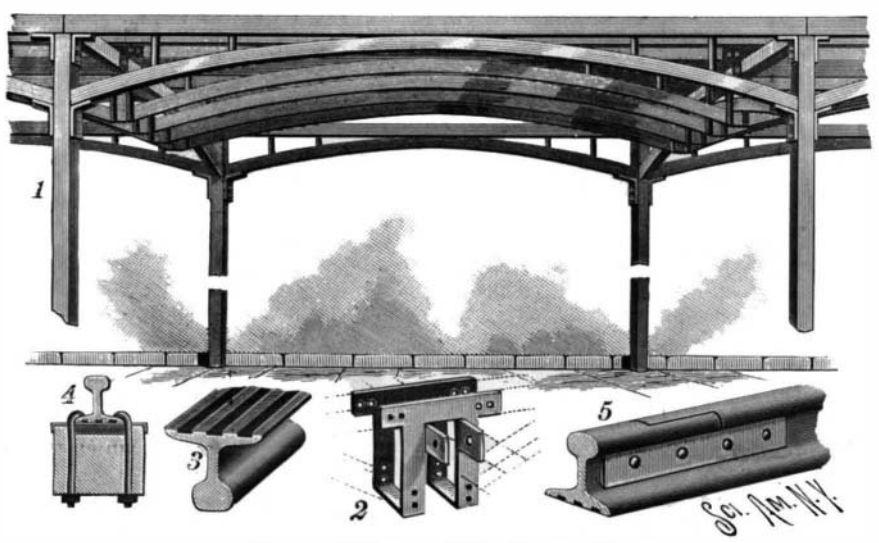
AN IMPROVED ELEVATED RAILWAY STRUCTURE.

A construction designed to combine lightness with strength in the building of elevated railways, while interfering as little as possible with the light of stores and dwellings, and in which provision is made for the deadening of the sound, is illustrated in the accompanying engraving, and has been patented by David D. Toal, of No. 151 Avenue B, New York City. Fig. 1 is a longitudinal view, in perspective, of the improved structure, Fig. 2 showing supports of the interior arched beams and Fig. 3 a bottom view of one of the rails, in which lead cushions are applied. Fig. 4 represents the fastening of the rail to its bed and Fig. 5 shows the meeting ends of rails, made with interlocking tongues. The uprights are designed to be placed as near as possible to the curbing, and thus take but little room from that provided for the ordinary street traffic, and each pair is connected by a straight transverse tie beam supported by an arch beam, longitudinal arch beams also connecting the successive uprights to make a thoroughly braced and trussed structure. The sleepers or track beams are laid longitudinally, and each one is braced and supported by a longitudinal arch beam. In the bottom face of each rail are grooves filled with lead, as shown in Fig. 3, and preferably the entire upper face of each sleeper or track beam is covered by a sheet of dead metal, to obviate jar and noise. Instead of the usual spikes, bolts are employed to attach the rails to the track beams or sleepers, as shown in Fig. 4. The arch beams are designed to allow for expansion and contraction, and the entire structure, including the sleepers or track beams, is of metal. It is claimed that



TOAL'S ELEVATED RAILWAY STRUCTURE.

with this construction the cars may be run over the center of the street without being objectionable to the residents or those doing business along the line of the road, and that any desired speed may be obtained without danger, whether steam, electricity, cable, or other means of propulsion are employed.

Largest Brandy Still.

The largest brandy still in the world is at El Pinal vineyard, in San Joaquin County, not far from Stockton, says the San Francisco Call. Part of it has been built about four years and the other part was finished only a short time ago. As is well known, El Pinal vineyard has always made a specialty of brandy and sweet wines. It was the intention of the proprietors to do this when they went into business, and for that reason they had the largest still built that was ever put up. That was, as has been stated, about four years ago, and even then it was ahead of anything in existence. It could produce more brandy in twenty-four hours than any other still in the world, and it has not been surpassed since. But even that was not enough to supply all the alcohol needed in their business, so another still was built and made to work in connection with the original one. The two are really one still, as they are used, and have about three times the capacity of any other still in the world.

This enormous machine is located in a building by itself, and part of the year is kept running day and night. It is very complicated in its workings, so that a description of that part of it cannot be attempted here. It will be sufficient to state that the grape juice or wine is pumped from vats to a tank on top of the hill. From there it simply passes through a series of heated chambers in the form of a vapor and comes out in the shape of brandy.

