gree. Our government endeavored to do something in this direction by the law of June 2, 1879, which provided that our consuls in foreign ports should see that every vessel bound for the United States should comply with the rules and regulations necessary "to secure the best sanitary condition of the vessel, cargo, passengers, and crew," and prohibiting the entry here of any vessel not provided wtih a prescribed "certificate required to be obtained at the port of departure." In Cuba this law was denounced and its enforcement rendered impracticable, so that it has remained a dead letter. It is evident, therefore, that something further should be done in the way of enforcing a more stringent supervision than is at present exercised on vessels leaving Cuba for the United States, for, with our present exposure we are constantly running the risk of a pestilence which may, in some particularly trying year, be brought thence to our Atlantic cities. Our commercial intercourse with Cuba, important as it may be deemed, should not be considered of sufficient moment to justify our taking any further risks of this kind.

CHEAP PATENTS CHEAPEN GOODS.

The attorneys of anti-patent associations waste no end of rhetoric in describing the burdens put upon purchasers by the multiplication of patent rights. Everything is patented or made with patented machinery or by patented processes; therefore everything must cost a great deal more than it would were there no patents. This is their logic stripped of verbiage. The only fault with it is the persistence of facts in always going dead to the contrary. It is plausible, but it is not true. The moment one sees the word "patented" stamped on an article it is safe to infer one of two things: either the thing is cheaper and better than anything of the sort previously in market, or it is an entirely novel article, which in all probability would never have been produced except for the patent laws.

A pretty illustration of this industrial and commercial paradox occurs in a paper lately read by a prominent English builder before the Manchester (England) Scientific and Mechanical Society. The reader had been, for the second time, comparing English with American made builders' hardware, showing the "marked superiority" of the latter, and was summing up the causes which had led to the competition upon their own doorsteps from American manufacturers. He said:

"Another and most important factor in the sum of deadweight under which we have to stagger in this race is our absurd patent laws. If our legislators had set out with the intention of suppressing the inventive genius of the country, they could not have succeeded more completely than they have done. Can we wonder that America is such a close competitor in the manufacture of these small articles, when we know that for a payment of £18 the inventor can secure himself for seventeen years, whilst in this country it will cost at least twice the money to secure an invention for three years only? How can a man with inventive skill, but with limited means, make the most of his talents? Too often he spends all his little savings, ruins himself, and, when his three years have expired, sees some other person take his invention in hand and realize the profit that belongs to himself. The result is that, disheartened and disgusted, he for ever after buries his talent in the earth. I show you here a small article of American make, not connected with the building trade, as an illustration of the different influence of the patent laws of the two countries. This little machine (an apple parer) carries eight patents, yet its wholesale price in England to-day is less than 4s."

A most ingenious paradox, truly!

The apple-parer was beyond English competition because it carried eight patents. It is safe to say that every single patent had improved its working or lessened its price.

But why could not the English manufacturer, having no patent royalties to pay, produce and sell the article on the spot cheaper than the American, with 3,000 miles of freightage to pay in addition to the cost of manufacture? There may be several reasons more or less sufficient; but one is enough. Having no monopoly of the manufacture, the Englishman could not afford to risk the investment necessary to enable him to produce the article cheaply.

Our Canadian friends discovered that law of trade when they undertook to reap the benefit of Yankee inventions without payment of patent royalties. The only drawback was the simple circumstance that, though Canadians had the world's best inventions to choose from gratis, no man dared to undertake the manufacture of novel articles when everybody else was free to set up in opposition. Canadian industries would not multiply until the Canadian Government recognized the property rights of all inventors; then the Canadians began to be a manufacturing people.

Our Western and Southern citizens are rapidly learning the same important lesson. Industries increase and multiply, and industrial products improve and cheapen in direct proportion to the number of patents issued; and the number of patents issued depends very largely upon the lowness of the official fees for issuing them. Which brings us round to our thesis, that cheapening patents cheapens products.

American Manufacturing Industries.

There are few qualities in one's nature more objectionable perhaps, than egotism, but it is difficult to withhold from others the pardonable pride we feel in referring to the superior engravings which our artists produce each week for this paper.

