ELECTRICITY AS A MOTOR FOR AERIAL NAVIGATION.

M. TISSANDIER gives an account in *La Nature* of some experiments which he has carried on in regard to the propulsion of air balloons by electric motors. Since the commencement of these experiments considerable progress has been made in the construction of accumulators, but the Faure and Planté accumulators, constructed by M. de Kabath, are of considerable weight in comparison with the work which they are capable of doing. It takes but little less than two hundred and fifty kilogrammes of accumulators to produce one horse power. It would not be impossible to construct special accumulators much lighter and of large capacity, but without renouncing in any manner the secondary batteries, M. Tissandier wishes to take into account all that can be obtained from primary batteries of great power. The batteries of large power are but few, numbering three: the Bunsen, the Daniell, and the bichromate of potash battery. The last is the most advantageous in the present case.

After numerous experiments for determining the best composition for the exciting liquid, the nature of the jars, the limit of thickness of the carbons and zincs, the number of the latter in each element, finally to have a maximum power under or below a minimum weight, M. Tissandier constructed a model with a large surface, which has given preliminary satisfactory results. The idea of this model was obtained from seeing the bichromate batteries of M. Trouvé work in his electrical boat, and the first experiments were made with four Trouvé batteries.

The twenty-four elements, mounted in tension, put in motion a small Gramme motor of half a horse power. The work produced measured was 14 kilogrammeters per second during one hour, and 10 kilogrammeters during the following hour. The Gramme motor employed was not constructed to work with these batteries, and the experiment was made under the worst conditions, but it was demonstrated that the bichromate batteries are much more constant than is generally believed. The new model of battery is composed of an ebonite trough, 5 millimeters thick, measuring 0·55 m. in length, 0·16 m. in height, and about 0·14 m. in width. In this trough are placed vertically thirteen carbons and twelve amalgamated zincs, arranged in alternation. The carbon plates are two and a half millimeters in thickness, the zinc plates about one millimeter. These plates are fixed to longitudinal bands of copper, which are screwed upon the exterior edge of the ebonite trough. Notwithstanding its lightness, the elements thus mounted are very solid and may be shaken quite violently without the carbons or zincs being deranged.

The ebonite vessel is furnished with an opening in the lower part to admit a tube which, by the aid of a rubber pipe, communicates with a receiver containing the bichromate solution. By raising or lowering this receiver above or below the battery elements, the battery may be filled or emptied. The battery contains about 4 liters of liquid strongly charged with bichromate and sulphuric acid (the composition of the liquid, in weight, is, water 100 parts, bichromate of potash 16, and sulphuric acid 37). The solution being very concentrated, the electrical resistance is less. The electromotive force of this battery is very variable, and may become considerable when the exterior resistance is very feeble. In an experiment performed with a hot and very concentrated liquid, a mean current of 110 ampères was obtained during twenty minutes with a difference of potential at the limit of 1·68 volts. This represents transferable work equivalent to 18 kilogrammeters per second. The boiling was so violent the liquid escaped outside of the vessel and put an end to the experiment.

This result may be obtained practically, but the returns which may be depended upon in the normal condition of work are favorable enough, and then the battery will be nearly constant from one hour and a half to two hours. We give the figures, from which one may form a correct idea of what may be obtained. These are the mean figures obtained by a series of experiments made upon variable resistances:

A battery of eighteen elements, arranged for tension, weighs 140 kilogrammes. Over a circuit of 0·54 ohm resistance it gives a transferable electric energy of 135 kilogrammeters per second for about one hour and a half with a current of 50 ampères. A motor adapted to this battery will yield better results. The motor weighs about 50 kilogrammes; the results obtained are as follows:

With a weight of 200 kilogrammes, battery and motor, it is possible to produce a continuous and constant work of 100 kilogrammeters per second during one hour and a half.