It can be tested in the different chambers and the change noted. In the first chamber it is little more than warm wine, and it gradually gets stronger and stronger until it is sharp to taste. From the time the wine leaves the tank until it comes out as grape brandy only ten minutes is occupied. In the old method of distilling it used to take about three hours.

In appearance the largest brandy still in the world is simply a conglomeration of tanks, pipes and boilers. The capacity of this still is enough to make a person wonder what becomes of all its products. When running full time it can convert 15,000 gallons of wine into brandy in a day. This will make 4,000 gallons every twenty-four hours, or enough to keep about 40,000 men in a state of intoxication during that time. In a month there would be enough of brandy on hand to intoxicate 1,700,000 men, or about the entire population of New York. But, as it happens, very little of this brandy is sold as brandy. It is used to fortify sweet wines, so that they will be in condition to keep until ready to send to market. The alcohol acts as a preservative of the grape juice the same as it would of anything else. It keeps it from turning sour.

A GIANT TRICYCLE.

In this age of "big" things one is always prepared for the construction of mammoth engines, ships, buildings and public works, and the rage for the superlative seems to be universal. It has even invaded the bicycle world, where at least one would think size and weight were at a discount, and. moved by its inspiration, a New England firm has produced the colossal—no other word justly describes it—tricycle shown in the accompanying engraving.

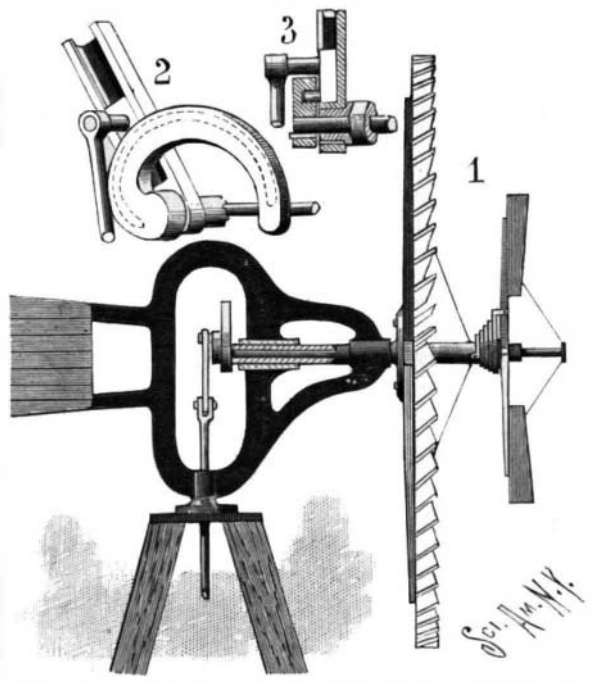
It is driven by eight men, which is, it is true, only two more than are mounted on a sextuplette; but whereas the latter weighs approximately as much per man as an ordinary single machine, the tricycle weighs about 300 pounds to the rider, the total weight, with the men mounted, being about a ton and a half. The front wheel is six feet, and the rear wheels are eleven feet in diameter. The frame consists of two parallel trusses which are arranged side by side and finish at the front in a cross truss to which the steering head is attached. The steering is done by one man. Each side wheel is driven by the four riders which are nearest to it, and a curious feature in the machine is that it is geared down instead of up. This was rendered necessary by the great dead weight which had to be moved. Even if the crank sprockets and the wheel sprockets had been the same size, the gear would have been 132, whereas it has been geared down to 54. The left hand chain and sprockets can be clearly seen in the engraving. The total length of the machine is 17 feet.

The tires are pneumatic tires, made exactly in the same way as the ordinary Vim roadster tire, and they are, therefore, single tubes. This "Jumbo" among cycles has been put to practical test on the roads, having been ridden from Boston to Brockton, Mass., a distance of 25 miles, and from there to Concord, N. H., 125 miles distant. We can realize that it has found its proper field of work when we are informed that it has done duty in many torchlight parades, political and otherwise.

It should be mentioned that the front tire is eleven, and the rear tire eighteen inches in diameter, the latter being about half an inch thick on the tread. The large wheels have spokes half an inch in diameter, and the small wheel spokes are one-quarter inch diameter.

