Vital Energy and Electricity.

Thomas A. Edison has spoken his mind, touching energy, as follows:

'Of course there is a source of energy. Nature is a perpetual motion machine, and perpetual motion implies a sustaining and impelling force.

"When I was in Berlin I met Du Bois Reymond, and, wagging the end of my finger, I said to him, 'What is that? What moves that finger?' He said he didn't know; that investigators have for twenty-five years been trying to find out. If anybody could tell him what wagged this finger, the problem of life would be solved.

"There are many forms of energy resulting from the combustion of coal under a boiler. Some of these forms we know something about in a practical way, but there may be many others we don't know anything about.

"Perhaps electricity will itself be superseded in time, who knows? Now a beefsteak in the human stomach is equivalent to coal under a boiler. By oxidation it excites energy that does work, but what form of energy is it? It is not a steam pressure. It acts through the nerve cells, performs work that can be measured in foot pounds, and can be transformed into electricity, but the actual nature of this force which produces this work—which makes effectual the mandate of the will—is unknown.

"It is not magnetism; it doesn't attract iron. It is not electricity—at least not such a form of electricity as we are familiar with. Still, here it is necessary to be guarded, because so many different forms of electricity are known to science that it would be rash to say positively that we shall not classify vital energy as a form of electrical energy. We cannot argue anything from difference in speed. Nerve force may travel as fast as electricity, once it gets started. The apparent slowness may be in the brain. It may take an appreciable time for the brain to set the force going.

"I made an experiment with a frog's leg that indicates something of the kind. I took a leg that was susceptible to galvanic current. The vibration produced a note as high as a piccolo. While the leg was alive it responded to the electrical current; when it was dead it would not respond. After the frog's leg had been lying in the laboratory three days I couldn't make it squeal. The experiment was conclusive as to this point: The vital force in the nerves of the leg was capable of acting with speed enough to induce the vibration of the diaphragm necessary to produce sound.

"Certainly this rate of speed is much greater than physiologists appear to allow, and it seems reasonable that there is a close affinity between vital energy and electricity. I do not say they are identical; on the contrary, I say they are very like. If one could learn to make vital energy directly without fuel, that is, without beefsteak in the stomach, and in such manner that the human system could appropriate it, the elixir of life would no longer be a dream of alchemy. But we have not yet learned to make electricity directly, without the aid of fuel and steam.

"I believe this is possible; indeed, I have been experimenting in this direction for some time past. But until we can learn to make electricity, like nature, out of disturbed air I am afraid the more delicate task of manufacturing vital energy so that it can be bottled and sold at the family grocery store will have to be deferred.

"Electricity, by the way, is properly merely a form of energy, and not fluid. As for the ether which speculative science supposes to exist, I don't know anything about it. Nobody has discovered anything of the kind. In order to make their theories hold together, they have, it seems to me, created the ether. But the ether imagined by them is unthinkable to me. I don't say I disagree with them, because I don't pretend to have any theories of that kind and am not competent to dispute with speculative scientists. All I can say is, my mind is unable to accept the theory. The ether, they say, is as rigid as steel and as soft as butter. I can't catch on to that idea.

"I believe that there are only two things in the universe—matter and energy. Matter I can understand to be intelligent, for man himself I regard as so much matter. Energy I know can take various forms and manifest itself in different ways. I can understand also that it works not only upon, but through, matter. What this matter, what this energy is, I do not know.

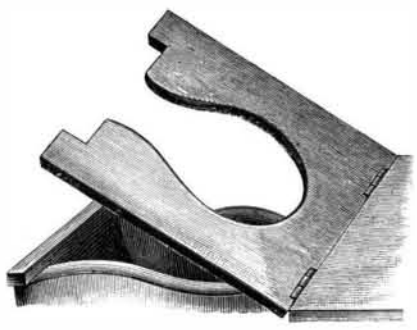
"However, it is possible that it is simple matter and energy, and that any desire to know too much about the whole question should be diagnosed as a disease; such a disease as German doctors are said to have discovered among the students of their universities—the disease of asking questions."—*American Engineer.*

Palpitation of the Heart.

