they disappeared long ago. Every other block is left vacant, and is beautifully kept as a park or garden. Of course the city is vastly larger than the old city of New York. It includes the whole of Long Island, Staten Island, and Westchester County, both banks of the Hudson River for fifty miles, and a good portion of the States of Connecticut and New Jersey. We smile as we read of the old-time talk about consolidating with Brooklyn; the former bed room of New York is now one of the central wards of Manhattan. And the present heated discussion is about the propriety of consolidating Manhattan and Philadelphia.

As already mentioned, every dwelling in the city stands by itself, with windows on every side. That one fact has added incalculably to the happiness and health of the city. We shudder as we read of the barbarous "brown-stone fronts" of old New York, with their rows of square holes called windows in front and behind, and the unwholesome darkness and stuffiness of their rooms. And when we read of the old New York "flat," we hesitate to believe that such an outrage on humanity was ever perpetrated. But then we reflect that everything was possible in the dark ages.

Speaking of the size of Manhattan suggests the pavements and the means of locomotion. The pavements are made of a recently invented substance which, though as smooth as glass, is never slippery. And as it practically never wears out, and is never torn up, we may be pardoned for looking back on the old style of affairs in New York with amused superiority. There are, of course, no horses to be seen, for their presence in the city is strictly forbidden by a city ordinance. A few unprogressive people in the back country districts still use horses to haul the old creaking, rattley-bang wagons and carriages that were until recently the only means of locomotion, aside from that other antiquated invention, the steam railway car. But the recent development of electric locomotion has superseded all this in the cities and towns. There are great viaducts on which electric cars are run to every part of the city, for through passengers. But for short trips we never use these cars, because we don't need them. Every one, even the day laborer, going to and from his work, has his own electric carriage. They are neat and jaunty-looking affairs, made in all sizes to accommodate from one to twenty persons, having two large wheels behind and one small wheel in front, and they are so simple in construction that an infant could manage them. All you have to do is to get in, touch a button, and you are off. One little lever regulates the speed, which ranges from a snail's pace to twenty-five or thirty miles an hour; and another little lever enables you to steer. You need no track, but can speed wherever you please and as you please. With such beautifully smooth and clean pavements—for the age of unclean streets is happily a thing of the past—the luxurious comfort of traveling can easily be imagined.

But that is not all. Not only in our social and industrial life, but in our means of locomotion we have absolutely banished noise from the city. One of the things which we cannot understand about our New York ancestors is how they lived in the intolerable noise they made, most of which was absolutely unnecessary. According to all accounts the din in their homes and factories and on their streets must have been both terrific and ceaseless. In fact, their civilization was as a civilization of clangor and noise. And yet so reconciled were they to it, apparently, that in looking over the files of old New York papers we see only a few passing references to it. Indeed, some of the cockneys of those days declared that they felt homesick when they were away from the noise and clamor of the city. And from all accounts their celebrations of the national holiday were simply a barbarous saturnalia of unmeaning noise. Verily our ancestors were queer customers. What a contrast the city presents to-day. No noisy or loud-voiced person can get into good society; our factories are absolutely noiseless, owing to the introduction of perfect machinery, and our vehicles, from the electric trains that run at the rate of 150 miles an hour to the little electric tricycles holding only one person, make no noise that can be heard ten feet away. The effect of this revolution on the life of the people has been profound and far-reaching, but we have not space here to dwell on it.

Dust, too, is banished, or, rather, it is not allowed to exist. We do not refer to the great masses of dried mud and filth that our ancestors used to have on their streets, and which, in one form or another, impregnated their whole physical being. As already intimated, all our streets to-day are as clean as a billiard table. We refer rather to the impalpable particles of matter that would naturally exist in the atmosphere of a great metropolis. To get rid of this dust, often laden with disease microcosms, we have a wonderful system of "dust consumers" on every street corner, and in every factory and shop of the city, which absolutely extract or "eat up" the foreign substances in the air. Our ancestors used to breathe in this dust; in fact, without knowing it, they themselves were "dust consumers." The result was seen in the prevalence of diseases, especially of the throat and lungs, and in the uniformly harsh voices of the people.

