

above opinions of the *Tribune* are calculated to do evil; if not, the public should be made aware of the fact. So far as the science of the question is concerned, our contemporary is evidently out of his sphere; he does not know the nature of the lightning-rod. Its function is simply that of a conductor—not an attractor. It is carried up to such an elevation above a building that it may tap the electric cloud, and conduct it silently to the earth, in order to prevent it striking the non-conducting part of the building. To do this perfectly, it must be continuous from point to base, and form a perfect connection with the moist earth below. If this connection is not perfect, of course the rod cannot perform the functions of a conductor, and a disruptive discharge may take place, as in Mr. Tait's case. There is abundant evidence for concluding that all houses that have been struck with lightning, when furnished with rods, have had their conductors imperfectly connected, either in the sections of the rod or in the earth. The rod should extend down several feet in the ground, and have a large plate or bar of metal at the base, according to the arrangement of the electric circuits at all the telegraph stations. If a house is built on a dry and sandy situation, it is all the more necessary to be careful in extending the conductor deep into the earth, where it will meet with moist soil. If all lightning-rods of the common size were thus carefully put up, we would seldom hear of such cases as the one referred to.

As a question of fact, we have solid testimony regarding the utility and efficiency of lightning-rods as protectors. In a work of Captain R. B. Forbes, of Boston (who has done so much to bring the subject to the attention of our naval authorities), it is stated that, in the British navy, ships furnished with conductors have escaped without injury, in severe thunder-storms, by very heavy flashes being carried off by "Harris' conductors." In Lucius Lyons' work on lightning-conductors, there are numerous cases cited of the efficiency of lightning-rods, and the most eminent scientific savans have lent their names to this side of the question. The ignorant idea that lightning-rods attract lightning has done more to prevent the application of electric conductors to ships and buildings than anything else. It is an erroneous and unscientific notion; and that it should be promulgated from the daily press, at the present day, is anything but creditable to its intelligence.

AMERICAN INDUSTRY ABROAD.

Our countrymen, as industrious civilizers, may now be found in every quarter of the globe, occupying some of the most important situations. In the government rifle factory, at Enfield, England, the largest for small arms in the world—where 1,600 stand of arms are turned out weekly—most of the machinery is of American invention. Quite a number of the machines were made by the Ames Manufacturing Company, at Chicopee, Mass.; some at Windsor, Vt., by Robbins & Lawrence; and some at Col. Colt's factory, at Hartford, Conn. The practical personal superintendents at Enfield are two Americans, namely, James H. Burton, chief engineer, and Oramel Clark, chief of the stock department. These gentlemen were long and honorably connected with our own armories; now they are as highly esteemed and rewarded by the mother country, where the value of American genius is being fully recognized.

In Russia, American engineers have long held important situations, especially in railroad engineering, and Majors Whistler and Brown have held the highest positions in the government employ. The names of Winans, Harrison, Kirk, and others of our American machinists are more familiar in Moscow than in New York. And now, away in a distant part of the Russian dominions in Asia, on the Amoor river, which flows into the Pacific, opposite the northwestern shores of our continent, our countrymen are also busy as pioneers of improvement and industry. At Nicolaefsk, situated on the northern bank of the Amoor, and containing some 3,000 inhabitants, the government has erected a large machine shop and foundry, the works for which (of every kind) were made at Philadelphia, Pa., at a cost of over \$300,000; and there are now over five hundred tons of American-made machinery landed and under cover, awaiting the construction of the buildings, on which great numbers of Russian laborers are employed. The greatest favor is shown to Americans, whose enterprises are encouraged, and who fill every position in the place

requiring mechanical skill. A company of Americans have obtained the privilege of navigating the river, and they have recently built a small steamer of light draught capable of penetrating 2,000 miles into the interior. They intend to trade with the natives, exchanging American goods for the products of that country—furs, tallow, hides, &c.

If we now turn our eyes to old Japan, which four years ago was hermetically sealed against all foreigners except the Dutch, we find our countrymen there also, snugly settled, and doing a smart business. By recent accounts, one of them has discovered a very rich copper mine; and the emperor, king, or whatever else his title may be, has granted him the privilege, it is said, of working it by paying a very small tax. That island is yet destined—if the people are dealt with in a proper manner—to promote a large trade with our country. It is rich in minerals, and rare vegetable products. Gold is found in various localities, and copper is abundant. Iron abounds in various parts of Japan, the mines of which are extensively worked, much more so at present than those of copper. By our treaty, coals, zinc, lead, and tin are to be exported at a duty of five per cent. The vegetable productions of Japan that are most probably destined to become articles of commerce are camphor, vegetable tallow, drugs, isinglass, &c. Of all the nations of the East, the Japanese are the most susceptible to civilizing influences, and they are far in advance of their ancient neighbors, the Chinese, in obtaining a knowledge of other nations.

In Brazil, a railroad is building of a somewhat difficult character, on seventeen miles of which there are thirteen tunnels, all being constructed by Americans. E. D. Muhlenberg, of Pennsylvania, is one of the contractors, and R. Harvey another. In Chili, our locomotives have earned a high character in fair competition with those from the mother country; and in whatever direction we look, it is gratifying to our honest national pride that, in the peaceful and industrial pursuits of life, our countrymen are exercising such an honorable influence.

EXPLAINING THINGS.