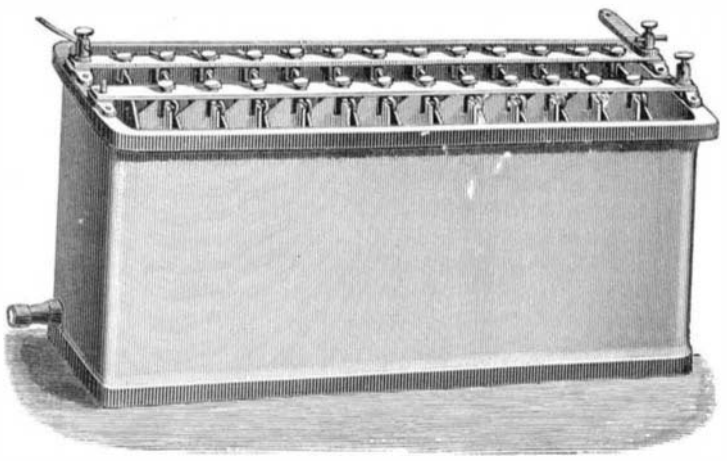
Some experiments already performed show that the production of electricity may be prolonged:

1st. By agitating the liquid; this is facilitated by employing communicating vessels;

2d. By adding new quantities of bichromate of potash to the warm and wasted liquid;

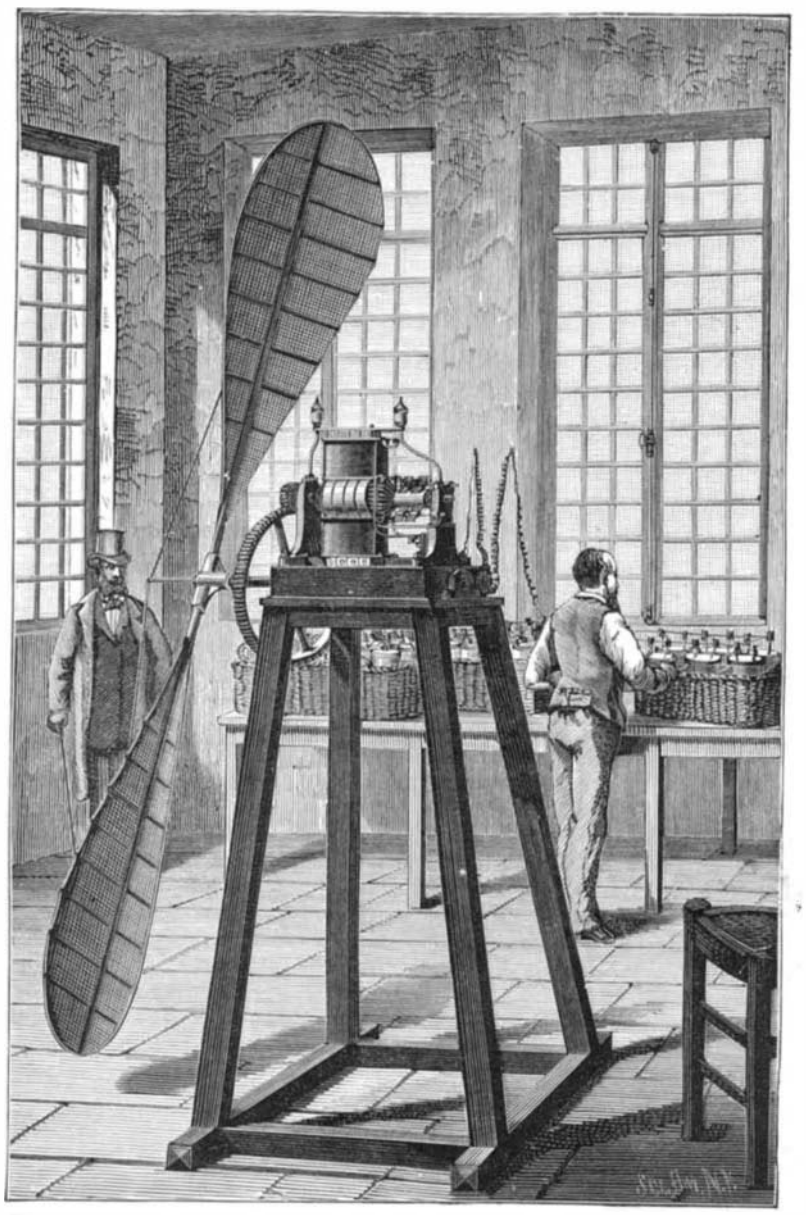
3d. By protecting the negative plate.

A battery of 18 elements, weighing 140 kilogrammes—the weight of two men—will probably furnish for over two hours a work of from one and a quarter to one and a half horse power, or the work of twelve to fifteen vigorous men. A similar battery with its motor may be easily carried by an elongated balloon of small dimensions and of small diameter, and offering in consequence little resistance to the air.



LIGHT BICHROMATE BATTERY.