They never knew what it was to breathe clean air, while we never know what it is to breathe anything else. And not only is our air clean, it is pure. In every block of the city there are air-purifying machines which are almost human in their intelligence.

They not only draw from the air all that is noxious and vitiating, but they actually improve the air which nature furnishes, making it more fit for breathing. Therefore instead of our citizens going to the mountains or the seashore to get a breath of fresh air, people from the country come to Manhattan when they feel the need of fresh air. That is, a few of them do; for, as in the old days, country people are strangely indifferent to the importance of fresh air. For the last forty years, since we first began to clean and purify our air, the average increase in longevity has been a little more than five years. The old philosophers used to waste a great deal of time in trying to find the elixir of life. We engage in no such vain quest; or, rather, we find the real elixir of life in a more intelligent understanding of the laws of life. The nearer we get to the conditions that nature intended, the longer we will live. How simple, and yet how many thousand years it has taken the world to find it out!

Underneath the streets there is a great and comprehensive system of other streets brilliantly lit with elec-

tricity, where most of the business of the city is done. Express wagons, drays, trucks, etc., are confined to these streets, thus leaving the upper streets for the exclusive use of the people. Underneath the city, also, is a magnificent system of sewerage, more perfect than anything known in the days of old New York. There are no longer any garbage wagons with their disgusting adjuncts. Connected with every house there is a chute which is opened once a day for the reception of all detritus. It is immediately carried into immense pipes through which it is conveyed to great establishments outside of the city, where it is made innocuous by recently invented chemical processes. The result in health and happiness from this admirable system of sanitation can hardly be estimated.

Another thing that adds greatly to the pleasure of living is the frequent flooding of the streets with salt or fresh water. On a hot summer day, for instance, this can be done at a moment's notice, and at the same time, by an ingenious device, sea air, laden with the delightful odor of salt spume, can be distributed through the city. This sea air is cooled, and is made to circulate as a breeze, no matter how calm the day may be. Another interesting arrangement is a system of awnings to cover the streets, when necessary, in summer, and of glass roofs for the streets in winter. The citizens are thus able to travel on the streets without suffering from heat in summer or from cold or snow in winter.

Since the great anti-liquor revolution, which took place sixty years ago, there has not been a licensed saloon in the city, and the number of habitual drinkers is very small. The causes which led up to this revolution had been gathering force for generations. The saloons increased enormously in number and power with the help of the politicians, and the latter in turn ruled

now voted every year to the "Pleasure and Profit Fund." Out of this fund we maintain a number of splendid theaters, opera houses, music halls, and places of popular entertainment and instruction. The best artists of the world are engaged for these places, and all citizens are admitted to them free of charge. This does not promote pauperism, for recreation and amusement are properly a part of our education, and even our benighted ancestors believed in making education free.

The old socialistic dream of a deadening equality has not been realized among us. Some of us are rich and some of us are poor; some wise and some foolish. But there are no extremes of wealth and poverty as there were in the old days. Our wealthy citizens long ago realized the folly and danger of amassing wealth, folly because they could not possibly use or enjoy more than a certain portion of it, and danger because it sowed the seeds of revolution and anarchy by exciting the anger and envy of less-favored citizens. So when a citizen acquires a certain specified sum which is amply sufficient to maintain himself and family in luxurious comfort, he either stops acquiring wealth or, if he does not stop, he is obliged to turn over his surplus wealth to a municipal fund called the "Brotherhood Fund." Some men have a peculiar aptitude for making money, and love to do so for the pleasure it gives them, just as they would love a game of chance. It is not a very noble characteristic, but such as it is, we turn it to account by making those men help those who are less fortunate. In a word, the Brotherhood Fund is used to train, educate, and wisely assist the citizens who do not have much natural capacity to make their way in life, or who, for some reason, have been handicapped in their efforts to earn a living. The result of all this is that there are no very poor people among us, except a very

The heights of the figures illustrate the proportionate amounts spent in England on education, tea, coffee and cocoa, milk, bread, and alcoholic liquors.—*Daily Graphic*.

