expense, may be extended through any building. This system is extensively used in New England, and so valuable is it considered, that many of the insurance companies in that section will not insure a manufactory unless it is put in.

We know of several instances where large buildings, containing hundreds of thousands of dollars worth of property, have taken fire, but it was instantly extinguished by simply letting on the water. We call to mind no instance where the apparatus has failed. It puts out a fire in as many minutes as are often required in hours by the ordinary fire engines.

In our opinion, the Hall system of perforated piping ought to be placed in all large stores, warehouses, and buildings containing much inflammable material.

Where there is a proper supply of water, the use of this system comes about as near to perfect safety against fire as we can reasonably expect to attain.

THE PROPOSED EXHIBITION OF VIENNA, IN 1873.

We have been inclined to believe that the Exposition of Paris, 1867, was destined to be the last that the world would ever see of exhibitions, planned and accomplished on so gigantic a scale: but it seems that the Austrian Government is ambitious of trying its hand at the expensive luxury, and, as our readers are aware, has issued its prospectus for a great international exhibition, to be opened on the 1st of May, 1853.

It has been our rare good fortune to visit every one of the World's Fairs, in London, in 1851 and 1862, in Paris, in 1853 and 1867, in New York, in Dublin, and in Munich, and at each we have been astonished at the magnitude of the preparations and the importance of the results.

We observe that the Austrian Government intend to introduce several important new features, and to outstrip all of the preceding efforts of other countries. They propose to bring out, in special magnificence, specimens of the almost inexhaustible resources of the Indian Empire. This will be the strong point of the exhibition, as Eastern nations have never been fully represented, and there is great curiosity to see what they can produce. Another new feature is the intention to present the productions of all countries in groups corresponding with their geographical position. It is also proposed to represent a history of inventions, a history of prices, a history of industry, and a history of natural productions, "so that the world's progress in arts, science, industry, and natural products will thus be brought into contrast." The classification, of the objects to be exhibited, we have given in a former number, to which we must refer to avoid repetition.

Our object now is to call attention to the exhibition, and to impress upon inventors the importance of being well represented on an occasion that bids fair to attract a larger multitude of people than was ever collected together on any similar occasion. At the Paris Exhibition we were very poorly represented in quantity, but admirably in quality. The few articles sent over from this country attracted great attention; nearly every one received a commendatory notice, and it would be interesting to know how much business grew out of this small show. Americans felt that there were many omissions, and, for the credit of this country, as well as for the good of society, they were sorry to observe this want. The mistakes of 1867 ought not to be repeated in 1873. We ought to begin at once in the organization of committees and commissions to take the matter in charge, so that, by circulars and special effort, a majority of our best things may be forwarded to Vienna. We doubt if any good article need be brought back, and it is impossible to predict the extent of trade that is likely to grow out of such an extensive notice as the Fair will give to all exhibitors.

The inhabitants of the populous countries of the East will be present in large numbers. It is notorious that they have great need of many mechanical contrivances; and as, on the seaboard and in large cities, they have already called for a large number of steam engines, they will be apt to order many minor articles for the interior, and offer their own rich wares in return.

We remember what crowds of people gathered around the sewing machines at the Paris Exhibition of 1855. It is almost incredible that the woman to work the machine had to be sent out from America, as there was no one in Paris who understood its management, and yet it is true. The sewing machine was seen by several hundred thousand people, and out of this Exhibition has grown an enormous industry.

American pianos took the prize over all others, in 1867, and the consequence has been heavy orders from Europe. But it is in the thousand and one little inventions adapted to supply the wants of every day life that we excel. Such articles appear to be too insignificant to be sent abroad, and yet they are exactly what they need in Europe. If the preparation of a list of desirable objects to be sent were to be entrusted to a proper committee, some system could be thrown into the selection of objects, and there would be less danger of important omissions. A central advisory board, composed of twenty-six experts, representing the groups into which it is proposed to divide the Exhibition, could be organized in New York, and they could cull out the best articles in each department. The labors of such a commission would be productive of much good, and we dare say that a sufficient number of desirable men could be found willing to work in so good a cause.

At the time of the last Paris Exhibition, an advisory committee was organized in New York, and all of the articles to be forwarded were examined and passed by them; this committee also induced several manufacturers to send forward their inventions for the sake of doing credit to our country.

It may be more difficult to send bulky articles to Vienna than it was to Paris, but we have no doubt that the Austrian Government will seek to obviate this disadvantage by granting peculiar facilities to all persons who send from a great distance.

