power, operating through wire rope and suitable gearing, drums, etc. The smoke or carbon black is scraped into pans hung upon the car, and these are dumped at each end of the route into receptacles, which are in turn emptied and deposited in the purifying and packing house. After simply removing cinders, etc., by passing through sieves, the soot is ready for the market. The daily product of this plant will be ½ pound carbon black per burner, *i. e.*, 2,000 pounds, there being 4,000 burners. Another plant of 4,000 burners is to be erected, the 8,000 burners to turn out two tons of carbon black daily. There will then still be 12,000 cubic feet of gas go to waste hourly, sufficient to light a good sized town. The owners of the Murraysville gas well refused $20,000 for it from the Edgar Thomson Steel Works, of Pittsburg, who wanted to connect the well with their works by a gas main, about 15 miles in length.

The phenomenon of an invisible gaseous substance issuing from the earth made visible, condensed into solid form, and packed up for market is strikingly illustrated in this establishment. The gas as it issues from the ground is unseen, but a given volume of it is found by chemical analysis to consist approximately (we do not mean to say absolutely and exactly) of twenty-four parts by weight of carbon and four parts of hydrogen; in other words, a quantity of the gas that weighs 28 pounds is made up of 24 pounds of carbon and 4 pounds of hydrogen. This hydrogen seems to have the power of imprisoning and concealing the carbon from human view. But carbon is carbon, whether in this gas or existing in the carbonic acid that gives pungency and effervescence to the soda water we drink, or in the lamp flame imparting its brilliancy, or in the sparkling diamond, the hardest of substances and the purest form of carbon.

The carbon that comes up in the gas well is rendered visible by separating the hydrogen from it, which is done by the heat of the flame. The hydrogen contained in the gas is burned up by uniting with the oxygen of the air, but only a portion of the carbon is burned; the unconsumed portion of the carbon, liberated by the burning of its hydrogen, rises up against the plates, where its sticks fast until scraped off as described.

NEW YORK ACADEMY OF SCIENCES.

The Chemical Section of the New York Academy of Sciences met Monday, Nov. 9, Prof. Newberry in the chair.

Mr. Kunz exhibited a specimen of fluorspar, one half of which was of an amethyst tint, and which had been fashioned into a rude ornament. It was found near Elizabethtown, Harden county, Ill., where fluorspar occurs in immense deposits.

He also exhibited a rock crystal pitcher of exquisite workmanship. It was made of an unusually large piece of crystal, and is without a flaw. Messrs. Tiffany & Co., to whom it belongs, value it at about six hundred dollars.

The paper announced for the evening was on the

ADULTERATION OF FOOD,

by Prof. A. R. Leeds, of the Stevens Institute of Technology, who had undertaken the investigation of a large number of articles of domestic consumption as a part of the work devolving upon him by his connection with the New Jersey Board of Health.

Prof. Leeds prefaced his remarks by the reassuring statement that many of the fears awakened in the public mind by the discussions in the newspapers concerning the deleterious or even poisonous character of various substances said to be used in the adulteration of many articles of food are entirely groundless, and that the most searching analyses in his own laboratory failed in nearly all cases to reveal their presence, although the articles tested were for the most part purchased at the meanest shops, whose custom consisted of the poorest class of the community. The adulterations found consisted mostly of substances harmless in themselves and used for the purpose of increasing the weight or bulk of the articles sold. Such adulteration must of course be branded as fraudulent; but while it is an offense against public morality, it is not one against public health. The following are some of the articles examined.