JOHN BULL'S DRINK BILL.

with the help of the saloons. It was a game of seesaw, with the saloons and the politicians alternately on top, but with the people always at the bottom. Crime and ruin, moral and physical, held sway in every grade of society. The Prohibitionists tried in vain to stem the tide of evil, and good citizens began to despair.

Then, no one knows just how, a frenzy of hot indignation spread through the community. Good citizens in every walk of life, few of whom were Prohibitionists, and many of whom were themselves moderate drinkers, though recognizing the wisdom of abstinence, banded themselves together to suppress the curse of drink. The suppressed fury of years got the better of them, and a wild saturnalia of indefensible violence ensued. Distilleries and breweries were burned, thousands of liquor shops were wrecked and their contents poured into the sewer. Hundreds of saloon keepers and disreputable politicians were hanged on lamp posts, and thousands of others were driven out of the city. Lawless and criminal as the uprising was—and no one attempted to justify it—it proved to be the salvation of Manhattan. It ended forever the domination of the saloon and the saloon politician. It was the triumph, not of prohibition, but of abstinence, two things which, though often confused, are radically different. To abstain is always feasible, to prohibit is not. Abstinence is the higher virtue, and it has only become possible through the growth of moral character in the people. Among us a man who doesn't abstain is as loathsome as being as was the brutal murderer in the old days. With such a public opinion dominant there is nothing to fear from the drink habit. It lurks only in a few dark corners, and even then is so attenuated as to be harmless.

And what a revolution it was! To take one fact, a per capita equivalent of the amount that used to be spent in drinking and other forms of vice, as well as on the institutions made necessary by the drink habit, is

few who are incapable or incorrigible, and these we take care of in institutions.

The spell ceases to work. The vision of the greater New York that may be, may we not hope of the New York that is to be, becomes blurred and indistinct. At last it disappears entirely and our eyes again look upon the concrete New York that now is. The contrast between the possible and the actual is one calculated to make us sad. But we will be optimists in spite of so much to discourage us. If, as the inspired penman declared, faith is the substance of things hoped for, the evidence of things not seen, then we have faith that New York will some day be worthy of the love and admiration of all her children, and our dreams about her greatness and glory will be realized facts.—*N. Y. Tribune*.

THE PRECIPITATION OF COPPER BY IRON.

By J. ESSNER.

WHEN roasted cupreous pyrites is alternately moistened and dried in the air and then extracted with water, a solution of copper sulphate and ferric salts is obtained. If this solution is treated at 70 to 80° C. with metallic iron, a precipitate of metallic copper is formed, which, however, contains such a large amount of ferric hydrate that it is difficult to separate the copper. All kinds of iron were employed for the precipitation of the copper in these experiments, and the latter was obtained in three different states—pulverulent, granular, and fibrous. Experiments made with carefully chosen iron show that the structure of the latter is of considerable influence on that of the copper, which could be obtained in the granular and fibrous forms at will. The cause of the separation of ferric hydrate was found to be the presence of a basic ferric sulphate of the

formula $\text{Fe}_2(\text{OH})_2\text{SO}_4$ in the solution. This salt decomposes when treated with metallic iron into neutral sulphate and ferric hydrate:

When a very dilute solution of neutral ferric sulphate is treated with iron in the same way no precipitation of hydrate occurs, but rather a reduction of some of the ferric to ferrous salt. In order to prevent the precipitation of hydrate the author makes the liquor obtained from the burnt pyrites slightly acid with sulphuric acid, and is then able to obtain a very pure deposit of copper by the action of iron.—*Chem. Zeit.*