This alarming and often very distressing symptom is often due to dyspepsia, caused by excessive mental or physical exertion. Sir Walter Scott was much subject to it. In his private journal, written in 1826, he says: "What a detestable feeling this fluttering of the heart is! I know it is nothing organic, and that it is entirely nervous; but the sickening effects of it are dispiriting to a degree. Is it the body brings it on the mind, or the mind that inflicts it upon the body? I cannot tell; but it is a severe price to pay for the 'Fata Morgana' with which fancy amuses men of warm imagination. In the country I drive it away by exercise. I wish I had been a mechanic, a turning lathe or a chest of tools would have been a godsend; for thought makes the access of melancholy rather worse than better. I have it seldom, thank God, and, I believe, lightly, in comparison with others."

AN IMPROVED WATER CLOSET.

The improvement shown in the accompanying illustration is especially designed to promote cleanliness,



CHADBOURNE'S WATER CLOSET.

and is particularly adapted for use in the toilet rooms of public places. It has been patented by Mrs. Anne G. Chadbourne, of No. 100 Blue Hill Avenue, Roxbury, Mass. The bowl, which is preferably set up without cover or wood inclosure, is of porcelain or earthenware as usual, and has a wide forwardly extending portion at the top, terminating in a crosslip or strip-like part. This special construction of the upper marginal portion of the bowl in front operates, in conjunction with the form of the seat, to make a practically air-tight joint between the seat and bowl. With this form of closet, the body is kept from contact with the front portion of the seat and bowl, and the seat is kept clean.

LAMBRECHT'S POLYMETER.

This is a combination instrument for indicating the state of the atmosphere, its temperature, relative humidity or percentage of moisture, vapor tension, and dew point or absolute humidity. For meteorological purposes it has been stated by high authority to be more accurate than the wet bulb hygrometer, and far more convenient, as it indicates the relative humidity of the atmosphere on a dial which can be read as one reads the temperature on a thermometer scale. The thermometer on the stem of the polymeter gives the temperature of the air in Fahrenheit degrees, the same as any standard thermometer, but, as is well known, the amount of moisture which the air will carry, or the greatest possible vapor pressure without precipitation, varies constantly with the temperature. At 30° F., the maximum of vapor pressure is 0·165 in.; at 40° F., 0·248 in.; at 50° F., 0·361 in.; at 60° F., 0·518 in.; at 70° F., 0·733 in.; at 80° F., 1·023 in. Relative humidity is the percentage of moisture in the atmosphere at any degree of temperature, and this the polymeter gives by the index hand on the dial, zero being extreme dryness and 100 extreme saturation, or the air filled with moisture. The quantity of vapor which completely saturates the air at 32°, on having its temperature raised to 50° becomes only one-half saturated, and the index of the polymeter will point to 50 per cent; on a further rise of temperature to 70°, the amount of vapor remaining the same as at 32°, the index hand will point to 25 per cent or one-quarter saturation, which is too dry for human health and plants.

By the use of this instrument one can better calculate the prospects for fair or foul weather, the temperature and dew point or absolute humidity being given. Those who keep meteorological records, either for scientific or practical purposes, will find it a great aid, and for the physician it has a special value, as in a moment he or the nurse can ascertain the humidity of the air in his patient's chamber, and note whether it is too dry or moist. This knowledge in some diseases is very important. If the air is found too humid, a little fire in an open grate will remedy it. If too dry, the moisture may be increased by the evaporation of more water.

The instrument is made and sold exclusively in the United States by Gall & Lembke, 21 Union Sq., N. Y.

How to Preserve Potatoes.

The French Minister of Agriculture publishes the details of the process in the official *Bulletin du Ministere de l'Agriculture* for March, 1891. The following is a translation of the essential part of the scheme:

1. The method of preservation consists in plunging the tubers, before storing them away, for ten hours into a 2 per cent solution of commercial sulphuric acid in water; two parts of acid to 100 parts of water.

