of soda has cost from 19.1 cents to 16.5 cents per pound; averaging 16.7 cents.

The average wholesale cost of nitrogen in nitrate of soda has been about 14.3 cents per pound during the year.

The average retail cost has been about 17.1 cents per pound, or 19.5 per cent. advance on the wholesale rates.

Phosphatic Materials.

Refuse Bone Black, which in December, 1883, was quoted at $22.50 per ton wholesale in New York, declined in February of this year to $22.00. In May it was quoted at $21.50, in June $20.37, in July and August $21.75, then fell to $16.50 in October, where it remained in November.

Ground Bone remained steady at $31.50 per ton till July, fell to $30.50 in August, and since then has been quoted at $29.00.

Charleston Rock, f. o. b. in New York, quoted in December of last year at $8.50 per ton, remained steady till April. In May it was quoted at $8.75, and has held that price ever since.

Sulphuric Acid 66° quoted at $1\frac{3}{8}$ cents per pound in December, 1883, fell to $1\frac{1}{4}$ in February, and since July has averaged a shade lower (1.22).

The above are wholesale quotations. If we assume that soluble, reverted and insoluble phosphoric acid have commercial values which stand in the ratio of 10, 9, and $2\frac{1}{4}$, as is assumed in our valuations, then the New York *retail cost* of soluble phosphoric acid bought direct of manufacturers, as shown in analyses reported by the New Jersey Station, has been on the average:

In bone black superphosphates,	7.3 cents per lb
In South Carolina rock superphosphates,	8.6 " "

In Connecticut markets the retail cost of soluble phosphoric acid has averaged 9.2 cents per pound, the extremes being 7.5 cents and 10.5 cents.

Actual Potash.

In Muriate of Potash.

At wholesale in New York potash in muriate was quoted in December, 1883, at 3.22 cents per pound. It rose in May to 3.44 and since then has ruled quite steadily at 3.38 cents per pound. The average price for the year has been about 3.3 cents.

At retail in New York and Philadelphia it has cost on the average about 3.7 cents, and in Connecticut 3.87 cents per pound, or 17.3 per cent. advance on the average wholesale quotation for the year.

In Kainite.

At wholesale in New York kainite was quoted in December, 1883, at $8.65 per ton. It fell steadily till April, when it cost $7.13 per ton. It rallied to $7.83 in July, and fell again in August to $7.50, in September to $7.00, and in November to $6.38.

The average price for the year has been about $7.57 per ton.

Kainite varies somewhat in composition. Assuming 12.2 per cent. of actual potash as its average content, the above quotations may be expressed in cost of actual potash, as follows:

At wholesale in New York actual potash in kainite cost 3.5 cents per pound in December, 1883. It fell steadily till April, when it cost 2.9 cents per pound. It rallied to 3.2 cents in July, and fell again in November to 2.5 cents per pound.

The average wholesale price for the year has been about 3.1 cents per pound.

At retail in New York and Philadelphia potash in kainite has cost about 4 cents per pound. In the two samples here analyzed it has cost 4.21 cents and 6.19 cents per pound.

To recapitulate, nitrogen has fallen during the year considerably. Phosphatic materials are lower, with the exception of South Carolina rock, which is a little higher than a year ago. Sulphuric acid is a shade lower and potash is a little higher.

The market quotations given above are taken from the "Oil, Paint and Drug Reporter," published in New York. The weekly

quotations for each month are averaged, and this average is taken as the quotation for the month.

There is a field here which might be profitably occupied by our agricultural papers, in securing *trustworthy* wholesale and retail quotations of fertilizers and fertilizing chemicals from the Boston, New York and Philadelphia markets and arranging them in a way which could be readily understood.

The following explanations will be helpful in the examination of the market quotations, and will also serve to show the basis on which they have been interpreted in this review:

Phosphate rock, *kainite*, *bone*, *fish scrap*, *tankage*, and some other articles are quoted and sold by the ton. The seller usually has an analysis of his stock, and purchasers often control this by an analysis at the time of purchase.

Sulphate of ammonia, *nitrate of soda and muriate of potash* are quoted and sold by the pound, and generally their wholesale and retail rates do not differ very widely.

Blood, *azotin and ammonite* are quoted at so much "per unit of ammonia." A "unit of ammonia" is one per cent., or 20 pounds per ton. To illustrate: if a lot of dried blood has 7.0 per cent. of nitrogen, equivalent to 8.5 per cent. of ammonia, it is said to contain $8\frac{1}{2}$ units of ammonia, and if it is quoted at $2.25 per unit, a ton of it will cost $8\frac{1}{2} \times 2.25 = 19.13$.

The term "ammonia" is *properly* used only in those cases where the nitrogen actually exists in the form of ammonia, but it is a usage of the trade to reckon all nitrogen, in whatever form it occurs, as ammonia.

To facilitate finding the actual cost of nitrogen per pound from the cost per unit of ammonia in the market reports, the following table is given:

Ammonia at	$4.00	per unit	is equivalent to	nitrogen at	24.3	cts.	per lb.
"	3.90	"	"	"	23.7	"	"
"	3.80	"	"	"	23.0	"	"
"	3.70	"	"	"	22.4	"	"
"	3.60	"	"	"	21.8	"	"
"	3.50	"	"	"	21.2	"	"
"	3.40	"	"	"	20.6	"	"
"	3.30	"	"	"	20.0	"	"
"	3.20	"	"	"	19.4	"	"
"	3.10	"	"	"	18.8	"	"
"	3.00	"	"	"	18.2	"	"
"	2.90	"	"	"	17.6	"	"
"	2.80	"	"	"	17.0	"	"
"	2.70	"	"	"	16.4	"	"
"	2.60	"	"	"	15.8	"	"
"	2.50	"	"	"	15.2	"	"
"	2.40	"	"	"	14.6	"	"
"	2.30	"	"	"	14.0	"	"
"	2.20	"	"	"	13.4	"	"
"	2.10	"	"	"	12.8	"	"
"	2.00	"	"	"	12.2	"	"

Commercial sulphate of ammonia contains on the average 20.5 per cent. of nitrogen, though it is found to vary considerably in quality. When it has that amount of nitrogen (equivalent to 24.3 per cent. of ammonia),

At	5	cents	per lb.	Nitrogen	costs	24.4	cents per lb.
"	$4\frac{7}{8}$	"	"	"	"	23.7	"
"	$4\frac{3}{4}$	"	"	"	"	23.1	"
"	$4\frac{5}{8}$	"	"	"	"	22.5	"
"	$4\frac{1}{2}$	"	"	"	"	21.9	"
"	$4\frac{3}{8}$	"	"	"	"	21.3	"
"	$4\frac{1}{4}$	"	"	"	"	20.7	"
"	$4\frac{1}{8}$	"	"	"	"	20.1	"
"	4	"	"	"	"	19.5	"
"	$3\frac{7}{8}$	"	"	"	"	18.9	"
"	$3\frac{3}{4}$	"	"	"	"	18.3	"
"	$3\frac{5}{8}$	"	"	"	"	17.6	"
"	$3\frac{1}{2}$	"	"	"	"	17.0	"
"	$3\frac{3}{8}$	"	"	"	"	16.4	"
"	$3\frac{1}{4}$	"	"	"	"	15.8	"
"	$3\frac{1}{8}$	"	"	"	"	15.2	"
"	3	"	"	"	"	14.6	"

Commercial nitrate of soda averages 95 per cent. of the pure salt or 15.6 per cent. of nitrogen.

If quoted at	$3\frac{5}{8}$	cents per lb.	Nitrogen costs	23.2	cents per lb.
"	$3\frac{1}{2}$	"	"	22.3	"
"	$3\frac{3}{8}$	"	"	21.5	"
"	$3\frac{1}{4}$	"	"	20.8	"
"	$3\frac{1}{8}$	"	"	19.9	"
"	3	"	"	19.2	"
"	$2\frac{7}{8}$	"	"	18.3	"
"	$2\frac{3}{4}$	"	"	17.6	"
"	$2\frac{5}{8}$	"	"	16.9	"
"	$2\frac{1}{2}$	"	"	16.0	"
"	$2\frac{3}{8}$	"	"	15.2	"
"	$2\frac{1}{4}$	"	"	14.4	"
"	$2\frac{1}{8}$	"	"	13.6	"
"	2	"	"	12.8	"

Commercial muriate of potash usually has 80 per cent. of the pure salt, or $50\frac{1}{2}$ per cent. of actual potash.

If quoted at	2.00	cts. per lb.	Actual potash costs	3.96	cts. per lb.
"	1.95	"	"	3.86	"
"	1.90	"	"	3.76	"
"	1.85	"	"	3.66	"
"	1.80	"	"	3.56	"
"	1.75	"	"	3.46	"
"	1.70	"	"	3.36	"
"	1.65	"	"	3.26	"
"	1.60	"	"	3.16	"
"	1.55	"	"	3.06	"
"	1.50	"	"	2.96	"

The following table shows the fluctuations in the wholesale prices of a number of fertilizing materials in the New York market, since May, 1881. The price given for each month is the average of the four weekly quotations in that month. Sulphate of ammonia is assumed to contain 20.5 per cent. and nitrate of soda 15.6 per cent. nitrogen, and muriate of potash $50\frac{1}{2}$ per cent. of actual potash or 80 per cent. of the pure salt. For three months azotin and ammonite were not quoted at all.

		COST OF NITROGEN AT WHOLESALE IN				COST OF POTASH AT WHOLESALE IN
		Blood. cts. per lb.	Azotin or Ammonite. cts. per lb.	Nitrate of Soda. cts. per lb.	Sulphate of Ammonia. cts. per lb.	Muriate of Potash. cts. per lb.
1881.	May	21.3	21.8	21.9	24.7	3.78
	June	21.5	21.8	21.1	24.8	3.86
	July	22.0	21.8	20.8	25.6	3.92
	August	22.4	22.1	20.8	25.2	4.06
	September	23.8		20.9	24.7	3.78
	October	23.0	24.3	20.8	24.9	3.64
	November	23.3	24.3	20.4	25.6	3.62
	December	23.1		20.3	25.7	3.60
1882.	January	23.0		19.9	25.6	3.71
	February	22.3	22.2	19.8	25.6	3.60
	March	19.6	20.1	18.3	25.0	3.36
	April	19.7	19.7	18.4	23.8	3.24
	May	19.1	19.7	18.3	22.7	3.26
	June	18.9	19.7	16.9	22.4	3.28
	July	19.8	19.5	16.8	22.4	3.40
	August	19.5	19.5	16.8	22.4	3.52
	September	19.7	20.3	17.7	22.4	3.60
	October	19.7	20.1	17.8	22.3	3.56
	November	19.7	20.0	17.6	22.2	3.56
	December	19.7	20.1	17.6	21.8	3.58
1883.	January	19.7	20.1	17.9	20.7	3.51
	February	19.4	19.7	17.9	21.9	3.42
	March	18.0	18.9	17.8	20.7	3.42
	April	18.2	18.9	17.9	20.1	3.40
	May	18.2	18.9	16.3	20.1	3.34
	June	17.8	18.9	16.3	20.0	3.36
	July	17.2	18.9	15.6	19.0	3.23
	August	16.0	18.9	15.3	18.6	3.18
	September	15.3	17.0	14.8	17.6	3.21
	October	15.0	15.2	14.8	17.3	3.12
	November	14.5	15.2	15.2	16.4	3.20
	December	14.4	17.0	15.2	16.4	3.22
1884.	January	12.9	13.2	14.8	16.4	3.28
	February	13.2	13.7	14.3	15.0	3.23
	March	13.6	13.7	14.2	14.6	3.34
	April	13.6	13.6	14.0	14.6	3.38
	May	14.0	13.9	14.4	15.3	3.44
	June	13.9	13.5	13.8	14.6	3.36
	July	13.2	13.5	14.2	14.9	3.37
	August	13.6	13.3	14.3	14.7	3.36
	September	12.8	13.3	14.4	14.4	3.28
	October	12.9	13.2	14.3	14.8	3.38
	November	12.4	12.6	14.4	15.2	3.26

Answers to Correspondents with regard to Fertilizers, etc.