It has been objected to by some that bread is adulterated with potatoes, but this addition, so far from being injurious, actually improves the quality of the bread. A few samples of bread contained very small quantities of alum, said to be used for the purpose of making it whiter and lighter. Some contend that a very little alum is not injurious because it is rendered inert by the phosphate of lime contained in the flour, and also by the acids of the gastric juice. Not the slightest trace of copper was revealed in the bread examined by the most searching methods of analysis. Saleratus was found in nearly all cases to consist, as it should, of perfectly pure bicarbonate of soda; but cream of tartar was found to be adulterated in some cases as much as sixty per cent. with terra alba. Baking powders, which should consist of bicarbonate of soda and cream of tartar in suitable proportions, kept from combination by the admixture of a little starch powder, were found to vary greatly in the amount of their effective constituents. All the sugars examined were found to be perfectly free from all injurious substances, while the cheaper grades of sirups contained considerable glucose, a substance much inferior in sweetening power to cane sugar. No trace of strychnine, cocculus indicus, or other poisons popularly supposed to be used in the manufacture of liquors, beers, etc., were discovered. No sulphuric, nitric, or hydrochloric acids were found in vinegar. All the samples examined derived their activity from acetic acid, of which, however, they contained different proportions. In other words, some of them were more or less diluted with water. None of the samples of milk examined were found to contain any more serious adulterant than water. A diligent search was made to find brightly colored cucumbers whose tint would seem to indicate that copper had been used to make them more attractive; in none of them, however, was even the faintest trace of copper found to be present. Canned goods were found to be free from all deleterious substances. Spices procured from various sources differed greatly in strength, and all contained foreign substances increasing their bulk and diluting their pungency. Different samples of teas examined chemically and under the microscope revealed the fact that they were adulterated by leaves of other plants to a very great extent. Some of the cheapest kinds, selling (say) for 35 cents a pound, contained no tea leaves whatever. Candies were found to be much more free from injurious substances than the public has been led to believe. Many of them contained a large admixture of glucose, but the coloring matters used were comparatively harmless. In some of them aniline colors were used, which, although poisonous, cannot be fairly so-called in the very minute quantities necessary to color candy.

Prof. Leeds also examined green wall papers for arsenic, and exhibited several tubes containing arsenic extracted from them. These papers must be condemned as highly injurious, especially as the arsenic is but loosely applied to the surface and is easily diffused through the air, whence it finds its way into the lungs. One specimen of arsenic shown was extracted, curiously enough, from a little green Christmas tree candle.

He concluded his paper by remarking that three things were necessary to keep the practice of adulteration in check: a strong public sentiment kept aroused by the public press; the enactment of stringent laws; and the appointment of competent persons to execute them.

Mr. Kunz remarked that a firm in New York city made a fortune by selling cocoanut shells to the manufacturers of spices, who ground them up to increase the bulk of their products.

Capt. Blake stated that it was perfectly impossible to buy pure tea at 35 and 50 cents a pound, seeing that a good article costs $1 a pound at Fouchow. C. F. K.

The New York Academy of Sciences met Monday evening, November 17, President Newberry in the chair. A large number of minerals was exhibited, among which a rough diamond from Brazil and a diamond crystal from South Africa attracted much attention. They were shown by Mr. Kunz, expert in gems at Tiffany & Co.'s. The first paper of the evening was on some

RECENTLY DISCOVERED CAVES,

by Prof. Newberry. A great many caves having been discovered in this country within the last few years, it may not be wholly devoid of interest to those who have not made them the subject of special study, to describe the method in which they were formed. An excellent illustration is furnished by the triangular plateau of Central Kentucky, which, like all the formations abounding in caves, consists chiefly of limestone rock. This rock, by its numerous fissures and joints, as well as by its solubility in water charged with carbonic acid, is peculiarly liable to be attacked by the action of rain water, which always contains a small percentage of carbonic acid. The surface of this plateau is always dry, and no rivulet or brook is found upon it. The rain almost immediately finds its way to the underground channels which previous rains have hollowed out, and continues the work of excavation. At first the natural joints or seams of the rock are widened into fissures, and then, where some portions are more soluble than others, these fissures are further hollowed out into caves, some of them twenty and thirty and even more feet long, whose ceilings and floors are adorned with beautiful stalactites and stalagmites deposited from solution as the water containing carbonate of lime slowly filters in and evaporates. In this way immense tracts of country, where limestone is the principal formation, are literally honeycombed with subterranean caves. The Mammoth Cave itself is a member of such a system of caves. In many cases, especially in the region of the Upper Missouri, and between the Rocky Mountains and the Sierra Nevada, the same volcanic action that upheaved the limestone also brought up from below springs containing metallic substances in solution. These substances were then deposited in the fissures of the rock and also on the walls and floors of the caves. The most common are ores of iron, such as limonite, and of lead, such as galena. Many fortunes have been made and lost again by those who made it their business to explore these limestone regions for caves containing lead. The method followed is that of simply sinking wells at intervals and examining the excavated minerals. In this connection Dr. Newberry told an amusing story of an enterprising individual who had spent several fortunes acquired in this way. When at length his purse was nearly exhausted, he spent his time driving around the country to examine the wells dug by others in the hope that his superior experience would enable him to recognize signs of mineral deposits which had escaped the eyes of others. He succeeded in purchasing an unpromising looking well for a hundred dollars, and, upon exploring it, he found sufficient indications to warrant him in buying up considerable land around. When he had established his title, he descended his well alone to continue his search. To his great surprise, he struck a passageway leading into a cave that contained thousands of tons of lead ore. He jumped down into it, stuck his candle into the sand, and began to reflect how he could apply his new fortune to a better purpose than his former ones. His pleasant reverie was, however, brought to a sudden close. His last candle went out, and he was left in darkness so dense that he could not find the hole through which he had entered. After many fruitless attempts he finally thought of the following very sensible method. As he tried each spot along the walls of the cave by raising his pickax above his head and feeling his way with it, he marked the place with a stone. He finally regained the upper regions hungry and faint, after an imprisonment of forty-eight hours. Notwithstanding his good resolutions, the new fortune did not last much longer than the old ones.