THE FIXATION OF FREE NITROGEN.*

FROM the results of the experiments of Boussingault, and also of those made at Rothamsted under conditions of sterilization and inclosure more than thirty years ago, Sir J. B. Lawes and the author had always concluded that at any rate our agricultural plants did not assimilate free nitrogen. They had also abundant evidence that the Papilionaceæ, as well as other plants, derived much nitrogen from the combined nitrogen in the soil and sub-soil. Still, they had long recognized that the source of the whole of the nitrogen of the Papilionaceæ was not explained; that there was, in fact, "a missing link." They were, therefore, prepared to recognize the importance of the results first announced by Prof. Hellriegel in 1886; and they had hoped to commence experiments on the subject in 1887, but they had not been able to do so until 1888. Those first results showed a considerable formation of nodules on the roots, and coincidently great gain of nitrogen, in plants grown in sand (with the plant ash) when it was microbe-seeded by a turbid watery extract of a rich soil.

In 1889 and since, they had made a more extended series. The plants were grown in pots in a glass house. There were four pots of each description of plant, one with sterilized sand and the plant ash, two with the same sand and ash, but microbe-seeded with watery extract, for some plants from a rich garden soil, for lupins from a sandy soil in which lupins were growing luxuriantly, and for some other plants from soil where the particular plant was growing. In all, in 1889 and subsequently, they had grown in this way four descriptions of annual plants—namely, peas, beans, vetches, and yellow lupins; and four descriptions of longer life—namely, white clover, red clover, sainfoin, and lucerne. Enlarged photographs of the above-ground growth, and of the roots, of the peas, the vetches and the lupins, so grown, were exhibited. Without microbe seeding there was neither nodule formation nor any gain of nitrogen; but with microbe seeding there was nodule formation, and, coincidently, considerable gain of nitrogen.

As, however, in this exact quantitative series, the plants were not taken up until they were nearly ripe, it was obvious that the roots and their nodules could not be examined during growth, but only at the conclusion, when it was to be supposed that the contents of the nodules would be to a great extent exhausted. Another series was, therefore, undertaken, in which the same four annuals, and the same four plants of longer life, were grown in specially made pits, so arranged that some of the plants of each description could be taken up, and their roots and nodules studied, at successive periods of growth: the annuals at three periods—namely, first when active vegetation was well established, secondly when it was supposed that the point of maximum accumulation had been approximately reached, and thirdly when nearly ripe; and the plants of longer life at four periods—namely, at the end of the first year, and in the second year when active vegetation was re-established, when the point of maximum accumulation had been reached, and lastly when the seed was nearly ripe. Each of the eighth descriptions of plant was grown in sand (with the plant ash) watered with the extract from a rich soil; also in a mixture of two parts rich garden soil and one part of sand. In the sand the infection was comparatively local and limited, but some of the nodules developed to a great size on the roots of the weak plants so grown. In the rich soil the infection was much more general over the whole area of the roots, the nodules were much more numerous, but generally very much smaller. Eventually the nodules were picked off the roots, counted, weighed, and the dry substance and the nitrogen in them determined.

Taking the peas as typical of the annuals, and the sainfoin of the plants of longer life, the general result was that at the third period of growth of the peas in sand the amount of dry matter of the nodules was very much diminished, the percentage of nitrogen in the dry matter was very much reduced, and the actual quantity of nitrogen remaining in the total nodules was also very much reduced. In fact, the nitrogen of the nodules was almost exhausted. The peas grown in rich soil, however, maintained much more vegetative activity at the conclusion, and showed a very great increase in the number of nodules from the first to the third period; and with this there was also much more dry substance, and even a greater actual quantity of nitrogen, in the total nodules at the conclusion. Still, as in the peas grown in sand, the percentage of nitrogen in the dry substance of the nodules was very much reduced at the conclusion. In the case of the plant of longer life, the sainfoin, there was, both in sand and in soil, very great increase in the number of nodules, and in the actual amount of dry substance and of nitrogen in them, as the growth progressed. The percentage of nitrogen in the dry substance of the nodules also showed, even in the sand, comparatively little reduction, and in soil even an increase. In fact, separate analyses of nodules of different character, or in different conditions, showed that while some were more or less exhausted and contained a less percentage of nitrogen, others contained a high percentage, and were doubtless new and active. Thus, the results pointed to the interesting conclusion that, in the case of the annual, when the seed is formed, and the plant more or less exhausted, both the actual amount of nitrogen in the nodules, and its percentage in the dry substance, are greatly reduced, but that, with the plant of longer life, although the earlier formed nodules become ex-