While testing the power of the battery, M. Tissandier experimented with a screw attached to a dynamo-electric motor. A screw of 2·80 m. in diameter was fixed to a small Siemens dynamo-electric machine, weighing 65 kilogrammes and mounted upon a large stool (Fig. 2). The screw is composed of two plane wings, formed of wooden frames, on which silk, varnished with gum lac, is stretched in such a manner as to form a smooth rigid surface. Slender bands of iron strengthen the wooden arms, and small wires prevent the screw from being put out of shape during its rotation. The wings have an inclination of about thirty-five degrees. The motor was worked by a Faure accumulator, constructed by M. Reynier. The experiments were carried on in the Siemens workshop. With forty accumulators mounted in tension, the screw made one hundred revolutions a minute, the armature of the motor making one thousand.



ELECTRICAL PROPELLER FOR BALLOONS.

Under these conditions it was easy to calculate by the column of air displaced, that the screw worked very energetically. The current of air at from one to two meters from the apparatus was intense, and could be sensibly felt at a distance of ten meters. This fact was authenticated at the Observatory where the system was exhibited.

A Statue Struck by Lightning.

During a thunderstorm, June 22, the Confederate Monument in the State House grounds, Columbia, South Carolina, was struck by lightning, and the marble statue of a Confederate soldier that surmounted it was thrown to the ground. The head was cut completely off at the neck as if with a sword, and falling, struck on the upper base stone of the northern front of the monument. In falling the body struck the lower base on the eastern side, driving it out of place for an inch or two. The cannon at the rear of the statue was broken off. The right leg was severed at the skirt of the coat. The hands, which rested on the musket, were broken off, and the left leg was driven into the ground six or eight inches. There is nothing left on the top of the shaft but a fragment of the left leg, which is broken off at the ankle, and rests upon the broken stock of the musket. The statue was hurled to the ground with so great force that where it struck the stone base it was crushed into powder. Many fragments were carried off by curiosity seekers. The head and hands were deposited in the Secretary of State's office for safe keeping, and the rest of the statue was placed under the guard of the State House keeper.

The monument was erected by the South Carolina Monumental Association, composed of ladies, on May 13, 1879. The association was founded in February, 1865, and work was begun in 1869. The total expenses of the enterprise amounted to $11,761 46. The statue surmounting the monument, which was of fine Italian marble, cost about $5,000.

Progress of Homeopathy.

At the recent meeting of the American Institute of Homeopathy, at Indianapolis, Dr. Talbot, of Boston, read a report showing that there are 7,000 homeopathic physicians and 278 institutions in the United States; 4 national societies report 1,067 members; 26 State societies, 1,783 members; 103 local societies, of which 66 report 2,355 members; 18 clubs, of which 7 report 79 members; 23 general hospitals, of which 18 report 1,268 beds; 15 of these hospitals reported having treated last year 6,675 patients. The cost and value of 11 of these is $770,500. Of 30 special hospitals 15 report 859 beds, and 9 of them treated last year 10,609 patients. The cost and values of these hospitals are $1,106,000. Of 29 dispensatories, 27 reported having treated last year 1,469 patients. To these had been furnished 256,589 prescriptions. Twelve medical colleges have had 1,267 students, and graduated 412 physicians this year, and 5,680 since they were founded.

Some Newly Observed Properties of Glucose.

Among the many fluctuating observations formerly made regarding glucose were the following important ones: first, the reduction of alkaline copper solutions; second, the absorption of alkali in a titered solution. To these Léon Cuisinier adds the following new ones:

If a dilute solution of glucose which is saturated with lime be left standing for a long time, the rotatory power decreases more and more, without passing beyond the light orange color. After a larger portion of its rotatory power has disappeared, only a comparatively small part of the alkali is absorbed. If it is saturated with carbonic acid, it will be found that its power of reducing a copper solution has not perceptibly altered in comparison with what it was at the start, while its rotatory power has disappeared entirely. By this reaction an optically inactive body has been formed which has no action on litmus, but unites with some alkali, and absorbs oxygen with avidity, so that an alkaline glucose solution in a well closed bottle absorbs so much oxygen that there is a considerable reduction of pressure. If a certain quantity of the neutral body is put in an alkaline copper solution, the oxide is immediately reduced to the brown (red?) suboxide. Hence it would seem that the reducing property of glucose is to be ascribed to this neutral body entirely, which is presumably an alcohol from which are derived the various kinds of sugar.

[This is not so surprising, for in 1880 Prof. H. W. Wiley showed that the reducing power bore no constant relation to the rotatory power of glucose.—ED.]

