Scientific Notes.

THE CAUSE OF THE OPEN POLAR SEA—A correspondent of the New York *Times* presents the following theory of the open polar sea:—

"When the facts become more fully understood, I think that it will appear that this singular result will be found to proceed from very simple natural causes, namely, the centrifugal force and the internal heating power of the earth. The centrifugal force has a tendency to heap up the waters under the equator, thereby producing a continual surface current toward the South, and a consequent absence of water from the polar regions, which must be supplied, and is undoubtedly by a submarine current. The waters descend in the temperate regions of the earth, where they are much above the freezing point; their heat is retained, and probably increased at the vast depths in which they move, and when they emerge at and about the pole, they produce a warm and open sea, and a warm atmosphere about it. But in their flow to the South, the superabundant caloric of the water is continually being given off, until the waters are finally reduced to the freezing point, and ultimately become vast fields of ice."

[We conceive that the above is not a good explanation of the cause of the open polar sea. It is well known that there is a cold surface current in the Atlantic flowing to the tropics from the Northern Sea, but if the centrifugal force theory here set up were correct, there would be a surface current from the south and an under current from the north, which would prevent fields of ice forming in the Northern Ocean. An open arctic sea is not a new discovery; it is describedin Lieut. Maury's work, and he believes that, like the Gulf Stream, it often changes its position somewhat. There is a warm under current flowing from the tropics to the Arctic ocean, and were it not for this, the northern seas would freeze to the very bottom, and what then would we do for herring, mackerel, cod, and other fine fish, whose natural feeding waters appear to be in the Arctic Ocean.

A STRATUM OF SALT UNDER NIAGARA FALLS—E. Merriam, of Brooklyn, who has examined the rocks underlying the limestone bed of the Niagara river, states that he found a saline stratum under them. This stratum is the foundation of the great limestone walls which form the great cataract of Niagara, a frail structure it is, and it is in this stratum that the Niagara has the whole of its bed below the Fails, and being soft, the water which falls over the Horse Shoe and over the American, North of Goat Island, has had no difficulty in sinking chasms of vast depth, into which the broken rock of the limestone walls which compose the cataract falls. This stratum extends over a large tract of country, watered by the great lakes, which seem to have a subterranean communication with the volcanoes of Hecla, in Iceland, and those of the southern part of the European continent, as the disturbance caused by the earthquake at Lisbon, in 1775, caused the agitation of the waters of Lake Ontario. He says that an immense volume of gas arises from the chasm into which Niagara plunges from the lofty precipices which form the Horse Shoe on the American fall, and might with proper apparatus be ignited—and when on fire would greatly exceed in beauty the flames of the gas ascending from the deep ravines of the salines of Kanhawha, which give a column of flame of seventy feet in hight. His conclusion, from all his observations is, that the great falls do not date beyond the universal deluge.

A PETRIFACTION, AND NATURAL DAGUERREOTYPE ON STONE—The editor of the Oquaqua *Spectator*, Illinois, it is stated, has two remarkable curiosities in his cabinet. One of them, he says, appears to be a petrified ham, so perfect in form that even the skin preserves its distinctness where the knife of the trimmer has rounded the edges. The other specimen is a stone containing a photographic impress of a beautiful landscape. It is about four inches long by two inches in width; the picture represents, in their true colors, a bluff or bank of yellow clay, the meandering line of a creek lined with willows and cotton woods, and a spring crowned with a large tree. This landscape is the correct representation of a view in Warren County, Ill. Mr. Patterson, the editor, attributes the picture to the action of electricity during a thunder storm, while the image had been reflected on the surface of the stone.

THE EFFECTS OF CANNONADING ON THE BAROMETER—M. Le Maout, the chemist, who has acquired some celebrity at St. Brieuc, his residence in France, for his observations of the barometer, as affected by a distant cannonade, states in the *Publicateur* of St. Brieuc, that he announced the cannonade and the assault of Sevastopol from the changes affected in the mercury. He adds, that it takes an hour and forty minutes to receive the impression of the guns of Sevastopol on barometers in France.

