LAPIDARY WORK.

Translated from the French.

There were, in 1860, 146 establishments engaged in this branch of industry in Paris, of which 5 employed over 10 hands, 39 from two to ten, and 102 but one each. The total number of hands employed was 317, there being 148 men paid by the day, and 105 by the piece; 6 women paid by the day, and 58 apprentices, who were boys under sixteen years of age. The total value of the annual production was 3,849,-120 frs.

The lapidary's art is very ancient, but the method of cutting diamonds with their own dust was scarcely known before the thirteenth or fourteenth century. This discovery has for a long time been attributed to Louis de Berquem, of Bruges, who lived in 1746, and it is only within a short time that new researches have proved that the art of cutting diamonds was known before that period. It is known, for instance, that, early in the fifteenth century, princes and lords owned and made presents of diamonds, and that there was in Paris, in 1407, a diamond cutter named Herrmann, who had the reputation of being very skillful in his art. It is proper, also, to add, that the jewelers, in an act of 1739, against lapidaries, quote an ordinance of the Provost of Paris, dated Nov. 18th, 1387, according to which the number of jewelers who devoted themselves particularly to the cutting of diamonds and precious stones was about 15 or 16.

In the Middle Ages, as has been shown, the jewelers alone practiced the cutting of precious stones; this privilege they preserved without opposition until the year 1584, when some of their members associated themselves with the masters of an old society of crystal cutters, founded in the time of St. Louis, and obtained from the former a number of workmen sworn to cut precious stones for them, to the exclusion of all others, even the jewelers themselves.

Dissentions immediately sprang up between the lapidaries and the jewelers. The former, not being satisfied with the power which they had obtained, began to encroach on the privileges reserved to the jewelers; while the latter continued to practice gem cutting, while awaiting the final judgment of the trial pending before the Parliament. Finally, on the 6th of September, 1631, the court rendered a decision by which the lapidaries were maintained in the sole right to cut all kinds of precious stones, and to work in pearl and crystal, but they were expressly forbidden to set the stones in gold or silver. Two decrees, one rendered by the Council of State, Jan. 28, 1673, the other by the Parliament, Feb. 9, 1740, prohibited the lapidaries from assuming the rank of merchant jewelers, and from giving to their workmen the title of guards and allowed them only to call themselves master lapidaries, engravers, and workers in all kinds of precious natural stones. In spite of these decisions, the lapidaries did not cease to claim the right to sell mounted gems, and asserted their claims with such persistence that, after the reorganization of the society, in 1776, they were allotted the exclusive right to set artificial stones, and authority to set natural stones conjointly with the manufacturing jewelers.

At the time of the Renaissance, lapidaries often cut precious stones in the form of vases and cups, but their principal work has always been the cutting of precious stones to be set in rings, necklaces, etc.

The art of cutting diamonds has been very slow in attaining perfection. In the fifteenth century, diamonds were table cut, and cut in the form of shields and stars; in the following century, the cutting of rose diamonds was introduced, and it was only under the reign of Louis XIV. that the method of cutting brilliants was discovered; the twelve diamonds to which Cardinal Mazarin has left his name were the first in France that were cut in this way.

During the latter part of the eighteenth century, diamond cutting was practiced on a great scale in the city of Amsterdam, and the minister Calonne, wishing to establish a diamond-cutting establishment in the Faubourg Saint Antoine, was obliged to call a master and some workmen from Holland. The Revolution finally dispersed the Parisian lapidaries, and, since that time, Amsterdam has exclusively practiced the art of cutting diamonds.

The work of cutting is performed in the same way as in former times, the only modifications in the art arise from the substitution of steam engines for the old motors. The cutting of diamonds is divided into three operations: the cleavage, which is designed to remove the defective parts of the stone, consists in breaking the diamond by means of the blade of a chisel placed in a groove made with another diamond; the blocking out or reducing it to its first rough form, which is done by rubbing together two diamonds fixed by means of mastic to the ends of two wooden handles; and finally the polishing, by means of which the diamond receives its smooth and brilliant surface and its regular facets, which is done on a horizontal wheel covered with diamond dust soaked with olive oil. The workman fastens the diamond to the end of the cement rod by pouring lead around it and then applies it to the mill. He is the sole judge of the best form to be given to the diamond, and has no guide but his own experience.

