(For the Scientific American.)

**Adumbration of the Creator's Transcendent Wisdom in the Adaptation of Things.**

[Concluded from page 27.]

Sulphur will not mix with water at all. Sugar mixes with it very readily. If the earth had been in this respect like sulphur rain water would have run off as soon as it fell; there could have been no vegetation, and creeks and rivers would have overflowed many farms at every shower. Had the earth absorbed water as sugar does, we should have sank over our heads into the mud after every copious rain, buildings could only have been erected upon immense rocks, but without timber, for large vegetables could not have withstood the slightest wind. Indeed the earth would not have been habitable. But sulphur and sugar, yea, all things, are most wisely and exactly adapted to their respective uses. By whom?

In Chili it does not rain because the trade winds, which are necessary to agitate the watery and the atmospheric oceans and keep them pure, sweep the clouds past South America, and drive some of them up against the Andes, where they are condensed by almost continual thunder showers and run down across the level country in copious streams. Evaporation in this warm country is very brisk, aud the vapor rising from the broad Pacific, being blown on the land by trade winds falls in copious showers of dew, making Chili one of the most fruitful countries on the Pacific coast.

In Egypt it does not rain, and there are no mountains to intercept the clouds, nor a broad ocean on the west to yield copious moistures supplying water for dew. But the all-wise Creator and giver of every good and perfect gift, was at no loss to make that country what she once was—the granary of the world. Egypt is a level country—the Nile, whose waters it, rises in the mountains of the moon, as the rivers in South America do in the Andes, causing the Nile to overflow its banks at a proper period every year. The rain lasts long enough, and the distance is just great enough, to produce the flood two months after the rain has fallen.

In Greenland timber does not grow, and train oil serves in part for fuel. The timber necessary to form utensils for killing the whale and seal is sent by certain winds and currents from great distances and lodged among the islands; whence it comes is to the natives unknown. And the whale retires from his more potent executors, annually, and takes refuge under the polar ice to propagate its species.

Those planets which are near the sun have no moons and need none,—those farther off which need them have a number; and are so large that their moons cannot disturb their motions. If Mercury and Venus had been as large as Jupiter, their motions round the Sun must have been so rapid to balance their centrifugal forces, as to shorten their siderial revolutions very much; and then their diurnal rotations must also have been altered in proportion.

In addition to the winds, it was necessary that the ocean should be agitated by tides, and the Sun and Moon do effectually to keep the water (which is also impregnated with salt for the same purpose) pure. Lakes are constantly supplied with fresh water which flows off, and therefore need no tide.

If the moon were much nearer to the earth, or larger, the tides would be increased and overflow the fertile shore: were she farther off, or smaller, her light would be fainter, and the tides insufficient for the purpose intended.

If the earth, or the moon, or any of the planets or of their moons, or the sun, were either larger or smaller than they are, the harmonious motions of all the bodies belonging to our solar system, would be disturbed in their orbits, and the whole system must undergo a new arrangement till every body belonging to it had again balanced itself in relation to all the rest, or be doomed to destruction.

If the earth's diurnal motion were quickened, the torrid zone would be overflowed by the ocean,—if diminished, the same catastrophe would happen to the frigid, and those parts of the temperate zones which are nearest the poles, while the ocean's bed would be left dry in the equatorial region; for it is the centrifugal force, produced by the earth's rotation on her axis, that maintains the ocean every where at the height at which the water now stands. Hence, also, a river that runs north or south, as does the Mississippi, may have its mouth at a greater distance from the centre of the earth than its source.

La Place filled five large quarto volumes with a description of the bodies belonging to our solar system, and an investigation of the laws which govern their motions. By the aid of present improved telescopes. more than a hundred millions of such systems as ours may be counted in the universe. Now, at this rate, it would require more printing to describe all the celestial bodies in God's boundless kingdom, so far as we can explore it, than has been done since types and presses were invented; and it is indeed very probable that human eyes have as yet seen only a very small part of the Great Architect's magnificent buildings.

H. R. Schetterly.

Howell, Mich.

**Liebig on Electro Magnetism as a Motive Power.**

At the present moment, electro-magnetism, as a moving power, is engaging great attention and study; wonders are expected from its application to this purpose. According to the sanguine expectations of many persons, it will shortly be employed to put in motion every kind of machinery, and among other things it will be applied to impel the carriages of railroads, and this at so small a cost that expense will no longer be a matter of consideration.

Such expectations may be very attractive, and yet they are altogether illusory! they will not bear the test of many simple calculations; and these our friends have not troubled themselves to institute.