Value of Gas Lime.

Gas Lime is not constant in composition. Applied, fresh from the works, even in small quantity it is deadly to plants. It is made harmless by long weathering or composting, but if weathered would probably lose largely or entirely its special value as an insecticide. It is reported in agricultural papers that when dried and powdered it has been used with good effect on turnips and beets to keep off insect pests, being sprinkled on them like Paris green. Some insect pests are destroyed by proper use of any fine powder.

If you wish to try it as a fertilizer on a small plot, it should be applied very early in spring or late in the fall at the rate of say fifty bushels per acre. Slacked lime is a safer source of lime.

Causes of Failure in Use of Fertilizers.

A correspondent writes:

"Last fall in sowing my crop of spinach I used in addition to other manures, some of the —— tobacco manure, sowing it in the drill and leaving occasionally a row without fertilizing. Up to the closing in of winter the crop had made a good growth but there was not the least perceptible difference in the fertilized and unfertilized plots, and now the question has arisen, where was the difficulty? I am sure that the land was not so rich, but that a judicious application of a good fertilizer must have had some effect everything else being favorable. . . . It would seem as if an application of 500 to 600 pounds per acre applied in close contact to the roots as it would be, being sowed in the drill, should make a perceptible difference, and perhaps an analysis of this sample will throw some light upon the subject."

The fertilizer referred to in this letter was analyzed, and though somewhat below the guaranteed composition, could not be called a very inferior fertilizer.

The reply was as follows:—

"The question why the fertilizer had no perceptible effect on the crop would be difficult to answer without knowing many conditions with regard to the soil and manner of application, which it

is very difficult to ascertain. If the soil for that crop needed either phosphoric acid, nitrogen or potash this fertilizer supplied them. If the fertilizer was applied too heavily or too near the roots it might have damaged the crop, particularly if the soil was dry. Sometimes this damage is evident to the eye, sometimes it is only enough to neutralize the good effect of the manure, so that apparently the manure produces no effect at all.

Sometimes, no doubt, what the soil needs is tillage; lightening or making it more compact, and in such cases no amount of manure will help much until there has been thorough tillage of the land."

It may be added here that the full effect of high manuring can only be got with the coöperation of the prolonged high temperature and strong light of summer weather. Cold and dark seasons largely neutralize the effect of all manures.

The Supply of Lime for the Tobacco Crop.

Gypsum or Stone Lime.

In answer to a letter on this subject was written:

Gypsum is thought to be favorable to the "burning quality" of tobacco, *i. e.*, it tends to make the ash burn white. This is the result of observation, and it goes to show that the tobacco plant is able to supply itself with lime from plaster, although in so doing the lime must be separated from the sulphuric acid with which, in plaster, it is united.

If it seems desirable to substitute plaster for lime the relative quantity of the former to use is easily calculated from the statement that 56 pounds of good fresh-burned stone lime contain as much lime as 202 pounds of good unburned plaster.

I do not think, however, that it would be generally profitable to substitute plaster for lime, because, as you will see on referring to my examinations of tobacco, published in the Report of the Board of Agriculture for 1872,* the average amount of sulphuric acid reckoned to be contained in the crop of an acre of tobacco was 17 pounds, and that of lime 88 pounds.

In the amount of plaster that will supply 17 pounds of sulphuric acid there are 11.9 pounds of lime, and in the quantity of plaster which can yield 88 pounds of lime there are 126 pounds of sulphuric acid.

* See also this Report, page 96 *et seq.*

If the tobacco crop of an acre is obliged to supply itself with lime from plaster alone, this 126 pounds of sulphuric acid must be disposed of. The only way this can be done without liability of injuring the crop is by having some substance in the soil with which it can unite at once to form an inert compound. If other sulphates, such as potash, are present in the soil, or have been applied as fertilizers, their sulphuric acid will be separated in the same manner, in a degree proportional to their service in nourishing the crop, and if muriates or phosphates are on hand, their acids are likely to accumulate in the soil, because the tobacco plant takes up from all of them the alkali or base much more abundantly than the acid.

Now, *lime* applied as carbonate (or shortly becoming carbonate if supplied as slacked lime) is the cheapest, safest, and on all accounts best material to have in contact with the roots, to neutralize any acids which may become free in the soil when the plant withdraws from them the alkalies or bases they were associated with. The liberation of strong acids like sulphuric and muriatic acids in the soil, of course goes on slowly, and they are vastly diluted, and some small quantities of them may exist there without detriment.

It is, however, pretty certain that there is a liability to injury from this cause, and it is safer to avoid such liability. Again, lime as carbonate favors the conversion of the nitrogen of inert vegetable matter into nitrates, is a cheap accessory means of supplying this element, and therefore is a substitute in some degree for the costly nitrogenous fertilizers which are now so largely used. I should advise to supply to tobacco land no more than enough plaster to provide the crop with sulphur. 100 pounds of good Nova Scotia plaster, containing about 45 pounds sulphuric acid (anhydrous), 32 of lime and 22 of water, etc., will probably be enough.

If superphosphates or "specials" are used they will supply abundance or superabundance of plaster, since sulphate of lime is usually a necessary accompaniment of soluble phosphoric acid.

In such cases plaster in addition would be of no use whatever.

If sulphate of potash be used, I should apply no plaster but use with it the above amount of lime.

Especial pains should be taken to avoid all muriates or chlorine compounds.

What is Kieserite?

Kieserite is impure magnesium sulphate or Epsom salts, one of the products of the salt mines of Stassfurt, in Germany. The crude Kieserite often contains 30 per cent. or more of water, and may have considerable magnesium chloride—a compound injurious to plants if applied in any considerable quantity to them. "Calcined Kieserite" is that which has been partially freed from chlorine by heating strongly.

A recent analysis made at the Massachusetts Experiment Station showed 48.6 per cent. of magnesium sulphate (dry Epsom salts), 2.2 per cent. magnesium chloride, and the rest, 49.2 per cent., water and insoluble matter.

Complete Analysis of a Fertilizer.

Mr. S. A. Smith, when sending Sample No. **1264,** writes: "The analysis on the bag tells that there is:

Ammonia,	3 to 4½	per cent.
Available phosphoric acid,	10 to 12	"
Potash,	2 to 3	"
	15 to 19½	

Now, I should like to know what the other 80½ to 85 per cent. is composed of."

The full analysis of the sample in question is:

Potash,	3.00
Soda,	5.90
Lime,	15.17
Magnesia,	.81
Phosphoric acid,	10.95
Sulphuric acid,	21.59
Chlorine,	3.86
Sand or clay, insoluble in acid,	.65
Moisture,	14.09
Organic and volatile matters,	23.98
	100.00

With the organic (vegetable and animal substances destroyed by heat) and volatile matters are included 2.44 per cent. of nitrogen; 1.98 per cent. of this is present in the form of ammonia combined in the fertilizer with sulphuric acid.

The soda, chlorine and perhaps the magnesia, principally came from the kainite (?) used as a source of potash.

The lime, phosphoric acid and insoluble matters principally came from the phosphatic material employed. The sulphuric acid was introduced to "cut" the phosphate and make it readily soluble, which it does by combining with the lime and so setting phosphoric acid free, or causing it to form a soluble phosphate. A portion of the sulphuric acid, about 5.00 per cent. comes from the sulphate of ammonia, used to supply nitrogen or to "ammoniate" the goods.

The moisture comes in part from the water in the crude materials used, and in part from water unavoidably introduced in the process of manufacture.

On Sampling Fertilizers for Analysis.

The most difficult and critical part of the examination of a lot of any fertilizer or fertilizing chemical is the drawing and preparation of a sample for analysis.

Only in certain rare cases will it do to assume that one part of a heap or cargo of goods in bulk is like the rest, or that one package is like the others lying by it or that portions taken at the top or bottom of a single bag or barrel, have the same composition as the other portions. In a cargo or heap very great variations in the amount of moisture present are sure to be found in different parts of the lot, to say nothing of other sources of difference; and it is useless to hope for a sample that will be fairly representative unless the whole lot is overhauled, and from every car or barrow load removed, a small amount, say $\frac{1}{100}$, is taken, put in a place where it cannot lose or gain water, and finally, after thorough mixing, a portion of this large sample is separated, by a similar method substantially, for analysis.

In a lot of manufactured goods no two packages are absolutely alike. It is difficult in the manufacture of fertilizers to secure perfect mixing, especially when high grade articles are employed.

For instance, 3 per cent. of potash may be introduced by adding 120 pounds of high grade muriate of potash to 1880 pounds of other material. The bulk of this amount of a heavy salt is so small that the chances of perfect mixing are much less than if the same amount of actual potash were contained in, say 600 or 1,000 pounds of material. So that no two samples drawn from different bags can be expected to be precisely alike.

There is also likely to be a difference, depending on the amount of moisture present. One bag may have been filled from the surface of a large heap which has lain a few days in dry air and has dried out a good deal on the surface; the next bag may be from the center of the same heap, which is considerably damper.

The bags which have lain on the damp floor of a retailer's storehouse (in a number of cases Agents of the Station have found them lying on the ground which was noticeably moist) will not show as good results on analysis as those lying on the top tier, exposed to dry air.

Supposing that no valuable material has gone out of the bag and only moisture has gone in, a chemical analysis will yet show the goods inferior, for no account is taken of the extra weight in the packages caused by the water.

It is then advisable in drawing a sample to take from a number of bags or barrels instead of from one, and to select the bags with some care from different parts of the lot.

Further than this, it is evident there may be considerable differences in the composition of the several portions of even a single package. A barrel of bone, for instance, requires only a little shaking, such as it gets by transportation, to bring the coarser particles to the top and the finer underneath; so that a double handful taken from either end may misrepresent the quality of the goods.

In the case of articles of fine and uniform grain, superphosphates, etc., the chief danger is of another sort, namely: that the portions next the bagging, the *surface* of the goods, will be wetter or drier than the deeper interior layers, according as the the atmosphere is wet or dry. Some kinds of goods, moreover, attract and bind water chemically, and in moist air these will be quite wet on the surface, while the interior is much dryer. They will at times absorb so much water as to dissolve partially and soak out of the bags.

These considerations go to show that the proper sampling of fertilizers is no very simple thing. It requires good judgment and a knowledge of the errors to be avoided.

The Station Agents are instructed when drawing samples to open at least three packages of each brand of goods in every case, and if the number of packages is large, to take a portion from every tenth one. The contents of bags or barrels are rapidly and accurately sampled by means of a sampler consisting of

two brass tubes about three feet long—one fitted within the other. The inner tube has a handle at one end. The outer tube at the other end carries a point of solid metal. A slit three-quarters of an inch wide runs nearly the entire length of both tubes. The package is laid on its side, so that the sampler can be pushed into it *diagonally* and *horizontally* from top to bottom. The inner tube is then turned so that the slits in the two tubes coincide, the fertilizer falls in and fills the inner tube, which is then closed and withdrawn.

By this means a section of the contents is obtained which fairly represents the whole package.

A single observation has been made of the variations likely to occur in the contents of different bags when sampled with care in the way described.

Ten bags were selected from a lot of Mapes' Special Manure for Heavy Soils, at the Hartford warehouse, and sampled as above. The samples were immediately bottled and analyzed. The material was fine and apparently well mixed.

The mechanical analyses of four samples will indicate their fineness and uniformity.

	1113	1115	1117	1119
Finer than $\frac{1}{50}$ inch,	55.9	56.3	50.4	57.1
Between $\frac{1}{50}$ and $\frac{1}{25}$ inch,	23.4	23.3	25.3	25.9
Between $\frac{1}{25}$ and $\frac{1}{12}$ inch,	18.8	17.6	21.7	16.1
Between $\frac{1}{12}$ and $\frac{1}{6}$ inch,	1.9	2.8	2.6	0.9
	100.0	100.0	100.0	100.0

Here follows the partial chemical analyses and average composition.