Formerly, the cutting of diamonds caused a loss of from 50 to 60 per cent of their weight, but by the present methods of cutting, the loss is not more than from 40 to 50 per cent. The diamonds do not appear as well, but as they are sold by weight the merchant obtains a better price.

Diamond lapidaries cut diamonds only. The other precious stones, such as rubies, emeralds, sapphires, topazes, amethysts, garnets, etc., are cut, in Paris, by special workmen, who also cut jasper, onyx, agate, cornelian, turquoise, etc.; still, merchants, when they have large quantities of stone to cut, apply to the lapidaries in the Jura, and even to those of Germany and Switzerland, where hand labor is much cheaper than in Paris.

Hard stones are cut in the same style as diamonds, and are polished with tripoli and water. The hardest are cut with emery on lead wheels, or with tripoli on wooden wheels.

The average wages received by the hands employed in this branch were: men, 6·37 fr.; women, 2·54 fr.; and apprentices receiving pay, 1·5 fr.

The amount exported was 257,000 fr., of which 48,000 was to America, 35,000 to England, and 30,000 to Russia.—*Industrial American.*

HOW TO OBTAIN A FINE PATINA ON BRONZE STATUES.

Translated for the Scientific American from the Polytechnic Journal.

It has been experienced in most large cities, especially in those where mineral coal is used as fuel, that bronze statues erected in public places do not obtain a fine patina, but become dark-colored and unsightly. The desire to find a means for obviating this, induced the Berlin Society for the Promotion of Industry to make careful experiments on this subject. The first question to be answered was this: Does the existence of a patina depend on the chemical composition of the bronze? To decide this query, samples were taken from ten different bronze statues, all of which were covered with a beautiful patina. Each of these samples was analyzed simultaneously, by two reliable chemists. The results obtained showed these bronzes to be of very different composition The amount of copper varied from 77 to 94 per cent. One sample contained as much as 9 per cent of tin, others 4 per cent, and some only 0·8 per cent of tin, but up to 19 per cent of zinc. The other accessory ingredients, such as lead, iron, and nickel, also varied very much. However, all these bronzes had formed a fine green patina. It is quite possible that the chemical composition of the bronzes has some influence on the time required for the production of a patina. But the above-mentioned analyses undoubtedly prove that a fine patina can originate on bronzes of the most different composition.

It has been noticed that those parts of public bronze monuments which were accessible, and which were often touched by the hands of visitors, were covered with a fine, though not a green patina; all the other parts of the same monuments being dark-colored, and of a very unfavorable appearance. This fact led the investigating committee to the supposition that the presence of greasy matter might be of importance in the formation of patina. Some experimental bronze busts were therefore set up in such parts of the city where impure exhalations are frequent, and where several public statues previously erected had assumed a dirty-looking black color, without forming even a trace of patina. One of these experimental busts was daily rinsed with water to keep it clean, and was besides painted over with neat's-foot oil once a month; the oil being put on by means of a brush, and rubbed off again with woolen rags immediately after. Another bust was rinsed with water every day like the first; but was not treated with oil. A third was also rinsed with water daily, and treated with oil twice a year. A fourth was set up and left entirely untouched.

The 1st and the 4th of these busts were put up in 1864, the 2d and the 3d in the beginning of 1866. They have fully verified the supposition of the committee regarding the action of greasy matter. The bust treated with oil once a month is now covered with a dark-green patina, which is declared very fine by all art critics. The one treated with oil twice a year has a less fine patina; while that cleaned only with water, presents nothing of that peculiarly fine appearance produced by the formation of patina. The bust which was not cleaned at all looks black and dull, making a highly disagreeable impression on the observer.

