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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 212,

For the Week ending January 24, 1880.

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ACTION OF SEWER GAS ON LEAD, ETC.

The sanitary inspector of Dundee, Scotland, Mr. T. Kinnear, has watched the effect of the gas on portions of the zinc eaves of buildings where it was striking on the under part, and found, in the course of a couple of years or so, pretty large holes eaten completely through, showing that material could not longer withstand the effect of the gas. Lead is, of course, more durable than zinc, but the difference is only a question of degree, as shown by the fact, in not a few of the water-closets repaired by the officers of the department during the year, small apertures were found in the main vertical lead pipe, and in the cross or horizontal one leading from it to the trap of the closet various perforations were found on the top, indicating clearly the operation of foul air from the drain. Lead traps and soil pipes from water-closets, baths, and fixed basins are all subject to wear and tear; but the traps, being burdened with the additional strain of barring the passage of sewer gas, do their work less efficiently, and for a much shorter period, than they are generally credited with, hence the necessity for proper ventilation and occasional inspection.—*English Paper.*

The Sanitary Board of this city long since made the same discovery as to the corroding effects of sewer gas as reported above.

Not long ago, under the direction of an engineer attached to our Sanitary Board, we had occasion to have a lead waste pipe leading from the third story to the cellar of our residence examined, for the purpose of detecting the source of a slight odor. This pipe connected with the main pipe, which extended to the sewer. On taking down the waste pipe, we found it in many places honeycombed, and in others it had become so thin as to be compressible between the thumb and finger. This was probably due to the presence of carbonic acid gas in the sewage, a gas which is almost always present in drain pipes. Carbonic acid gas corrodes lead very rapidly; hence the use of lead as a material for the main drain pipes of dwellings has of late years been generally abandoned, and iron pipes substituted. But even iron is not wholly free from objection, though it is considered safer than lead.

Occupants of city houses which have been built some time should not neglect to have the plumbing work in their homes examined and a remedy applied at once to any discovered defect. At this time of year diphtheria, scarlet fever, measles, and kindred diseases are most apt to prevail, and the cause may frequently be traced to defective traps, loose joints, and worn out pipes. Every pipe leading into a sewer or cesspool should be ventilated. One very common method of doing this is to run a pipe from the main or discharge pipe up through the house above the roof.

THE TYPICAL YANKEE.

In a recent speech at a society meeting in Michigan, the Hon. T. W. Palmer said that the Yankee's idea of life is business, and business with him means activity rightly directed: "Firm in intent, but flexible as to methods and fertile in resource, the typical Yankee of to-day is the man who, more than another, puts himself in accord with natural laws."

This definition admirably characterizes the typical man of the nineteenth century, regardless of race. The world over, men of this character are giving new power, a broader scope, and a breadth of freedom to life, such as the world has never dreamed of before. And if such men abound in America more than elsewhere—so much more as to justify our calling the type pre-eminently Yankee—it is simply because of the large liberty America allows from the political, social, and ecclesiastical restraints which, in other lands, keep men from developing the power there is in them.

Not only does the typical Yankee seek to put himself in accord with natural laws, but he is persistent in seeking to widen his grasp of those laws, to make his knowledge real, and to set to practical work the forces which nature puts at the service of those who know how to use them. The freest of all men from superstition, the Yankee neither fears nor reveres the unexplained; and he has as little respect for the old simply because it is old. The secrets of nature are his game; he is bound to capture them. No custom, no alleged truth is sacred in his eyes because of its antiquity. His allegiance goes with utility. If the new is better than the old, that is reason enough for embracing it. His ideal is progress; he works for it, forces it, enjoys it. His genius is universal because it is unrestrained, fearless, practical; and American life everywhere shows the power and effect of it.

A BURIED RACE IN KANSAS.

It is well known that the wrought stone implements found in the ancient river gravels of California prove conclusively that during or before the glacial period the Pacific coast was inhabited by man. In a report on recent archæological explorations in Kansas, Judge E. P. West, of that State, presents a large amount of evidence to show that at an equally remote period that region was peopled by a race compared with which the mound builders must be accounted modern.

The geology of the region is simple. Prior to the drift epoch the river channels were deeper than now, and the river valleys were lower. Subsequently the valleys were filled by a lacustrian deposit of considerable depth. In or beneath this last deposit the remains of an extinct race occur.