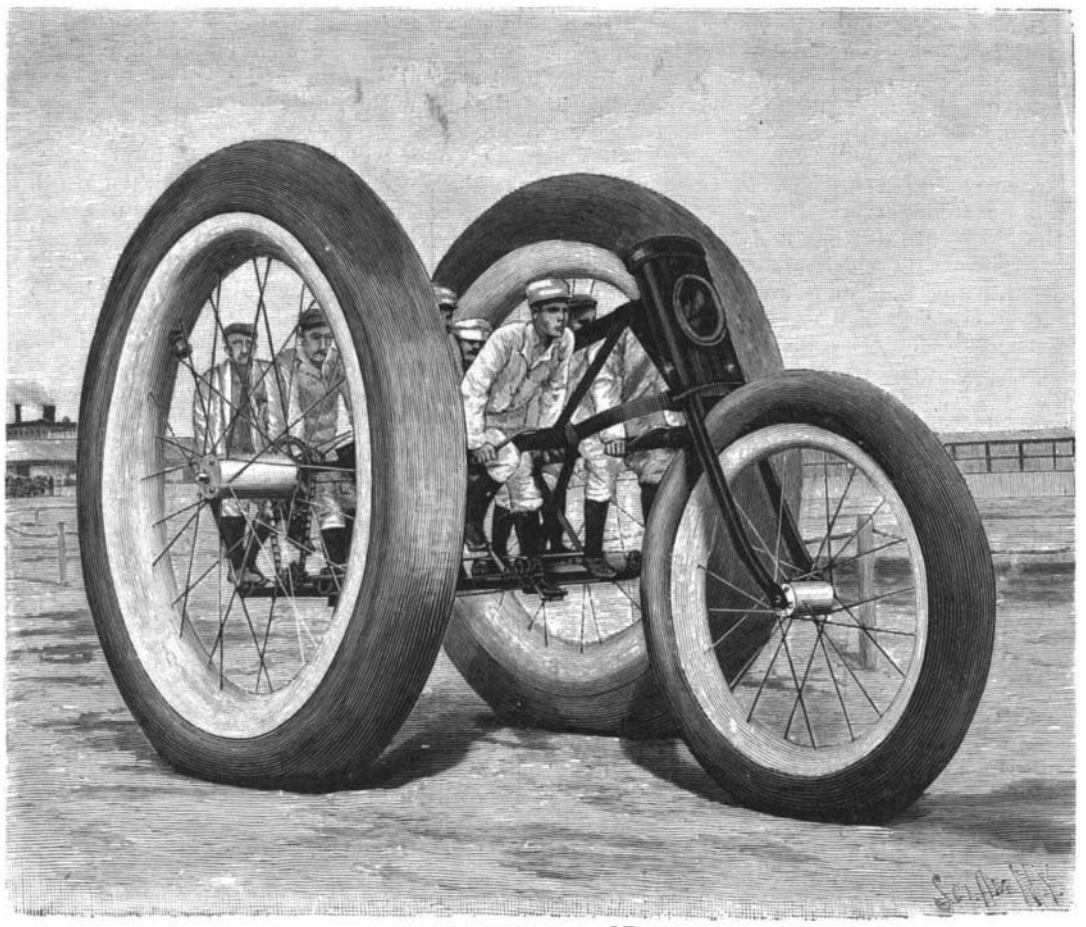
A WINDMILL POWER TRANSMITTING GEAR.

The illustration represents a gear of strong and simple construction for regulating the length of the stroke according to the force of the wind, and transmitting the power of the windwheel to a pump or



HOFFNER'S WINDMILL POWER TRANSMITTING GEAR.

other machinery without much friction. The improvement has been patented by William C. Hoffner, of Prospect Park, Cal. The windwheel has a hollow shaft journaled in suitable bearings on the windwheel frame turning on the upper end of the tower, in the usual manner, and on the shaft is a crank arm in which slides a block carrying a wrist pin engaged by a pitman connected with the upper end of the pump rod, as shown in Fig. 2. The position of the sliding block and the wrist pin changes according to the wind, the stroke being less during a light wind than in a heavy wind, and a full stroke being given only during a strong wind. To regulate the position of the block, it is provided with a pin located below the wrist pin, and which, as shown in Fig. 3, projects into a cam groove in a cam on a shaft mounted in the hollow windwheel shaft, and carrying at its outer end a small windwheel, a spring being interposed between the hub of the small wheel and that of the large one. This spring has an adjustable tension, and is strong enough to offset the power of the small wheel in an ordinary breeze, the wrist pin then remaining in an innermost position, but with an increased force, to rotate the small wheel faster than the large one, the cam is moved to shift the sliding block and the wrist pin outwardly, thus lengthening the stroke of the pump rod. As the wind diminishes the spring pulls the small wheel back, and the cam draws the sliding block inwardly to shorten the stroke, which is thus automatically regulated, according to the force of the wind.