It may be safely inferred from these experiments that a bronze monument erected in a public place can be made to obtain a fine patina, if the bronze is kept clean and rubbed with oil once a month. If the frequency of this operation can be reduced, and to what extent, can only be decided by future experiments. The operation presents some practical difficulties with many large monuments.

The committee has put up two more bronze busts which had been artificially patinated by chemicals; and it now remains to be seen how these will stand, when subjected to similar treatment. It has not as yet been explained in what way the oil takes part in or influences the formation of the patina. So much, however, has been ascertained that any surplus of oil has to be avoided, and that all the oil that has been put on, must at once be removed as carefully and as completely as possible. If any oil remains on the bronze, it makes the dirt stick to it, and gives it an unclean appearance. It cannot be supposed that the remaining small quantity of oil would form a chemical combination with the layer of oxide on the bronze, especially because neat's-foot oil, as well as olive oil, has been found to be equally adapted for the purpose. It seems more probable that the oil, by forming a thin layer over the bronze, prevents any moisture from settling on it. This moisture, if not kept off, would cause the dust to adhere, would absorb gases and vapors, and would favor the growth of a vegetation of microscopic plants, by which the appearance of the surface of the metal would inevitably be slighted. However this may be, it is an established fact that grease is an important agent in the formation of patina. It is to be expected that the treatment with oil will also be advantageous in another respect. It has been noticed that bronzes which are covered by a fine patina get a white, opaque, chalk-like surface in those places over which the rain-water is chiefly running. A proper treatment with oil will doubtless prevent this. At any rate it may be expected that through the use of oils, finely patinated bronze monuments will in future be seen in large cities where mineral coal is used as fuel, and that these monuments will not appear light-green, but dark, perhaps even black, but they will have the peculiar luster and other fine qualities of patina. S.

SCIENTIFIC INTELLIGENCE.

BISMUTH.—The increased demand for this metal has occasioned the examination of new localities, and the search has, in several instances, been attended with success. A remarkably pure ore has been found in Peru, which, on analysis, gave: Bismuth, 93·372; antimony (with trace of tin), 4·570; copper (with a little iron), 2·058—total, 100. The absence of arsenic and sulphur is noteworthy, and distinguishes this ore from the Saxon variety. Also, in South Australia, seams of bismuth have been found associated with copper.

NAPHTHALIN RED.—This coloring matter is called in England, "Magdala Red," in honor of Lord Napier, the hero of Abyssinia, in imitation of the French names of Magenta and Solferino for aniline colors. It is prepared by the action of nitrous acid on naphthylamin, and is manufactured in large quantities in France and England. It is a dark brown powder, soluble with deep red color in boiling alcohol; only slightly soluble in cold water, but largely in hot water; not soluble in ether. The solution in alcohol is highly fluorescent, which reaction affords, according to Hoffman, a method for distinguishing it from aniline red. In depth of color it is said to be equal to aniline, while it is superior to that dye in permanency; but it loses luster on dark tints, and hence its use is limited to light shades.

ARTIFICIAL ALIZARIN.—At a recent meeting of the Chemical Society of Berlin, Messrs. Graebe and Liebermann made the interesting communication that they had succeeded in preparing artificially the beautiful red principle of madder from anthracen, one of the waste products of the distillation of coal oil. They exhibited specimens of the color and some cloths dyed with it. The process of the manufacture is not divulged; but if it proves to be practicable it will be one of the most important contributions yet made by organic chemistry.

