cated by the fact, that notwithstanding man struggles by his inventions to shift the burden upon the brute forces, still the world's work grows and accumulates. Man constructs labor-saving machines, which, while they lessen the labor required to produce individual articles, always increase the aggregate demand for its class, in a far greater ratio than the labor on each article is diminished, and so the aggregate work of the world is swelled by each mechanical improvement. The efforts of mankind to emancipate the race from the necessity of labor, are, therefore, or at least have been as yet utterly futile. The most that has been accomplished, has been to remove some of the heavier and more disgusting features of labor, and redeem toil in some measure from its original severity.

That such efforts will continue futile in spite of the predictions of optimists who dream of a time to come, when at least the toil of man shall become altogether directory and supervisory in character, is in our opinion a fact based upon the very nature of man.

The desire to appropriate to personal use anything which renders life more luxurious or desirable, will always prevent men from contenting themselves with the minimum of labor necessary to merely afford comfortable subsistence. There is in mankind a hunger for other and higher enjoyments than are found in the simple satisfaction of the desires for simple food, drink, clothing, and shelter, and out of the desire to appease this hunger, has sprung all civilization. The production and the use of articles decorated by art, the refinements of cookery, the ornaments of person and residence by which taste is cultivated and gratified, are among the most conspicuous of the external marks of civilization.

The moral necessity for these things is the result of this natural craving. The rudest savage manifests in some rough way the existence of this taste, the cultivation of which starts him at once from barbarism on the road toward civilization.

The world's work now consists mainly in the supply of the necessities of taste. The proposition may at first seem startling, but its truth will become apparent upon a comparison of the personal effects and requirements of savages, with those of civilized people. We say necessities of taste. That is always a necessity, which, being attainable, cannot be dispensed with, except by the sacrifice of an enjoyment, more to be preferred than the saving of money or effort requisite to its attainment. For such an object there is as positive a force compelling man to attempt its procurement as hunger, thirst, or sexual desire. It presses men on into a hard struggle for the acquisition of wealth, that through wealth they may secure the gratification of their tastes. Not one man in a thousand seeks money for money's own sake. Misers are morbid outgrowths—exceptions which only establish the general rule.

And this mental and physical appetite, for all the appetites are mental as well as physical, is no more permanently satisfied by enjoyment than any other. It has often been asserted in derogation of the grosser appetites and passions, that it is impossible ever to attain their full and permanent satisfaction; but instead of this being any reason why the gratification of any natural and healthy appetite should be held in contempt, it is to be regarded as a beneficent provision for the perpetuation of enjoyment. Did we once cease to desire, we should cease to enjoy. All enjoyment is the temporary fulfillment of desire. Absolute content is neither desirable nor attainable.

In all this we see clearly indicated, the moral necessity of work. Could every luxury now enjoyed by the most wealthy and refined, be placed, without any exertion on the part of the recipient, within the reach of every man, woman, and child on the face of the globe, they would still yearn for more, and work to get it.

DEATH OF THREE DISTINGUISHED CHEMISTS.

DR. AUGUSTUS MATTHIESSEN.

One of the youngest and at the same time most ardent and successful of chemists has just cut short his career by taking poison. Augustus Matthiessen was born in London, January 2, 1831. He early went to Germany, and became a favorite pupil of Professor Bunsen, whom he greatly aided in the preparation of the rare metals of the alkalies and alkaline earths, by electrolysis. His first paper on this subject, in 1856, was one of the most important contributions to our knowledge of the rare metals that has ever appeared; and the research begun in Bunsen's laboratory was continued long after his return to England.

Dr. Matthiessen has greatly enriched our knowledge of the electric conductivity of the metals, and the laws he has deduced are now in constant use by practical electricians. He had so many wires running through his laboratory that they closely resembled an immense spider's web. He was a man of great sensitiveness, and of unquestionable purity of character, and his conscientiousness gave to his scientific statements peculiar value.

He was accused of false pretenses in reference to some of the rare metals, and intimations were expressed that they were not what they purported to be. This and other charges trumped up against him, seem to have unsettled his mind.

He was found dead in his room, having taken poison "while in a state of temporary insanity."

In a note referring to the false charges, he says: "Although I am innocent, it blights all my future prospects, and I have therefore resolved to resign all."

WILLIAM ALLEN MILLER.

We recently noticed the death of this distinguished man, and recur to the subject again for the purpose of adding some details of his life.