The experience we acquire in getting ready for the Vienna Exhibition will be of service in preparing for the great centennial celebration, to take place in Philadelphia in 1876.

It is the characteristic of the age that good things are not hidden away, and the chief benefit of international fairs is to make known what one people produces and what another wants. The Vienna Fair will be a grand opportunity for advertising our good things, and it ought not to be neglected.

FIREPROOF BUILDINGS FOR PRESERVING PUBLIC RECORDS.

The insecurity of public documents and records is one of the painful reflections forced upon us by the recent fire in Chicago. Our readers will find in another column an account of the character of the public buildings that were destroyed in that ill fated city.

The building that contains the records in the city of New York is, though nominally fireproof, only so by virtue of its isolation from other structures, and no doubt the majority of such buildings throughout the country are equally insecure.

In connection with the statements of the Chicago *Tribune*, relating to the shabby character of the Post Office, Custom House, and Sub-Treasury buildings that burned, we may profitably consider some statements in regard to the New Record Office, in London, and to methods of fireproofing buildings employed in Europe.

The Record Office, in London, is built wholly of iron and stone. It has no room larger than seventeen feet by twenty-five feet, and seventeen feet high. None of these rooms communicate with any other in the building. Each opens into a vaulted hallway. The doors are iron. The contents of any one room might burn without endangering those of any other in the building.

The use of wood in building for such a purpose ought to be strictly prohibited; then, if partitions were made sufficiently thick, and they were generally constructed on the plan of the London Office, the public records would be probably as nearly safe from fire as it is possible to make them.

How many more severe lessons are necessary to teach us wisdom? There are ways and means, cheap and available, for making buildings that will resist the progress of a fire, even if they will not withstand such heat as was generated by the united burning of the wooden buildings of Chicago. The French have a way of filling in the spaces between timbers, in partitions, with rubble and plastering. There are, in this way of building, no passages for flames through walls. In a very common way of constructing partition walls in this country, with lath and plaster upon studs, the whole building is a series of flues through which flame will rush the moment the plaster wall is crumbled by the heat.

The French method of filling partitions is employed in other parts of Europe. Houses thus constructed are almost as fireproof as if built of brick throughout.

We need not allude here to the many patented devices, calculated to increase security against fire, which have been described in our columns, since they have thus been rendered familiar to our readers. The plain truth is that, with plenty of resources, we have been building throughout the country in a manner disgraceful to a nation whose progress has been so rapid in other respects. Let the lessons we have received teach reform in this matter, and the pecuniary damage sustained will be in great measure compensated for.

SCIENTIFIC INTELLIGENCE.

CONTRIBUTIONS TO OUR KNOWLEDGE OF CARBON.

Berthelot states that the specimen of meteoric iron from Cranbourne, near Melbourne, Australia, contains, among other foreign constituents, fragments of pyrites and amorphous carbon, which latter is generally called graphite. The author concludes, from the behavior of this carbon to nitric acid, or to a mixture of this acid and chlorate of potash, that it is identical with the so called graphite contained in cast iron, but not with native graphite. All of the oxidation products of the meteoric carbon exhibit the same properties as the products of the oxidation of cast iron carbon, differing, however, from what can be obtained from graphite. He infers that the carbon of the Cranbourne meteorite was dissolved in the fused mass of iron, and separated on rapid cooling. From the coincident occurrence of pyrites, he concludes that the carbon comes from the decomposition of bisulphide of carbon by the glowing iron, and not from carbonic oxide. And he sustains this conclusion by acting, upon carbon thus prepared, with nitric acid and chlorate of potash, and finding that it is almost entirely dissolved, the same as the carbon from cast iron. From these experiments, it appears to follow that the native graphite cannot have been originally separated from iron, because it differs entirely from the carbon thus prepared. It is equally improbable that the natural graphite originated from anthracite or from the decomposition of organic substances, as the carbon thus produced does not yield graphitic acid. The author states that true graphite can be obtained by acting upon bisulphide of carbon at a high heat. If his conclusions are correct, the carbon from cast iron is not the same thing as graphite, and we must look to the decomposition of some such compounds as the bisulphide of carbon, or possibly of cyanogen, if we wish to discover the probable origin of graphite. Berthelot some time since prepared the compound of carbon with hydrogen, known as Marsh gas, by passing a mixture of bisulphide of carbon and sulphuretted hydrogen over metallic copper contained in a porcelain tube heated to redness. It would be well for future investigators to employ the method for the determination of carbon, described in the October number of the *American Chemist* by Mr. Cairns, of the Columbia College School of Mines, namely, by oxidizing directly with chromic and sulphuric acids.