2. The acid penetrates the eyes to the depth of about one-fortieth inch (two millimeters), which serves to destroy their sprouting power; it does not have any appreciable effect upon the skin of the potatoes.

3. After remaining in the liquid ten hours the tubers must be thoroughly dried before storing away.

4. The same liquid may be used any number of times with equally good results.

5. A barrel or tank of any kind will do for the treatment. The acid is so dilute it does not affect the wood.

6. Chemical analysis shows that potatoes treated by this process are as nutritious and healthful after eighteen months as when freshly dug.

7. Potatoes thus treated are of course worthless for planting.—*Gerald McCarthy, N.C. Experiment Station, Raleigh.*

A Secure Base for Electrotype Plates.

Plates which offer little space for nails are usually fixed with very fine pins which very soon rust through in the perpetually damp wood, and before you know where you are, a plate is torn off its block by the inking rollers and crushed flat into the type by the printing cylinder. Sometimes the damage is even greater.

Every printer can rid himself of this nuisance in the following way: Take the plate off the wooden block, fit it with very strong wire pins, and bend these with nippers into hooks at the back of the plate. Of course these hooks must be less than type-high, and under no circumstances must the plate be bent. This plate is now to be placed on a table, and surrounded with type-high furniture slightly smeared with fat. Good, slow-setting Portland cement should now be mixed to a stiff consistency, poured into the form and allowed to project a little above the top.

This work is best done in the evening and the cast left to dry and set overnight. In the morning the electro and its block can be taken out of the form, after scraping away the superfluous cement with a brass rule. The block will then have been worked down to type height; that is, if a medium degree of warmth has prevailed in the room during the night, otherwise the drying will require a longer time. The cement block must now be allowed to dry another twelve hours in the air, and then placed twelve or twenty-four hours under water to harden.

A block of this kind has now been systematically treated for truth, warmth, cold, and damp, and will stand any amount of printing without alteration.

A plate mounted in this way, being anchored fast into the block, cannot now loosen; it can only be separated by destroying the block, but the cement is so cheap that that does not matter.

It must be admitted that the length of time required for making a cement block prevents their manufacture as an article of trade, but for the printer who can do this kind of work at odd moments this is no disadvantage. By this process one gets electro blocks which are far preferable to cast-on metal blocks and almost as durable.

The writer of this article has had electros thus mounted in use for more than three years, and asserts that they last splendidly.—*Paper and Press.*

Tone Signaling.

The last of a series of demonstrations of a new method of signaling was lately given at the Naval Exhibition, London, by the inventor, Mr. W. B. Chalmers. The apparatus consists of a series of ten immensely powerful reeds, arranged to give a complete diatonic octave with a note on each side, by means of which it is, of course, possible to produce a virtually unlimited number of short groups of notes standing for letters, numerals, or whole sentences, such as are most likely to be required in a fog, or at night by two ships meeting. In many cases three notes suffice for a message that with the ordinary fog horn using the Morse code would take about half an hour to transmit. The first strains of the various national hymns are, of course, used to declare the nationality of the ships using the code, and some of the groups of notes are very happily chosen. For instance, the minor cadence, C, B, A, standing for "I am in distress, stand by me," may almost be said, in the words of the analytical programme, to "speak for itself," and a cheery phrase for "I will send a boat to you" is scarcely less obvious. There will probably be little difficulty in finding men who can readily work the signals, as no musical complications are suggested, and for the use of unskilled ears a small set of organ pipes can be applied to the instruments, for purposes of verification.

Failure of English Heavy Guns.