RECENT EXPLORATIONS OF DEEP-SEA FAUNA.—In the January number of the *American Journal of Science and Arts*, Professor A. E. Verrill gives an interesting summary of recent investigations on life at great depths. The first observations were made by Dr. Wallich, in 1860, when worms, crustacea, bryozoa, and echinoderms were found at depths varying from 445 to 1,913 fathoms. This was deeper than life had previously been supposed to be possible. Similar observations were made by Milne Edwards, by the discovery of living mollusca or corals adhering to the telegraph cable between Algiers and Sardinia, when taken up for repairs, on portions that had been sunk to depths of 1,093 to 1,577 fathoms. Later, G. O. Sars found nine fishes living at 200 to 450 fathoms. These discoveries have very important bearings upon geological science and physical geography, as well as geology, and will occasion important changes in many generally accepted theories. The following are some of the results already obtained. (1). Life does not disappear at 300 fathoms, as supposed by Forbes and others, but shallow-water animals are found at much greater depths. (2). It follows that a great abundance of fossils, in a geological formation, is no proof of shallow-water origin. (3). Bright colored animals are also found at great depths, so that this peculiarity cannot be assumed as evidence of shallow-water origin in fossils. (4). Several species of deep-sea crustacea have perfectly developed eyes, which would seem to show that light penetrates to greater depths than is commonly supposed. (5). That the temperature of the water at great depths is not everywhere the same, but is often far below the freezing point, as shown by Carpenter at 700 fathoms. (6). Finally, the investigations throw new light on the manner of the deposition of rocks, and modifies the doctrine of natural selection.

WHAT GEORGE STEPHENSON ACCOMPLISHED.

At the banquet given by the manufacturers of Pittsburgh to the American Railway Master Mechanics' Association on the occasion of its last convention, which was held in that city, Hon. J. Tyng Brooks, in response to the toast, "George Stephenson, the Great Master Mechanic," made an eloquent speech, from which, as published in the Second Annual Report of the Association we make the following extract:

"How marked is the change in the public sentiment respecting railroads now and forty years ago, when George Stephenson, whose name and deeds we would recall to-night, was reasoning, pleading, coaxing, and fighting, for it took all of these to persuade England into having a railroad. Far different from this scene of splendor which is spread before us to-night were the associations of his early life; no banquets were given to him when he was unfolding the properties of the locomotive and studying how he might make it useful to his fellow-men. Instead of plaudits from the press, encouragement from the Government and men of science, the unlettered Northumbrian miner had to fight his way in the face of them all until he planted his railroad and locomotive in their midst and justly won a place among the benefactors of his race.

"Go to the mining districts of your own State, to the Lehigh valley, the Westmoreland or the Youghiogheny mines, and you cannot find so humble an abode as that in which George Stephenson was born and reared. One single room in a house of four rooms, each occupied by a family, was for years the home of his father, mother, and six brothers and sisters. Away from schools, books, and educated companions, his toil at the mines began when he was big enough to lead a horse, his comrades, the rough uncultivated miners and drivers, his leisure time employed in such diversions only as his own ingenuity or fancy could devise. And yet from such a beginning and such surroundings, grew the world-renowned Master Mechanic, the accomplished engineer, the opulent railroad and locomotive builder, the companion of scholars, statesmen, and princes. His life, while full of interest to the casual reader, and especially to those who are interested in the history and progress of railroads, is the most instructive example I could name for those to imitate, who, in youth and poverty, aspire to excellence and fortune. For George Stephenson was not wafted by fortunate winds nor lifted by powerful friends to the eminence he attained. At every step in his inventions he was stubbornly opposed by the ignorant, the selfish, the prejudiced, and sometimes even by the educated, until at length he triumphed over every obstacle, and by his individual exertions raised himself to the proud position he finally occupied. His success was due to patient industry, careful study, frugal habits, and above all a spirit that was ever undaunted and invincible. When quite a boy his enthusiasm was centered on the stationary engine, and hours that were given by his companions to play, he spent in taking the engine to pieces, examining carefully its separate parts, learning the purposes of each, and when at an unusually early age he had mastered its details, he began to suggest and make improvements. Evenings he devoted to make shoe lasts, mending clocks and shoes, and cutting out garments for the miners, and at eighteen years of age he began to learn the mysteries of the alphabet and try to read, write, and cypher. And now behold the work he accomplished and the results he achieved. When he came to the Killingworth mines he found them embarrassed by defective machinery for hoisting, pumping, and ventilating, and the product of the mines was drawn in carts by horses down to the sea. He left them with improved engines, with improved methods of pumping and draining, a safety lamp of his own invention, to protect miners from their stealthy and dreaded foe, fire damp, and two locomotive engines and a railway by which to transport coal to the shipping port. He appeared before societies of learned men, before parliamentary committees, and with earnest Northumbrian dialect asserted the utility of traveling engines and iron tracks.