A GIANT TRICYCLE.

The Cyanide Process Patents Declared Void in the Transvaal.

Word was received recently by the N. Y. Sun that the High Court at Pretoria, the capital of the South African Republic, had declared void the Macarthur-Forrest patents for the cyanide process for the recovery of gold. This decision was given in a suit brought by the combined gold mine owners of Johannesburg and the Transvaal. The information came in this cablegram to Lawyer C. W. Truslow, of the Mills building.

Throughout the gold bearing regions of the world there lie millions of tons of auriferous rock in which is held more wealth than man ever knew, but in particles so small that, rich as the rock might be, the gold could not be caught by any of the processes which could be used with economy until the cyanide process was introduced. Formerly mercury was the great agent for catching and fixing gold. In the placer mines, where nature had placed nuggets and grains of gold in the beds of streams or old alluvial deposits, often not even mercury was needed. These are the mines where the lonesome miner with no tools but his pick and shovel and a pan could wash out a fortune sometimes in a few weeks or months, for nature, in breaking up the goldbearing rocks by her slow but rude processes and washing them down toward the sea, had carried away all the smaller grains of gold and left the bigger ones to stay snuggled away among the pebbles and sand, holding themselves there by their own weight.

Then in many parts of the world, and notably in a large part of our own gold mining districts, when man began to attack the rock that holds the precious yellow metal he found it sprinkled through the quartz in grains which mercury could easily reach and hold. These are the goldbearing rocks which furnish such pretty specimen pieces, gilt with yellow splashes or shining with big grains of pure gold. Great stamps crush the rock to powder, and from this the shining quicksilver quickly chooses the golden harvest, makes a union with it, and holds it for the miner until it is driven off by heat, condensed, and saved to do its work over again.

In other parts of the world, however, where the riches of the earth are as great as or greater than those just mentioned, the inexperienced man would never discover that there was a particle of gold in the rocks. Instead of the pinhead grains which catch the light and betray themselves by their glitter, there is in these rocks only a powder of gold so finely divided that nothing but a microscope will disclose it. In other mines these two kinds of grains are together. Grind up one of these rocks and mix the powdered stone with mercury. The mercury will grasp what gold it can, but much will elude it. If you have ever taken a bit of quicksilver and watched its movements you can understand why this is so. Wherever it has a chance the liquid metal gathers itself all together and draws its sides up into rounded forms as if shunning contact with all earthly dross. Shake it into bits, and no matter how finely divided it may be, each bit will become a rounded atom. So, no matter how well mixed the mercury may be with the goldbearing dust from the crushed rock, its little globes will draw away from the jagged interstices of the crushed stone and leave in those spaces the gold. While gold could be picked up in placer mines, men would not bother even to crush the richest of rocks, but, as the other sources of wealth became scarce, they attacked the solid quartz. With big profits coming in from these the miner gave little heed to the smaller particles of gold, but let them flow away in tailings. In some few places attempts were made to work by more economical methods, but it needed the discovery of the wonderful mines in the Transvaal to force the development and adoption of methods which would catch the finest bits of gold which nature had hidden in her storehouses.

As the Boers fled further and further away from the hated town life which interfered with their pastoral delights, the English followed them nearer and nearer to the land which is said to have contained King Solomon's mines. In about 1884 the gold mines in the Transvaal were discovered, and every day since then has seen a bigger output from them, until to-day the output of gold from there is as great as or greater than the entire output of gold from America.

The export of gold from the Transvaal through Natal had reached the great sum of $9,259,525. In 1891 it was $14,507,350, and in 1892 it reached $22,396,545. Last year it was nearly double this enormous sum. A great part of the increase was due to the introduction of the cyanide process.