Since the time of Faraday there is no man whose loss will be so much mourned and regretted. He was born at Ipswich, in Suffolk, on the 17th of December, 1817, and died of apoplexy at Liverpool, on the 30th of September, 1870.

About a year ago he lost his wife, to whom he had been tenderly attached. This so affected his mind that he never fairly recovered from the blow. He left London on the 13th of September, to attend the meeting of the British Association, and was taken ill on the journey. His family, consisting of a son and daughter, were sent for, and every effort was made to restore him to health. The first attack was brain fever, which terminated in apoplexy, and suddenly cut short his life.

Professor Miller, like nearly all of the scientific men of England, had sprung from moderate circumstances. He was reared among the Society of Friends, and the impressions of his early youth were retained throughout his subsequent career, for we have rarely met with a man of greater urbanity, kindliness of manner, tender sympathies, greater cheerfulness of disposition, and unselfishness. He was ever ready to lend a helping hand to young students, and his loss will be keenly felt by this class.

The early contributions of Professor Miller were in the direction of the electrolysis of compounds. Subsequently he took up the study of spectrum analysis, and was one of the first to give us the composition of the light proceeding from the stars. His text-book on chemistry will be an enduring monument to his fame. There is nothing equal to it in the English language.

ALEXANDER POMPEJUS BOLLEY.

Professor Bolley died in Zurich, on the 3d of August, 1870, at the age of fifty-eight. He was a native of Heidelberg, and graduated at that University, and became the assistant to the celebrated Gmelin. In consequence of his sentiments in favor of a united Germany, he was obliged to quit his home and seek refuge in Switzerland, where he received an appointment at one of the Canton schools, and finally became the Director of the Polytechnic School, at Zurich.

In the department of technology Professor Bolley has had no superior. His text-books are the best we have on that subject. As a man and teacher he resembled Faraday and Miller. Full of life, of humor, of enthusiasm, of kindness, of organization, of originality, he was the great favorite of professors and pupils, and the influence he was able to exert was of the most beneficent character in the circle where he lived.

On the morning of August 3d, he lectured as usual to his class. Being somewhat fatigued, he rested for half an hour in his study, and then started for a little exercise. It was his last walk, for he was attacked with disease of the heart, and dropped dead in the street.

Thus have passed away three of the most distinguished of our chemists, whose places can with difficulty be filled.

TRANSPORTATION OF FRESH MEATS AND FRUITS, ETC., THROUGH LONG DISTANCES—THE DAVIS REFRIGERATOR CAR.

As our readers are aware, we have taken a deep interest in the solution of the great problem of how to transport all sorts of commodities, perishable when exposed to the action of air at ordinary temperatures, from places where such commodities are cheap and plentiful to where they are scarce and dear. The satisfactory solution of this problem would result in inestimable benefit to the human race, enabling those remote from a market to realize profits on what is now comparatively of little value, and cheapening the necessaries of life in densely populated centers of civilization.

The subject of refrigeration is therefore at the present time compelling the most earnest attention of practical and scientific men, and is second in importance to none other with which inventive genius is at present grappling.

Our attention has been called several times of late to paragraphs from Western papers relative to what is called the "Davis Refrigerator Car," which is claimed to be able to convey meats and fruits in a perfectly fresh unchanged condition over any distance, and for any reasonable or required length of time. These statements, however, were so vague and indefinite in details of construction that we preferred to await the time when it was announced that the car would itself be in New York with a freight of fruit brought from California, and to base what we might say upon personal examination.

Having learned on the 29th October that the car had arrived, we visited the Hudson River Railroad Depot and examined both the car and its contents, and found, so far as we could judge, that its load of grapes, peaches, and pears was in as good a condition as when shipped. The fruit certainly exhibited neither mold nor decay to any noticeable extent. The packages were perfectly dry; there was no odor of decay or any other indication that the fruit—which we were informed had been twenty-four days in the car—would not keep for as many days longer.

Several packages selected at random were opened in our presence, and appeared in uniformly good condition, and was found of good full flavor when tasted.

Our readers will be interested in the construction of this car, which, though strictly in accordance with scientific principles, is extremely simple.

The shell of the car consists exteriorly of the ordinary wood casing. A second wooden shell is made smaller than the first, and placed within it, so as to leave an air space or chamber entirely around the top, bottom, and sides of the car. Within this second shell is placed a layer of hair, about two inches in thickness, and this again is lined with an interior wooden shell. This construction makes a non-radiating and non-conducting compound shell or case, of great power to resist the action of external heat, and renders the expenditure of ice quite small to maintain the required depression of temperature, after the interior of the car and its contents have been cooled down to the proper point, say from 34° to 38° Fah.