Such remains have been found at various depths in seven different counties along or near the Kansas Pacific Railroad, namely Douglass, Pottawatomie, Riley, Dickinson, Marion, Ellsworth, and Lincoln counties. With one exception the remains have all been found on the second bottom or terrace of streams, and consist of stone implements, pottery, human bones, and bone implements. In most cases they were struck in digging wells, at a depth of from twenty to thirty feet below the surface. In view of the fact that there is not more than one well to the square mile in the counties named, and the area of a well forms but a very small fraction of a square mile, Judge West thinks the evidence already obtained not only sufficient to prove the former existence of the buried race, but to prove that they were very numerous. We can hardly assume that chance has directed the digging of wells only where human remains are buried.

Whether the race existed before the glacial epoch or immediately after it is too early to determine. Judge West is inclined to fix their time of occupancy as after the glacial epoch and prior to the deposition of the Loess. In calling upon the local newspapers of Kansas to lay the facts before the people and urging the propriety of saving such remains when found, and noting carefully the conditions under which they occur, the judge says:

"Here we have a buried race enwrapped in a profound and startling mystery—a race whose appearance and exit in the world's drama precede stupendous geological changes marking our continent, and which perhaps required hundreds of thousands of years in their accomplishment. The prize is no less than determining when this mysterious people lived, how they lived, when they passed out of existence, and why they became extinct."

TAKING DOWN CLEOPATRA'S NEEDLE.

The *Herald's* correspondent at Alexandra, Egypt, writing December 12, reports the safe removal of Cleopatra's Needle from the pedestal which had supported it for nearly nineteen hundred years. This pedestal is of the same kind of granite as the obelisk itself, and must have been brought from the quarry at Syene, near the first cataract of the Nile. It is remarkable that the existence of this pedestal, measuring nine feet high and six feet square and weighing forty-three tons, was unknown previous to the present excavations. The obelisk was formally ceded to Commander Gorringe and Lieutenant Schweder by the Governor of Alexandria, on October 22. By the 10th of November the earth was removed to some twenty feet below the present level of the soil, and the base of the obelisk and the large pedestal resting on three marble slabs were made visible. The base of the Needle is rounded by age. It originally rested upon four bronze crabs, each about three feet long by one wide. One of these crabs was under each corner, firmly fixed to both obelisk and pedestal by two bronze bars an inch in diameter and over a foot in length. One of these bars, projecting perpendicularly from the back of the crab, is fitted into a hole in the base of the obelisk. The other bar, descending perpendicularly from the crab's belly, is fitted into a similar hole in the pedestal. Both of these bars were firmly soldered with lead.

Owing to the jamming of one of the claws with a projecting piece of the base of the pedestal much difficulty was experienced in lowering the shaft, but on the 6th the work was successfully accomplished. When overturned the obelisk rested on sections of a float, whence in due time the Needle would be shoved into the steamer intended to bring it to New York. The steamer purchased for this purpose was the Dessouk, of 1,600 tons register. The Dessouk was built in England and bought by the Egyptian Government while on the stocks. She is not fast, but is very strongly built.

The Commerce of New York.

The official record of arrivals of vessels at this port last year was 21,421, against 19,110 in 1878, and 19,536 in 1877, the increase being in the trade with foreign and eastern domestic ports. The arrivals from foreign ports were 8,077, against 7,348 in 1878, and 6,244 in 1877. The arrivals from domestic ports were 13,344, against 11,762 in 1878, and 13,112 in 1877. Of the arrivals from foreign ports, 1,591 were steamers, 1,096 being British, 188 American, 129 German, 59 Belgian, 40 French, 35 Dutch, 29 Danish, 10 Spanish, 3 Italian, and 1 Russian.

In 1878 the United States led in the number of sailing vessels from foreign ports; in 1879 Great Britain had the larger number, namely, 2,804 against 2,414 of United States register. Norway was third, with 1,139, of which 1,000 were barks. Then follow Italy with 560 vessels, Germany with 459, and Austria with 236, 216 of which are barks. Then come France, Sweden, Holland, Belgium, with 59 steamers and two other vessels; Spain, Denmark, Hayti, Portugal, Russia, Venezuela, Costa Rica, Mexico, the Argentine Republic, Nicaragua, and Brazil, in that order, the number of arrivals credited to each ranging from 82 French vessels to 1 of the last two nationalities. Two-thirds of the steamers were British; one-third of the ships American, and another third British; one-third of the barks Norwegian, one-quarter British, and one-eighth American, and another eighth Italian; nearly half the brigs were American, as were three-quarters of the schooners.

General Wool's Monument.