Up to 1891 the reduction works had been running upon the old plan, stamping up the rock, and getting out of it what gold was coarse enough to be taken out by quicksilver. All the rest ran off with the tailings, and hundreds of thousands of tons of ready ground rock were shoveled away as refuse from the stamping mills until there were hills of it at every mill and a hidden fortune in every hill. Every ton of these tailings contained about $2 worth of pure gold in powder so fine that nothing but a chemical process could gather it from its surroundings. It was at this time that the two Scotchmen, Macarthur and Forrest, took out patents all over the world for the cyanide process of gold recovery. They were so early in the field in the South African Republic that their first patent—the one for dissolving the gold from its ores by the use of a dilute solution of cyanide of potassium—was only the forty-seventh patent issued by the newly organized Boer republic. Their second patent, which covered a process of recovering the gold by passing the cyanide solution over zinc shavings in long tanks, was only number seventy-two of the South African Republic's patents.

In the two processes referred to lies the key to the whole of the system. The beginning of the process is to mix the finely ground rock with a weak solution of cyanide of potassium. No particle of gold can elude this, and in the course of one to three days the whole of the precious metal is dissolved. In the second process the zinc shavings are placed in shallow tanks and these tanks are loaded with the cyanide solution. As the solution flows along the gold is precipitated upon the zinc, and then it is recovered as metallic gold by sublimating the zinc by fire. Shrewd men were among the Outlanders who were running the mines at Witwatersrand, Barberton, Klerksdorp, Potchefstrom, and Malmani.

Here it was that Cecil Rhodes and his coadjutors had gained a foothold and were reaping fortunes out of the earth, paying John Hays Hammond, the American mining engineer, a fortune every year for his skillful services. Many other Americans were in the mines and dozens of Englishmen, who were reaping fortunes.

These, in fact, were the interests which built the town of Johannesburg, and afterward led in the abortive attempt of Captain Jameson and the party of Cecil Rhodes to capture Johannesburg and declare an independent Transvaal government.

These men saw the vast possibilities of the new process and began to use it at once. Recent tables show that since January, 1891, the output of gold recovered by this process has been steadily increasing, until in August, 1895, the production by all other processes being 140,000 ounces, or about $2,800,000, the production by the cyanide process alone was 60,000 ounces, or about $1,200,000 for the month. In 1894 the mills produced 1,405,282 ounces of pure gold in the Witwatersrand district, and the cyanide process produced in the same district 618,480 ounces. In that single year 2,847,378 tons of tailings and 18,351 tons of concentrates were put through the process. These yielded more than $10,000,000 worth of gold with an apparent profit, over the cost of the process, of about $7,375,000.

This seems to indicate that the miners ought to have been well satisfied, but there was a serious drawback to their happiness. The African Gold Recovering Company, which controlled the Macarthur-Forrest patents in the South African Republic, didn't let any one use the process without the payment of big royalties.

These payments varied with individuals, but they were so large that they amounted to millions of dollars every year, and it became a common saying in the Transvaal that the invention had benefited the inventors a great deal more than it had the miners.

The miners made efforts to get reductions of the royalties, but no agreement was reached. Then they determined to fight, and a peculiar feature of the Boer republic's laws opened the way for a direct action. This was by an application to the Attorney-General to have the patent set aside because of a lack of novelty.

The Attorney-General appointed James Hay to bring such an action at the miners' expense in the High Court of Justice, the equivalent of our United States Supreme Court and the court of last resort. It was asserted by the miners that, although the patentees of the cyanide process may have been original inventors, the chemical facts upon which it was founded were known long ago to the world, appearing in chemical and other publications and mining works, and that any skilled metallurgist having this knowledge could do just what was claimed by them as new. Further, it was asserted that the same thing had actually been done before, although not upon a large scale. Commissions were issued for the taking of testimony in the United States, Australia, New Zealand and England in the case.

The most important field was in this country, where Mr. Truslow was employed to find the evidence for the miners and Walter W. Williams for the patentees. Walter W. Edmunds, of this city, took the miners' side of the testimony as commissioner, and Edward Kent that for the patentees.

Mr. Truslow began his work a year and a half ago, and it led him to examine almost every chemist of note, every college or public library, and to look into all sorts of trades where gold is used for evidences of what he knew was true. One curious instance will show how difficult was the work of getting testimony. One of his assistants in this work was Prof. Henry Wurtz, of this city.