We allude, especially, to the series of full page engravings, illustrative of the most prominent American industries. The present issue, containing the article on book paper making, is the thirty-seventh of the industrial series which have already appeared in these columns. The views of the several manufacturing establishments we have illustrated were sketched by our own skilled artists on the premises, and for accuracy and artistic grouping of the interior views, showing the various processes of manufacture, we believe there has been nothing attempted before in journalism that has met with the same gratifying success which has been accorded to this interesting feature of this paper.

A continuation of this industrial series we purpose to continue until every important industry of the country has been illustrated and described, and we would thank our readers to suggest what extensive works in their vicinity would furnish interesting material for publication.

NEW YORK ACADEMY OF SCIENCES.

A meeting of the New York Academy of Sciences was held Monday, March 15, at 8 P.M., President Newberry in the chair.

Mr. Kunz exhibited a necklace made of beautiful iridescent shells, and also several handsome pearls from fresh water mussels found near Portland, Maine. Mr. McCarty exhibited several minerals.

The Recording Secretary, Prof. Leeds, read a letter from Norman Lockyer, in which the latter expressed his thanks to the Academy for his election as an honorary member.

THE COAL AND IRON RESOURCES OF VIRGINIA.

The paper announced for the evening was on the coal and iron resources of Virginia, by Prof. Thomas Egleston. The following is a brief synopsis of it:

When Alsace was separated from Lorraine the commissioners drew the boundary in such a manner as to give to Germany all the iron lands and leave nothing of value to France. In like manner the division of Virginia left all the iron in the old State and gave the new one all the coal. These are not, however, the only mineral resources of Virginia. Gold, small quantities of silver, lead, and zinc are also found. Near Wythevill, particularly, the zinc ore rivals that of Friedensville near Bethlehem, Pennsylvania. It appears to be very free from lead, and the zinc made from it has been commanding more than double the price of the common metal in the market.

The great iron region of Virginia lies between the Alleghanies on the west and the Blue Ridge on the east. The space thus inclosed consists of a number of shorter ranges, abounding in limonite, hæmatite, specular iron, and especially on the James River region, in magnetite. For magnitude of extent and facility of exploitation this region is second to none in the United States. As we ascend the successive terraces of the mountains we find the iron deposits folded so as to form numerous outcroppings succeeding each other at short intervals. Over 80 ores coming from the region between Stanton and the James River were analyzed, and none of them contained over 1·2 per cent of phosphorus. Most of the ores contain only from one to five-tenths of one per cent of phosphorus. A year ago Bessemer engineers would have considered this circumstance a great advantage; but with the new processes larger quantities of phosphorus are rendered available and even necessary to obtain the requisite degree of heat in the converter. Taking the whole iron region together the ore will average from 45 to 55 per cent of metal.

To the west of the iron district there are very extensive limestone deposits, and as we enter West Virginia we strike the coal measures. There is a belief current in that region that it is only the lower coal that will coke well, but this is an error. Coal has been found there that will give only two per cent of ash, and the coke formed from it gives but six per cent. As we leave the river banks the coal deposits increase in thickness, until they reach a depth of twelve feet, as, for example, at Hawk's Nest. The valley of the Kanawha River is not one of erosion, but was formed by a geological accident. As a consequence of this the mines that have been started along the banks will have to be abandoned sooner or later and carried over the hills further inland to follow the veins.

It is impossible to tell how much coal there is in Virginia, and nowhere is there so little known about it as in Virginia itself. Since Prof. Roger's report, in 1838, no systematic explorations have been made on account of the difficulty of access. For the want of facilities for transportation, the few iron furnaces that have been run from time to time in Virginia have used charcoal at great expense. During the war the Confederate Government was particularly unfortunate in locating its furnaces near ore containing an exceptionally large amount of phosphorus which they did not then know how to manage.

If the present great revival in the iron trade should continue greater efforts will, no doubt, be made in a few months by the railroads to open up these great mining regions; combinations will be formed between the iron interests of Virginia and the coal interests of West Virginia, and the effect will be to raise the district to the importance of the Pennsylvania iron and coal regions. Then surveys will be made either by private enterprise or by the governments of these States, and the capital of the country will pour in, producing a prosperity such as Virginia has never had. At present these deposits are but dormant wealth for a future generation.