The defects which have recently developed in the heavy artillery supplied to our most modern battle ships should cause more than a little anxiety in the minds of the responsible officials connected with the Ordnance Department. The Benbow, which has recently returned to Chatham after an unusually short commission in the Mediterranean, is to have her two 110 ton guns removed and sent to the Elswick Ordnance Works to be strengthened. Only a few months since the weapons of the Sans Pareil were similarly treated, and it is well known that the heavy guns of her sister ship, the Victoria, are not altogether perfect, one of them, in fact, having the inner tube cracked near the muzzle. In each of these ships the guns are all of the same type, and seem to suffer similarly after the firing of a few rounds with the service full charge of powder, which is 960 pounds. The life of one of these guns is officially recognized as being from 75 to 80 rounds, but in the light of actual experience it appears as if these monster weapons would be placed *hors de combat* through inherent weaknesses long before the theoretical limit of their life had been reached. Drooping of the muzzle and cracking of the inner steel tubes are the primary evils engendered, but these evils are sufficiently serious in themselves to render perfectly useless the vessels by which the guns are carried. The shifting of the outer tubes or coils near the muzzle is another fault which experience has shown might occur. This, however, is less serious, and may be easily remedied, but the more grave imperfections which appear to baffle our ordnance officials ought to be subjects for strict investigation.

It has been suggested by an eminent authority on naval matters that one of these guns should be treated just as it would probably be used in actual service, and be fired for a large number of rounds until it was incapable of further use. Knowledge thus gained would be invaluable, and would no doubt prove a key to the solution of the erratic behavior of these monster weapons. Not a few experts contend that they are defective in longitudinal strength; others assert that they are both rifled and projectiled incorrectly. The total length of the 110 ton gun is 43 feet 8 inches, and the rifling adopted begins at the breech with an increasing spiral, which terminates about 80 inches from the muzzle; from this point forward to the muzzle the twist is uniform. Commenting on the rifling of heavy guns, some two years ago, Admiral Robert Scott, who is recognized as an authority on gun construction, made a few condemnatory remarks on the system in vogue, and submitted a few suggestions of his own, which, briefly summarized, were as follows: He would rifle his gun with a shallow-rounded grooving of uniform twist, and he would not force his projectile to accommodate rings on its base to the grooving, but would make his projectile to fit the grooving, and would give it long bearings, not of soft metal, but of iron, so that the whole length of it should be properly centered and supported in the barrel, and there should be no possibility of "wobbling." Experiments alone can either refute or confirm the various theories and ideas of different authorities, and it is only to rigid experimental investigation that we may look for a solution of the difficulties which seem to beset the production of a thoroughly reliable, accurate, and durable piece of heavy artillery.

Hitherto the 67 ton gun has been considered a perfectly trustworthy weapon, but the continuity of failures already referred to has been further augmented by the discovery of defects in two of these guns, one mounted in the battle-ship Anson and another carried by her sister ship the Howe. At the recent annual inspection it was found that the inner lining of the left gun in the after barbette of the Anson was cracked so seriously that the vessel was ordered to Portsmouth, on the completion of her refit at Devonport, to have the damaged gun removed and replaced by another of a similar type. The Anson was commissioned in May, 1889, and since the gun was first mounted on board only about three dozen rounds have been fired, and the majority of these with reduced charges. The nature of the defect has been investigated, but the cause remains yet to be explained. A few days ago the Howe was engaged in firing practice off Portland, and since then a serious fault has been discovered in one of her after barbette guns, but whether the injury was caused at the time, or whether it existed previous to the firing practice, is not known. It is of such a character, however, that the vessel has been ordered back to Portsmouth that the gun might be overhauled. This weapon, too, has been fired comparatively but a few times. Past experience with the 110 ton guns has been anything but gratifying, but to have the confidence in the 67 ton gun so rudely shaken is of more serious moment, especially when there is no reason to assume that the defective guns of the Anson and Howe differ in construction or otherwise to the remainder of the same caliber now afloat, or to those already complete and in progress for the new battle-ships nearing completion, and that a similar disablement may occur at any time to any one of these weapons.

