For the Scientific American.

Electro-Magnetism as a Motive Power.

Much has been said in disparagement of this power as a prime mover; it has been urged that it is more expensive than steam power, I know of no instance where it has been attempted to prove that it could be made a power as cheap as steam; I would therefore throw out the following observations to the future experimenter in this branch of the arts:—At present the metal used to produce galvanism is zinc, which, being dissolved by sulphuric acid, produces sulphate of zinc, an article of little commercial value. But if we could use some other metal, the residue, or salt, of which would be of some intrinsic value, we might, perhaps, reduce the cost of electro-magnetism to a mere cypher.

Faraday has demonstrated that the amount of galvanism which any battery produces is in exact proportion to the amount of metal consumed; Prof. Hare is of the opinion that we cannot produce galvanism of any practical utility without the consumption of some metal, chemical decomposition is absolutely necessary to produce galvanism, and the power of that galvanism depends on the quantity and the rapidity with which that metal is consumed. Liebig seems to despair of electro-magnetism ever taking a prominent position as a prime mover.

For certain purposes, I admit, it will never be used to advantage, as, for example, in steam-ships or railroad cars, for the very reason that Liebig advances, namely, that one pound of coal produces as much mechanical power as thirty-two pounds of zinc. It is not the expense, but the bulk and the weight of the metal to which I object, for it would require four and four-sevenths times more room to stow away enough zinc to produce as much power as coal, besides being thirty-two times heavier. But for stationary engines, I believe electro-magnetism will, some day not far distant, take the place of steam. It so happens that hitherto the arrangement of the battery has been such, that the salt formed by its action is of no value. In the construction of a galvanic battery, two things ought to be kept in view, viz., economy and power; the former has been sadly disregarded, all the ingenuity of the inventor has been bestowed upon the latter.

I have constructed a battery in which silver takes the place of the zinc, and intric the place of sulphuric acid, the salt formed by this battery—nitrate of silver, is of much use in the arts, and is worth as much as the silver and the acid used in its production, leaving the galvanism produced a net profit.

Mr. Joule has proved that 45 pounds of zinc consumed in a Groves' battery, in 24 hours, are capable of producing one horse power; 45 pounds of zinc, dissolved in sulphuric acid, yield 30 pounds of sulphate of zinc. From the researches of Faraday, it appears that the quantity of the voltaic fluid given out during the solution of various metals, is in the ratio of their atomic weight; accordingly it will require 30·9 pounds of silver to produce the same effect. Now 30·9 pounds of silver will yield 46·69 pounds of nitrate, which is worth $1,12 per ounce, making the salt produced, in a one horse-power engine per day, worth $627,50. Coin silver is worth $1,16 per ounce, accordingly 30·9 pounds of silver are worth $430, leaving a balance of $197,50; my battery consumed 3 dwts. of silver and one ounce of acid in 24 hours; nitric acid is worth $1,12 per pound, accordingly $24,68 worth of acid will be required per day to work the engine, leaving $172,71 to pay for collecting and casting the nitrate into sticks ready for market.

Using mercury and muriatic acid instead of silver and nitric acid, corrosive sublimate was formed, and I have no doubt that many other arrangements can be made in the battery, producing a number of salts, useful as paint, medicine, and for dyeing.

Dr. Boyton has demonstrated that muscular motion is produced by electro-magnetism, and that the brain is the galvanic battery; the nerves the conductors, and the muscles the electro-magnets. Now, if we for a moment contemplate the animal system, we are astonished with the immense power which this small battery exercises, for it is not merely the work which an animal can do that measures its power, but by far the greatest part of its power is consumed in re-production and respiration. Hoffman and Haller say that the heart alone pumps out about seven tons of blood per day.