With a simple flame of spirits of wine, under a proper vessel containing boiling water, a steam carriage of 200 to 300 pounds weight can be put in motion, or a weight of 100 pounds may be raised to a height of 20 feet. The same effects may be produced by disolving zinc in dilute sulphuric acid in a certain apparatus. This is an interesting discovery; but the question to be determined is, which of the two processes is the least expensive?

If we require 8 pounds of oxygen to produce a certain effect, and we wish to employ chlorine for the same effect, we must employ neither more nor less than 35 1-2 pounds weight. In the same manner, 6 pounds weight of coal are equivalent to 32 pounds weight of zinc.

Heat, electricity, and magnetism, have a similar relation to each other as the chemical equivalents of coal, zinc, and oxygen. By a certain measure of electricity we produce a corresponding proportion of heat or of magnetic power; we obtain that electricity by chemical affinity, which in one shape produces heat, in another electricity or magnetism. A certain amount of affinity produces an equivalent of electricity in the same manner, as, on the other hand, we decompose equivalents of chemical compounds by a definite measure of electricity. The magnetic force of the pile is therefore limited to the extent of the chemical affinity, and in the case before us is obtained by the combination of the zinc and sulphuric acid. In the combustion of coal, the heat results from, and is measured by, the affinity of the oxygen of the atmosphere for that substance.

It is true that, with a very small expense of zinc, we can make an iron wire a magnet capable of sustaining a thousand pounds weight of iron: let us not be misled by this. Such a magnet could not raise a single pound weight of iron two inches, and therefore could not impart motion. The magnet acts like a rock, which while at rest presses with a weight of a thousand pounds upon a basis: it is like an enclosed lake, without an outlet and without a fall. But it may be said, we have, by mechanical arrangements, given it an outlet and fall. True: and this must be regarded as a triumph of mechanics; and I believe it is susceptible of further improvements, by which greater force may be obtainod. But with every conceivable advantage of mechanism, no one will dispute that one pound of coal, under the boiler of a steam engine, will give motion to a mass several hundred times greater than a pound of zinc in the galvanic pile.

**Millholland's Coal Burning Locomotive.**

We find a very interesting account in the Philadelphia Ledger, of a valuable improvement made in locomotives, by our friend Mr. Millholland, director of the machine department of the Reading Railroad, Pa., to which we wish to direct the attention of all our railroad managers and engineers. The improvement consists of two parts, namely:—the fire-box and boiler.

"The Fire-Box.—Instead of filling up the bottom of the fire-box (as usual) with open grate bars, clear to the back and sides; Mr. Millhollandfirst sets in a stout cast iron frame, showing a flat surface of 16 inches at the back and of 9 inches at the sides of the fire-chamber—the remaining space only having grate bars.

The successful effect is this, viz:—the coals that lie on the broad plates, get so little air that the combustion cannot be active, and consequently the heat cannot be intense where the fire is in contact with the back and sides of the fire box. The fire is in fact so deadened at the sides, that the fire box promises to last for years, and the same effect at the back, preserves the tubular ends of the boiler as well.

In our locomotive engines, the boiler is one horizontal cylinder filled with tubes of copper or wrought iron, usually 2 1-2 inches in diameter. Through these tubes the fire passes. In this way the combustion of the fuel is very imperfect; a vast amount of carbon is merely converted into vapor, which for want of air to effect combustion, passes off in the draught unburned. This long single cylinder Mr. Millholland cuts in two (as it were,) leaving a chamber 26 inches wide between the sections. This chamber is a gas fire-box, and the sections of the boiler are so far connected as to surround the opening with water; Into this chamber jets of highly heated air flow, that consume the carbon which in the common engine escapes unburned, as we have explained.

It may be observed that in Winan's best anthracite locomotives, the depth of coal in the fire-box is 18 inches; in Millhollands improvement it is only 7 inches. The deeper the mass of coal the more imperfect the combustion must be, because a less proportionate supply of air can penetrate through the denser mass, and without a certain amount of pure air there can be no perfect combustion. But to further insure a supply of air, Mr. Millholland has a perforated door to his fire-box, which casts a sheet of air immediately over the top of the coals. But even with this aid to combustion, plenty of unburned carbon escapes into the gas fire-box, to be there consumed by contact with fresh hot air injected through finely-perforated tubes. The front section of the improved boiler is one-third, and that part of it back of the gas fire-box, is two-thirds of the whole. the iron tubes in the front section are 4 inches, in the back section they are 2 1-4 inches diameter. And it is found that the fragmentary stuff that usually clogs the passages falls to the bottom of this gas-box, and is readily removed through a door. When the fire is out, the gas-chamber forms a ready man-way for easy access to the tubes that may require attention, and in every other respect this improvement gives the greatest facility for repairs.