Station No.	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	Av.
Nitrogen in Ammonia,	3.41	3.51	3.62	3.40	3.51	3.42	3.64	3.47	3.38	3.55	3.49
Nitrogen in Nitrates,	.70	.68	.71	.68	.74	.67	.74	.73	.70	.72	.71
Phos. Acid,	13.31	13.15	12.80	13.09	12.99	13.12	12.42	13.18	13.25	12.74	13.02
Potash,	3.62	3.58	4.19	3.50	3.87	3.48	4.02	3.96	3.46	4.04	3.66
Water,	11.40	11.60	11.00	11.40	11.00	11.80	11.00	11.50	11.90	11.20	11.38

The greatest difference in nitrogen (sum of nitrogen of ammonia and nitrates), between any two bags was .30 per cent.; in phosphoric acid, the greatest difference was .73 per cent.; in potash .73 per cent. The greatest difference in valuation occasioned by

difference in the chemical analyses of single bags would be about $1.50 per ton, and in any combination of 3 bags, the differences would be very trifling. Such are the variations to be expected under the most favorable circumstances when the goods are very fine and well mixed and the sampling done with the greatest care.

Analyses of the Ash of Healthy and Diseased Peach Wood.

P. M. Augur, Esq., the State Pomologist, recently sent to the Station for examination two samples of wood marked,

I. "From Mt. Rose peach tree supposed to be healthy."

II. "From diseased Mt. Rose peach tree."

The disease from which II was suffering was stated to be the "Yellows."

For analysis twigs of equal size were selected from the two lots. They were about $\frac{5}{16}$ inch diameter at the butt end and $\frac{3}{16}$ to $\frac{4}{16}$ inch diameter at the tip and were of last year's growth.

The pure ash of I (carbonic acid, coal and water excluded) amounted to 1.87 per cent. The pure ash of II amounted to 1.61 per cent. The analyses of 100 parts of the ashes are as follows:—

	I. *Healthy.*	II. *Diseased.*
Silica and matters insoluble in acid,	5.38	9.47
Oxide of iron,	1.09	2.09
Lime,	54.20	54.05
Magnesia,	9.49	7.49
Potash,	16.31	13.95
Soda,	1.18	1.19
Phosphoric acid,	4.34	4.68
Sulphuric acid,	6.90	6.53
Chlorine,	.46	.43
	99.35	99.88

In comparing the above analyses we note that the ash of diseased twigs contains:—

4.09 per cent. more silica, etc.,
1.00 per cent. more oxide of iron,
.34 per cent. more phosphoric acid,
.15 per cent. less lime,
2.00 per cent. less magnesia,
2.36 per cent. less potash and
.37 per cent. less sulphuric acid

than the ash of healthy twigs.

Dr. Goessmann, in his analyses of Crawford's Early Peach,* reported in the ash of branches diseased by Yellows

0.93 per cent. more oxide of iron,
9.71 per cent. more lime,
2.70 per cent. more magnesia,
3.00 per cent. less phosphoric acid and
10.34 per cent. less potash

than in ash of healthy branches, taken from a once slightly affected tree which had been restored by treating (for three years?) "with a phosphatic fertilizer in the usual proportion, adding at the same time from three to four pounds of muriate of potash for every tree, the diseased branches," at the outset, having been "cut back to healthy wood." Dr. Goessmann infers that "the diseased objects (wood and fruit) contain less potash and more lime than the healthy ones."

Dr. Goessman leaves out of the account the items, Silica and matters insoluble in acid, Soda, Sulphuric acid and Chlorine, which in the above analyses amount to 13.92 per cent. of the ash of the healthy twigs and 17.62 per cent. of the ash of the diseased twigs. To omit those would somewhat increase the differences between the ash of the two, and would make lime in the ash of diseased twigs 3 per cent. more than in the healthy ones.

A more correct comparison is that of the absolute quantities of the several ash-ingredients contained in the same amount of the fresh twigs, as follows:—

In 10,000 parts of the peach twigs from Mr. Augur there are:

	Healthy	*Diseased.*
Silica and insoluble,	10.07	15.25
Oxide of iron,	2.04	3.36
Lime,	101.44	86.99
Magnesia,	17.75	12.05
Potash,	30.55	22.45
Soda,	2.20	1.91
Phosphoric acid,	8.14	7.53
Sulphuric acid,	12.91	10.51
Chlorine,	0.87	.70
	185.97	160.75

* Paper read before Mass. Hort. Society, March 18, 1882.

Here it becomes manifest that in the peach wood here examined 10,000 pounds of diseased twigs contain

5.2 pounds more silica,
1.3 pounds more oxide of iron,
14.5 pounds less lime,
5.7 pounds less magnesia,
8.1 pounds less potash,
0.3 pounds less soda,
0.6 pounds less phosphoric acid,
2.4 pounds less sulphuric acid and
.2 pounds less chlorine

than the healthy twigs. The diseased twigs in this case thus manifest, as compared with healthy ones, a *poverty of all the ash-ingredients*, the first two alone excepted.

The ingredients most largely deficient, and those therefore whose supply to the soil by way of fertilizing applications is most imperative, are lime, potash, magnesia and sulphuric acid.

To judge from the relative quantities of the deficient ingredients, the application of lime and magnesia in the case of Mr. Augur's peach orchard is as essential to the production of healthy wood and fruit as the addition of potash, and more necessary than the application of a phosphatic fertilizer.

The investigations of Drs. Gœssmann and Penhallow indicate that chlorine, though present in the wood in very small quantity, is yet important in the foliage as a means of assisting the transfer of nutritive matters from the leaves to the fruit and buds, and therefore must not be deficient in the soil, although evidently no large amount is needful.

Fertilizing Swamp-Muck Land.

A correspondent writes:—

"I have on my farm some twenty acres of swamp-muck land, the muck ranging from three to eight or ten feet deep. I have drained it, and part of it (some four or five acres) has been seeded down and mowed for three or four years, but the grass soon runs out. The piece where the muck is deepest I have now plowed and am about to seed it to grass again. I have a quantity of stable manure that I was thinking of putting on and harrowing in; but it has been suggested to me that perhaps I had better put on some other kind of fertilizer and use the stable manure on my upland.

"I want your advice, what to put on to bring good crops of grass—whether to use the stable manure there, or what to use instead of it. Any suggestions you may give me in regard to fertilizing that muck ground will be very thankfully received."

Answer.—Some varieties of swamp muck are nearly destitute of all kinds of plant-food except nitrogen, and contain this element in a very unavailable form. To make them fertile they require frequent applications of mineral fertilizers or else to be "amended" by dressing with large quantities of earth, marl, leached ashes, coal-ashes, or the like.

Stable manure is likely to be more profitable on the upland. Application of slacked lime at the rate of 10 to 25 bushels per acre and of some kind of phosphatic guano such as "Orchilla" or "Curaçao" guano 100 to 200 lbs., together with 100 lbs. of "sulphate of magnesia and potash," would supply the deficiencies that probably exist. Instead of Orchilla or Curaçao Guano, 200 to 300 lbs. of fine ground South Carolina Rock Phosphate might be used.

Lime should be applied some week or two before seeding. All the materials might be applied at the same time or they may be broadcast separately as convenient.

It is not easy to give entirely trustworthy advice in this case, but from knowledge of the character of muck in Connecticut, I should recommend the lime, etc., as likely to answer your purposes.

The cheapest lime to be had will serve, provided it slacks to a fine powder, or is a fine powder so as to admit of distributing evenly.

ANALYSES OF TOBACCO LEAF.

In response to the inquiries of Mr. H. H. Austin, of Suffield, the following analyses of various samples of tobacco leaf were made with especial reference to the connection between their ash-composition and burning quality, and to the question what Soil and Fertilizers are adapted to produce good "Wrappers."

The SAMPLES were all supplied by Mr. Austin, who is responsible for such description of them as follows:

The samples 1 to 8 inclusive were the stripped leaves as used for cigar wrappers. Of these, five had undergone the sweating process, three were unsweated. The growths of Cuba, Sumatra, Wisconsin and Connecticut are represented.

Particulars follow:

The "quality" refers to all the characters that give value to wrappers, including color, texture and mode of burning.

No. 1. Havana leaf from Cuba (sweated). Good quality, burns white.

No. 2. Sumatra leaf (sweated). Burns well, poor quality otherwise.

No. 3. Wisconsin leaf, Havana seed (sweated). Quality fair, burns white and free.

No. 4. Connecticut seed leaf (sweated). Raised on new land with barn yard manure and no commercial fertilizer. Good quality, burns well.

No. 5. Connecticut leaf, Havana seed (unsweated). Manured with Cotton seed ashes, 1 ton Cotton seed meal, 300 lbs. lime, 300 lbs. plaster. Quality very good.

No. 6. Connecticut leaf, Havana seed (unsweated). Manured with 400 lbs. bone; 500 lbs. double sulphate potash and magnesia; 1 ton cotton seed meal; 300 lbs. lime and 300 lbs. plaster to the acre. Quality very good.

No. 7. Connecticut leaf, Havana seed (unsweated). Raised on stable manure, at least 10 cords to acre. Quality fair except that it crusts in burning.

No. 8. Connecticut leaf, Havana seed (sweated). Raised on good loamy land with slaughter-house manure worked over by pigs. Poor quality, crusts badly and will not burn well.

ANALYSES OF TOBACCO LEAF.—TABLE I.

	Weight of sample analyzed. Grams.	Per cent. of water in samples.	Dry weight of samples.	Weight of crude ash.	Per cent. of crude ash in dry leaf.
No. 1	65.7083	7.00	61.109	15.8213	25.89
2	57.0000	7.47	52.743	10.7160	20.32
3	75.0000	7.83	69.1275	19.1795	27.74
4	75.0000	9.25	68.0625	19.6310	28.84
5	75.0000	7.15	69.638	15.9275	22.88
6	75.0000	8.27	68.7975	16.2522	23.62
7	77.5175	7.13	71.991	15.5685	21.62
8	75.0020	7.80	69.152	18.4290	26.65

To prepare the crude ash the air-dry tobacco was burned at a heat scarcely rising to visible redness. The ash as thus obtained includes the sand and earth that adhered as dust to the leaf, and also small amounts of unburned carbon. A little moisture absorbed subsequently to the burning also figures in the analyses.

The potassium in the ash being partly combined with chlorine and partly with oxygen, it is necessary to deduct oxygen equivalent to chlorine when, as is most convenient for comparison, the potassium is all given as potash.

Composition of Crude Ash of Tobacco Leaf.—Table II.

	Burn well.							Burn badly.
	Sweated.				Unsweated.			Sweated.
	1	2	3	4	5	6	7	8
Sand and soil insoluble in Acids and Silica	25.10	3.65	7.75	19.50	4.52	5.30	7.90	8.20
Oxide Iron & Alumina	1.63	.20	.35	1.25	.28	.22	.96	.81
Lime	21.80	23.92	24.30	19.61	23.57	22.25	25.23	19.32
Magnesia	5.08	6.84	5.44	12.10	8.71	8.57	6.48	7.27
Potash	15.13	28.18	25.72	18.22	26.02	26.50	23.20	28.29
Soda	.29	.30	.37	.59	.29	.15	.42	.11
Phosphoric Acid	1.92	3.65	3.46	2.05	2.14	2.18	2.24	1.79
Sulphuric Acid	3.05	3.93	4.53	4.08	5.99	6.62	3.98	4.31
Carbonic Acid	16.20	23.30	24.96	16.20	22.54	20.50	21.40	19.40
Chlorine	5.43	4.08	.89	4.72	4.12	5.58	6.30	7.62
Carbon	3.55	1.21	1.56	1.66	.98	2.05	1.94	2.35
Water	1.90	1.10	.80	1.14	.90	1.10	1.30	2.16
	101.08	100.36	100.13	101.12	100.06	101.02	101.35	101.63
Oxygen equivalent to Chlorine	1.22	.92	.20	1.06	.93	1.25	1.42	1.72
	99.86	99.44	99.93	100.06	99.03	99.77	99.93	99.91

The analyses of crude ash do not serve as a proper basis for comparison because of certain accidental or variable ingredients which they include. These analyses show to some extent the accuracy of the chemical work, and serve as the basis for calculating the composition of what is termed the pure ash.