REAPING MACHINES IN ENGLAND—The report of the trial of Reaping Machines, which took place in England on the 29th of August last, before the Royal Agricultural Society, has recently been published. The Judges awarded two prizes, the first to Burgess & Key's improvement of McCormick's reaper; the second to Palmer's improvement of Forbush's reaper. Hussey's reaper, as improved by Wm. Dray & Co., of London, was highly commended, but did not have any prize awarded. This trial is stated to have been a severe and impartial one. One of the most remarkable circumstances about such trials is, that during the five years in which the English Royal Agricultural Society has offered premiums for the best machines, in each year a different machine has been pronounced the one superior to all others. In the first year McCormick's was classed first; in the second year Hussey's; in the third year Bells, manufactured by Crosskill; in the fourth year Hussey's, manufactured by Dray & Co.; in the fifth, the present year, McCormick's, manufactured by Burgess & Key. These yearly changes may probably be attributed mainly to new improvements introduced into machines which failed on previous trials.

PHLEGER'S COAL BURNING LOCOMOTIVE—The *North American Gazette*, (Phila.) states that an experiment has recently been tried on the West Chester Railroad, (Pa.) with a new coal burning locomotive constructed by L. Phleger, named *Anthracite*, which performed satisfactorily with half the quantity of coal usually consumed. No sparks nor smoke were emitted from the chimney, and the steam was maintained at 100 lbs. pressure on the inch without any trouble, during the whole trip. How this locomotive economizes, the *Gazette* does not tell.

American Inventions in France.

A correspondent of one of our daily papers gives utterance to the following interesting remarks:

"Some time ago a separate department was made in the Paris Exhibition Palace in which were collected all the useful, cheap articles of household furniture, wearing apparel, and utensils for the poor. A jury, consisting of seventeen members, has just been appointed to examine this class, and make awards. This idea has been much applauded by the French economists; but to those who have seen similar collections in the United States, or in England, the result is far from satisfactory. The French are too fond of detail to be simple and practical, too fond of effect to be cheap. It is much to be regretted that the United States could not enter fairly in competition with France in a field where she is so eminently in advance of all other nations.

While on this subject it will be proper to mention that, although nothing new has transpired in regard to the awards of the juries since my last, it is becoming more and more evident that the owners of important inventions in the United States have made a grand mistake in a pecuniary point of view in neglecting a representation at the Paris Exhibition. Every important invention brought here will be manufactured in France on a large scale by French companies before the lapse of six months, and will afford a highly remunerative income to the inventors. The avidity with which these few inventions have been seized by French capitalists, shows the appreciation which is placed upon American inventive genius, and demonstrates sufficiently that if our people will cease to bore the French government with infernal machines for war purposes, and turn their attention to bringing over the hundreds of really great inventions for agricultural and other useful purposes which abound in the United States, they will not only increase their fortunes, but add largely to the national reputation. There is no proposition more self-evident than that the greatest military nation of the world would certainly never think of looking to an eminently agricultural and commercial people, without army and without wars, for the arms which it is to use in military service; while it is equally evident that the reputation which our people have already established for the invention of practical and useful articles will always gain for them a ready appreciation and a good market. The number and extent of the experiments which are constantly being made in the arsenals and military depots of France would, we think, if known to that class of individuals in the United States who have their attention turned to improved methods of human slaughter, forever deter them from presenting themselves and their machines to be laughed at by the military commissions of France."

Resistance of the Atmosphere to Moving Bodies.

MESSRS. EDITORS—Near the close of the last volume of the SCIENTIFIC AMERICAN there were some speculations concerning cars moving on railroads at high velocities. Your statement that there were other forces to encounter more serious than the resistance of the air, was perfectly correct; yet, it is easily demonstrated that the resistance of the air alone is sufficient to prevent the attainment of two or three hundred miles per hour. From investigation, agreeably to the known laws of mechanics, corroborated by experiments, the force of a current of air against a fixed obstacle is found to be nearly 50 lbs. to the square foot, when moving at the rate of 100 miles per hour, which pressure increases as the squares of the velocity. 100 miles per hour is 8,800 feet per minute. And supposing a car to present a front of 100 square feet, we have a resistance of 5,000 lbs., moving 8,800 feet per minute= 5,000×8,800=44,000,000 lbs., 1 foot per minute, or 44,000,000÷33,000,=1,333 h. p. The amount of power necessary, to overcome the resistance of the air alone, when moving at the rate of 100 miles per hour. If the car should move 200 miles per hour, the resistance will be quadrupled, and the velocity doubled; that is, 20,000 lbs. moving 17,600 ft. per min.=352,000,000 lbs. 1 foot per min., or 352,000,000÷33,000 =10,666 horse power. And when moving at 300 miles per hour, it would require a steam engine of 36,000 horse power to overcome the resistance of the air. Hence we may also deduce the futility of attempting to navigate the air by steam. No balloon can be constructed to carry a steam engine sufficiently powerful to impel it against a current of air.

