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NEW YORK, SATURDAY, MAY 8, 1880.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 227,

For the Week ending May 8, 1880.

Price 10 cents. For sale by all newsdealers.

WHITE NICKEL BRONZE.

Pending the legal decision of the questions at issue with regard to processes of nickel-plating, manufacturers of nickelized wares are likely to be specially interested in a plan which is being developed in France looking to the substitution of nickel bronze for nickel plated iron or brass.

An ore of nickel, garnierite, is found in extensive deposits in New Caledonia, the French penal colony east of Australia, and are there worked by Messrs. John Higginson & Co., of Nouméa. On preliminary roasting the garnierite yields a regulus containing from 60 to 70 per cent of nickel, which is shipped to the works of the French company, at Septèmes, near Marseilles, where it is smelted into ingots and granules containing 99½ per cent of pure nickel and ¼ per cent of utilizable metallic substances. The extent of the mineral deposits in New Caledonia, the reduction in the cost of freight owing to the concentration of metal through the preliminary fusion, and the economy effected by the new methods of reduction devised by M. Jules Garnier, enable the company to sell the pure metal at about one-half the price it obtained three years ago.

After many experiments the company have succeeded in rolling and forging the pure metal; but greater success is attained by mixing the pure metal with various proportions of copper, zinc, and tin, forming nickel bronze. Twenty per cent of nickel suffices to give the desired tint and to secure inoxidizability. All articles now made of brass or copper, nickel plated, can be produced in solid bronze by the same processes and with the same plant, and at practically the same cost. So made they are 20 per cent stronger, and may generally be much lighter. Its great strength and the property of non-oxidization make this alloy eminently suitable for mathematical and musical instruments.

A small quantity of nickel added to steel increases its hardness and renders it inoxidizable, while edge tools made of the alloy stand better than those of ordinary steel. A nickel bell metal is also found to give good results. The Paris Exhibition of 1878, says the *Journal of the Society of Arts*, proved the action of a totally new system of metallurgy in connection with this beautiful metal; and that of 1879 showed its practical introduction into most branches of manufacturing industry.

THE EXPORTATION OF AMERICAN MANUFACTURES.

Many of our manufacturers have suffered grave disappointment from the difficulties encountered in obtaining a lucrative foreign trade. To make the best article of its class, and at the lowest first cost, do not of themselves open the door for a demand from other countries. The manufacturer and his home customers may, indeed, be the only ones who are willing to concede that his product is the best, but supposing that proper means have been taken to inform the buyers of distant markets, and that there may be tacit agreement on this point, there are still other and quite as weighty considerations which enter into the problem. Our exports of manufactured goods in any considerable quantities commenced but yesterday, as it were. The agricultural interests have so largely predominated here that the growth of any one manufacturing industry has been generally gauged by the approximation we were making to the supply of the home demand, and in almost every department, except in articles of food, we have always heretofore been large importers. In 1873 there commenced a steady diminution in our imports, with a corresponding growth in our manufactures. In this way we at once cut down the largest and most valuable trade of the manufacturers of England, France, and Germany. They have had hard times there, and reduced the prices of many kinds of goods to so low a figure that, with wages much below ours, it has been impossible for their manufacturers to make the 2½ or 3 per cent interest on their capital which is the most that many of them expect, It is, therefore, with foreign competitors in this condition that our manufacturing industries have become so flourishing as to lead to large expectations of a profitable export trade.

More than this, also, the foreign manufacturers who used to supply us so largely, and have labored so strenuously to maintain their hold, have likewise been the caterers for the other foreign countries to whom we now desire to sell goods. For more than half a century English manufacturers have had branch agencies in nearly every quarter of the globe where it was possible to find a market for the productions of English workshops, and, to a less extent, this has also been true relative to French and German productions. They have well established business relations, and know the wants of customers, thus holding a great advantage, even as against better goods at lower prices. And with these agencies, as with their principals at home, it necessarily follows that they will make the most strenuous efforts to keep what trade they have. Their money is invested in it, and the capital of foreign houses is generally much larger in proportion to the amount of business done than is the case here, so they are able to give long credits, while being satisfied with rates of interest too low to tempt American investors.