The largest obelisk ever quarried in the United States was recently set up in Oakwood Cemetery, near Troy, N. Y., as a monument to General John E. Wool and his wife. The obelisk is 60 feet high, weighs 100 tons, and is mounted upon a pedestal comprising three plain bases, a moulded base, a die and neck mould. The lower base, 17 feet 6 inches square and 2 feet thick. This and the two succeeding

courses are each composed of two stones, while the fourth or moulded base, as well as each course above, is of a single stone. The total weight of the pedestal, which rests upon solid rock, is 150 tons. The weight of the entire structure is, therefore, 250 tons; the height, 75 feet 6 inches. In the curve of the mould are military emblems cut in *alto rilievo*, consisting of a field glass, the sword, scabbard, and hat of a major general, all effectively grouped. The die, 6 feet high, is 9 feet square at the bottom, tapering to 8 feet 2 inches square at the top, to correspond with the lines of the obelisk, which tapers from 5 feet 6 inches square at the base to 3 feet square at the base of the pyramid, in which it terminates, the altitude of the latter being 5 feet 6 inches. The angles and upper edges of the die, together with the neck mould, are embellished with carved Egyptian mouldings, and the four sides of the die bear inscriptions.

The stone was quarried at Vinalhaven, Fox Island, Maine, 400 miles from Troy, whence it was transported in a strongly built barge towed by a steam tug. From the dock at Troy it was moved to the cemetery on rollers by means of capstans and heavy hawsers, this part of the work requiring more time than the 400 mile sea and river voyage.

MOLES AT THE CAPE OF GOOD HOPE.

Mr. H. N. Moseley, in his Challenger notes, writing of Simons Town, South Africa, says: The sandy flats and fields about the sea shore are covered with mole hills, and bored in all directions with tunnels, large enough to admit the hand and arm easily, by the sand mole (*Bathyergus suilus*). Bathyergus is a rodent, with an excessively long pair of projecting lower gnawing teeth. It is a foot long, and covered with a light gray-brown silky fur.

There is another similar rodent mole of about half the size (*Georychus capensis*), which rather affects higher land, but occurs also sometimes with Bathyergus.

The two together are in such abundance as to cover the country in all directions with mole hills, and in galloping over the sand one is very apt to be thrown headlong by one of their galleries giving way under his horse's feet. I had two such falls in one day. A clever horse brought up in the country learns, however, while turned out on the run, to lift his foot out of a hole without stumbling.

It is the custom to call the moles, such as we have in Europe, the true moles, and to regard these rodent moles as animals which in some extraordinary way have adopted habits not proper to rodents, but natural and what is to be expected in a certain group of insectivora. But in reality, there seems to be no reason why the one set should be the *true* moles rather than the other, excepting merely as a matter of home nomenclature and prejudice. The South American rodent mole, the tucutuco (*Ctenomys*) is familiar as described by Darwin in his journal. And besides this, there are all the Spalacini, or blind moles, of which there are nine genera, including Bathyergus and Georychus, forming steps toward the ground squirrels, Geomys. Of the true moles, or insectivora, with the habits and outward shape of Bathyergus and Georychus, there are only five or six genera in all. Why should not Talpa be looked upon as the plagiarist?

There is still another very different animal, with mole-like habits, the little armadillo (*Chlamyphorus*) of the Argentine Republic. It seems remarkable that no Marsupial in Australia has become modified to suit mole-like habits. All other mammalian habits almost have been adopted by Marsupials. Bathyergus has, like our Talpa, a bare snout, and strong digging hands and feet.

It burrows of course in search of roots and vegetable food only, not for worms like Talpa. The people about Simons Town have an idea that the animals work the earth at certain stated hours, and have regular periods of rest; but I was always able, by going over a good deal of ground, to find one working at any time of the day. The heaps thrown up are huge, a foot high, five or six times as big as those of our little mole.

A fresh heap is betrayed at once by its darker color, that is, its dampness; in a few hours the dry heat of the Cape reduces it to a glistening white. One has not long to watch, standing a few yards off, before the fresh heap is seen to heave up, three or four times in succession, as the mole forces freshly scooped-out earth up with it from below.

I tried at first shooting into the heap as it was thus heaving, in the hopes of getting the mole, but never with any success.

In order to shoot the worker, the earth should be quickly thrown back from the fresh heap, and the hole laid open to the air.

One then has only to retire about ten paces and wait patiently. The mole does not like the fresh air, and in the course of five minutes or so, comes back to fill it up, but usually puts its head out for a moment first, to find out what's up, though it certainly cannot see far with its minute eyes, which are not bigger than the heads of carpet pins, the whole eye ball, when extracted, being not bigger than a tenth of an inch in diameter.

Of course a charge of shot at the moment the animal shows its head is effective. But the easiest method of getting specimens is on scraping away the earth from the fresh mound, to insert in the hole a common rabbit gin, well secured with peg and string. I trapped a good many Bathyergi in this way, and one Georychus.