Our neighbors across the Channel have a large number of heavy guns afloat, and little or nothing of a serious nature has transpired in connection with them. In fact, the French authorities seem perfectly satisfied with their heavy pieces of artillery mounted on the Formidable and Admiral Baudin, which weigh 75 tons each, and an expert, in commenting recently on the perfection of engines of war, is stated to have said that "the French in guns and rifles are far superior to anything that Europe possesses." Can it be, then, that the principle or system of construction of our big guns is at fault? Whatever the cause of so many failures may be, it behoves our ordnance authorities to pause and consider, and to rigidly investigate the collapse of the guns of the Howe and Anson, as they belong to a type which will be supplied to the eight first-class battleships now building, and on these vessels may depend the future welfare of the nation.—*Industries* (*London*).

The Puerto Cabello, San Felipe, and Araure Railway.

A most important concession has just been restored to Mr. Henry F. Rudloff, C.E., a citizen of the United States, by special act of the Venezuelan government, dated August 28, 1891.

It is for a line of railway commencing at the port of Puerto Cabello and thence *via* San Felipe to Araure, supplemented by an extra concession to continue the line to Guanare, a total distance of 350 kilometers, Guanare being the capital of the State of Zamora.

A glance at the map of the American continents shows that the great mountain chain of the Andes or Rocky Mountains attains to peaks of greater elevation in Ecuador than in any other State throughout its entire course from north to south. From about the city of Quito a powerful chain or branch is thrown off from the main range to the northeast, and traversing the republic of Colombia, it passes through its capital Bogota, and through all the northern portion of Venezuela adjacent to the sea, terminating opposite to the island of Trinidad in the West Indies.

The general elevation of this mighty range of mountains is very great. In the State of Los Andes, Venezuela, within some ten miles of Merida, the capital, there is a group of snow-capped peaks, five or six in number, of from 16,000 to 18,000 feet elevation. The average height of the coast range skirting the Caribbean Sea is between 7,000 feet and 10,000 feet.

Throughout the whole of this extensive chain of mountains, which may be taken at from 1,500 to 1,800 miles long, there are only two passes from the Atlantic Ocean to the interior favorable for the construction of a railway. One is from San Felipe to Araure, the subject of the present letter, and the other is 200 miles further to the east, from Barcelona to Soledad, the latter being a point opposite to Ciudad Bolivar on the Orinoco.

A correspondent of *Engineering* says the line takes advantage of the best of the natural passes through the mountains to unite by a railway the navigable waters of the great Orinoco River and the finest seaport on the Caribbean Sea. The pass from San Felipe to Araure is wide and ample, like a large open valley, the main range from Colombia running into the sea at or near Incacas. There is no gorge or cañon to pass through, requiring heavy and expensive works. After San Felipe the mountains commence by degrees to resume their original height, and geologists say that they are of an entirely different age and formation.

As a harbor, Puerto Cabello needs no recommendation to those who know the South American coast. It is notably among the best and safest in the world. It resembles Curacao, Havana, or Rio de Janeiro, the entrance being narrow and deep, and the harbor entirely land-locked. The inner harbor is immense, but not much used by shipping, a limited portion only of the deep water, near the town and the entrance, being sufficient for the requirements of the port at the present time.

The summit elevation of the line will not exceed 1,200 feet, the divide between the Yaracui River and the Barquisimeto River being in the neighborhood of Yaritagua, a distance of about 75 miles from the Atlantic port. Plans of the line have been made and show that no gradients will be required over 1 in 50, or 2 per cent, so that the operating expenses can be reduced to a minimum.

In this respect the proposed railway will be a striking contrast to all other lines in Venezuela, starting from the coast, on all of which gradients of 4 and 5 per cent have been used for long distances, and in some cases the rack on the Abt system.

The population to be served by the new line is estimated at 525,000, or about one-fourth of the entire number of inhabitants of Venezuela. The districts through which it will pass are by far the most populous in the country. They include upward of fifty towns and villages of varying size and importance, besides "haciendas," or large landed properties, and small farms.