Notwithstanding all these obstacles, however, the great superiority of many articles of American manufacture, which, from our improved machinery and better methods, can be produced at a lower cost here than similar goods of an inferior quality can be made abroad, undoubtedly affords solid grounds for expecting a steady growth in our exports of manufactures. Comparing the imports for the year ended June 30, 1879, with our receipts of foreign manufactured goods in 1873, the great falling off which has been shown in six years ought to be as encouraging to us as it has been discouraging to foreign manufacturers. In watches and watch movements this decrease amounted to $2,354,226; in manufactures of cotton, $14,821,141; in flax goods $5,734,549; in iron and steel and their manufacturers, $49,861,304; in copper and its manufactures, $3,392,389, and in lead and its manufactures, $3,182,813. In nearly all of these articles, however although we still continue to be liberal importers, we have a steadily growing export trade—nothing to be compared to the great increase we have had in the exports of farm produce, it is true, but amply sufficient to prove that our manufacturers, while rapidly covering the field at home, are successfully competing for foreign custom. The results have thus far, in many cases, seemed small, in proportion to the efforts put forth, but this is just where the characteristic impatience of American manufacturers and the nervous impetuosity of American business men are most apparent. They do not fully appreciate the character and extent of the competition they have had, and are far from attaching such importance to the progress they have already made as is given to it by their foreign competitors themselves. It has been a life or-death struggle with the latter, and, with every advantage they have had, they now see that American competition, which was scarcely known ten years ago, will have to be met hereafter in all the leading markets of the world, in every prominent description of manufactured goods. In cotton and woolen manufactures, in machinery, railway supplies, and general hardware, as well as in hundreds of minor articles of which we formerly imported a large part of what we consumed, they see that the manufacture is now established here on such a basis that they will have more to fear from us hereafter than they have heretofore had from competition among themselves. The recent advance in tariff rates by Germany, the efforts to impose higher duties by France, the talk about "protection" even in England, all have their origin in the fear of American goods, and such considerations should encourage our manufacturers to put forth still further efforts in many branches of business where we have as yet made but little more than a commencement.

NEW JERSEY MINES AND MINERALS.

The annual report for 1879 of the State Geologist, George H. Cook, gives, in addition to other valuable matter, a large amount of information touching the mineral resources of New Jersey. The list of iron mines includes nearly 300 separate openings, ranged in four parallel belts known as the Ramapo, Passaic, Musconetcong, and Pequest. The output for the year 1879 was 488,028 tons, an increase of 19 per cent upon the year before. At the close of the year there were eleven furnaces in blast with a capacity of 3,210 tons a week, and three spiegel furnaces making 132 tons a week. The State has in all seventeen stacks, with a yearly capacity of 200,000 tons.

The zinc mines produced a little short of 22,000 tons of ore.

The statistics of the clay deposits give evidence of a prosperous year. The figures for the clay district of Middlesex County, according to the three principal groups of pits, are as follows:

	Tons.
1. Woodbridge—Fire clay, fire sand, kaolin, and fire brick, shipped	115,060
2. Claybanks north of the Raritan River—Fire clay, fire sand, and kaolin	90,000
3. Claybanks south of the Raritan River—Fire clay, fire sand, and kaolin	60,000
Total refractory materials	265,060

The product of the mines and pits of stoneware clay in Middlesex County is set down as 10,000 tons, or about half that of the previous annual output. The clay banks on the Delaware side of the State yielded 31,847 tons of refractory materials.

The red brick works along the Raritan and South rivers did not begin to be worked to the full capacity until September. The product for the year was 87,000,000; this year it is expected to be 110,000,000.

The greater part of the products of the eastern part of the State is manufactured into fire brick, retorts, drain pipe, terra cotta, and wares, at works in the neighborhood of the pits. The employment of the dense clay of the Raritan fire clay stratum for glass pots is likely to be successful. This clay burns very solid and free from checks, resembling in this respect the best of the foreign clays imported for making crucibles and glass pots and strong fire brick. This clay is abundant, and can be sold for half the price of the imported clay. The finer grades of white clay from the vicinity of Woodbridge and Amboy are extensively used in the manufacture of cream-colored and white granite wares. They are good for mixing with the less plastic Delaware clays, but do not burn white like kaolin clays. A practical method of removing the oxide of iron would be a valuable discovery, as it would permit the use of these clays in place of the more costly and less plastic clays now employed. Several new uses for New Jersey clays have been recently developed, with promise of great advantage to the State. The potteries making white ware at Trenton, Elizabeth, and Jersey City number 101 kilns, producing $2,500,000 worth of wares a year, or more than half the whole product of the country. They employ 3,000 hands, and pay out $1,250,000 a year in wages.