Bathyergus is very fierce when dragged out of its hole, fast by one leg in a gin.

The animal bites the air savagely with its enormous teeth, which project an inch and a half from the lower jaw, and makes an angry, half snarling, half grunting noise.

I took several of the moles on board the ship alive in a sack. I let the sack swing by accident against one of my legs, and one of the moles gave me a very unpleasant nip, biting through the sack and my clothes.

When put in a strong wire cage the mole first tried to burrow, but finding that absolutely impossible, tried to bite the wires all round, and that failing, became sullen and quiet. The animal can evidently see for a short distance.

Besides these moles, which are a great pest in gardens, there is a little insectivorous mole (*Chrysochloris inauratus*), the golden mole, which is not more than half the size of our English mole, and has a dark, silky fur, shot with most brilliant metallic golden tints.

This mole makes quite superficial runs in the ground so near the surface that the earth is raised all along the run, and hence the track can be followed everywhere above ground.

When one of these is seen at work it can be thrown out with a stick or spade at once.

Progress of the Great Suspension Bridge between New York and Brooklyn.

At the last monthly meeting of the trustees of the Brooklyn Bridge the Executive Committee reported that the amount required to complete the bridge is as follows:

Estimated cost of the bridge, Feb. 1, 1879		$13,708,026.60
Expended at that date		10,103,553.54
Amount required, Feb. 1, 1879		3,604,473.06
Expended since that date up to Dec. 1, 1879	$1,006,262.04	
Cash on hand and receivable from two cities at this date	596,676.04	$1,602,938.08
Remaining to be provided for		$2,001,534.98
Add for rise in land, materials, and labor 10 per cent since Feb. 1, 1879		200,153.49
Add for contingencies		48,311 53
Grand total to be provided for		$2,250,000.00

At the same meeting the test of seven of the suspenders of the bridge in the testing machine at the U. S. Arsenal, Watertown, Mass., was reported on. The tested suspenders were chosen at random from those made for the bridge. The object of these tests was to ascertain the efficiency of the mode of securing the suspenders to the parts by which they are attached, respectively, to the main cables and to the suspended superstructure. The suspenders are attached to a wrought iron fixture at one of their ends and to a casting at the other end, by being inserted into conical sockets, 3¾ inches in diameter at the base of the cone. At the other end the diameter is just sufficient to allow the suspender to be passed through. The suspenders are secured in these sockets by spreading the wires which compose the rope, and then driving in the voids tapering pins of wrought iron; the projecting wires are turned over, and the cavities filled with lead. The tests seem to show that turning over the wires and filling the cavities with lead do not add to the strength of the fastening. The length of the tested suspenders ranged from 18 feet 9½ inches to 24 feet 3 inches. The strain to which they were subjected varied from 141,000 pounds to 194,000 pounds. In none of the tests was the full strength of the suspender ropes themselves brought out, and in no case did the suspender pull out of its socket.

The maximum stress that can be brought on any suspender from the weight of the structure alone, or the dead load, as it is termed, is 8,200 pounds, and from the movable, or rolling load, 13,125 pounds, making a total of 21,325 pounds. The mean breaking strain of the seven suspenders which were tried was a trifle over 168,000 pounds, or over seven times the strain which they will ever be required to stand. If the lowest breaking strain of the seven tests—141,000 pounds—be taken, the factor of safety will be about seven.

Facts about Gold.

In a recent lecture on gold, Professor Egleston, of the School of Mines of Columbia College, remarked that it was formerly supposed that gold was to be found only in or on the Ozoic and Paleozoic formations. When, in California, Whitney discovered it in the Jurassic, it was a revelation. It is now found in the deposits of all ages. The rock in which it lies is generally metamorphic, and therefore it is the surroundings that indicate the period. By gold we mean a yellow substance, which contains a quantity of pure gold, mixed with other substances, of which silver is almost always one. It is common to consider the quantity of gold in the world to be large. But there is only seven thousand millions worth, which is about half pure gold and half silver. The annual production is about one hundred millions worth, and the production has decreased 44 per cent during the past thirty years. The production of silver, however, has increased 100 per cent, and now equals that of gold. One third of the gold goes to wear and tear, one third goes into circulation, and one third into the arts and manufactures. All the gold in the world would make a pile only 25 feet wide, 45 feet long, and 25 feet high.

The First American Patent.