Deducting from the crude ash in each case the accidental ingredients, viz: sand and soil, carbon and water, and also the carbonic acid which is likely to be retained to a variable degree, and reckoning the remaining ingredients to 100, we arrive at the following statement:

Composition of Pure Ash.—Table III.

	Burn well.							Burn badly.
	Sweated.				Unsweated.			Sweated.
	1	2	3	4	5	6	7	8
Oxide Iron & Alumina	3.04	.28	.54	2.01	.39	.31	1.42	1.17
Lime	40.66	33.76	37.34	31.81	33.18	31.62	37.16	28.38
Magnesia	9.47	9.66	8.36	19.80	12.26	12.18	9.54	10.67
Potash	28.21	39.76	39.48	29.42	36.62	37.69	34.17	41.54
Soda	.54	.42	1.11	.94	.40	.21	.61	.17
Phosphoric Acid	3.58	5.15	5.31	3.31	3.01	3.10	3.30	2.62
Sulphuric Acid	5.69	5.55	6.95	6.60	8.43	9.41	5.86	6.31
Chlorine	10.13	5.76	1.36	7.65	5.80	7.93	9.28	11.19
	101.32	100.34	100.45	101.54	100.09	102.45	101.34	102.05
Oxygen equivalent to Chlorine	2.28	1.30	0.31	1.72	1.31	1.79	2.09	2.52
	99.04	99.04	100.14	99.82	98.78	100.66	99.25	99.53
Pure Ash, per cent.	13.80	14.38	17.99	17.74	16.25	16.80	14.58	18.08

The notion appears to have established itself that fertilizers containing chlorine, whether in the form of common salt, muriate of potash or kainite are highly detrimental to the quality, and especially to the burning quality of tobacco. It is also believed that lime and especially potash in the form of sulphates and carbonates, are favorable to the quality and particularly to the burning quality of tobacco.

It is likewise thought that slaughter-house offal and fish scrap are injurious, while Peruvian guano, castor pomace and cotton seed meal are beneficial to the quality of leaf tobacco, and this different effect is attributed to the supposed greater quantity of salt or other chlorine compounds contained in the offal and fish.

The chemical examination of tobacco-ash ought to make manifest whether there is a connection between burning quality and relative quantities of chlorine, potash or other ash-ingredient. As regards chlorine the above analyses show that while the pure ash of the well-burning leaf, in general, contains less than the ill-burning, and while the largest content of chlorine is found in the worst burner, No. 8, and the smallest in a good burner, No. 3, yet the bad burner, No. 7, contains less than the good burner, No. 1. Of the two samples 5 and 6 designated as "very good," one contains 5.8, the other, 7.9 per cent. of chlorine.

With respect to potash and lime, we find the most potash and least lime in the bad burner, No. 8, while the reverse is true of

the good burner, No. 1. But the bad burner, No. 7, contains the next highest per cent. of lime with less potash than is present in the four good burners, Nos. 2, 3, 5, and 6.

The relative proportions of sulphuric acid and of the other ash-ingredients likewise stand in no obvious relation to the quality of the leaf.

The influence of the ash-ingredients on the burning quality of tobacco is however evidently not to be looked for merely in their mutual proportions, but also in their relations to the vegetable matter which burns in contact with them.

Tables I and III prove indeed that the proportion of total ash, whether "crude" or "pure," stands in no connection to quality.

To bring out the relations of individual ash-ingredients to quality, it is needful to reckon the quantities of them which exist in equal amounts of the dry leaf, as follows :—

PER CENT. OF ASH INGREDIENTS IN WATER-FREE TOBACCO LEAF.

TABLE IV.

	Burn well.						Burn badly.	
	Sweated.				Unsweated.		Sweated.	
	Cuba.	Sumatra.	Wis.	Conn.	Conn.	Conn.	Conn.	Conn.
	1	2	3	4	5	6	7	8
Sand, Soil and Silica	6.49	.74	2.15	5.62	1.03	1.25	1.71	2.19
Oxide of Iron and Alumina	.42	.04	.10	.36	.06	.05	.21	.22
Lime (CaO)	5.65	4.86	6.76	5.65	5.39	5.25	5.45	5.15
Magnesia (MgO)	1.32	1.39	1.51	3.48	1.99	2.02	1.40	1.94
Potash (K_2O)	3.92	5.73	7.16	5.25	5.95	6.26	5.02	7.54
Soda (Na_2O)	.08	.06	.10	.17	.06	.04	.09	.03
Phosphoric Acid (P_2O_5)	.49	.74	0.95	.59	.49	.52	.48	.48
Sulphuric Acid (SO_3)	.79	.80	1.26	1.18	1.36	1.56	.86	1.15
Carbonic Acid (CO_2)	4.19	4.73	6.95	4.67	5.16	4.84	4.63	5.17
Chlorine	1.40	.83	.25	1.36	.94	1.32	1.36	2.03
Carbon	.92	.25	.43	.48	.23	.48	.42	.63
Water	.49	.22	.22	.33	.21	.25	.28	.58
	26.16	20.39	27.84	29.14	22.87	23.84	21.91	27.11
Oxygen equivalent to Chlorine	.31	.18	.05	.30	.21	.29	.30	.45
Summing of Analysis	25.85	20.20	27.79	28.84	22.66	23.55	21.61	26.66
Total Crude Ash, per cent.	25.89	20.32	27.74	28.84	22.88	23.62	21.62	26.65
Potash Carb. in Ash sol. in water	1.37	5.23	7.60	2.91	4.54	4.29	3.46	4.74

From Table IV we gather that there is in fact for the same amount of dry tobacco nearly one-third more chlorine in No. 8 than in No. 1, but we see likewise that badly burning No. 7 contains no higher proportion of chlorine than is contained in the well burning Nos. 6 and 4, and scarcely more than in No. 1.

Table IV reveals no connection between burning quality and abundance or deficiency of potash, lime or any other ash-ingredient since among the good burners may be found both higher and lower percentages of each ash-ingredient than exist in No. 7 and 8.

According to Schloesing* the ash of tobacco contains more potassium carbonate in proportion as it burns well while bad burning tobacco contains little or none. Nessler found this rule of Schloesing to have some exceptions. Dr. Moore in his valuable investigation of American tobaccos (report of 10th U. S. Census, Vol. III, p. 870) remarks that while with one exception out of 12 samples the seed-leaf varieties (wrappers) yielded more carbonate of potash than the others (plug, etc.,) the amount of carbonate in the seed-leaf stood in no simple relation to the combustibility.

This result is in accord with Table IV, in which the last item is potash carbonate of ash soluble in water. The smallest as well as the largest quantities are seen to be found in the good burners Nos. 1 and 3, while the medium quantities are found alike in good and bad burners.

* The French Government has for many years maintained a Laboratory for the investigation of all questions connected with the culture and manufacture of tobacco. Schloesing, the able director of the laboratory, in an article contributed in 1877 to Wurtz's *Dictionaire de Chimie* writes in substance as follows: "Tobacco which, rolled into a cigar, holds fire for three minutes burns very well; if it holds fire for two minutes it burns well; for one minute it burns poorly; for half a minute it burns very poorly. The burning quality is absolutely independent of the variety of tobacco, of the thickness of the leaf, of the texture, of its strength, of its flavor, and of climate. It stands in relation only to the proportion of potash-salts of vegetable acids contained in the leaf and consequently to the richness in potash of the soil on which it grows."

"This theory of the combustibility of tobacco has been established by chemical analysis and by direct experiments in culture. The ashes of tobacco that burns well contain and yield to water, carbonate of potash, those of badly burning tobacco contain little or no carbonate but yield to water only sulphate or muriate of potash."

"The carbonate of potash is however a result of the burning of malate, citrate, tartrate and oxalate of potash and the burning quality is therefore related to the presence in the tobacco of these salts. If enough of the above named potash-salts

The very positive way in which Schloesing connects the burning qualities of tobacco with the amount of organic potash salts in the leaf or with the quantity of potash carbonate in the ash stands in sharp contrast with the foregoing results. The unequaled facilities which Schloesing has enjoyed for investigation during his long service to the French government, which monopolizes the sale of tobacco in all its forms in that country, and his recognized ability as an investigator may well make one hesitate to publish analyses which contradict his conclusions.

Nessler, Director of the Experiment Station at Carlsruhe, in his valuable little book on "Tobacco, its Composition and its Treatment," and Dr. G. E. Moore of New York in his "10th Census Report on the Chemistry of American Tobaccos," the only other chemists, to my knowledge, who have studied the composition of tobacco with reference to its burning qualities, find Schloesing's views confirmed in a general way but have noted some exceptional cases and conclude that burning quality is not so simply related to presence of potash salts as Schloesing assumes.

It is quite certain that to pronounce upon the burning quality of a sample of tobacco is not always an easy thing. Nessler has made comparisons by cutting from 6 different leaves (from the plants of each experimental plot of 40 sq. ft.) a piece $1\frac{1}{2}$ in. broad from the midrib to margin, kindling these pieces at a lamp-flame as uniformly as possible and noting for each piece the time during which the combustion continued. The average of the 6 results was adopted. Nessler observes that the different leaves from the same stem burn unequally. The lowest leaves hold fire for the

is incorporated with a badly burning tobacco to give an ash containing a certain amount of potash carbonate, the tobacco is thereby made to burn well."

"On the other hand a well-burning tobacco is caused to burn badly by impregnating it with a certain proportion of sulphate or muriate of lime or sulphate or muriate of magnesia. The effect of these salts is to convert the malate, citrate, tartrate and oxalate of potash into the corresponding lime or magnesia salts, so that, on burning, the ashes contain their potash as sulphate or muriate and contain no potash carbonate but carbonates of lime and magnesia."

"In a cigar the fire is held by the charred tobacco. If this char be compact the fire easily goes out but if it be light and porous it continues to burn just as a compact lump of wood charcoal soon ceases burning when taken from the fire while an equal mass of pulverized charcoal burns away to ashes."

"Now the oxalate, malate, citrate and tartrate of potash when heated melt before they burn and by further heating yield an inflated, highly porous coal, favorable for holding fire. But the corresponding salts of lime and magnesia give a compact coal which is easily extinguished."

least time, the upper leaves hold fire better, and the intermediate ones the best. The same leaf burns differently in its different parts. The tips and edges frequently hold fire longer than the inner portions. Nessler found that in some cases tobacco which at first burned badly improved by keeping, and after three years burned well. This happened where nitrate of soda and cow-manure were applied, and the improvement by age was probably a result of fermentation. Dr. Moore found considerable discrepancies in his comparisons, and the writer has had no better fortune.

Some trials were made upon single leaves taken in a state so dry that they required most careful handling, each leaf being folded lengthwise closely upon itself, forming a flattened irregular stick of tobacco some $\frac{1}{2}$ to $\frac{3}{4}$ inch wide and $\frac{1}{8}$ to $\frac{1}{4}$ inch thick. The leaves were supported horizontally, set on fire by a lamp flame, and the time of burning and distance in inches traversed by the fire were noted. The results are as follows, in four successive trials on different parts of the leaves:

	I. Near Tips.		II. Near Middle.		III. Near Middle.		IV. Near Base.	
No.	Time.	Dist.	Time.	Dist.	Time.	Dist.	Time.	Dist.
8	2 min.	$1\frac{1}{4}$ in.	2 min.	$\frac{3}{8}$ in.	1 min.	$\frac{1}{8}$ in.	$\frac{1}{2}$ min.	$\frac{3}{16}$ in.
6	2 min.	$1\frac{1}{4}$ in.	2 min.	$\frac{3}{8}$ in.	$2\frac{1}{2}$ min.	$\frac{1}{4}$ in.	$1\frac{1}{2}$ min.	$\frac{1}{2}$ in.
1	2 min.	$\frac{3}{4}$ in.	4 min.	$\frac{1}{2}$ in.	$2\frac{1}{2}$ min.	$\frac{3}{16}$ in.	$2\frac{1}{2}$ min.	$\frac{1}{4}$ in.
3	4 min.	2 in.	6 min.	$1\frac{1}{4}$ in.	$5\frac{1}{2}$ min.	$1\frac{1}{2}$ in.	$2\frac{1}{2}$ min.	$\frac{5}{16}$ in.