hausted, others are constantly produced, thus providing for future growth.

As to the explanation of the fixation of free nitrogen, the facts at command did not favor the conclusion that under the influence of the symbiosis the higher plant itself was enabled to fix the free nitrogen of the air by its leaves. Nor did the evidence point to the conclusion that the nodule-bacteria became distributed through the soil and there fixed free nitrogen, the compounds of nitrogen so produced being taken up by the higher plant. It seemed more consistent, both with experimental results and with general ideas, to suppose that the nodule-bacteria fixed free nitrogen within the plant, and that the higher plant absorbed the nitrogenous compounds produced. In other words, there was no evidence that the chlorophyllous plant itself fixed free nitrogen, or that the fixation takes place within the soil, but it was more probable that the lower organisms fix the free nitrogen. If this should eventually be established, we have to recognize a new power of living organisms—that of assimilating an elementary substance. But this would only be an extension of the fact that lower organisms are capable of performing assimilation work which the higher cannot accomplish; while it would be a further instance of lower organisms serving the higher. Finally, it may here be observed that Loew has suggested that the vegetable cell, with its active protoplasm, if in an alkaline condition, might fix free nitrogen, with the formation of ammonium nitrite. Without passing any judgment on this point, it may be stated that it has frequently been found at Rothamsted that the contents of the nodules have a weak alkaline reaction when in apparently an active condition—that is, while still flesh-red and glistening.

As to the importance of the fixation for agriculture, and for vegetation generally, there is also much yet to learn. It is obvious that different Papilionaceæ growing under the same external conditions manifest very different susceptibility to, or power to take advantage of, the symbiosis. The fact, as shown by Prof. Nobbe, that papilionaceous shrubs and trees, as well as herbaceous plants, are susceptible to the symbiosis, and under its influence may gain much nitrogen, is of interest from a scientific point of view as serving to explain the source of some of the combined nitrogen accumulated through ages on the surface of the globe; and also from a practical point of view, since, especially in tropical countries, such plants yield many important food materials, as well as other industrial products.

In conclusion, it will be seen that the experimental results which have been brought forward constitute only a small proportion of those already obtained or yet to be obtained at Rothamsted, but they have been selected as being to a great extent typical, and illustrative of the lines of investigation which are being carried out.

ON A NEW METHOD OF PURIFYING CHLOROFORM.

By RENE DU BOIS REYMOND, M.D.

(Communicated by Dr. Frederic Hewitt.)

IT is now about a year ago that, by the advice of Prof. Liebreich, the Berlin pharmacologist, Prof. Pictet, formerly of Geneva, introduced a new method for the manufacture of chloroform. The main feature of the innovation is the application of intense cold, by means of which the chloroform is caused to crystallize, while the impurities it contains are excluded, and can be drained off. The process, as described in the patent, consists of three stages. First of all the chloroform is subjected to a mild degree of cold, by which moisture and other easily frozen matter is removed. This generally only amounts to a small quantity of snow-like substance, sometimes of a yellowish tint. It is readily eliminated by means of a filter previously placed at the bottom of the vessel, and afterward pulled up so as to receive all the solid particles on the way. The second and principal part of the proceeding consists in freezing the whole quantity of chloroform, draining off the liquid residue, and allowing the pure crystals, thus separated, again to liquefy. Thirdly and lastly, the pure chloroform is further refined by distilling under diminished pressure at a very low temperature.