Cotton-seed Fat as an Adulterant for Lard.

BY JOHN MUTER, PH.D., F.I.C.

This fat (of which I exhibit a specimen) is in some respects peculiar. It is, as you see, not at all unlike lard, being similar in consistence and general appearance. According to my analyses of several samples which I have had submitted to me by firms in the lard trade, anxious to know what it is, I find on an average the following result: (1.) It has an actual density at 100° F. of ·911·5 to ·912. (2.) It yields on saponification 95·5 per cent. of fatty acids, all insoluble. (3.) It is completely soluble in ether and in hot absolute alcohol. (4.) When melted and treated by my modification of Chateau's course, it gives reactions for cotton oil. It is, therefore, evidently the "stearine" separated out during the rectification of that oil. A most striking fact is that, although nicely made to almost the exact consistence of lard at ordinary temperature, and not becoming perfectly fluid under 90° F., yet, after melting, it does not again solidify, but remains a yellow oil, having the distant odor of fine cotton salad oil, until it has been kept at 40° F. for some time, when it again resumes its original appearance. Its detection in lard is happily rendered simple by its high density and by the article not setting so solid as it was at first, after having been kept melted for the purpose of taking gravity. If added to "butterine" it makes the article softer and better looking in winter, and increases the density, but the high insoluble acids then serve to distinguish such a "butterine" from a mixture of fat and butter. Many recent "butterines," which on the density actually show a considerable amount of pure butter, have not a trace, but the error is due to the presence of this cotton "stearine." —*Analyst.*

Enlarged Stereoscopes.

In the *Laterna Magica*, Dr. Liesegang, writing of stereoscopes, refers to Claudet's monster stereoscope, and says the latter possessed over the ordinary stereoscope the great advantages that one had not to strain the eyes to view the picture, and that several persons could see the picture at the same time, and with the improved lantern appliances of today a much better result might be expected than was obtainable with Claudet's instrument. It ought to be enough to place the two halves of a stereoscopic transparency, each in a sciopticon, and to project both pictures upon a matte glass so that they cover each other. Absolute coincidence is, however, impossible, as the two pictures are not exactly alike, their central points being separated in the two halves of the stereoscopic picture by a distance rather greater than that between the average human eyes, and an idea of Almeida's comes in. The two halves of a stereoscopic transparency projected as directed above upon the wall produces an indistinct image, the two pictures not being identical, so Dr. Liesegang would push a red glass in front of one side in the lantern and a green one in front of the other. The observer would then put on a pair of spectacles having a red and a green glass, and would only see the green picture through the green eye of the spectacle and the red picture with the other. Almeida maintains that by this means the relief is very well brought out, particularly if the observer bend sideways toward the wall.

The Population of New York City.

A special table has been prepared by the Census Bureau showing the population of New York city by ages, sexes, nativities, etc. The total population (for 1880) is 1,206,029. The native white population consists of 349,250 males and 359,158 females, making a total of 708,408. The foreign white population numbered 231,458 males and 245,707 females, making a total of 477,165. The colored population consisted of 9,536 males and 10,920 females. The number of children of five years of age and under is as follows: Native white, males, 80,739, females, 79,875; foreign white, males, 2,318; females, 2,384; colored, males, 1,012; females, 962. Total males, 84,069; females, 83,221, or a grand total of 167,290 children five years and under. Between the ages of 5 years and 20 years the figures were as follows: Native white, males, 138,399; females, 145,103; foreign white, males, 18,729; females, 22,016; colored males, 1,722; females, 2,001; total males, 158,850; females, 169,130, or a grand total of 327,980. Of the persons 90 years old and over the native white numbered 18 males and 48 females; the foreign white were 63 males and 200 females, and the colored were 1 male and 16 females, making a total of 346 persons reported to be 90 years of age and over. The oldest native white man was 98 years, while there were 3 native white females reported at 98, 2 at 99, and 1 at 100 years. Of the foreign white population, 6 males and 13 females were reported at 100 or over. The oldest colored man was reported to be 94, and 9 colored women were reported to be 100 years or over.

The Last of the Jeannette.