In the above trials the conditions were indeed not favorable for strictly comparable results, since the different tobacco-leaves varied considerably as to extent and compactness of cross-section. They confirm, however, in a general way what Nessler asserts with regard to the unequal burning of different parts of the same leaf, and also agree with Mr. Austin's judgment in rating No. 8 as lowest in burning quality.

It is most probable that "burning quality" is the result of the coincidence of several conditions. The abundance of organic potash salts in the leaf, the abundance of cellulose (woody tissue), the abundance of sulphates are evidently favorable for easy burning. On the other hand, sugar, gum (pectic acid) and albuminous matters are difficult of combustion. Mineral salts which fuse at the burning temperature, such as chlorides of potassium and sodium and phosphates of potash and soda, hinder free burning. Fermentation, which reduces the quantity of sugar and albumi-

nous matters, and perhaps also that of organic acids, and which may influence the distribution of the soluble salts, acts, on the whole, to improve the burning quality.

It therefore would seem evident that burning quality is good or bad according to the preponderance of favorable or unfavorable factors, and is not always related in a simple manner to the composition of the ash.

It would be going too far to assert that the use of chlorides (muriates) of fish or slaughter-house fertilizers *must invariably* produce tobacco of inferior quality. Nessler found in his field trials that application of salt generally gave badly-burning tobacco. In 1862, however, tobacco from the plot manured with salt, though containing little carbonate of potash in the ash, burned scarcely less well than the tobacco from adjoining plots to which carbonate of potash, sulphate of potash and stable manure had been applied.

The tobacco-grower will, however, do well to avoid the use of the above-named fertilizers, which experience in all countries agrees in indicating to be as a rule likely to injure the burning quality of the leaf.

Tobacco Stalks.

The stalks* of tobacco after stripping off the leaves are recognized to have considerable fertilizing value, and are accordingly returned to the land.

Mr. Austin supplied a sample of stalks taken from the plants which gave the leaf-samples Nos. 5 and 6 already noticed. The average weight of the stalks was estimated by Mr. Austin at ½ lb. The number per acre was 8,000. The total produce per acre is therefore estimated at 4,000 lbs. As brought to the Station the stalks were thought to be in about the state of dryness usual at the time of stripping. They contained 45.7 per cent. of water. The dried tobacco gave, on burning, 11.04 per cent. of crude ash composed as follows:

*These stalks are not to be confounded with the "Tobacco stems" of which an analysis is given in Station Report for 1878, p. 36. The "stems" are the midribs of the leaf rejected by the cigar manufacturers.

Tobacco Stalks, Composition of Crude Ash.

Sand, Silica and matters insoluble in acids	3.17
Oxide of Iron and Alumina	.30
Lime	8.53
Magnesia	5.15
Potash	43.93
Soda	.35
Phosphoric Acid (P_2O_5)	5.95
Sulphuric Acid (SO_3)	6.14
Chlorine	9.09
Carbonic Acid	14.80
Carbon	3.16
	100.57
Deduct Oxygen equivalent to Chlorine	1.04
	99.53

Composition of Tobacco Stalks.—Table V.

	Dry Stalks. Pounds per 100.	Moist Stalks. Pounds per 100.	Pounds per Acre.
Water	----	45.70	1828.0
Vegetable Matter*	90.88	49.39	1975.6
Lime	.94	.51	20.4
Magnesia	.57	.28	11.2
Potash	4.85	2.63	105.2†
Soda	.04	.02	.8
Phosphoric Acid	.66	.36	14.4
Sulphuric Acid	.68	.37	14.8
Chlorine	1.00	.54	21.6
Sand, Silica, Oxide Iron	.38	.20	8.0
Ash-ingredients	9.12	4.91	196.4
	100.00	100.00	4000.0
* Containing total Nitrogen,	3.41	1.85	74.1

† 28.6 lbs. of potash exist as muriate, making 45.4 lbs. of the latter. The remaining 76.6 lbs. of potash exist mostly as carbonate and sulphate with a little nitrate. The dry stalks contained 0.2 per cent. of nitrogen in the form of nitrates, which corresponds to 30.4 lbs. nitrate of potash in 4000 of moist stalks.

The valuation of 4000 lbs. of stalks on the data above given is as follows:

Nitrogen of Nitrates,	4.34 lbs. at 18 cents,	=	$ .78
Nitrogen of Organic Matter,	69.76 lbs. at 20 cents,	=	13.95
Potash as Muriate,	28.60 lbs. at 4½ cents,	=	1.26
Potash in other forms,	76.60 lbs. at 7¼ cents,	=	5.55
			$21.54

The above valuation is correct for 4000 lbs., but is perhaps too high for the acre-yield of stalks, because of the uncertainty of the estimate as to the amount of dry matter per acre, viz: 2172 lbs. (=4000—1828) which is probably too high.

The average weight of four water-free stalks examined by the Director in 1872 was 3½ oz. (96 grams). On this reckoning 8000 stalks would yield 1750 lbs. of dry substance instead of 2172 lbs. as above estimated. Dr. C. T. Jackson found in a crop raised at Hatfield, Mass. (in 1857?), 1490 lbs. of water-free stalks to 1750 of leaf. The valuation is very nearly one cent per lb. for the dry (water-free) stalks or $21.54 for 2172 lbs., so that calling the acre-yield of dry matter but 1500 lbs., the stalks would be worth $15 per acre at current rates.

FEEDING STUFFS.

Twelve samples of feeding stuffs have been examined during the year. Their analyses follow.

Maize Kernel.

CLXXXII, Canada Snub Corn, a variety long cultivated in Northford. This sample was raised by T. F. Barnes, and sent together with No. CLXXXIII by F. A. Hill. This corn is said to give a larger yield than the following variety. The relative weights of kernel and cob were the same, 6 lbs. 2 oz. of kernel to 1 lb. 6 oz. of cob, or 100 of the former to 22½ of the latter.

CLXXXIII, Canada Yellow Corn, raised by F. A. Hall, Northford. This variety has been grown in that place for only two years.

Analyses.

	CLXXXII.	CLXXXIII.
Water	16.66	16.50
Ash	1.03	1.32
Albuminoids	8.94	9.87
Fiber	.78	.91
Nitrogen-free extract (starch, sugar, etc.)	68.55	66.58
Fat	4.04	4.82
	100.00	100.00

	Water Free.	
Ash	1.23	1.58
Albuminoids	10.73	11.81
Fiber	.94	1.10
Nitrogen-free extract	82.26	79.75
Fat	4.84	5.76
	100.00	100.00

The above samples were sent for comparison as to their quality. The Canada Yellow contains one per cent. more of albuminoids and almost one per cent. more fat than the other variety, which however is claimed to be more prolific. So it may well be that the total crop of the Canada Snub Corn yielded more albuminoids and fat than the Canada Yellow. It would at any rate be unwise to generalize from a single analysis of each variety.

Beets and Potatoes.

CLXXX, White Star Potatoes from W. J. Jennings, Greens Farms.

CLXXXI, Sugar Beets, with regard to which Mr. Jennings says:—

"The beets are known as French Imperial Sugar Beets. Perhaps they do not yield quite equal to some of the mangel varieties, yet with strong ground 800 to 1,000 bushels per acre can be grown, equal to 20 to 25 tons. They appear to be equally hardy, and as easily cultivated as other beets.

They are better for feeding purposes than any other beets with which I am acquainted. Capital for sheep and cattle and good for swine."

The analyses are as follows:—

	CLXXX.	CLXXXI.
Water	78.01	84.42
Ash	1.00	1.13
Albuminoids	2.19	1.69
Fiber	.33	.93
Nitrogen-free extract*	18.39	11.75
Fat	.08	.08
	100.00	100.00

* Consisting in CLXXX chiefly of starch and in CLXXXI of cane sugar.

		Water Free.
Ash	4.55	7.25
Albuminoids	9.96	10.85
Fiber	1.50	5.97
Nitrogen-free extract	83.63	75.41
Fat	.36	.52
	100.00	100.00

Linseed Meal.

A single sample of Linseed Meal, CLXXIV, has been analyzed. Its analysis as a fertilizer has been given on page 67.

It was sent by H. H. Austin, of Suffield, who bought it of Wilder & Puffer, Springfield, Mass. Cost $28.00 per ton.

Analysis.

		Water free.
Water	9.90	----
Ash	6.74	7.48
Albuminoids	35.81	39.74
Fiber	8.63	9.58
Nitrogen-free extract	36.65	40.68
Fat	2.27	2.52
	100.00	100.00

Middlings.

CLXXXIV is a sample of "Fancy Middlings" costing $1.30 per one hundred pounds, sampled and sent by James W. Congdon, Hampton.

Analysis.

		Water free.
Water	10.93	----
Ash	2.41	2.71
Albuminoids	15.21	17.08
Fiber	2.00	2.25
Nitrogen-free extract	65.84	73.91
Fat	3.61	4.05
	100.00	100.00

It was stated that pigs refused to eat this bran. Nothing abnormal could be discovered in the sample sent. The composition is that of ordinary wheat middlings, except that there is much less fiber than usual, in this "fancy" middlings. It has no disagreeable or musty smell or taste. If there is disagreement between the pigs and the middlings we apprehend that the fault lies with the former.

Wheat Bran.

CLXXXV, a sample of wheat bran brought to the station by J. J. Webb, of Hamden, had the following composition:

		Water Free.
Water	11.90	----
Ash	6.33	7.18
Albuminoids	14.68	16.66
Fat	3.71	4.22
Nitrogen-free extract, Fiber	63.88	71.92
	100.00	100.00

The sample was brought by Mr. Webb on account of its inferior appearance. It contained a good deal of black material, consisting of seeds and fragments of seeds that are foreign to bran.

The seeds were chiefly of two kinds, the corn cockle (*Lychnis Githago*, L.) and black bindweed (*Polygonum Convolvulus*, L.). The former is a pest in wheat fields because the seeds damage the color of the flour, and are said to impart a bitter taste to it, the latter is a common twining weed, not so troublesome as the cockle. The cockle seed we understand is separated from the wheat before milling. Its presence in wheat bran would therefore indicate that the refuse from this separation of cockle seed and light wheat, had been turned in with the bran, or that the bran had been prepared from an inferior quality of wheat. The chemical composition of the bran is however about the average.

Hay and Straw.

The following three samples are from A. S. Hubbard, Glastonbury.

CLXXV, Coarse meadow hay or bedding.
CLXXVI, Good meadow hay.
CLXXVII, Rye straw.

Analyses.	CLXXV.	CLXXVI.	CLXXVII.
Water	11.04	10.48	9.73
Ash	6.58	6.00	2.75
Albuminoids	7.56	7.31	2.19
Fiber	28.69	26.93	43.29
Nitrogen-free extract	44.46	46.60	41.04
Fat	1.67	2.68	1.00
	100.00	100.00	100.00

With regard to the coarse hay and straw, Mr. Hubbard writes, "They are rather poorer fodders than we have been accustomed to feed, but the early frost stopped the growth of the corn so that we have been compelled to use them." Analysis gives the same composition for the coarse hay and good hay, save in respect to fiber and nitrogen-free extract.

Maize Ensilage.

CLXXVIII, Frost-affected Maize Ensilage.
CLXXIX, Drowth-affected Maize Ensilage.
Sampled and sent by A. S. Hubbard, Glastonbury.

Analyses.