Mr. Wurtz was positive that he himself had had knowledge of the main facts years before, but he could not place the time nor the way in which this could be proved. One day, while he was searching the libraries for general facts, and near the end of the work, he came upon a copy of the American Journal of Science and Arts, published in New Haven in 1866, and there, in an article written by himself, was a statement which covered the whole matter. Up in the Astor Library was found much which bore upon the matter, and as many of these books could not be duplicated and none borrowed, photographs of the needed pages were made. This work alone cost $1,500. Many experts were examined on both sides.

Rossiter W. Raymond was on the witness stand for twenty days for Mr. Truslow's side. It was shown by his testimony and that of William H. Adams, John Williams, Henry Wurtz, and others, that the process had actually been used in places here, and in one instance a quarter of a ton of ore had been so treated in 1885. The process was not needed here at that time, because most of our gold is coarse enough to work by the cheaper quicksilver method.

Since that time, however, fine grain ore has been found, and it is said that there is much of it in the country. The Mercur mine of Utah uses the Macarthur-Forrest process, and was sued by them a while ago, but it made a settlement privately.

The hearings in this country were finished in September, 1895, and the testimony and exhibits were put in a tin lined box, and this was sent as a registered letter by mail to Pretoria. It made the biggest registered letter ever sent through the United States mail. The package was as big as an ordinary dry goods case, and the postage was $187. It went from the New York post office. The biggest letter before that had cost about $40 postage. The case was heard by the High Court of Justice at Pretoria just before Jameson's raid in December of last year. As far as the South African gold fields are concerned, the decision throws the process open to the public.

It has been attacked and the patents overthrown in Austria, and the belief of the opposing lawyers now is that nowhere in the world will the users of the process continue to pay royalties, but will fight and overthrow the patents everywhere. This means much to the gold miner, and probably will result in immense additions to the world's stock of gold within a few years.

Embossing on Glass by Tinfoil Stencils.

The stencil may be cut out of thin sheets of metal or cardboard, in the same manner as for wall decorations, etc. If varnish colors are employed, lay them on as evenly as possible through the perforations in the plate, and harden afterward in a stove or oven. The metallic preparations used in glass staining and painting are also available, but require firing in a muffle or china painter's stove. For the process called embossing paint the portions of glass left uncovered by the spaces in the stencil plate with Brunswick black, dip or cover with hydrofluoric acid, wash in clear water, and remove the black ground. Every part that was covered will then present a polished, even surface; the remainder will have been eaten into by the acid. If the raised parts are to have a frosted appearance, rub them with a flat piece of marble moistened with fine emery and water. For putting patterns or lines on glass with a wheel there are two methods, one followed by glass cutters and the other by the engraver on glass. For the first mentioned rough in the pattern with an iron mill supplied with a trickling stream of sand and water, smooth out the rough marks on a wheel of York or Warrington stone, polish on a wooden wheel of willow or alder powdered with pumice, and finish on a cork wheel, with putty and rottenstone. The engraver cuts in and roughs the pattern with copper wheels, aided by emery of various degrees of fineness and olive or sperm oil, and polishes the portions intended with leaden disks and very fine pumice powder and water.—Pottery Gazette.

Effects of Molecular Bombardment.

Some years ago W. Crookes published the fact that diamonds phosphoresce of various colors when submitted to molecular bombardment in a vacuum tube under the influence of the secondary current from an induction coil, and it was also observed that the diamonds became discolored under this treatment, while in course of time they became black on the surface. This superficial blackening cannot be removed by ordinary cleaning methods, though polishing with diamond powder removes the discolored layer. Becquerel having shown that long digestion of graphite in a warm mixture of potassium chlorate and strong nitric acid converts it into graphitic oxide, while diamond remains unaffected, some discolored stones from Crookes' experiments were subjected to this treatment on the supposition that the superficial blackening might be due to conversion of diamond into graphite. This was proved to be the case, the whole of the black stain being removed from diamonds that had been specially bombarded in a vacuum tube for five hours, after digestion in the acid mixture for three days, while comparison of the stones with similar ones that had not been darkened seemed to show that the cleaned specimens had acquired extra brilliancy. A curious fact is that some of the historic specimens, preserved in a vacuum tube, appear less dark than they were some years ago, so that it is just possible the graphite formed may be ultimately reconverted into diamond.—Chemical News.