The apparatus used to produce the necessary cold was invented by Prof. Pictet. The chloroform purified by crystallization possesses a very mild and agreeable odor. Tested by the ordinary tests, it appears perfectly pure. But its special characteristic is its remarkable degree of durability. It has been affirmed that absolutely pure chloroform of 1.500 specific gravity will not keep. But this is evidently a mistake. The alcohol which is usually added to chloroform is only of use when impurities are present, and is quite unnecessary if the anæsthetic is chemically pure. As this is indisputably the only way in which alcohol affects the chloroform, it follows, from the mere fact that chloroform with alcohol seems to keep better than without, that really pure chloroform would keep still better. This conclusion is borne out by facts. The case is analogous to that of nitrate of silver, which will remain unchanged by the action of sunlight if perfectly pure and shut off from the air. The pure chloroform keeps as well without as any other chloroform with alcohol. This has been proved by the following tests. The addition of bichromate of potash indicates the total absence of alcohol previously contained in the drug. Tests as to durability were carried on during several months. Samples of chloroform in bottles of clear glass were exposed to the action of sunlight on the roof of the laboratory, and tested at certain intervals with nitrate of silver, iodide of zinc, and starch. While ordinary chloroform invariably gave signs of decomposition on the very next day, the crystallized chloroform on an average kept unaltered for a week. Repeated trials were made by means of a combination of the nitrate of silver and the sulphuric acid tests, in the following manner. A small quantity of chloroform was poured into a phial containing about the same volume of concentrated sulphuric acid, and was allowed to remain there, being well shaken from time to time. At fixed intervals the nitrate of silver test was applied to samples of the chloroform thus treated. The presence of the sulphuric acid acts as a permanently strong decomposing agent, and this method is therefore equal to and more handy than the sunlight test. Ordinary chloroform, as a rule, shows signs of decomposition after a few mi-

nutes; the best kinds will stand about twenty-four hours; but the crystallized chloroform held out for several days.

The new chloroform is at present being tried at the principal hospitals of Berlin, and the following remarks on its clinical properties may be ventured on: 1. There is no difference as to the excitability during the inhalation, or vomiting after. 2. Anæsthesia is produced more promptly and with smaller doses than ordinarily, frequently appearing before extinction of reflex action. 3. Anæsthesia remains after stoppage of inhalation longer than usual, sometimes even beyond return of consciousness.—*The Lancet.*

ANALYSIS OF FERMENTED LIQUORS.*

1. *Specific Gravity.*—This determination is made with a pycnometer, or a Westphal balance controlled by a pycnometer. Temperature, 25° C.

2. *Alcohol.*—One hundred cubic centimeters of wine at 25° C. distilled (preferably in glass) give x cubic centimeter alcohol.

3. *Extract.*—Fifty cubic centimeters of wine (at 25° C.), in case of sweet wines a less amount, are evaporated in a platinum dish on the water bath to a proper consistency, and then dried in a drying oven at 100° C. to constant loss of weight. Constant loss of weight is assumed when three weighings, with equal intervals between the first and second and second and third, give equal differences between the successive weighings. Weighings are to be made at intervals of fifteen minutes.

NOTE ON THE EXTRACT DETERMINATION.—So far as we are aware, no satisfactory method has been given for the determination of the extract of wine. We think that the method of the Bavarian chemists is, on the whole, the best. As the object is for the purpose of comparison with some standard, we cannot do better, we think, than to follow the standard most generally adopted. We have in mind, when the new chemical laboratory of the University of California is fitted up, to make some experiments on the determination of this extract in a vacuum at a moderate temperature. We should modify somewhat the method of Gautier. However, until some better method has been established, we believe the method given will be most satisfactory.

4. *Acidity* (total acid constituents of the wine expressed as tartaric acid).—If carbonic acid is present, expel by shaking. Titrate with dilute alkali solution. The neutral point is determined by adding a drop of solution to delicate litmus paper.