	CLXXVIII. Frost-affected.	CLXXIX. Drouth-affected.
Water	85.42	83.04
Ash	2.94*	1.22
Albuminoids	1.75	.95
Fiber	4.17	6.09
Nitrogen-free extract	5.40	8.06
Fat	.32	.64
	100.00	100.00

* 2.00 per cent. consisted of sand and clay.

Water Free.

Ash	20.18†	7.19
Albuminoids	12.00	5.60
Fiber	28.60	35.92
Nitrogen-free extract	37.03	47.52
Fat	2.19	3.77
	100.00	100.00

† 13.73 per cent. consisted of sand and clay.

Mr. Hubbard writes: "My stock eat the Ensilage much better than I had expected, in fact the frost seems to have done no further damage than to stop the growth of the corn before coming to maturity." The frosted ensilage has higher albuminoids (Protein) than the average of our analyses (see Table, p. 114), but its nitrogen-free extract (carbhydrates) is lower than any yet put on record. This is probably the result of freezing which ruptures the cell-tissue and makes their juices very accessible to ferment germs.

"The Concentrated Feed."

"The Concentrated Feed for horses, cattle, sheep, swine, poultry, etc., for sale by the Concentrated Feed Company, office No. 14 Pearl Place, Boston, Mass., U. S. A., O. P. Prall, Sup't."

A sample of "The Concentrated Feed" was sent to the Station in 1882, by Mr. Charles E. Lord, of Chester, with request to be informed of its value. To him was replied, "The station has a month's work to do before it can touch the Cattle Feed by way of making a regular analysis. Such an analysis is however hardly necessary.

The sample consists evidently of corn meal and perhaps fine bran or middlings, with some linseed cake, a good deal of salt and a little fenugreek to give it flavor. If you will refer to page 125 of the Station Report for 1878, you will find the analysis of a "Condimental Cattle Food," which is not unlike the sample you sent in composition and value. At $110 per ton it is a folly to buy it."

Subsequently Mr. Lord sent to the Station a copy of the analysis published by the Concentrated Feed Company, and stated "the manufacturer claims that it contains four to five times as much nutriment as corn, oats, etc." Thereupon was written, "The analysis of Concentrated Feed is received. Corn meal and linseed meal are now both quoted at $30 per ton or less. Bran or shorts at $25 per ton, and salt at $10 per ton. Accordingly the concentrated Food is worth for its raw materials, exclusive of fenugreek not more than $30 per ton. The cost of the latter and mixing certainly can't exceed $5 per ton. I should regard the stuff dear at $35 per ton. The claim that the mixture contains 4 or 5 times as much nutriment as corn, oats, etc., is false. A mixture of 40 lbs. corn meal, 40 lbs. bran, 16 lbs. linseed cake, and 4 lbs. salt would make 100 lbs. very nearly as good as The Concentrated Food." Another sample was recently sent to the Station by D. H. Van Hoosear, of Wilton, who stated that the Concentrated Food is offered for sale in bags of 50 lbs. each by Allen Betts & Co., of Norwalk, at 6 cents per pound.

The sample was analyzed and the station analysis is subjoined, together with the analysis (by B. F. Davenport, M.D., Mass. Coll. of Pharmacy), published in the Company's circulars, and also the average composition of Wheat Bran.

	Analysis. by Dr. Davenport.	by Station.	of Bran
Water	13.12	13.51	11.76
Fat	6.66	1.79	3.90
Carbhydrates	48.89	51.57	55.07
Albuminoids	13.52	13.31	14.88
Fiber	8.57	3.30	8.70
Mineral Salts	9.24	16.52*	5.69
	100.00	100.00	100.00

* Contains 11.6 per cent. of common salt.

It is seen that the sample here analyzed differs somewhat from that analyzed (March, 1881) by Dr. Davenport, containing less fat by 4.85 per cent. and more mineral salts by 7.28 per cent. The sample here analyzed differs also from that sent in 1882, by Mr. Lord, in having none of the aromatic odor of fenugreek. It had in fact a musty smell and viewed under the magnifier contained numerous minute insect larvae. Therefore either the fenugreek has been left out of the sample from Norwalk, or by long keeping the flavor has passed from aromatic to musty.

The sample from Norwalk was found by microscopic examination, to consist largely of maize meal with some linseed meal. The linseed meal was of the sort known as "new process," from which the fat (oil) has been mostly extracted. It was not attempted to identify all the ingredients of the sample and other varieties of feeding stuffs may have been present. It will be observed also, that so far as nutriment is concerned wheat bran at 1¼ cents per pound or less,† is not inferior to this "Concentrated Feed."

Notwithstanding the "satisfactory testimonials," as to the great value of "The Concentrated Feed," there can be no doubt that it is worth as feed when new and fresh no more than good wheat bran, because it is no more concentrated than bran. The difference between its cost and that of bran, viz: 4¾ cents per lb., is what the consumer must pay for the "manufacture." The claims that it has extraordinary nutritive and medicinal power are in all probability wholly fanciful and unfounded. As to the use of fenugreek and other aromatics, such as caraway, fennel, anise, ginger, elecampane, etc., which have been employed in "Condimental Foods," there can be no doubt that they are occasionally serviceable to sick animals, but their true place is that of medicine and

† $1.25 per hundred or $23.50 per ton.

not of food. Sir John Bennet Lawes, of Rothamstead, England, made, years ago, a most thorough practical trial on the use of condiments in feeding and demonstrated that there is no profit in it. One of his trials was made on twenty sheep (ten fed with plain food, ten with the same plus condiment), and continued twenty-eight weeks, when the animals were slaughtered and marketed. The *extra cost of feeding ten sheep with condiment* was £3 14s.; the result of the feeding being alike with condimented and with plain food.*

Sir John Lawes stated† that sheep ate no more food under the stimulus of condiments than without. Pigs, he found, indeed, to consume a larger quantity of food, but they assimilated no more and got no benefit from the increased consumption.

Abundant other testimony to the same effect may be found in the Agricultural Journals of Great Britain where Condimental foods were extensively tested twenty to twenty-five years ago.

Table of the Composition of American Feeding Stuffs.

By Dr. E. H. Jenkins.

On the following pages is given the average composition of the fodders commonly used in this country, compiled exclusively from American analyses. The compiler has aimed to bring together all analyses which have been published and could be obtained up to September 1st, 1884. Probably a few have been overlooked.

In the first column of the tables is given the total number of analyses from which the average was obtained. The probable accuracy of the average increases with the number of analyses on which it is based.

It is very desirable to know within what limits the composition of each fodder is likely to vary, and for that reason the maximum and minimum amounts of each ingredient have also been inserted in the table.

* Experiments on the question whether the use of Condiments increases the Assimilation of Food by Fattening Animals, or adds to the Profits of the Feeder; by J. B. Lawes, F.R.S., Edinburgh Veterinary Review, 1862.

† Journal of the Royal Society of England, xxiii, p. 425.

Composition of Feeding Stuffs.

Name.	Analyses.	Total Dry Matter.			Protein.			Fat.			Nitrogen-free Extr.			Fiber.			Ash.
		Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	
GREEN FODDER.																	
Maize fodder	22	7.10	30.89	*18.86*	.56	1.78	*1.30*	.14	.81	*0.32*	3.20	17.69	*10.65*	1.90	9.78	*5.37*	1.22
Maize fodder—ensilaged	31	12.32	27.82	*19.29*	.88	2.77	*1.47*	.27	1.80	*0.72*	5.62	13.47	*9.88*	4.04	10.02	*5.88*	1.34
Pea vine—ensilaged	1	----	----	*18.36*	----	----	*2.40*	----	----	*0.80*	----	----	*7.60*	----	----	*5.57*	1.99
Cow pea vines, green and succulent, with pods	2	13.97	17.90	*15.94*	3.00	3.25	*3.12*	0.58	0.62	*0.60*	5 34	8.46	*6.91*	2.87	4.09	*3.48*	1.83
Cow pea vines, probably after pods were removed	1	----	----	*27.19*	----	----	*1.85*	----	----	*0.21*	----	----	*7.86*	----	----	*15.27*	2.00
Soja bean, whole plants	2	30.15	30.65	*30.40*	3.88	3.94	*3.91*	1.05	1.55	*1.30*	14.24	14.39	*14.32*	8.26	8.91	*8.58*	2.29
Rye	5	----	----	*25.3†*	2.30	3.00	*2.60*	0.60	0.70	*0.65*	4.90	6.70	*5.90*	13.40	14.90	*14.30*	1.90
Beet leaves	1	----	----	*11.16*	----	----	*2.74*	----	----	*0.60*	----	----	*2.49*	----	----	*2.50*	2.83
Carrot leaves	1	----	----	*16.70*	----	----	*4.26*	----	----	*0.86*	----	----	*5.99*	----	----	*2.25*	3.34
Sorghum leaves	3	23.30	32.70	*27.00*	2.40	3.70	*3.10*	----	----	----	----	----	*15 1‡*	4.30	6.80	*5.20*	8.50
HAY AND DRY COARSE FODDER.																	
Clover hay	12	78.18	91.53	*84.98*	8.87	13.06	*11.38*	1.47	3.10	*1.98*	35.03	45.47	*40.11*	23.79	28.64	*26.35*	5.15
Hay containing much clover	6	85.70	88.63	*86.19*	6.38	14.42	*10.18*	1.50	3.09	*2.38*	42.07	45.19	*43.33*	19.66	29.53	*25.04*	5.26
Timothy hay	18	85.70	91.30	*87.42*	4.88	9.60	*6.36*	1.08	3.30	*2.03*	41.09	48.58	*44.89*	22.70	34.25	*29.93*	4.23
Timothy and Red Top	5	85.70	86.88	*85.94*	6.02	8.97	*7.45*	1.45	2.48	*1.97*	39.20	46.88	*44.45*	24.72	28.45	*26.82*	5.25
Low meadow hay	10	85.50	93.60	*89.50*	4.60	10.40	*7.70*	0.70	3.60	*2.20*	39.80	55.20	*43.60*	21.40	40.00	*30.20*	5.80
Salt marsh hay	11	81.40	92.80	*89.53*	4.30	7.80	*5.90*	1.63	3.10	*2.32*	34.10	53.67	*42.42*	27.00	37.90	*31.47*	7.42
Black grass hay	2	88.98	91.06	*90.02*	6.56	7.06	*6.81*	2.28	2.38	*2.33*	43 14	49.31	*46.26*	24 63	29.42	*27.01*	7.60
Black grass hay (with seed)	1	----	----	*90.84*	----	----	*7.50*	----	----	*2.96*	----	----	*51.44*	----	----	*22.10*	6.84
Hungarian grass hay	8	----	----	*83.30*	5.56	10.67	*6.59*	1.30	2.14	*1.81*	34.85	44.71	*42.49*	26.18	28.94	*27.16*	5.24
Maize fodder—field-cured	6	60.63	77.07	*67.95*	3.39	4.97	*4.29*	0.66	1.56	*1.24*	30.52	40.82	*35.96*	18.65	25.18	*22.14*	4.32

† Calculated to average water content.

‡ Includes fat.