J. B. CONGER.

Jackson, Tenn.

[In the articles referred to by our correspondent, we stated the exact amount of atmospheric resistance as he does, viz.: 50 lbs. on the square foot, when the car moves at the rate of 100 miles per hour. We only presented 50 square feet of car frontage, which is nearly correct. We also stated that the atmospheric resistance increased according to the square with the increased velocity of the moving body. He has carried out his calculations of atmospheric resistance at considerable length, but these in no manner contravene any statement made by us. The assertion was made in the New York *Tribune* that if the resistance of the atmosphere was removed, railroad trains could be very economically run at the rate of several hundred miles per hour We endeavored to correct such an error, and while we candidly gave the precise amount of atmospheric resistance quoted above, we said it was but a small amount of the total resistance which railroad trains had to overcome, and that there were other and greater resistances which also increased according to the square, with an increase of speed in the moving body. Our correspondent agrees with us and he is one whose knowledge of the laws of mechanics is profound. The position we assumed has never been controverted, but attempts were made to correct us by those who ought to know better, by asserting that the atmospheric resistance *alone* increased according to the square on railroad trains, while all the other resistances increased only with the speed. We then quoted that eminent authority on railroad engineering—D. K. Clark—to sustain us, and, while his opinion never was contradicted, his conclusions were evaded. There is not a competent railroad authority in our country, or any other—one acquainted with mechanical philosophy—who will disagree with us. Why should the atmospheric resistance alone increase according to the square, and all the other resistances—concussions, oscillations, &c.—simply increase with the speed of the moving body? Nature's laws are uniform, not capricious.

Our correspondent has long known the SCIENTIFIC AMERICAN, and he knows we never could have asserted that the velocity of a moving body could be increased without an increase of propelling force. The golden rule of mechanics is, "The power multiplied by the space through which a body moves in any given direction, must be equal to the total resistance multiplied by the space through which it moves in a corresponding direction." According to this law, the removal of any resistance to a moving body—like a railroad car—enables it to increase its speed in the same ratio, without requiring an increase of propelling force. This is the position on which we have stood, and it cannot be moved, for it is founded on an immutable law. We have therefore directed the attention of our railroad companies to improvements in the "permanent way," thus to remove the most prominent sources of the greatest resistances to railroad trains, and thereby decrease their running expenses, or obtain higher speeds for the same expenditure. Our correspondent presents a formidable array of horse power to move a car at the rate of 100 miles per hour against the atmosphere, viz.: 666 horse for 50 square feet of frontage. It does not look quite so large when we call it one tun two hundred and sixty pounds, moved at the rate of 1 mile 2520 feet per minute, which is the exact amount also. The power of an engine is just in proportion to the amount of steam the boiler can generate in a given time, and if it requires four times the fuel—according to the square—for a double velocity, the distance is passed over in one-half the time, which just makes the quantity of fuel double for a double speed. If the resistance is according to the cube, as is provided for in steamships, then the fuel required for a double speed—with eight times the increase of engine power—will be four times the amount. It has surprised us to hear some engineers making a wonderful ado about the difficulty of increasing the speed of a locomotive when running at a high speed. There is a point of velocity beyond which no engine can run; that point is its maximum capacity to generate steam. An engine requiring 100 gallons of steam per minute to run at a certain speed, will require the boiler to generate 400 gallons of steam, in the same time, to double its speed—that is according to the square. We trust we have always advocated sensible improvements; and it is surely self-evident that *every* resistance that can be removed on railways is a clear gain. It is, therefore the duty of every engineer to study well all the resistances to moving bodies, so as to know the exact amount of each, in order to remove them. This is the only way to economise, progress, and improve. What we have said has not been in answer to Mr. Conger, but suggestions relating to the laws of mechanics, that have naturally arisen from reading his letter, which will repay the careful consideration of our railroad engineers.

Australian Gold Statistics.

The colony of Victoria, in 1852, with about 60,000 diggers, produced, from two of the principal fields, gold equal in value to £14,000,000; in 1853, with about 80,000 diggers, and about six gold fields, £11,000,000; in 1854, with 100,000 diggers and sixteen gold fields, £8,300,000; and this year, with upwards of 100,000 diggers, and more than twenty gold fields, the estimated product is about £7,000,000, and this is obtained by applying machinery to the re-working the refuge of the old gold fields.—[London Mining Journal.

[This shows that the gold products of Victoria are decreasing.

A live lizard, measuring 19 inches in length, was posted in Somersetshire, directed to Dr. Pettigrew, in London, and actually arrived safe and lively.