5. *Volatile Acids* (expressed as acetic acid).—Distill in a current of steam, and titrate the carefully condensed distillate with standard alkali decinormal.

6. *Glycerin.*—(1) This is determined in dry wines as follows: The alcohol is driven off from 100 c. c. wine, lime or magnesia added, and the whole evaporated to dryness. The residue is boiled with 90 per cent. alcohol, filtered, and the filtrate is evaporated to dryness. This residue is dissolved in 10 to 20 c. c. alcohol, 15 to 30 c. c. ether added, and the mixture allowed to stand until it is clear. It is then decanted from the sticky precipitate into a glass-stoppered weighing bottle, evaporated to constant loss of weight, and weighed.

(2) The following method is employed for sweet wines: One hundred cubic centimeters wine are measured into a porcelain dish and evaporated on the water bath to a sirupy consistency, mixed with 100 to 150 c. c. absolute alcohol, poured into a flask, ether added in the proportion of 1½ volumes to each volume of alcohol used, the flask well shaken and allowed to stand until the liquor becomes clear. This is then poured off, and the residue again treated with a mixture of alcohol and ether. The liquids are mixed, the alcohol and ether driven off, the residue dissolved in water and treated as in (1).

(3) In all glycerin determinations it is necessary to take into consideration the loss of glycerin due to its volatility with water and alcohol vapor, and accordingly to add to the glycerin found 0.100 gramme for each 100 c. c. of liquid evaporated.

(4) It is necessary to test the glycerin from sweet wines for sugar, and if any is present, it must be estimated by Soxhlet's or Knapp's method, and its weight subtracted from that of the glycerin.

7. *Sugar.*—This is to be determined by Soxhlet's or Knapp's method. The presence of unfermented cane sugar is to be shown by inversion, etc. *Polarization.*—(1) The wine is decolorized with plumbic subacetate.

(2) A slight excess of sodic carbonate is added to the filtrate from (1): 2 c. c. of a solution of plumbic subacetate are added to 40 c. c. white wine, and 5 c. c. to 40 c. c. red wine, the solution is filtered, and 1 c. c. of a saturated solution of sodic carbonate added to 21.0 or 22.5 c. c. of the filtrate.

(3) The kind of apparatus used and the length of the tube are to be given, and results estimated in equivalents of Wild's polaristrometer with 200 mm. tubes.

(4) All samples rotating more than 0.5 degree to the right (in 2 mm. tubes, after treating as above) and showing no change, or but little change, in their rotatory power after inversion, are to be considered as containing unfermented glucose (starch sugar) residue.

(5) Rotatory power of less than 0.3 degree to the right shows that impure glucose has not been added.

(6) Wines rotating between 0.3 degree and 0.5 degree to the right must be treated by the alcohol method.

(7) Wines rotating strongly to the left must be fermented, and their optical properties then examined.

8. *Tannin.*—Determine with Neubauer's permanganate method.

9. *Potassic Bitartrate.*—The determination of potassic bitartrate as such is to be omitted.

10. *Tartaric, Malic, and Succinic Acids.*—(1) According to Schmidt and Hiepe's method. (2) Determination of tartaric acid according to the modified Berthelot-Flury method. (3) If the addition of 1 gramme finely powdered tartaric acid to 100 grammes wine produces no precipitate of potassic bitartrate, the modified Berthelot-Flury method must be employed to determine free tartaric acid.

11. *Coloring Matter.*—(1) Only aniline dyes are to be looked for. (2) Special attention is to be paid to the spectroscopic behavior of rosaniline dyes as obtained by shaking wines with amyl alcohol before and after saturation with ammonia.

* As adopted by the Association of Official Agricultural Chemists of the United States for 1890-1891.

* A abstract of a paper read before the Agricultural Chemistry Section of the Naturforschers Versammlung at Halle a. S., by Dr. J. H. Gilbert, F.R.S., September 24, 1891.—*Nature.*