density of 7.37 at 65 deg. F. The crystals oxidized in dry air only at a low red heat, but are more easily affected in moist air. Hot acids will dissolve them slowly, but nitric acid dissolves them in the cold. Another new compound, $FeBo_2$, has been obtained which appears to be the upper limit of the series. This body appears as a yellowish metallic mass. It is very hard, and will scratch quartz.

A GERMAN CHEMIST'S EXPERIENCES IN AMERICA.

In a paper read before the Märkische Bezirksverein Herr V. Samter, a young German chemist, has given a remarkably fair and impartial account of his American experience, which contains information of interest to all chemists in search of employment.

An American electrician connected with a great Berlin establishment wrote to friends on this side, recommending Samter as a man "who impresses me favorably." This phrase is quoted as characteristic of America, where personal appearance, manner, and dress are often more important than testimonials to special ability. A position as analytical chemist, at a small salary, in a factory near a large American city was offered to Samter, and he sailed for New York. He regrets that he did not come in the first cabin, where he might have made useful acquaintances, but he congratulates himself on evading the contract labor law, and warns others against betraying the fact that they have secured positions. At the factory he finds three other chemists and a German foreman, who furnishes him with excellent board and lodging for $4.50 a week. This experience suggests two interesting comments. One is on the great number of Germans in America who, like this foreman who had lived here twenty years, have almost forgotten German without mastering English, so that they cannot express themselves decently in any language. The second comment relates to the cost of living in America, and the exaggerated conception of it formed by those Germans who assert that a dollar will purchase no more here than can be bought in the old country for a mark (24 cents). Samter says this is sheer nonsense, as good board and lodging can be obtained in America for $5 to $8 a week in small towns and $7 to $10 in large cities, and there is no expense for "trinkgelder" or tips. The cost of living, however, is considerably higher in Western mining districts and some others and also in New York, "which genuine Americans have almost ceased to regard as an American city." The average German is too fond of his liberty to take kindly to a boarding house, but he can live cheaply in lodgings and restaurants unless he insists on unlimited beer and German dishes, which are to be had only at high-priced German restaurants. The comparison should be, not between German and American prices of German articles, but between the cost of living in German fashion at home and in American fashion here.

Samter was compelled to sign a contract for a year. This he did reluctantly, for he was eager to obtain higher and more remunerative work than analysis. He finds that employers prefer to make still longer contracts, at least with chemists who have proved their ability and learned the secrets of the establishment. He concedes that a contract for a year is, on the whole, advantageous for a young foreigner; for though it may delay a possible promotion, it removes the danger of being left stranded before becoming familiar with the language and customs of the country.

He quotes the average monthly pay of chemists in large American establishments at $60 to $75 for the first, $85 for the second, and $100 for the third year, with a gradual increase thereafter up to $200. Even managers of large factories demand only $4,000 to $7,000 per year. The payment of percentages on improvements is less common here than in Germany.

Nor is special knowledge so essential as it is in Germany. There are two reasons for this: the dearth of applicants possessing such knowledge, and the American habit of attaching paramount importance to general knowledge and intelligence. This trait is reflected in the remarkable breadth of the course of study in American technical schools, where a little of everything is taught, specialization being left to practice.

A good result of this system is that few American chemists betray the dense ignorance of matters not connected with chemistry that is so common in Germany. Every American chemist has some knowledge of machinery, mechanical drawing, and other things essential to the conduct of a factory. The German chemist is educated for a scientific career in a university or technical school or for the scientific solution of special problems in the laboratory of a great factory, while the American demand is for men qualified to act independently in positions of responsibility and to utilize the natural forces, circumstances, and men at their disposal.

Positions are most easily obtained through the scientific and technical schools, in which reigns a solidarity or *esprit de corps* that is absent from similar German institutions. The school, as well as the individual professors, looks out for the advancement of its graduates, and these, in turn, apply to their *alma mater* both for positions and for assistants.

The Massachusetts Institute of Technology, the Armour Institute in Chicago, and many similar schools have standing lists of situations, and some of them have more positions than their own graduates can fill. Hence young German chemists are advised to seek assistantships in such schools, through recommendations from German professors, for most professors of chemistry in those schools have studied in Germany, and Boston is said to harbor more of Ostwald's pupils than any other city except Leipzig.

The pre-eminence of Germany in the manufacture of dyes, medicines, and pure chemicals has created the erroneous impression that she leads the world in all chemical industries. But the most important of those industries are concerned with the production of staple articles on a large scale, or with processes that have been developed empirically and are not yet amenable to rigorous scientific treatment. The importance of science to industry is overestimated. Often science merely approves methods discovered empirically.

With the exception of the few branches in which strictly scientific methods are essential, applied chemistry is in a flourishing condition in America. The exception is due chiefly to the lack of thoroughly trained chemists, the high price of labor, and the more profitable employment of capital in the production of staples.

Paper, starch, sugar, glass, and the products of the distillation of wood are manufactured in large quantities. The production of cement increases fifty per cent annually, but fails to supply the demand. America leads, or will lead, the world in petroleum products, glucose, iron, copper, silver, and lead. American shoes and overshoes are sold throughout the world, and America's supremacy in electro-chemical industries is universally recognized. The meat industry, in which $175,000,000 are invested, offers unlimited possibilities in the chemical treatment of waste products. An important industry, almost unknown in Germany, is the preparation of cereal "breakfast foods."

There are opportunities for employment outside of factories. Governmental and municipal bureaus for analysis and research are certain to be multiplied in response to the awakening of public opinion by recent disclosures. Agricultural stations and laboratories connected with boards of health, which do many things left to private initiative in Germany, are already numerous.