In the course of the year there were 38 glass factories in operation in the State, each employing from 50 to 75 hands. In addition to supplying these works the glass sand pits along the Maurice River sell from 10,000 to 15,000 tons of sand for consumption in adjoining States.

The yield of greensand marls in the marl belt crossing the southern half of the State is large, and the supply is practically inexhaustible. No attempt was made to collect the statistics of lime burned in the State.

A large and valuable map accompanies the report, showing the leading features of the economic geology of the State.

THE COMMISSIONERSHIP OF PATENTS.

The President has nominated and sent to the Senate for confirmation the name of the Hon. Edgar M. Marble, of Michigan, to be Commissioner of Patents, in place of Gen. Paine resigned. It is understood that the new Commissioner takes his seat May 1.

This appointment will, we feel confident, give very general satisfaction. Mr. Marble is by profession a lawyer, and for a considerable time past has been Assistant Attorney-General of the United States in the Department of the Interior, where his labors have always been distinguished by marked ability. He is an enlightened and commanding man, in the prime of life—45 years—agreeable manners, sterling integrity, quick perceptions, and judicial mind. He believes in hearing both sides of a case carefully before deciding. We think that the interests of patentees and inventors will at his hands be promoted, and that the affairs of the Patent Office will flourish so long as he occupies the Commissioner's chair.

The retiring Commissioner, Gen. Paine, has been very successful in his management of the Patent Office, and his departure occasions general regret. During his term he thought it necessary to introduce a number of new rules of practice, some of which are regarded as mere additions to the length of official red tape. But it must be admitted that, as a whole, Gen. Paine's administration has been an able one. Some of his decisions in patent cases have a high value for their clear and original method of interpreting the law, and will always rank with the ablest documents among the official records.

THE EDISON LAMP TESTS.

To the Editor of the Scientific American :

Your correspondent, Mr. William C. Ramsdell, in his letter of April 9, in your issue of May 1, p. 281, shows that he is unacquainted with the very elements of the subject about which he writes, and criticizes the conclusions reached by myself and others only because he does not understand them.

In the first place he seems to think that electromotive force is the same thing as the energy involved or work done in a given circuit. If he had examined any of the text books on electricity he would have found that electromotive force expresses simply the specific power which any combination (battery or magneto-electric machine or the like) possesses for causing the transfer of electricity from one place to another. In a given couple, say a Smee battery, it is the same in a cell the size of a thimble and in one as large as a bath-tub.

It is very correctly measured by the product of the current into the resistance where these are known, but when its value is obtained we have *not* found that of the energy expended or work done in the same circuit. For the latter we must have the product of the current *squared*, into the time, into the resistance, into the constant .737335, if we would express the result in foot pounds.

Had Mr. Ramsdell been acquainted with these matters he would have been saved the absurdity of announcing that it would require the same expenditure of fuel to run twelve lamps as it would be needed to run one.

It is curious that this *reductio ad absurdum* of his own did not open his eyes. Why should he stop at twelve lamps? His own method of calculation would give him the same result with a thousand, or a million, and thus reduce the cost of lighting the country to that required for one lamp.

It is hardly necessary to point out that in the calculations made in our paper it was *not* assumed that the twelve lamps were in series.

Theoretically it would make no difference as to the total energy expended how they were arranged, but, of course, any one acquainted with the subject would know that to place them in series would introduce great practical difficulties. Our calculation as given is correct for an arrangement in parallel circuits; but Mr. Ramsdell's calculations are simply absurd.

Yours truly,

HENRY MORTON.

Stevens Institute of Technology, Hoboken, N. J., April 23.

THE NATIONAL ACADEMY OF SCIENCE.

The spring meeting of the National Academy of Science was held in Washington, April 20–23. The attendance was small. At a private session an amendment of the constitution was adopted limiting the number of members in the future to one hundred. Major J. W. Powell and Professor William H. Brewer were elected members, making the prescribed number complete. Professor Alexander Agassiz, of Cambridge, was chosen Foreign Secretary in place of Professor F. A. P. Barnard, whose term of office had expired. The Council elected for the ensuing year comprises S. F. Baird, Wolcott Gibbs, Asaph Hall, J. E. Hilgard, Clarence King, and Simon Newcomb.