These improvements have been thoroughly tested during three months, on three locomotives, and the Reading Railroad Company have decided to alter all their engines to Millholland's plan. The three altered engines were built by Mr. Ross Winans, of Baltimore, and consumed about 9½ tons each, during one trip, with a full train of cars. The same engines, as altered, use only 6 tons to do the same work.

The wood-burning locomotives on the Reading Railroad number eighty-one, and 14 cords of wood are used for one trip, the cost of this—sawing, &c.—is $56; the cost of six tons of coal only $12. The saving is very great. Coal-burning locomotives have been tried on some of our Eastern roads, but the great heat destroyed the fire-boxes so fast that they were found to be more expensive in the long run than wood-burning engines. As the improvement of Mr. Millholland remedies the evil in respect to the rapid destruction of fire-boxes, we hope to see his improvements introduced speedily upon all our roads. It will be a great relief to passengers, at any rate. It is stated that the expense of altering an iron tubed engine for wood is but small.

**American Telescopes.**

Within a few years our country has become greatly distinguished for astronomical knowledge and discoveries. Quite a large number of observatories have been erected and furnished with instruments of a superior character, but these instruments have been almost without exception of foreign manufacture.

Mr. Holcomb, of Mass., and Mr. Fitz, of New York have made a number of Telescopes. A new and very excellent one has recently been constructed by Mr. Josiah Lyman, of Mass. It is a reflecting telescope, having an aperture of nine inches, and a length of sixteen feet. It is on the Herschellian principle, the observer standing with his back toward the object under examination.

The performance of this telescope is said to be excellent. Professor Stephen Alexander, of Princeton, N. J., has furnished the following testimony:

"I was present at a partial trial of Mr. Lyman's telescope on the evening of August 23. The night was a tolerable one, and the magnifying power employed about 375. The two component stars Pi Aginlæ (distant apart from each other not quite two seconds) were satisfactorily separated; the cluster in Hercules presented somewhat of a granular appearance even at the centre; and the large nebula in Andromeda showed a variation of light at the centre, as though with greater light and power, it might have been resolved. I regard the performance of this telescope as highly satisfactory."

Mr. Lyman states that on the evening of August 29, with a power of 550, he saw the triple star Epsilon Equelei with perfect distinctness. Two of the components of this star were only half a second distant from each other in 1838, and since that time their distance has but slightly increased, yet this telescope separated them with perfect ease and sharpness.

In connection with this, we cannot omit to mention that at a very early date, America produced a Rittenhouse whose fame in connection with astronomical apparatus is world-wide and a matter of history.

**Cedars and Pines of California.**

A writer in the San Francisco Herald gives the following description of the pines and cedars of the land of gold:

"Of all the wonders I have ever seen in the vegetable kingdom," remarks this observant traveller, "nothing will bear comparison with the magnificent and lofty growth of cedars and pines, which embellish the hills and the mountains that lead and make up the Sierra Nevada range. The magnificence and grandeur of scenes, in which these trees abound, cannot be imagined by any man who has not seen them and felt the awe and sublimity to which they give rise. I have counted, in a circle of fifty feet, thirteen pine trees, not one of which was less than 250 feet in height, nor were any of them marked by the slightest curve or inclination. They are the inimitable and lofty monuments of Nature, uninfluenced by sweeping storms and winds, unbent and undecayed by a centurian age. Not a limb or a knot can be found upon their bodies, until you reach the altitude of from one hundred to two hundred feet, beyond which height they continue to grow, until their towering majesty overawes all surrounding objects, and affords a fit refuge for the noble bird which adorns the banner of our country. No man can travel through these scenes without feeling that the grandeur of Omnipotence itself is teaching him his finite and insignificant powers. Such was the moral influence of those leviathan growths of cedars and pines, upon my mind, I would not have dared to have given entertainment to a fugitive thought against the supremacy, wisdom, and power of Jehovah. Such are the pine and cedar forests of California, which cover an area of hundreds, if not thousands, of square miles."

**Scorpions in Egypt.**

The Egyptian correspondent of a London paper states that during a single week of the month of June, no fewer than eighty persons who had been bitten by scorpions were taken to the hospital at Cairo.