A dispatch from H. H. Gilder, correspondent of the *Herald* in Northern Siberia, describes the finding the bodies of De Long's party by Lieutenant Melville, March 23. The bodies were in two places, 500 and 1,000 yards from the wreck of a scow, at a place passed by Nindermann and Noros, the day after they were sent forward for relief. The natives with the search party first found two bodies under eight feet of snow close by where a gun barrel was found supported by four sticks. While these men were digging toward the east Melville went on along the bank, twenty feet above the river, to find a place to take bearings. He then saw a camp kettle and the remains of a fire about a thousand yards from the tent, and, approaching, nearly stumbled upon De Long's hand sticking out of the snow about thirty feet from the edge of the bank. Here, under about a foot of snow, they found the bodies of De Long and Ambler about three feet apart, and Ah Sam lying at their feet, all partially covered by pieces of tent and a few pieces of blanket. All the others except Alexia they found at the place where the tent was pitched. Lee and Koch were close by in a cleft in the bank toward the west. Two boxes of records, with the medicine chest and a flag on a staff, were beside the tent.

None of the dead had boots. Their feet were covered with rags, tied on. In the pockets of all were pieces of burnt skin and of the clothing which they had been eating. The hands of all were more or less burned, and it looked as if when dying they had crawled into the fire, Boyd lying over the fire and his clothing being burned through to the skin, which was not burned. Collins's face was covered with a cloth.

All the bodies were carried to the top of a hill 300 feet high, about forty versts to the southwest from where they were found, and there interred in a mausoleum constructed of wood from the scow, built in the form of a pyramid twenty-two feet long and seven high, surmounted by a cross twenty-two feet high and a foot square, hewn out of driftwood, and conspicuous at a distance of twenty versts. The mausoleum was covered with stones and is to be sodded in the spring. The cross is inscribed with the record and names of the dead, cut in by the search party.

After completing the tomb the party separated to search the delta for traces of Chipp's people. Melville went to the northwest part of the delta and west as far as the Olenek River; Nindermann took the center, and Bartlett the northeast. Nindermann and Bartlett found nothing. Melville had not returned. The search was to be extended to Cape Borchaya and the bay of that name.

The probability is that Chipp's boat was foundered in the gale which separated the three boats, and that no vestige of the party will ever be found. It also appears certain that De Long's party were all dead long before it would have been possible for Melville to reach them after meeting Noros and Nindermann, had he been able to continue his search in November.

Capacity of Dry Grain for Moisture.

The claim that grain absorbs moisture enough on a sea voyage to pay the freight charges has been verified by some test experiments made at the California Agricultural College. Various kinds of grain were placed in a moist atmosphere and the increase in weight was noted.

The greatest increase was during the first twenty-four hours, the absorption being nearly 33 per cent of the total absorbed during the fifteen days' exposure. The following table shows the figures:

	First 24 HOURS.	*Total* IN 15 DAYS.
Oats	2·79 per cent.	7·70 per cent.
Barley	1·45 per cent.	7·00 per cent.
Wheat	2·45 per cent.	6·56 per cent.

From the results obtained it was computed that perfectly dry grain at 65° Fah. would absorb as follows: Oats, 29·08 per cent; barley, 28·17 per cent; wheat, 25·02 per cent. Under ordinary conditions the percentage is perhaps not so high, 15 to 16 per cent probably being the average.

A Street Car Fare Conveyor.

Some of our city street car lines have introduced a device to save passengers trouble in paying their fares. It is a flat brass tube faced with glass running the length of the car and ending in the usual fare box. In the top of the tube are openings large enough to receive small coins, which as they roll down the tube are visible through the glass.

Wells Comet Seen at Midday.

Successful observations of the Wells comet were made at the Dudley Observatory, Albany, N. Y., June 11 and 12, at the meridian transit. The comet was seen to have a bright, perfectly round, and sharply defined nucleus. The apparent diameter of this nucleus is about three-quarters of a second, or, after allowing for irradiation, about 200 miles. The observation, June 12, shows that the comet was still increasing in brightness, and that the vapors which surrounded the nucleus were becoming more dense and abundant. The observations also proved the Dudley Observatory ephemeris to be remarkably accurate.

THE WIDEST GAUGE RAILWAY.—Washington Territory boasts the widest gauge railway yet reported. It is an 8 foot gauge logging road running back from Skagit River. The rails are wood, 8 by 8 inches. The cars are large and are carried on twelve wheels, of 9 inch face, with double flanges.

THE wrought iron columns made by the Phœnix Iron Works for the Albany bridge are said to be the largest ever made. The length of each is 53 feet 3⅜ inches. Each is composed of eight segments, the iron of which is 1 9-16 inches thick. Each column requires 894 steel rivets, and the weight complete is 18,806 pounds. The square inches of section are 104. The eight columns, therefore, contain 150,448 pounds of metal and 7,152 rivets.