The first American patent for an invention was issued to Samuel Hopkins, at New York, July 31, 1790, for an improved process of making potash and pearlash. A recommendation to the House of Representatives to appropriate $500 for the purchase of this patent was made by Secretary Schurz, January 8. The present possessor of the document is E. T. Hale, of Columbus, Ohio. It is written on a sheet of parchment in a round, old-fashioned hand, signed by George Washington, and certified by Ed. Randolph, Attorney-General, as being conformable to the act of Congress to promote the useful arts, and its delivery to the grantee is certified by Thos. Jefferson, with the seal of the United States.

Marine Foundations.

A great deal of ingenuity has been spent by engineers in the construction of the foundations of lighthouses and other similar structures. In some of these the stones are laid in offsets to a considerable height above the rock, with the object of breaking the sea; each stone in the face is dovetailed vertically and horizontally into the adjoining stones, while a further precaution is taken by bolting each stone to the course below it by bolts of yellow metal and galvanized steel. Such a mode of construction was adopted in the Wolf Rock Lighthouse off Land's End, considered the most difficult erection of the kind on the British coast. The rock on which it was built is seventeen feet above low water. In another structure, well known, the Bishop Rock Lighthouse, which, Findlay says, is probably the most exposed lighthouse in the world, the same construction is employed, and as a rule, in most sea rock structures, massive blocks, dovetailed and doweled together, have been used A notable exception to this mode of construction was the plan devised for building the Phare d'Ar-men. The rock, Ar-men, presented formidable difficulties; it was almost impossible to obtain a secure footing, an iron structure was out of the question, on account of the difficulty of landing large pieces of iron framing; and to make matters worse, the rock was divided by deep fissures. The method resorted to was as simple as it was bold; it was decided to bore a number of holes thirty centimeters deep and one meter apart all over the site, and others outside, in order to hold ring bolts necessary for craft and to fasten lashings. In some of these holes wrought iron gudgeons were fixed for the purpose of fixing the masonry to the rock, and thus to make the construction itself serve to bind the different parts of the rock together.

In addition to these gudgeons, horizontal iron chains were introduced into the masonry courses to prevent disjunction. The gudgeons were 0·06 meter square and 1 meter long, made of galvanized iron, and the lower masonry was of small undressed stones set with Parker Medina cement. Here we find a very different principle of consolidation necessitated mainly by the difficulties of landing large materials, and also by the rock cleavage. Of course, the object of dovetailing and doweling the blocks together is not only to insure strength, but to prevent displacement of the masonry by the force of the waves during construction before the superincumbent weight of masonry could be brought to assist. In some other instances the courses of the basement are divided into a number of keystone-like parts, each of which is secured to the underlying stones by granite plugs let into the adjacent courses. Iron and screw piles have now superseded, in several cases, the solid foundations we have been describing, as in the instances of the Fowey Rocks, Ship Shoal, and other structures in the United States; but the engineer of marine works will probably sooner or later have to resort to a method of building foundations under water in which the advantages offered by the combined use of concrete and iron must be acknowledged. The government works at Dover harbor, and the harbor constructions at Douglas, in the Isle of Man, are instances in which concrete blocks of large size have been successfully employed; and the question appears to be worth a passing thought, whether or not, by the use of iron in the shape of piles or pillars, together with chain bond, smaller blocks of concrete might not be used with more economy in structures which have to withstand the force of the waves, or in places where the employment of large blocks would be attended with risk and difficulties. Blocks of Portland cement concrete might be cast or moulded into forms capable of being interlocked together in the same manner as the stones of Eddystone, the Bell, and Wolf Rock towers, and these could be secured to the rock by a system of iron uprights and horizontal bars, so that the structure may possess both vertical and lateral cohesion under the most trying circumstances.—*Building News.*

The Sun's Rays as a Means of Research.

The Photographic *News* reports that M. Raoul Pictet is about to try, on an extensive scale and experiment, having for its object the dissociation of the metalloids by means of the sun's rays By the use of a huge metallic mirror he hopes to bring such a concentration of sun rays to bear upon the metalloids as will enable him to definitely determine the truth or fallacy of the theories of Messrs Lockyer and Victor Meyer. The experiment will probably be made at Geneva, and will, by reason of its magnitude, be unique for a research of this nature.

IRON PROTECTED BY GUM.—Sheet iron covered with gum of the euphorbiacea, common and luxuriant in tropical climates, was immersed in Chatham, England, dockyard, where everything rapidly becomes foul, and when taken out was found quite clean. The gum is intensely bitter and poisonous; hence marine animals avoid it.

PAPER NEGATIVES.—The paper is covered with collodion containing an iodide, floated upon a silver bath; washed, and floated upon a tannin solution. In order to render the paper negative transparent it is dipped into a solution of castor oil thinned with alcohol.—*M. Aimé Pêligry.*