At the conclusion of the paper Mr. Warner gave the fruits of his researches into the mysteries of the "fifteen puzzle," in the shape of a method of determining by inspection whether a given arrangement is or is not capable of solution.

C. F. K.

Proposed Exploration of Mexico.

It is announced that Mr. Pierre Lorillard, of this city, has entered into an agreement with the French Government to assist in the prosecution of a scheme of exploration among the ruins of Mexico. The French Government furnishes the outfit of the expedition and $9,000 in money; Mr. Lorillard gives $20,000 at once, and as much more when it is needed. The whole cost of the expedition for two years is put at $60-000. M. Charnay, the French scientist and explorer, will take charge of the work, which will begin next spring. The material results of the exploration will go to swell the treasures of the French museums. The report of M. Charnay will be first printed in the *North American Review*.

The field to be explored is rich in relics of the splendid though partial civilizations which had flourished for un known ages, and were in part declining, if not forgotten, when the Spanish conquerors arrived. But, since the days of the ill-fated Maximilian very little has been done toward their investigation except by our government surveyors in Colorado, New Mexico, and Arizona. These have found evidences of an antiquity for the origins of the civilizations of ancient Mexico far exceeding anything dreamed of a few years ago; and it is altogether probable that the questions of historic and prehistoric interest raised by such discoveries may be materially helped on toward solution by the labors of M. Charnay. At least, he cannot fail to add much to our limited knowledge of the later civilizations of Mexico, as shown in the ruins of the Aztec and Toltec cities destroyed by the Spaniards.

Road Engines and Wagons for Western Transportation.

A number of road locomotives and trains of wagons, for the transportation of minerals and general merchandise over the common roads of the far West, were received in this city by the steamship Erin the latter part of February. They were built in Rochester, England, and were consigned to Wadsworth, Nevada, where they are intended to take the place of mule trains on certain central routes in that State.

The engines weigh about 7 tons each, and are rated at 12 to 14 horse power. They have horizontal boilers, which are fitted with large fire boxes for burning almost any description of fuel, and water tanks are affixed capable of holding a supply for three or four hours. The engines are so arranged that they can be used for turning fixed machinery. The driving wheels are 7 feet in diameter and 12 inches in width, and the steering or front wheels are 4 feet in diameter and 9 inches wide. An important advantage in the road locomotive is that in case of need the road wheels can be replaced by the ordinary flange wheels for running on rails.

With the addition of a winding drum, fitted to the driving axle, capable of holding from 50 to 100 yards of coiled rope, these engines can be employed in hoisting heavy weights and in hauling the loaded wagons up otherwise impracticable grades.

It is claimed that one engineer and two laborers are all the manual force necessary for the management of each train, and on moderate roads, with grades not exceeding 1 foot in 12, each engine of the size sent to Wadsworth will haul from 10 to 12 tons of paying load, and travel at an average speed of 3½ miles per hour. Two or three wagons, each capable of containing from 5 to 6 tons weight, and the engine form the train. The wagons are coupled together and to the locomotive by strong coupling bars, and the whole train follows exactly in the track of the engines, even when turning sharp curves. The total cost of hauling by the road locomotives, it is estimated, will range from 5 to 10 cents per ton per mile, varying with the condition of road and load. This is probably not one-fourth of the cost of doing similar work with mules. The ordinary mule team, consisting of 16 mules, with heavy wagons capable of holding 6 to 10 tons, will not average more than 2 miles an hour. The first cost of the locomotive, with its train of wagons, compares favorably with the first cost of the mule team and wagons. It is believed, however, that it will be many years before the traction engines can abolish the use of mules on the Western roads, as the latter may be employed where it would be difficult, if not impossible, for the engines to travel.

The Electric Middlings Purifier.

A public exhibition was given in New Haven, March 13, of the electric middlings purifier, the joint invention of two young men of that city. The working of the device is said to have been highly promising. Over the wire bolting cloths are placed a bank of hard rubber cylinders, which are slowly revolved against strips of sheep skin and thus electrified. To these rollers the light bran is attracted, to be mechanically brushed into a proper receptacle. This substitution of electric attraction for the air blast in separating bran from flour is said to lessen the waste, while it obviates the necessity of doing the work in a closed chamber and the risk of explosions. The exhibition was made in an open room, and there was neither dust nor waste.