Practical Instructions for Coloring and Pickling Gold Alloys.

BY E. SCHLOSSER, OF VIENNA.

Gold alloys, particularly those that contain copper, acquire, through repeated heatings that take place during their manufacture, an unseemly brown or brownish black color, caused by the oxide of copper. To remove this they are boiled or pickled in very dilute sulphuric or hydrochloric acids, according to the color that they are to have.

If we have an alloy containing only gold and copper, either sulphuric or hydrochloric acid is employed, for gold is not attacked by either of them, while the oxide of copper dissolves so easily that after the pickling the articles have the color of pure gold, for the surface is covered with a thin film of gold.

If the alloy consists solely of gold and silver, the liquid employed is nitric acid, and the articles are left in it only a very short time; the acid dissolves a very small quantity of silver, and hence the articles acquire the color of gold.

If the alloy contains both copper and silver, besides the gold, the method of pickling can be varied to suit the color that it is desired to give to it. If, for instance, it is put in sulphuric acid, the copper alone is dissolved, and the color obtained is that of an alloy of gold and silver, for the surface consists of these two.

If nitric acid were used, both copper and silver would be dissolved, and in this case the color obtained would be that of pure gold.

The articles are gently heated and allowed to cool again before boiling. The object of the heating is to destroy any grease or dust that adheres to it. If they are soldered with soft solder, they cannot, of course, be heated, and must be cleansed from grease and dust by first putting them in a very strong lye, then washing with water and putting them in the acid.

The acids are used dilute, usually in the proportion of one part of concentrated acid to forty parts of water. The articles are laid side by side in a porcelain or earthenware dish and the dilute acid poured over them. From time to time one is taken out to see if they are yellow enough yet. When the proper color has been reached they are washed in clean water and dried.

While this pickling is merely to bring out the color of the gold, the coloring of gold has for its object the imparting to inferior goods the appearance of very good gold. Different mixtures can be employed for coloring gold, two of which are given below as giving very good results.

Mix together two parts of saltpeter, one part of table salt, and six parts of alum, with six and a half parts of water, and warm the mixture in a porcelain vessel. As soon as it begins to rise add one part of hydrochloric acid, and bring the contents of the vessel to a boil, stirring it the meantime with a glass rod.

The articles to be colored, suspended on hooks made of strong platinum wire, or of glass, are first dipped in sulphuric acid and then put in the slowly cooking solution last described and moved to and fro in it. In about three minutes they are taken out and dipped into a large vessel of water so as to see what color they are. If the desired shade is not yet attained they are dipped in again as often as necessary until they do have it. In the subsequent dippings they are only left in the liquid for one minute.

Articles colored in this way have a light yellow color, but matte appearance. They are repeatedly washed in water to remove the last trace of the liquid, and then dried in soft sawdust that has been warmed.

Instead of drying in sawdust, they can be dipped in hot water the last time and left in there a few seconds, and when taken out the water that hangs on them will evaporate almost instantly.

The second method of coloring gold alloys is by means of a mixture of 115 parts of white table salt and 230 parts of nitric acid with enough water added to dissolve the salt. This is boiled down to a dry mass of salt. The salt is put in a porcelain dish and 172 parts of fuming hydrochloric acid poured over it and heated to boiling. As soon as the suffocating odor of chlorine is perceived the articles to be colored are dipped in, and the first time they are left eight minutes in the liquid. In other respects the treatment is the same as above described. Articles that had been polished previously do not require polishing again. Of course care must be taken not to inhale this dangerous gas; the operation must be conducted under a draught or out of doors.

N. E.

A VALUABLE GRAPE VINE.—A scuppernong vine in the Tokay vineyard, near Fayetteville, North Carolina, bears 100 bushels of grapes a year. There are other vines in the same vineyard which produce from 25 to 40 bushels. The vines were planted twenty-five years ago.

Why the Wells Comet has no Tail.

The failure of the Wells comet to develop the tail expected by astronomers is accounted for by the absence of hydrocarbons from its composition. According to spectroscopic observations made at the observatory of Lord Crawfurd, in Scotland, the nucleus of the comet is unlike that of any comet previously examined, its chief element being sodium, with indications of iron and chlorine. These elements are much less volatile than the hydrocarbons found in all other comets.