Quite a number of scientific papers were read. The first was by Professor A. Agassiz, on "The Sea Urchins of the Challenger Expedition." A paper by Professor A. S. Packard, Jr, on "The Internal Structure of the Brain of Limulus Polyphemus," was read by Dr. Coues. Prof. O. C. Marsh discussed at considerable length "The Size of the Brain in Extinct Animals," reaffirming the law of brain growth enounced by him two or three years ago. Mr. D P. Todd, of the Nautical Almanac office, in a paper on "The Use of the Electric Telegraph during Total Eclipses Applied to the Search for Intramercurial Planets," gave a plan by which observers of the eclipse of 1882 might telegraph their discoveries from station to station, and so confirm and extend each other's work.

On the third day of the meeting papers were read by F. M. Green on "The Telegraphic Determinations of Longitude by the United States Hydrographic Office;" T. S. Hunt on "The Tatonic System of Geology;" S. P. Langley on "An Instrument for Measuring Radiant Heat, and on the Composition of Colors;" E. S. Holden on "The Nebula of Orion;" Theodore N. Gill on "The Distribution of Zeus Conchifera;" William Harkness on "The Solar Corona;" E. S. Morse on "An Early Race of Man in Japan." On account of the number of papers remaining for presentation, an extra session was held on the 23d.

It was decided to hold the Fall meeting in this city, beginning November 16.

NEW YORK ACADEMY OF SCIENCES.

At a meeting of the New York Academy of Sciences, held Monday, April 19, 1880, Prof. J. S. Newberry in the chair, Mr. I. C. Russell delivered an address on

RECENT OBSERVATIONS ON THE GEOLOGY OF HUDSON COUNTY, N. J.

From a study of the very large number of wells sunk in Hudson county, Mr. Russell had prepared a diagram showing the general stratification of rocks to be as follows: Shell heaps accumulated by the aborigines, sand dunes, glacial drift, red shales and sandstones, trap rock, sandstone and shales, serpentine, quartzite, and gneiss.

A large portion of the address was devoted to tracing the trap rock formation from the Kill-von-Kull, along the Bergen hills, the Palisades along the Hudson, and up to Haverstraw, where it reaches the height of a thousand feet. The general dip of the formation is 15° to the northwest. Both above and below it are found strata of triassic shales and sandstones. Specimens were exhibited showing the metamorphosis of these rocks where they came in contact with the trap. The whole configuration of the trap rock formation will be understood, as was shown by a diagram, if we imagine a stream of trap coming up from below and crowding out the sedimentary rock before it, chiefly following the direction of the strata, but now and then breaking through and forming branches from the main stream. These would then be partially exposed by subsequent erosion. There is every evidence that the surface erosion of this vicinity was a tremendous one. Upon following out the slope of the strata on both sides of the Bergen hills, and calculating the height, it will be found that they must have once formed mountains at least seven thousand feet high. This agrees perfectly with the theory proposed by Dr. Newberry, that the whole continent in the vicinity of New York City was once far more elevated above the sea level than it now is.

The denudation of the trap on the Bergen hills by erosion, and especially by glacial action, has given rise to peculiar conditions of drainage. Numerous basins without any outlet were hollowed out in the trap and filled with drift by the glaciers. It is evident that in such localities there can be no natural drainage, but that all impurities will accumulate and exhale poisonous gases. Yet wells have been known to be sunk in the drift and the water was used for drinking. On the western slope of the hills the retentive character of the drift does not interfere with the drainage.

The address was full of detailed information and illustrated by specimens and diagrams. In commenting upon it, Dr. Newberry expressed his gratification that it confirmed his views concerning the igneous nature of the trap, and also concerning the former great elevation of this portion of the country. He reiterated his belief that the margin of the continent once lay seventy or eighty miles further out from shore, and that the channels of the Hudson, the East River, Newark Bay, etc., were once very deep ravines. Further evidence of this is found in the soundings of the Coast Survey.

Dr. Newberry then spoke on the

VEGETATION OF THE VICINITY OF NEW YORK IN THE TRIASSIC AGE.

The mouth of the Hudson river during the triassic age must have presented very much the same conditions as the Bay of Fundy at the present time. Being, as it were, the tube of a funnel, it must have been the scene of tremendous tides, and consequently it must have been a very unfavorable locality for the preservation of delicate plants. A comparatively large number of the coarser parts of trees and plants had been found in sedimentary rocks of the vicinity, and of these several specimens were shown, along with some finer ones from the slates in the neighborhood of Boonton. Dr. Newberry expressed the hope that further search would be made.