Composition of Feeding Stuffs.—*Continued.*

Name.	Analyses.	Total Dry Matter.			Protein.			Fat.			Nitrogen-free Extr.			Fiber.			Ash.
		Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	
HAY AND DRY COARSE FODDER—*cont.*																	
Buckwheat straw	2	89.50	89.60	*89.55*	3.33	4.38	*3.85*	1 42	1.70	*1.56*	32.08	34.49	*33.28*	44 93	46.83	*45.88*	5.05
Oat straw	3	87.50	93.47	*89.89*	2.30	5.08	*3.35*	1.00	3 15	*2.07*	26.42	44.26	*36.97*	35 21	55.96	*42.78*	4.72
Rye straw	1	----	----	*87.5†*	----	----	*6.89*	----	----	*2.68*	----	----	*35.70*	----	----	*34.20*	8.03
Wheat straw	2	88.63	92.22	*90.43*	2.19	2.56	*2.37*	1.24	2.53	*1.89*	41.51	47.01	*44.27*	37.32	40.05	*38.68*	3.22
Cow pea vines	6	86.01	90.70	*88.95*	13.56	19.81	*15.68*	1.13	4.05	*2.87*	34.98	46.40	*42.17*	17.20	23.66	*1 .82*	8.41
ROOTS, BULBS AND TUBERS.																	
Beets (red)	2	10.54	12.32	*11.43*	1.48	1.73	*1.60*	.14	.21	*.18*	7.16	7.64	*7.40*	.64	1.69	*1.16*	1.08
Carrots	2	12.15	13.20	*12.68*	.97	1.99	*1.38*	.62	.71	*.67*	6.86	7.70	*7.28*	1.55	2.32	*1.93*	1.34
Mangolds	3	7.18	8.56	*7.96*	1.57	1.89	*1 70*	.03	.51	*.20*	3.56	4.91	*4.19*	.76	.91	*.82*	1.05
Onions	3	6.48	14.74	*11.56*	.77	2.28	*1.38*	.22	.36	*.27*	3.77	11.28	*8.61*	.63	.76	*.70*	0.59
Potatoes	2	20.31	22.39	*21.35*	1.14	1.32	*1.23*	.12	.14	*.13*	17.75	19.69	*18.72*	.28	.48	*.38*	0.89
Sweet potatoes	3	26.61	34.04	*29.72*	.45	1.28	*0.97*	.28	.36	*.31*	23.00	29.72	*26.13*	.60	2.50	*1.36*	0.93
Ruta bagas	1	----	----	*12.92*	----	----	*1.15*	----	----	*.09*	----	----	*9.11*	----	----	*1.16*	1.41
Turnips	1	----	----	*11.11*	----	----	*1.34*	----	----	*.09*	----	----	*8.11*	----	----	*.86*	0.71
Yam	1	----	----	*28.77*	----	----	*2.06*	----	----	*.25*	----	----	*25.24*	----	----	*.70*	.67
FRUITS, GRAIN AND OTHER SEEDS.																	
Apples	1	----	----	*15.89*	----	----	*.21*	----	----	*.28*	----	----	*14.26*	----	----	*.91*	0.23
Cucumbers	1	----	----	*4.30*	----	----	*.83*	----	----	*.21*	----	----	*1.95*	----	----	*.85*	.46
Peas	1	----	----	*21.94*	----	----	*4.37*	----	----	*.55*	----	----	*14.48*	----	----	*1.66*	.88
Squash	2	4.82	5.42	*5.12*	.64	.68	*.66*	.24	.32	*.28*	2.95	3.54	*3.24*	.53	.54	*54*	.40
Tomato	1	----	----	*8.74*	----	----	*1.00*	----	----	*.47*	----	----	*5.84*	----	----	*.70*	.73
Barley	9	87.40	92.80	*88.90*	8.60	15.70	*12.40*	1.50	3.20	*1.80*	66.70	73.00	*69.30*	1.30	4.20	*2.90*	2.50
Buckwheat	8	85.10	89.10	*87.40*	8.60	11.00	*10.00*	2.20	2.40	*2.25*	62.60	65.40	*64.50*	7.80	9.40	*8.70*	2.00

† Calculated to average water content.

Composition of Feeding Stuffs.—*Continued.*

Name.	Analyses.	Total Dry Matter.			Protein.			Fat.			Nitrogen-free Extr.			Fiber.			Ash.
		Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	
Fruits, Grain and other Seeds—*cont.*																	
Cotton seed, hulls and kernel	1	----	----	*92.28*	---	----	*15.72*	----	----	*18.56*	----	----	*29.09*	----	----	*25.75*	3.16
Cow pea	5	79.20	89.99	*85.21*	19.30	23.00	*20.77*	1.30	1.60	*1.43*	48.10	61.99	*55.75*	3.37	5.00	*4.06*	3.20
Doura (brown)	3	87.30	92.40	*89.00*	9.00	11.50	*10.30*	----	----	*4.20*	----	----	*69.90*	----	----	*1.50*	1.60
Soja bean	3	89.87	93.95	*91.41*	34.63	38.62	*36.22*	16.80	19.00	*17.92*	26.20	30.50	*28.66*	3.69	5.00	*4.24*	4.37
Maize kernel (dent)	77	85.95	93.78	*89.93*	7.53	12.07	*10.36*	3.80	6.93	*5.15*	66.26	75.73	*70.60*	1.25	4.81	*2.29*	1.53
Maize kernel (flint)	63	81.84	93.41	*88.93*	7.00	13.65	*10.67*	3.40	7.13	*5.00*	64.95	74.62	*70.08*	.78	2 88	*1 71*	1.47
Maize kernel (sweet)	24	89.14	94.02	*91.42*	9.45	15.31	*11.71*	5.25	11.89	*8.31*	61.78	72.35	*66.54*	1.46	5.24	*2.82*	1.93
Maize kernel ("Western corn")	3	79.30	83.60	*80.90*	7.80	8.60	*8.30*	3.60	3.90	*3.70*	64.90	68.20	*66.00*	1.70	1.80	*1.75*	1.20
Maize kernel (average of all varieties)	176	79.30	94.02	*89.51*	7.00	15.31	*10.62*	3.40	7.13	*5.49*	61.78	75.73	*69.72*	.78	5.24	*2.13*	1.55
Oats	21	86.50	91.10	*89.30*	8.00	14.40	*11.30*	4.10	5.80	*5.00*	57.10	66.90	*61.00*	1.50	12.90	*9.00*	3.00
Rice	10	86.00	88.60	*87.60*	5 90	8.60	*7.40*	0.30	0.60	*.40*	77.50	80.60	*79.20*	.10	.40	*.20*	.40
Rye	6	86.80	91.30	*88.40*	9.50	12.10	*10.60*	1.40	2.10	*1.70*	70 70	73.90	*72.60*	1.40	2.10	*1.60*	1.90
Sorghum seed	9	83 24	90.72	*87.48*	7.67	11.25	*8.88*	2.12	4.60	*3.65*	66.81	73.59	*71.27*	1.48	3.21	*1.88*	1.80
Wheat (winter)	229	83.77	92.90	*89 63*	8.25	16.63	*11.82*	1.26	3.93	*2.14*	68.08	76.64	*72.04*	.44	2.87	*1.77*	1.86
Wheat (spring)	13	86 65	91.88	*89.63*	8.14	15.40	*12.51*	1.82	2.56	*2 20*	66.07	78.66	*71.19*	1.33	2.30	*1.82*	1.91
Wheat (unclassified)	54	87.62	90.64	*89.28*	9.80	14.70	*11.97*	1.64	2.83	*2.09*	68.52	74.65	*71.49*	1.21	3.05	*1.91*	1.82
Wheat (average of all analyses)	296	83.77	92.90	*89.56*	8.14	16.63	*11.87*	1.26	3.93	*2.13*	66.07	78.66	*71.90*	.44	3.05	*1.79*	1.85
Flour and Meal.																	
Barley meal	3	83.80	86.00	*84.90*	8.80	13.90	*11.80*	0.70	2.20	*1.70*	----	----	*70.90*	----	----	*.10*	0.50
Buckwheat flour	3	85.06	87.22	*86.48*	4.18	8.00	*6.48*	0.65	1.74	*1.33*	75.81	79.37	*77.34*	.21	.35	*.28*	1.05
Graham flour	3	86.30	87.90	*86.90*	11.30	12.40	*11.70*	1.50	1.90	*1.70*	69.80	70.00	*69.80*	1.80	2.00	*1.90*	1.80
Hominy	2	86.38	86.64	*86.51*	8.08	8.41	*8.25*	.42	.46	*.44*	77.07	77.18	*77.12*	.31	.33	*.32*	.38

Composition of Feeding Stuffs.—*Continued.*

Name.	Analyses.	Total Dry Matter.			Protein.			Fat.			Nitrogen-free Extr.			Fiber.			Ash.
		Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	
Flour and Meal—*continued.*																	
Maize meal	20	75.46	90.14	*85.14*	7.38	13.94	*9 26*	2.36	4.63	*3.82*	60.72	72.70	*68.58*	.93	2.99	*2.29*	1.54
Oat meal	6	91.16	93.77	*92.15*	12.87	16.25	*14.66*	6.05	8.77	*7.06*	66.62	68.99	*67.57*	.64	1.15	*.86*	2.00
Rye flour	4	86.42	87.65	*86.90*	6.00	7.05	*6.65*	.78	.89	*84*	77.56	79.09	*78 28*	.35	.45	*.41*	.72
Wheat flour,* from winter wheat	1	----	----	*87.04*	----	----	*8.56*	----	----	*1.19*	----	----	*76.59*	----	----	*.17*	.53
Wheat flour, from spring wheat†	6	86.50	89.70	*87.68*	8.56	14.12	*10.68*	.56	2.01	*1.11*	68.32	78.11	*75.00*	.00	1.22	*.22*	.64
Wheat flour (unclassified)	17	86.83	88.81	*87.54*	9.69	13.31	*11.28*	.81	1.88	*1.15*	69.52	76.93	*74.43*	.06	.99	*.16*	.52
Wheat flour (average of all varieties)	24	86.50	89.70	*87.56*	8.56	14.12	*11.01*	.56	2.01	*1.14*	68.32	78.11	*74.67*	.00	1.22	*.18*	.56
By Products and Refuse.																	
Apple pomace	3	22.80	27.40	*25.90*	1.00	1.70	*1.40*	1.70	2.00	*1.90*	15.70	17.00	*16.70*	3.90	5.90	*5.20*	.70
Brewers' grains, from brewery	7	21.71	31.36	*25.46*	4.69	7.75	*6.01*	1.47	2.94	*1.85*	10.11	15.73	*12.63*	3.10	5.58	*3.96*	1.01
Brewers' grains, kiln dried	1	----	----	*97.40*	----	---	*20.40*	----	----	*6.40*	----	----	*54.90*	----	----	*11.80*	4.00
Brewers' swill	1	----	----	*5.70*	----	----	*1.90*	----	----	*.80*	----	----	*2.00*	----	----	*.70*	.30
Cotton seed meal	22	90.87	94.32	*92.17*	22.27	50.81	*42.45*	10.24	18.01	*13.36*	12.74	38.68	*23.49*	2.77	11.76	*5.67*	7.20
Linseed cake	2	89.66	91.65	*90.62*	34.14	34.93	*34.53*	5.22	6.06	*5.64*	33.44	37.43	*35.42*	7.97	9.36	*8.66*	6.37
Linseed meal	4	87.53	93.83	*91.28*	27.68	33.95	*31.23*	5.16	11.57	*8.72*	31.45	44 89	*37.75*	7.12	7.57	*7.34*	6.24
Linseed meal (new process)	6	86.65	93.21	*89.49*	27.10	37.10	*33.45*	1.30	4.01	*2.83*	35.22	48.03	*38.78*	7.58	9.00	*8.37*	6.06
Palm nut meal	3	89.16	93.86	*91.71*	13.53	16.01	*14.39*	6.41	18.73	*13.30*	33.85	41.66	*38.88*	18.75	23.98	*21.40*	3.74
Sorghum meal, from seed mostly decorticated	1	----	----	*86.84*	----	----	*8.25*	----	----	*3.85*	----	----	*71.27*	----	----	*1.88*	1.59
Sorghum bagasse	3	11.30	16.60	*14.50*	0.62	0.68	*0.65*	----	----	----	----	----	*10.20*	2.80	3.30	*3.10*	0.60
"Hominy chops," "hominy feed," "Baltimore meal," "white meal"	8	86.47	91 07	*88.18*	7.88	10.20	*9.45*	4 45	10.20	*7.78*	60.95	71.10	*65.12*	2.54	4.79	*3.47*	2.36

* The average of 18 analyses, most of them incomplete, is: Total dry matter, 89.63; Ash, .64; Protein, 10.92.

† The average of 16 analyses, some of them incomplete, is: Total dry matter, 88.55; Ash, .60; Protein, 11.63.