A NEW CONSTANT BATTERY.

Figuier recommends, for the construction of a constant battery, a special preparation of the carbon which will work with one liquid, namely, dilute sulphuric acid. The carbon pole is coated with a thin layer of porous platinum or of silver. To accomplish the first operation, the carbon is brushed over with a solution of chloride of platinum, dried and exposed to red heat. To coat with silver, the carbon is soaked in a solution of nitrate, then suspended in an atmosphere of hydrochloric acid gas, and heated to free the chloride of silver thus produced. This chloride is subsequently reduced by the hydrogen gas that is evolved. Carbon thus prepared is said to give a constant current in dilute aulphuric acid.

CHEMICAL ACTION OF LIGHT.

M. Morren advances, as the result of numerous experiments, the following hypothesis: All chemical reactions occasioned by sunlight can be divided into two classes; the first class, characteristically represented by sulphuric acid, includes those bodies which are chiefly formed by the heat rays; the second class, represented by hydrochloric acid, includes such compounds as are produced by the action of chemical rays. The research is an important one, as the action of heat in determining chemical reactions is not sufficiently understood. The practical application of our knowledge of chemical rays to photography has led to a closer study of this branch of the subject; by the same industry, applied to heat rays, we may arrive at heat pictures and other interesting applications of this department of physics. A good many hidden changes in chemical compounds may possibly be traced to the action of the thermal rays of light.

VEGETABLE CEMENT.

A good vegetable cement may be prepared by mixing gum arabic with nitrate of lime. The latter is prepared by dissolving an excess of marble in nitric acid, and filtering. The filtered solution will contain 33·3 per cent nitrate of lime, which may be dried by evaporation. For the cement, take two parts by weight of the nitrate of lime, twenty parts of pulverized gum arabic, and twenty-five parts of water. The mixture can be further diluted to adapt it to the uses to which it is to be applied. In the manufacture of artificial stone, a cement of a similar character has been found to serve a good purpose. Something of the kind is used in the Frear stone, but in the *Béton-Coignet* no additional binding material is found necessary.

PRESERVATION OF MEAT.

By repeatedly immersing the meat in hydrochloric acid, subsequently drying, it is sufficiently cured to keep for a considerable time. When required for use, the acid must be neutralized by a little carbonate of soda, by which it will be salted. The strength of the hydrochloric acid must be determined by experiment.

PRESERVATION OF WOOD.

Armand Muller has instituted some interesting experiments upon this interesting subject, and arrives at the conclusion that the phosphate of baryta, formed by the mutual decomposition of phosphate of soda and chloride of barium in the pores of the wood, is one of the best preservative agents available to chemists. For the purposes of the experiment, Muller took twelve pieces of green oak wood, four inches long and one and a half inches in diameter, which he buried for twelve months, after suitable impregnation, in constantly moist earth, near a manure pit. One piece was left without any protection, for purposes of comparison.

No. 1, coated with tar, showed signs of mold and decay.

No. 2, impregnated with a mixture of light and heavy tar oils, containing three to four per cent of creosote, was only tolerably protected.

No. 3, with chloride of calcium, worthless.

No. 4, with chloride of barium, badly decayed,

No. 5, in a solution of borax, and afterwards in a solution of chloride of barium, was covered with mold and decaying.

No. 6. Soak the wood five days in a seven per cent solution of phosphate of soda, and after drying, suspend in a thirteen per cent solution of chloride of barium for seven days. The author thinks that wood thus prepared will withstand the action of moisture better than with any other preparation. The chief obstacle to the use of such chemicals is in their cost. He found the test piece of wood nearly as hard and unchanged as if it had not been buried at all.

No. 7 was separately soaked in solutions of sulphate of iron and soluble glass; result, tolerable.

No. 8. Soda, soap, and sulphate of copper. The wood was perfectly well preserved. This result suggests experiments upon ships' bottoms with such a mixture, as the poisonous effects of the copper would kill the boring worm, while it preserved the wood from decay.

No. 9. Soda, soap, and hydrated chloride of aluminum (chloralum); wood tolerably preserved.

No. 10. Chloride of zinc; this is well known to be one of the best wood preservers.

No. 11. Sulphate of copper, also well known.

No. 12. Corrosive sublimate; same as the last. Mercury salts have long been used as antiseptics.

No. 13, without any preparation, was entirely rotted and useless.

The best results appear to be attained whenever two antiseptic mineral salts mutually decompose each other in the pores of the wood, coagulate the albumen and exclude the water; and in searching for good wood-preserving material,