"And so slow was England to believe him, so blind to the value of railroads that her House of Commons rejected the first bill to allow one to be built, because the proposed route lay through a certain nobleman's fox cover. Even his own friends and supporters were incredulous of the power and speed he predicted of his locomotive, and when he declared it could be made to travel twenty miles an hour, they begged him to speak within bounds, for he would certainly ruin their prospects if he talked of so insane a project as a train moving at twenty miles an hour. And when a new survey was made to avoid the nobleman's hunting ground, when Stephenson's tongue was bridled so that it would speak of eight or nine miles an hour instead of twenty, it still took lawyers, lobbyists, and thousands of pounds sterling to convince the Solons of England that a railroad would be a useful institution. And the bill for the second railroad in England could only be carried through Parliament on condition that the cars should be moved by horses and not by traveling engines. People everywhere cried that railroads would ruin the country. Catholic priests in a neighboring county denounced them as the beginning of the reign of Antichrist. Men claimed that they would destroy canals and stage lines; horses would become worthless; half the men in England would be forced to idleness and poverty; cattle and sheep in pasture would be terrified to death at the sight of a locomotive flying through the air, breathing fire and smoke, and unearthly noises in its mad career; gardens and strawberry patches would be ruthlessly invaded; game preserves would be destroyed; women would be brought to premature confinement, and universal disquiet, disorder, and calamity, would follow the establishment of railroads. Such objections as these were urged sincerely and persistently by all classes of people forty years ago. But when permission was finally given by Parliament to build a railroad, new and more formidable obstacles were encountered. Land owners stood at their boundaries and forbid the engineers to enter and make the surveys, and the latter were forced to all manner of expedients to out-wit them and accomplish their work. They surveyed at meal time when the farmer was at dinner, by moonlight when he was asleep, and on Sunday when he was at church. Sometimes they were mobbed by superior numbers, their instruments smashed to pieces, and their very lives put in jeopardy. But when all these obstacles were surmounted, when the route was surveyed and a track laid, a holiday was appointed by the directors, and a free ride promised to all who should come and be present at the joyful occasion of opening the road. The people came by thousands in Sunday attire from every direction to witness the novel sight. And a novel sight it must have been. The procession was headed by a man on horseback, carrying a flag, behind him stood the low, uncouth little engine, the smoke streaming lazily from its stack, and George Stephenson, with his hand on the lever, waiting for the signal to start. A long train of coal cars was attached, and into them a few—the more courageous of the spectators—ventured, while hundreds upon foot and in vehicles waited in suspense the result of the enterprise. Soon the signal was given, the man on horseback started, waved his flag, the engine began to puff and the train to move, and amid music from the bands and shouts from the multitude that pressed eagerly behind and followed for miles, the procession moved off at about six miles an hour, and the railroad was voted a complete success. From that day George Stephenson's name and fortune were made. A few years passed and he was the proprietor of locomotive works at Newcastle employing nearly a thousand men, and the engineer of thirty different railways. Soon the golden stream, whose current had been against him, turned in his favor, and he became a millionaire. Railway companies voted him medals and placed his bust in their offices and public stations. He was consulted by statesmen and capitalists at home, and became the honored guest of kings abroad.