It is hardly necessary to point out that Venezuela produces most of the articles of prime necessity for human existence in any and all parts of the world, namely, coffee, cocoa, sugar, tobacco, rice, cereals, and cattle. The zone of country to be occupied by the railway is acknowledged to be the richest and most fertile in the before-mentioned products of all Venezuela, and on the plains of the Orinoco cattle abound in tens and hundreds of thousands. For these reasons the new railway cannot fail to have a brilliant and highly prosperous future.

The report on the estimated returns and earnings of this promising enterprise has been made by an eminent French engineer, and it exhibits most flattering prospects for the new line, from the very commencement. The lands adjacent to the railway, being in the valleys, are almost all cultivated and rich. An increasing traffic is certain to grow up with each succeeding year.

The mining interests, also, are considerable, but undeveloped. Gold, silver, antimony, coal and other minerals are known to exist, and copper is the main staple of the region. From the mining industry alone the company can look for handsome returns.

But the most important feature of the new line is its central position as a grand trunk line for the South American continent. The existence of this low pass in the mountains, opposite to the most northerly point of Venezuela, or indeed of South America, and leading directly to one of the finest of all known natural harbors, is a rare geographical fact, which is little known in Europe, and almost as little known in Venezuela itself. The advantage to a railway company of controlling such a territory cannot well be overestimated, because at no other point on the northern coast of South America can access to the sea be had from the interior under such favorable conditions: 1. For geographical position. 2. For harbor facilities. 3. For gradients and works on a railway.

The line when fully developed in the future has the incontestable prospect of being, as it most assuredly must be, the grand trunk intercontinental line for the South American continent.

The enterprise must be considered, in view of the exceptionally favorable conditions of the pass for gradients and for construction, as of importance not only for the Venezuela of to-day, but as the outlet to the sea in a few years' time of all the interior portions of Colombia, Brazil, Peru, and Bolivia, east of the Andes. The policy of the company should be to push on as speedily as possible beyond Guanare to Barinas, and skirting the Cordillera on the flat grounds of the upper Apura and the Meta, to reach Bogota, the capital of Colombia, from the east.

Explorations have been made, and surveys of the upper regions of the Meta, which prove that the task of arriving at the Colombian capital from that side is by no means a difficult one; whereas it is well known that attempts have been made for a long series of years to get there with a railway from the west, and so far without a particle of success, and even if it were to be accomplished from Honda, or any other point on the Magdalena River, the results would still be unsatisfactory in the highest degree. It takes from six to sixty days, according to the water, of tedious traveling by river steamer to reach Honda from Barranquilla, a journey fraught with all kinds of risks from shallow water, consequent delays, heat, mosquitoes, and every abomination which can possibly make traveling a burden and an undertaking to be avoided. From Barranquilla, travelers have to go by rail to Savanilla, a place which is no better than an open roadstead, where the ships have to lie at a distance of from one to two miles from the landing stage. This journey from the ship to the railway has to be done generally in a heavy sea and in an open boat, or at best a small tug steamer, under circumstances of the greatest possible discomfort.

By tapping Bogota from the east, as foreshadowed in this letter, passengers will be brought in palace cars, sleeping and dining cars, in forty-five hours from their homes in Bogota direct to the ship's side at Puerto Cabello, under conditions of the greatest possible luxury and comfort attainable in modern railway traveling.

The calculation is for a speed of 15 miles per hour. The number of ocean-going steamers which visit Puerto Cabello in the space of one year is upward of 400. Several first-class European lines send their ships to this port, the best known being the Royal Mail, the West India and Pacific, the Harrison Line (Liverpool), the Compagnie Grato Transatlantique, the Spanish Line (Lopez), the Hamburg-American, and others.

The Red "D" Line, of New York, runs regular steamers three times per month, affording by far the best, safest, and quickest communication between Puerto Cabello and the markets of the United States and Europe. The transit to New York by this line is accomplished in from six to seven days with unerring regularity, and to Europe an average passage takes from seventeen to twenty days.

To Get Rid of Fleas.

Place the common adhesive fly paper on the floors of the rooms infested, with a small piece of fresh meat in the center of each sheet. The fleas will jump toward the meat and adhere to the paper.