COMPOSITION OF FEEDING STUFFS.—*Continued.*

Name.	Analyses.	Total Dry Matter.			Protein.			Fat.			Nitrogen-free Extr.			Fiber.			Ash.
		Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	
BY PRODUCTS AND REFUSE—*continued.*																	
Gluten meal	2	91.57	92.60	*92.13*	28.03	35.00	*31.51*	8.01	8.73	*8.37*	44.72	54.46	*49.60*	.73	3.25	*1.99*	.66
Maize cob	13	85.58	92.82	*90.67*	1.23	3.73	*2.50*	.08	.92	*.47*	45.31	66.38	*55.99*	28.23	38.26	*30.36*	1.33
"Starch feed," refuse from starch manufacture	2	27.80	37.70	*32.90*	3.60	5.70	*4.60*	1.30	2.00	*1.60*	18.80	28.90	*23.80*	1.60	3.40	*2.50*	0.20
"Sugar feed," refuse from glucose manufacture (dry)	2	89.60	93.40	*91.50*	13.10	13.50	*13.30*	5.90	11.20	*8.60*	54.90	61.40	*58.10*	8.40	10.70	*9.50*	2.00
"Glucose waste," (wet)	1	----	----	*24.00*	----	----	*3.72*	----	----	*1.63*	----	----	*17.39*	----	----	*.75*	0.51
Malt sprouts	3	88.03	92.69	*89.73*	21.00	25.91	*22.95*	1.09	2.98	*1.79*	45.47	50.30	*48.60*	9.30	11.99	*10.72*	5.67
Rye bran	3	86.30	89.70	*87.70*	12.60	16.80	*15.26*	1.79	2.60	*2.19*	59.75	67.00	*63.12*	2.50	4.10	*3.51*	3.62
Wheat middlings	9	86.15	89.44	*88.03*	10.13	15.00	*12.27*	2.07	4.35	*3.23*	60.21	70.86	*65.48*	3.47	7.45	*4.58*	2.47
Wheat bran	2	85.82	91.35	*87.98*	7.81	16.89	*14.54*	2.39	5.84	*3.66*	50.41	58.93	*55.16*	7.24	16.64	*8.79*	5.83
Wheat shorts	6	86.41	89.04	*88.15*	11.13	15.13	*13.14*	2.50	4.85	*3.79*	55.62	62.32	*58.96*	6.34	10.47	*7.94*	4.32
Rice flour	1	----	----	*89.68*	----	----	*14.00*	----	----	*13.49*	----	----	*51.22*	----	----	*6.12*	4.85
Rice meal	1	----	----	*84.90*	----	----	*9.30*	----	----	*1.60*	----	----	*59.90*	----	----	*8.10*	6.00
"Rice polish"	1	----	----	*88.79*	----	----	*12.93*	----	----	*7.69*	----	----	*62.96*	----	----	*2.41*	2.80
Rice feed	1	----	----	*89.67*	----	----	*11.43*	----	----	*11.49*	----	----	*47.20*	----	----	*9.93*	9.62
Rice bran	1	----	----	*90.70*	----	----	*12.78*	----	----	*5.23*	----	----	*62.34*	----	----	*2.00*	8.35
Rice bran, "douse"	1	----	----	*91.22*	----	----	*10.93*	----	----	*8.20*	----	----	*41.93*	----	----	*17.76*	12.40
Rice hulls	2	91.50	92.30	*91.90*	3.12	4.68	*3.90*	0.55	0.65	*.60*	38.74	41.60	*40.17*	30.27	38.57	*34.42*	12.81
Rice straw	1	----	----	*96.34*	----	----	*4.68*	----	----	*1.74*	----	----	*50.90*	---	----	*28.31*	10.71

SEEDS.

During the year a considerable number of seeds have been tested both for seedsmen and for those who have bought of them.

The samples whose examinations are reported (see next page), were bought by an agent of the station, and in most cases from the contents of boxes of garden seeds which bore the names of the firms mentioned. The purchases were made in Bridgeport, Hartford and Middletown rather than in smaller and more remote places where there is more suspicion that the seed may not be in all cases fresh.

Fifteen out of the forty-eight samples examined, or about 31 per cent., are of quite inferior quality, and three of them were absolutely worthless.

Variety.	Put up by	Station No.	Seed sprouted, per cent.	½ the sprouted seed germinated in days.
ONION—				
White Portugal.	John Reck, Bridgeport.	283	.3	--
Large Wethersfield.	" "	285	1.0	--
Southport White Globe.	Hegemann & Sturgis, Bridgeport.	294	79.0	4
Yellow Danvers.	Comstock, Ferre & Co.	297	86.3	5
Wethersfield Large Red.	" "	298	57.0	5
Early Red Globe.	" "	299	61.1	5
Danvers Yellow.	A. H. Dunlap & Sons.	300	48.0	5
True Danvers Yellow.	D. M. Ferry & Co.	301	73.3	5
Early Red.	" "	302	81.8	6
Large Red.	" "	303	26.8	6
Early Danvers Round Yellow.	Rice, Cambridge, N. Y.	304	71.0	6
White Portugal or Silver Skin.	" " "	305	70.0	6
RADISH—				
Early Red Turnip.	John Reck, Bridgeport.	284	86.8	3
French.	Hegemann & Sturgis, Bridgeport.	295	79.5	4
Early Scarlet Turnip.	Comstock, Ferre & Co.	317	77.0	3
Early Long Scarlet.	A. H. Dunlap & Sons.	318	36.8	10
Scarlet Turnip.	" "	319	47.8	5
Early Scarlet Turnip.	D. M. Ferry & Co.	320	54 6	5
New Breakfast French.	" "	321	68.5	5
Early Scarlet Turnip.	Hiram Sibley.	322	37.3	5
TOMATO—				
Livingston's Perfection.	John Reck, Bridgeport.	288	78.0	7
Trophy.	Comstock, Ferre & Co.	312	57.3	7
New Early Perfection.	A. H. Dunlap & Sons.	313	96.0	7
Early Acme.	" "	314	77.0	7
Early Round Smooth Red.	Johnson & Robbins.	315	66.8	7
Trophy.	Ferry & Co.	316	87.3	5
LETTUCE—				
Early Curled Simpson.	Hegemann & Sturgis, Bridgeport.	289	88.0	3
Hanson.	A. H. Dunlap & Co.	306	97.0	4
Early Curled Silesia.	" "	307	82.5	4
Ferry's Early Prize Head.	D. M. Ferry & Co.	308	86.8	4
Early Curled Silesia.	Hiram Sibley.	309	27.1	4
Early Curled Silesia.	Rice, Cambridge, N. Y.	310	93.0	4
Hanson.	" " "	311	87.8	4
CABBAGE—				
Flat Dutch.	Hegemann & Sturgis, Bridgeport.	290	92.8	3
Early Jersey Wakefield.	A. H. Dunlap & Sons.	330	33.2	4
Mammoth Late Flat Dutch.	" "	331	8.0	--
Premium Flat Dutch.	Rice, Cambridge, N. Y.	332	32.0	4
True Early Winningstedt.	" " "	333	65.8	4
True Early Winningstedt.	D. M. Ferry & Co.	334	89.3	3
Early Drumhead.	" "		94.5	3
TURNIP—				
Early White Egg.	A. H. Dunlap & Sons.	325	90.0	3
Early White Flat Dutch.	Rice, Cambridge, N. Y.	326	96.5	3
Ruta Baga.	" " "	327	84.8	5
New White Egg.	" " "	328	95.0	3
Golden Ball.	Johnson, Robbins & Co.	329	90.0	3
PEA—				
Henderson's First of All.	Hegemann & Sturgis, Bridgeport.	291	99.0	3
CARROT—				
Square Orange.	Hegemann & Sturgis, Bridgeport.	292	51.8	4
CUCUMBER—				
Early White.	Hegemann & Sturgis, Bridgeport.	296	95.8	2

REPORT OF THE BUILDING COMMITTEE.

The Act entitled "*An Act concerning The Connecticut Agricultural Experiment Station*" (Public Acts of 1882, p. 213, Chapter CXXXIII), was approved April 26, 1882, and appropriated twenty-five thousand dollars to the Station "for the purpose of buying a suitable lot and erecting thereon buildings, and equipping the same for the permanent use of said Station."

A special meeting of the Board of Control was held May 9th, 1882, at which the Executive Committee described the several parcels of land they had examined, and laid before the Board correspondence relative to property brought to their notice in other parts of the State, with such other information as they had pertaining to the matter.

The Board, after visiting several lots and parcels of land in and about New Haven, and after discussing the merits and prices of each, directed the Treasurer to purchase the lot on Suburban street, if it could be done on certain terms. A building committee was chosen, consisting of the Hon. H. B. Bigelow, Messrs. T. S. Gold, J. J. Webb, S. W. Johnson and Wm. H. Brewer to carry out the intentions of the Act.

This Committee organized the same day, choosing Governor Bigelow, Chairman, Mr. Webb, Vice-Chairman, and Mr. Brewer, Secretary. A second meeting was held May 12th at which certain preliminaries were transacted, and May 13th the property was bought for twelve thousand (12,000) dollars, and immediate possession given.

The property consists of about five acres of land on Suburban street, in the immediate suburbs of New Haven and just within the city limits, about one and five-eighths miles from the City Hall and near the Whitneyville Horse Railroad. There was a large dwelling house, a barn, and a well on the property.

A new laboratory was planned and a substantial brick building built for this use during the same year. The station office was opened in its new quarters in September of that year, but the laboratory was not in condition for much chemical work until the next February. This building was formally accepted from the builders Jan. 13th, 1883, and up to the date of the annual meeting of the Board of Control, three days later, the amount expended was $20,809.04.

During the next fiscal year, the fitting up of this laboratory was finished, sundry repairs made, and $3,029.96 was expended.

While this work had been going on, a new law concerning commercial fertilizers had been passed which modified the work required of the Station, so the Committee after consultation with the Board of Control decided to defer using the remainder of the special appropriation until the next year, by which time experience with the working of the new law and the running of the Station in its new quarters would indicate how the small balance could be used to the best advantage to the State. The balance was put into the savings bank for the winter.

Early in 1884 various plans were considered, and after several meetings and careful consideration of the matter by the Committee and the full Board, the Committee decided to erect a wooden addition to the north end of the house. The contract was made May 12th, 1884, and the addition handed over by the contractor and occupied by the Station in July. On this the balance of $1,207.46 was used.

With the expiration of Governor Bigelow's term of office as Governor, Mr. Webb became Chairman until July 1st, 1884, when his term of office as member of the Board of Control expired. Mr. Gold was then chosen Chairman. No new members were added as these dropped out by limitations of office.

The total receipts and expenditures by this Committee are as follows:

Special appropriation	$25,000.00	
Savings bank interest on deposit	46.46	
		$25,046.46
The property as bought	12,000.00	
Unexpired insurance	26.99	
Lumber on place	11.06	
Water connection	500.00	
Gas connection	155.75	
Builder's contracts,	6,662.46	
Architect	277.75	
Steam heating apparatus	800.64	
Sundry carpenter's bills	2,288.35	
Masons' bills for repairs	545.21	
Plumbing, gas fitting and drainage	1,530.02	
Painting and glazing	248.23	
		$25,046.46

All the accounts pertaining to this special appropriation have been examined, audited and balanced by the State Auditors, and closed.

The buildings are now in good repair and condition.

Signed, T. S. GOLD,
S. W. JOHNSON,
WM. H. BREWER.

ERRATA.

Page 41, Station No. **1235,** under Phosphoric Acid Available, for 9.82 read 10.18
" 42, " **1216,** " " " " 8.24 " 7.25
" 44, " **1313,** " " " " 9.00 " 10.94
" 56, " **1318,** " " " " 6.66 " 6.94
" 42, " **1186,** " Phosphoric Acid total, for 13.66 " 13.26
" 55, " **1160,** for Bowker's read Stockbridge's.
" 55, " **1155,** " " " "

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