"He found the locomotive a loose, disjointed machine, running by cog wheels on a tooth track, without symmetry, power, or speed; he left it the grandest production of human skill, a magnificent monster, instinct with life, terrible as a fiend, docile as a lamb, a perfect model of grace, majesty, and power. Forty years ago, his two little engines doing drudgery at the Killingworth mines, were the only locomotives in Europe. To-day more than eight thousand are harnessed to trains of people and freight in Great Britain alone, drawing people by the thousand, and freight by the hundred tun at ten to sixty miles an hour. Then the only use conjectured of railroads was to carry coal and heavy merchandise, and no one but Stephenson believed that passengers would trust themselves behind an explosive machine going at twenty miles an hour. Now more than three hundred and fourteen million passengers are annually carried on the railroads of Great Britain, and find it not only convenient and pleasant, but cheap and safe in the highest degree. For, in England, to-day it is cheaper to ride in cars than to walk, and the victims of lightning and the gallows are far more numerous than those of railroads. Then the Stockton and Darlington Railroad was the only line in Europe upon which engines and cars could be seen moving. To-day the citizens of London can stand at one of the stations on one of the many lines of railway that center in that vast metropolis and count seven hundred trains each day bearing, with mathematical precision and safety, their animate and inanimate burdens. Thus the railroad is no longer a bugbear or chimera, but a living, indispensable reality, and projectors of railroads are not hooted at and mobbed, but rather welcomed as the real promoters of our civilization."

MICROSCOPICAL EXAMINATION OF MILK UNDER CERTAIN CONDITIONS.

READ BEFORE THE MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY, NOV. 30, 1869, BY J. B. DANCER, F.R.A.S.

In August and September last an account appeared in one of the newspapers (and also in other periodicals), which had been copied from the *Journal des Connaissance Médicales*, of some microscopical observations made by M. V. Essling on milk, in which the author stated that "if the surface of fresh cream be examined under the lens, one perceives, amid myriads of milky and fatty globules, a number of either round or oblong corpuscles, sometimes accompanied with finely-dotted matter, being neither more nor less than germinative masses of vibrios—just what is seen in most substances in a state of putrefaction.

"In summer these corpuscles make their appearance within 15 or 24 hours after milking; in winter they will be perceptible after the lapse of two or three days. If the observation be continued until the moment of coagulation, we see these corpuscles increasing in number, bud, form ramified chains, and at length be transformed into regular mushrooms or filaments composed of cells placed end to end in simple series, and supporting at their extremities a spherical knob filled with granulous matter. M. V. Essling thinks that they may be classified among the Ascophora. But the important point is, that the first appearance of these spores occurs before the milk gets sour, and as this substance is almost the exclusive aliment of children, there is reason to suppose that many of the gastric affections to which they are subject are owing to this state of the milk. To prevent these evil consequences, M. V. Essling recommends the milk to be drunk as soon as possible after extraction, and, at all events, to keep it closely bottled during the interval, so as to keep out the smallest particle of air. Moreover, the temperature should be kept as nearly as possible the same as that which the milk had in the teats."

Having for many years been familiar with the microscopical appearance presented by milk and cream, and not having seen the changes as described by M. V. Essling, I was desirous of satisfying myself on this point, more especially as it affected a very important article of food. The composition of ordinary milk, as stated by Fownes, is as follows:

Water	873·00
Butter	30·00
Casein	48·20
Milk sugar	43·90
Phosphate of lime	2·31
Phosphate of magnesia	0·42
Phosphate of iron	0·07
Chloride of potassium	1·44
Chloride of sodium	0·24
Soda in combination with casein	0·42
	1,000·00

Composition of casein in 100 parts:

Carbon	53·84
Hydrogen	7·15
Nitrogen	15·64
Oxygen } Sulphur }	23·37
	100·00

Composition of albumen in 100 parts:

Carbon	53·5
Hydrogen	7·0
Nitrogen	15·5
Oxygen	22·0
Phosphorus	0·4
Sulphur	1·6
	100·00

Casein and animal albumen are remarkably similar in composition; casein differs in not being coagulated by heat, and is precipitated by acetic acid. Certain animal substances cause its coagulation, such as the dried stomach of the calf, known as rennet, used in the manufacture of cheese.

When a thin film of milk is examined with the microscope, it is found to be a transparent fluid, in which are floating numerous transparent globules of fat; these are surrounded by a thin pellicle, and when this pellicle is broken mechanically, as by churning, the fat is liberated and forms butter. The fluid part consists of casein, saccharine matter, and salts in solution. The proportion of these organic principles varies in different animals, and also in the same animal when fed under different conditions. Human milk usually contains a larger proportion of sugar than cow milk, and is coagulated with greater difficulty. It is well known that the secretion and quality of milk are influenced by the mental emotions.