In discussing the social and business rank of the chemist, which he finds lower here than in Germany, Samter says that we have little respect for scientific attainments. "Success" and "results" are mottoes of American life. "Successful business man" is a title of honor which assures its bearer general admiration and makes him eligible for the highest offices. Some of these idols have recently been thrown from their pedestals, and the American people are probably acquiring a better notion of greatness.

Some German chemists have been convinced by experience that chemists are regarded as common workmen in America. One, who was engaged to devise improvements in silvering mirrors, was put under a foreman and received weekly pay and a time card. In many factories chemists and ordinary workmen have the same hours. Samter fared better because his employer was a graduate of a technical school, but he resigned his position on account of continual friction with the manager, an energetic and intelligent but uneducated man, who, after working successively as shop boy, factory hand, and foreman, had been promoted to his responsible post over the heads of the chemists.

Samter heard of many similar cases. He ascribes them to the very high value put upon administrative talents, especially the ability to increase the output, largely because of the high price of labor and its poor quality, most of the workers in Eastern factories being Italian and other immigrants.

He found the condition of the working classes not quite as favorable as he had expected. He quotes the following daily wages in Eastern manufacturing districts: laborers, $1.25 to $1.50; non-union mechanics, $2.50 to $3.33; union mechanics, $4 and over. The workman is more independent and more prosperous here than in Europe, but he enjoys less protection against accident and less benefit from benevolence. If injured at work, he can obtain damages only by proving the negligence of his employer by means of a long and costly lawsuit. Hence he usually compromises for a small sum. Samter cannot understand why American workmen do not exert their great influence on law makers to improve these conditions.

He concludes with the diverting story of a sulphuric acid manufacturer who visited a tannery to investigate a complaint about the strength of the acid he had furnished, and asked the manager to produce the areometer for comparison with his own. The tanner, who had never heard of an areometer, bared his left arm and said: "See those blisters? They were raised by the old strong acid. Your acid is so weak that it only makes red marks like this."

BALLOON, AIRSHIP, AND FLYING MACHINE COMPETITIONS AT ST. LOUIS.

The second annual balloon race for the Bennett International Aeronautic Trophy is to be held at St. Louis on Monday, October 21, and in all probability ten balloons, at least, will compete. England and France will be represented by two balloons each, while Germany and America will each have three balloons. One of the American balloons will be piloted by Lieut. Frank P. Lahm, who won the trophy last year by his flight of 402 miles from Paris to a point on the eastern coast of England. Lieut. Lahm will use the same balloon with which he won the trophy last year. The other American representatives will be Mr. Alan R. Hawley in the "St. Louis," and Mr. J. C. McCoy in the "America."

In order that the proprietors and inventors of airships and flying machines may receive some financial encouragement, the Aero Club of St. Louis has raised the sum of $5,000, to be given in prizes to the best dirigible balloon, or airship; and to the best aeroplane or other gasless-type machine which competes in the trials that have been arranged for immediately after the balloon race. Half of this sum will be awarded to the successful dirigibles, and half to the successful aeroplanes, or other heavier-than-air machines. There are two classes, Class A being for the dirigible balloons, and Class B for all heavier-than-air machines which have no gas-bag attachment. Two thousand dollars is to be given to that competitor in Class A who, in strict accordance with the rules, shall make the round of the course in a dirigible balloon in the best average time, and $500 is to be given to the competitor who makes the next best average time. To win these prizes, the airship must cover the full course at least once in continuous flight without touching the ground. The heavier-than-air machines will be judged according to the distance they cover, the speed at which they cover it, and the general behavior of the machine. To win the first prize of $2,000 in Class B, the machine must make a continuous flight, without touching the ground, of at least 100 feet. A second prize of $500 will be given to the aeroplane or other heavier-than-air machine that makes the next best performance. For the airship tests, a triangular course three-quarters of a mile in length, and marked by captive balloons, will be provided. Competitors will be allowed to choose the direction in which to start, but they will be obliged to start from the home goal, turn around each of the outer goals, and return to the starting point. The average speed of the airships will be computed by the actual air-line distance over the ground. No allowance will be made for the wind or for deviations from the course marked out.

An entrance fee of $10 must be sent in to the secretary of the Aero Club of St. Louis before October 1, 1907, by anyone desiring to enter these contests. This fee is to be refunded if the contestant appears with his machine upon the date set. It is probable that the test will be held on October 22.

On account of the non-completion of the machines which were to compete for the SCIENTIFIC AMERICAN trophy at the Jamestown Exposition on the 14th instant, no competition was held on that date. It is expected, therefore, that the trial flight for the trophy will be made at St. Louis at the time of the other competitions. This trophy can, however, be competed for at any time, provided the inventor or owner of a machine can satisfy the Contest Committee of the Aero Club of America that he has ready an apparatus which is capable of flying.

BUTTERFLIES AND THE ROENTGEN RAYS.

Some very interesting experiments as to the effect of the Roentgen rays upon butterflies, at various different stages of their evolution, have recently been made by Dr. Hasebrook, of Hamburg. The pupæ of several moths, including one of the hawk-moth which had passed over the winter months (September to May), were not affected at all despite repeated intense exposure to the rays, and the Lepidoptera emerged in due course under perfectly normal conditions. The caterpillars, after casting their skins for the last time, were not affected by the rays, except that they remained a little smaller in size; the formation of the pupæ was not interfered with in any way, nor was any difference caused in the duration of the comatose or quiescent stage. On the contrary, the exposure to the rays, during the last caterpillar and first pupa stages, caused marked alterations in the Lepidoptera, the moths of several varieties being smaller, and showing marked degeneration in the formation of the scales and down on the wings and increase in the black pigment, although the characteristic markings were maintained. Another peculiar phenomenon was that the moths had entirely lost the power of flight. It is hoped that further experiments may be made in this direction, and that still more interesting results may be obtained.