The caves found between the Rocky Mountains and the Sierra Nevada, in the region of the lost mountains, so-called because short mountain chains rise there at intervals from a perfectly level surface, are distinguished by the fact that they contain the precious metals associated with iron and lead: gold with iron pyrites and silver with galena. The celebrated Emma mine and the Eureka are examples of this kind of deposit. The fluctuations in the value of mining stocks of this kind depend upon the beautiful uncertainty as to the continuity of the deposit. It may "pinch out"—that is, become so insignificant at any time that it will not pay to work any longer; and then again it is just as likely that new openings into rich deposits may be found.

The next paper was on a new proof of the

SUBSIDENCE OF OUR COAST,

by Prof. G. S. Martin. He exhibited specimens of peat that had been washed ashore at Long Island. They were similar to those found by Scudder on the Nantucket beach, and by Dall at Nahant. Their appearance indicated that they had been burrowed into to such an extent as to cause them to be broken by the action of the waves and detached from ancient peat bogs, whose edges crop out along the coast under the surface of the sea. These bogs, which belong to the period of glacial, or perhaps to that of terrace, elevation, thus furnish an additional evidence of the subsidence of portions of our coast extending through long periods of time.

C. F. K.

The American Institute of Architects.

The thirteenth annual convention of the American Institute of Architects began in this city, Nov. 19, nearly all the chapters being represented. In his annual address, President Walter spoke very hopefully of the influence exerted by the organization in raising public opinion to a higher level in all matters pertaining to architecture. Works of recent date exhibit, he said, a freshness in their architectural handling that seems to indicate the advent of a new era in the art of design. The manifest tendency of architects to break away from the trammels of conventional rules, and to make style subservient to the spirit of the age, indicates a progress in the development of independent thought hitherto unknown. Architecture, both in this country and in Europe, is obviously in a transition state. What may be the result remains to be seen; if, however, architects are careful to design their works on true æsthetic principles and in conformity with the science which underlies the art, it is not likely to be regretted that they show a disposition to do their own thinking. Classic forms and combinations are everywhere yielding to more ornate compositions bearing the names of fashions of building having no trace whatever of paternity, either ancient or modern. Particular stress was laid upon the claims of domestic architecture, particularly with reference to improvements in processes for warming and ventilating dwelling houses, the disposition of sewer gas, drainage, and other sanitary questions.

THE NATIONAL PUBLIC HEALTH ASSOCIATION.

The annual convention of the American Public Health Association took place at Nashville, Tennessee, Nov. 18. Over two hundred members were present at the first session, including nearly all the leading sanitarians of the country. The programme announced some weeks since in this paper contained many subjects of interest and importance to the whole country; and there is reason to expect large public benefits to flow from the united attention brought to bear upon the great questions of public sanitation treated in the numerous papers and discussed by the members.

THE description of Ward's steam generator, on page 323, of current volume, states that the generator furnishes steam to a single engine. Mr. Ward informs us that it supplies steam for two engines, 9¾ cylinders, 36 inch stroke, making 35 revolutions per minute.

A Ban on Inflammable Goods.

In consequence of recent disclosures the directors of the North German Lloyd's Steamship Company have decided to refuse transportation on their vessels to the class of heavy French silks which are so weighted with chemicals and oils as to cause danger of spontaneous combustion.

A HANDSOME TRIBUTE.—The Lords of the British Admiralty have given orders for the making of a handsome piece of furniture from the timbers of the old Arctic exploring ship Resolute for presentation to Mrs. Grinnell, the widow of the late Henry Grinnell, of New York, who fitted out at his own expense two expeditions for the search of Sir John Franklin.