The main object of the communication was, however, to correct an error that was liable to find its way into print concerning a specimen, photographs of which had been shown him by Professor Cook, and which had been pronounced a lepidodendron found in triassic rock. It has been a well settled belief that lepidodendra became extinct with the carboniferous age. To show the correctness of this belief, Professor Newberry exhibited the photographs of the specimen, and then proceeded to show that it was not a lepidodendron at all. He drew a diagram upon the blackboard showing the characteristic elongated rhomboids with smaller rhomboids inclosed of the lepidodendra, and called attention to the fact that they were absent in the specimen.

C. F. K.

TORNADO IN MISSOURI.

On the night of Sunday, April 18, a storm of wide range and unprecedented severity passed over Missouri and parts of the adjoining States, developing locally numerous whirlwinds which caused frightful havoc and great loss of life. The storm was most severe in Southwestern Missouri. The town of Marshfield, containing 200 dwellings, was almost entirely destroyed, only about a dozen houses escaping unharmed by wind and the fires which broke out in the demolished buildings. Fully 100 persons were killed in the town and around it, and twice as many more were seriously hurt. The northwestern part of Arkansas and the southeastern part of Kansas also suffered severely. The little town of El Paso, Ark., was leveled to the ground, with considerable loss of life. Great havoc was wrought at Oakbower, Ark., where twenty-six houses were destroyed and several lives were lost. At Fayetteville, Ark., a tornado cut a narrow swath through the town, destroying or badly damaging every building in its track. About twenty business houses and several dwellings were demolished, and quite a number of people are reported killed and wounded.

The severity of the storm was felt as far north as Davis County, Iowa, where two whirlwinds caused much loss of property. One of these left a path of destruction twenty miles long and from fifty to three hundred yards wide. Much damage was done also in Illinois, Indiana, and Wisconsin.

The storm was most severe, however, as already noted, in Southwestern Missouri. Between Marshfield and Jefferson City several villages were more or less completely destroyed, and a large number of country houses were wrecked or demolished, and numerous deaths are reported from every quarter of the afflicted region. Among the curious incidents reported of the storm one dispatch tells of a child two years old which was found on the afternoon of the 19th in a tree-top, where it had been nearly twenty-four hours. It was considerably bruised, but will recover. It was claimed by its parents, who lived two miles and a half from the southern portion of the town. The child's aerial flight must, therefore, have extended over three miles.

Professor John H. Tice, meteorologist, of St. Louis, went at once to the track of the storm to investigate its phenomena. In a telegram to the St. Louis *Republican* he says:

"Everywhere along the track of the tornado there is evidence of a wave of water flowing in the rear of the cloud spouts. At some places there are only faint traces of such a wave. At others the *debris* is carried up and over obstructions two or three feet high. These waves or currents flowed in the greatest volume up hills. There are places where the entire top soil is washed away by the currents. Fibrous roots and tufts of grass show their direction to have been up hill, and, what is more significant, from all points of the compass toward the top of the hill when the tornado was raging at the time and expending its force. No trace at any point can be found where they flowed down hill. Many level places are swept clean of soil. Leaves, grass, *debris* of wrecked buildings, and fragments of planks carried along by the current and left in its track arranged themselves longitudinally to the current.

"The following is vouched for by George Gilbert, of this place. He and his wife and four children were on a visit eight miles in the country, and the center of the tornado passed within five or six yards from where they were. A wave of water, apparently fifteen feet high, rolled in the rear of the point of contact of the cloud spout with the earth. It rolled over them in a second, and was icy cold, drenching them thoroughly. About two miles northeast of the town stones weighing from five to seven hundred pounds were lifted out of the earth and carried along some distance in the track of the tornado.

"J. H. Williams, presiding justice of the county court, and residing in Panther Creek Valley, tells me a stone fell in the center of a field belonging to H. Rose, the weight of which was estimated at two tons. It is not known whence it came."

The tornado, so far as is known, commenced in Arkansas, in Stone County.

Opening of the Canals.

The Erie and Champlain Canals were opened for navigation April 20, two weeks earlier than last year. A large fleet of boats were at Buffalo awaiting this event, something over 5,000,000 bushels of grain being stored there for early shipment to tide water. A considerable increase is expected in the number of steamers on the canal. From careful observations made during a trial trip from Buffalo to New York last summer, the State Engineer estimates that a steamer and consort can make nine trips while two horseboats are making seven, at a cost nearly $500 less. Counting this saving, with the profit on the two additional trips, the gain for the steamer and consort during the season would be $1,382, without considering return cargoes.