Milk as obtained in towns is frequently adulterated, and as foreign matter would alter its microscopical characteristics, it was necessary to procure pure milk. One of our members, Mr. Kipping, kindly supplied me with a bottle of fresh-drawn milk. The cow had calved about three months previously, and had been fed on grass, bran, and bean-flour. This milk was examined soon after I received it, and was found to be very rich in oleaginous globules, forming a plentiful supply of cream. There was no appearance of dotted matter or any fungoid growth when examined by powers varying from 200 to 1,500. The smallest oil globules exhibited (as usual) great molecular activity. A bottle was filled with some of this milk and securely corked; other portions of the milk were placed in open cups; one cup was kept in a cabinet which was closed during the day, the milk of the second cup was placed in a closet, the atmosphere of which I knew to be favorable to the growth of fungi, the Mucor Mucedo being the most abundant and of the same family as that mentioned as having been found in cream by M. V. Essling. The milk in the bottle and that in the cups were examined daily, precautions being taken to close the bottle speedily after a portion was removed. On the third day, the milk in the open cups was sour to the smell, but no change appeared visible under the microscope; the upper portion of the milk in the bottle had become very rich in oil globules by the formation of cream. On the fourth day the casein had coagulated in the milk in the open cups, and the flaky precipitate was visible under the microscope; the pellicle surrounding the oil globules now appeared to be very easily ruptured, and with the slightest pressure some of the globules could be joined together—sometimes a number of globules which had been ranged in line by a current would coalesce by a slight movement of the fluid, and form an elongated mass. Fifth day, no appreciable alteration. Sixth day, the milk which had been placed in the closet had patches of mold visible on its surface; a microscopical examination of this mold showed it to be the Mucor Mucedo, such as I had frequently found on fruit which had been left in this closet. The fungi appeared on the surface only, no trace of it could be found in the milk taken from various depths. The milk in the cup kept in the cabinet exhibited no appearance of the Mucor Mucedo or any other vegetable or animal organism; it had become thickened into a pasty mass, with an intense sour odor. These observations were continued for eleven days, and the only difference observable was in the oil globules—they began to lose their spherical form, as if the investing pellicle had been weakened in parts and had become expanded.

These experiments were repeated with a second supply of milk, which Mr. Kipping kindly supplied, and the results were alike in both cases. The range of temperature during the experiments was from 45° to 63° Fah. These experiments would lead me to believe that vegetable organisms do not, as a rule, make their appearance in pure unadulterated milk unless it is exposed for some time to atmospheric influences; most probably the spores are supplied by the atmosphere. Further experiments are wanted to decide the question. The microscopical examinations should be continued in hot weather. I hope to be able to resume the inquiry next summer under different conditions, which have suggested themselves during the examinations I have detailed. In any case, M. V. Essling's suggestions to bottle the milk is very good, and, in my opinion, cream pans with covers would be a very great improvement on the opens ones as at present employed, at the same time having due regard to the cleanliness of the apartment and the vessels in which the milk is kept.

In a microscopical examination, such as I have recorded, it is quite necessary to have pure materials. The milk as supplied by vendors we know to be very frequently adulterated, and the most simple and easy method is by the addition of water. We know also that in towns where the water has a high character for purity, it sometimes happens in dry, hot weather the reservoirs are charged with vegetable and animal organisms. Milk may not always have town's water added to it; in this case there may be an extra quantity of vitalized matter introduced. What a surprising account a microscopist might furnish from the examination of milk containing such an importation In the cold weather, such as we have at present, animal organisms are not so abundant, and this may account for their absence from a sample of milk obtained in this town, in which I found *Algæ*, but not belonging to the pure milk. One curious circumstance was noticed in this milk, no Mucor Mucedo appeared in or on it, although exposed in the closet for the same length of time as Mr. Kipping's milk, which showed signs of this growth on the sixth day, and on the twelfth day the town milk had none visible. I may mention that pure milk in a bottle securely corked remained fresh twelve days; possibly the low temperature favored its preservation.