The refrigeration is accomplished in the following manner: Along the sides of the car are placed sheet-metal tanks shaped like the frustra of very gradually tapering wedges. They extend from the top to the bottom of the car, and are about five inches thick at the top and two and one half inches at the bottom. These tanks communicate at the top with the exterior of the car through funnel or hopper shaped openings and at the bottom through drip-pipes which convey away the moisture. The funnel-shaped openings at the top are used for putting in the refrigerating mixture consisting of broken ice and salt, and are provided with air-tight covers. The car is entered through a hatchway at the top through which its freight is also introduced. This hatchway is also provided with a tight-fitting cover, made non-radiating and non-conducting like the sides of the car.

The store of ice and salt for the trip is contained in a separate department in one end of the car, so that its contents can be reached, and the refrigerating tanks supplied without opening the freight room.

The freight is placed in the car on strips of board, strips of board also preventing its coming in contact with the walls of the refrigerating tanks. The packages are also so placed as to leave interspaces through, between, and around each. During the process of refrigeration the air circulates around the packages and along the sides of the tanks like water in a steam boiler the colder air falling, and the warmer air rising to the top, becoming chilled in its passage along the sides of the tanks, and depositing its moisture on the tanks till their sides are covered with a thick stratum of congealed water or hoar frost. Thus the air is not only cooled but dried, no accession of moisture being derived from the external air or from the ice in the tanks, with either of which the interior of the car has no communication so long as the car is kept closed.

The two essentials for the preservation of substances liable to ferment, namely, absence of heat and of moisture, are thus secured in a very perfect manner, and the arrangement of the tanks is such that the space within the car for the storage of freight is not materially reduced. Some addition to the refrigerative mixture in the tanks is made each day, and the temperature is easily regulated and kept at the desired point by the addition of more or less salt in proportion to the charge of ice.

The proprietors express the utmost confidence that they can ship meat or fruit from any part of the continent to any other place, no matter how remote, and not only have it in good condition when taken from the car, but in a state which will guarantee its keeping after removal therefrom as long as it would have done previous to its shipment, under the same conditions. Certainly what we have seen goes far to warrant this confidence, and for the sake of humanity at large, we sincerely trust future experiments will prove as successful as the one we have described, and as others, which we have not seen, are represented to have been.

CHEMISTRY AT THE FAIR OF THE AMERICAN INSTITUTE.

In a large show case we saw some billiard balls, rings brooches, knife handles, and other objects resembling ivory, which, upon close inspection, proved to be made of gun-cotton. Here was the application of Schönbein's discovery that the original inventor could never have anticipated. The solubility of gun-cotton in a mixture of alcohol and ether has long been known, but that a tincture of camphor would produce the same effect has not been suspected until recently. It now appears that moist camphor and cotton pulp are mixed together, and put under an hydraulic press, when the mass so closely resembles ivory that it can be made into billiard balls, buttons, and, in fact, everything for which ivory is employed. The cotton can be colored without injury to its texture. It is a curious fact that the vapor of camphor decomposes gun-cotton with evolution of red fumes—in fact, the cotton is decomposed explosively. What the action of the camphor is on the gun-cotton has not been explained. It would appear as though the nitrogen of the pyroxyline was expelled by it in the form of binoxide, and this in turn took oxygen from the air and became nitrous acid. The matter is worthy of investigation, as perhaps offering important applications in the arts.

By the side of this show-case was a modest display of silvered glass, equal to the best productions in this line of industry that we have ever seen. From the card attached to these articles, it appears that they are manufactured by an improved process patented by H. Balen Walker, in 1869. The inventor claims that his method is an improvement on Liebig's, as it does not require to be backed by varnish or copper. There are many reasons why silver mirrors ought to be substituted for the mercury glasses so long in vogue. We will state a few of them. The silver reflects nearly 90 per cent of the light that falls upon it, and it also gives back a true image, whereas the ordinary quicksilver absorbs half of the light, and throws back a yellow and imperfect image. Silver is incomparably superior to mercury.

Another advantage possessed by silver is a sanitary one—it is perfectly safe and harmless to the workmen, while quicksilver is the occasion of much disease and suffering to those who are obliged to live in its fumes. In some parts of Germany, especially near Nuremberg, a large proportion of the population are engaged in making toy mirrors. They are furnished by dealers with the requisite tin foil and mercury, and actually manufacture millions of the small glasses required for toys. It was in consequence of witnessing the