Nothing can be fully explained. In every department of knowledge, if we go a few steps from that which is muscle bone the surface, we come to absolute mystery which no man can explain. Ask the most learned surgeon to explain the motion of the hand. He tells you that the hand is at one end of a bone which has a joint at the other end; that a band of flesh, which he calls a muscle, is attached at one end to this bone and at the other end to another bone beyond the joint, in such a way that, when the muscle contracts, the bone moves upon the joint and carries the hand along. A nerve leads from the brain to the muscle and carries the influence by which the will acts upon the muscle. If you ask the surgeon how the brain acts upon the nerve, and the nerve upon the muscle, he can tell you no more than the smallest child or the most ignorant savage can. What the nervous influence is—whether it is a fluid or a vibration, or whether it is something different from either of these—is known to God, but it is not known by any of the children of men.

We see a pebble fall to the ground, and we are told that it is drawn by the attraction of gravitation; but what the attraction of gravitation is—how it reaches up from the earth and takes hold of every atom of the pebble and pulls it down—is to us an unfathomed mystery. There must be some material connection between the stone and the earth. This was so plain to Sir Isaac Newton that he regarded the person who denied it as incapable of comprehending the proposition. But if we pass our hand between the stone and the earth we cannot feel any substance, we cannot see any with our eyes, and yet we know that there is some matter interposed between the two bodies which draws them together with tremendous power. We know some of the properties of gravitation; we know that it draws all ponderous bodies together with a force proportioned to the quantity of matter which they contain, and in inverse proportion to the square of the distance between them. But what its essence is, and how it takes hold of matter, no human being has ever learned.

Oxygen is more ready to enter into chemical combination with zinc than it is with copper, but why this is so not all the chemists in the world can tell. Vast indeed is the amount of knowledge in regard to chemical affin-

ity; what substances exhibit its power with the greatest energy, how it manifests itself in thousands of curious and complicated and wonderful operations, all in accordance with fixed and infallible laws, have been learned by patient and laborious study of many among the greatest intellects of our race; but what the essence of chemical affinity is, or how it takes hold of the atoms which it moves, has never been ascertained.

If we attempt to understand thoroughly any fact whatever which comes under our observation, we shall find that a few steps will bring us to the dark gulf of profound and unfathomed mystery. Carlyle says: "Sooty Manchester, it too is spanned by the skyey firmament, and there is Life in it, and Death in it; and it is every whit as unimaginable, as inconceivable, as the oldest Salem or prophetic city!"

TEA.

One of our correspondents (B.) furnishes us with the following statistics in regard to tea:—

"This plant furnishes the most important beverage, not alone of the English nation, but one half of the whole people on the globe—that is, 500 millions of persons. An immense extent of land is devoted to the cultivation of this plant in China, in which country and Japan no less than 500 millions of dried tea are annually consumed. It requires 3 pounds of fresh tea leaves to make 1 pound of the drug. About 80 million pounds are exported annually to the following countries:—England, 40 millions; United States, 28; Russia, 7; Holland, 2½; Germany, 2¼; France, half a million. The first tea brought into Europe was by the Dutch, in 1600, and for 64 years they furnished England with all she required. In 1780 the consumption in England was 3 million pounds per annum; in 1802, 20 millions; now it is no less than 40 millions. This plant is now successfully cultivated in Java and Sumatra (Dutch possessions), and in Assam and Ceylon (English)."

As a supplement to the statistics of our correspondent, we will add that land-carried tea and that carried in ships formed the subject of a conversation at the recent meeting of the British Scientific Association. It is well known that an opinion has become somewhat fixed in the public mind, regarding tea carried on sea being inferior to that transported by land. It is considered that its flavor and quality are injured in the former case; but how, we never found one who could explain. As all the tea of Russia is carried overland, it is asserted that it is superior to that which we obtain; but Sir John Bowring, who has lived so many years in China, states that this is not the case. This idea of superiority in land-carried tea has been promulgated by the Russian government, because sea-carried tea is prohibited in that country, and because as good tea can be bought in England for 8s. sterling per pound as in Russia for 25s. He believes that tea loses none of its excellent sanitary qualities by being carried in ships; and in this opinion we think he is correct.

COAL OIL LAMP.

Drake's improved lamp, illustrated on page 280 of the present volume of the *SCIENTIFIC AMERICAN*, is intended expressly for coal oil, being adapted to both the heavy and light varieties. The extra wick of soft cotton carries up the heavy oil and, by affording a copious supply to the burning wick, prevents that from charring. The wick being lighted below the slit in the cap, one current of warm air comes in contact with the blaze within the cap, and another after it issues through the orifice in the top between the cap and the chimney, thus securing a complete consumption of the oil. The inventor says that this lamp will burn coal oil of the various qualities in the market without smell or smoke, and will produce a satisfactory light from any of them.

LITERARY LARCENY.—An extraordinary statement is in circulation in London respecting the "Pilgrim's Progress," namely, that this celebrated work was not written by John Bunyan, but that the entire story is made up from an ancient manuscript. Miss Catherine Isabella Curt has published a translation, from a French manuscript (in the British Museum), of the "Pylegremage of the Sowle," by G. de Geideville, a churchman who flourished in the fifteenth century. A translation of the original work was printed by Caxton in 1483, and Bunyan's "Pilgrim's Progress" is said to be nearly a verbatim copy of that extremely rare book.