In the construction of electro-magnets, too, little regard has been had to nature; the muscle of the animal consists of many hundred small fibres; these fibres are hollow tubes, containing many thousand minute globules, only visible by the aid of the microscope, these globules are composed of about 90 per cent. of iron, and are encircled by a nerve, and the galvanic circuit being closed by the will, are rendered magnetic and attract each other, thereby shortening or contracting the muscle. On the circuit being broken, the muscle is again restored to its former position, thereby producing animal motion. It is singular that nature should construct her electro-magnets globular instead of the shape of the horse-shoe, as man has done, the question arises, which of the two is the proper form? I am inclined to think that the former is the best; the matter contained in two globes can be brought into closer attractive proximity, than the same quantity of matter can be brought in any other mathematical figure, and as the power of electro-magnets is rapidly diminished by being drawn asunder; that is to say, gravity is diminished as the square of the distance is increased, but magnetism is decreased in a much more rapid degree. According to R. Hunt, a magnet, in contact with an armature, lifted 220 pounds; when separated only one-fifth of an inch, it was only capable of lifting 40 lbs. It is also necessary that the electro-magnets be made very small, making a powerful magnet by the combination of numerous small ones instead of very large ones. J. F. Mascher.

Philadelphia, 1851.

[For the Scientific American.]

Remarks on Inks.

It is important to have good ink, and as your paper is the best medium for communicating information of this kind to the public, I will make a few remarks of useful import.

The best nutgalls are externally of a dark lead or bluish color. When broken, the internal surface is "brownish, hard, solid, brittle, with a flinty fracture, and a small spot or cavity in the centre, indicating the presence of the undeveloped or decayed insect." Inferior galls are lighter, both externally and internally, sometimes reddish or nearly white, of a loose texture, with a large cavity in the centre, often communicating externally by a small hole, by which the fly has escaped. As it is often the most worthless kind of galls that is kept ready ground for sale, they should not be bought in that state. The poor galls are unfit for making good ink, as I have ascertained by many experiments. It is better not to boil the galls.

Logwood is often added to ink to give it a purple cast, though it soon turns to a brownish black, (about the same color as galls). It is generally thought not to be so permanent as galls, but my experiments, made twelve years ago, with logwood, in place of galls, do not show any fading. Cheap inks are also made with oak bark, &c.

Several of the salts of iron will make ink: the best is the sulphate (green copperas). The copperas of commerce, though not pure, is generally near enough so for our purpose. The crystals only should be chosen. Copperas, by exposure to the air, effloresces, that is, loses its water of crystallization, and falls into a dirty white powder; the iron, or part of it, at the same time, passes into the peroxide. The same effect can be produced by calcining it; the powder and galls will make a black ink at once, but for reasons which will be explained, the green sulphate is much preferable.

One part of green copperas to two parts of galls, I believe to be the right proportion for durability. If the galls are increased (the other articles remaining the same) to three or four parts, the ink appears to be very little, if any stronger. When the copperas is increased up to equal the galls, the color, too, is somewhat increased. More copperas than this adds nothing to the color, and is hurtful. Lewis, and some others, recommend three parts of galls to one of copperas, on the supposition that the iron, being stronger than the gallic acid, overcomes it after some years, and the ink fades for want of a larger proportion of the gallic acid. As only about one-fifth of the weight of green copperas is iron, it will be seen that when metallic iron is used, it must be diminished somewhat according to that proportion. Cast-iron, steel, scales of iron, iron rust, &c., will not answer. It must be wrought-iron, (turnings or fine wire) and vinegar, or some vegetable acid used with it.

It was recommended by Lewis to add a piece of metallic iron to the ink, probably with the view of its taking up any free sulphuric acid which might be in the copperas. A very small piece, or a few filings might be beneficial, but too much is too much, even of iron.

A small proportion of the sulphate or of the acetate of copper, seems to add somewhat to the intensity of the blackness of new ink, but it causes a considerable precipitate, and I think on that account it is best left out.

Gum arabic or senegal, and sometimes sugar, is used to assist in keeping the coloring matter suspended, to prevent the ink from spreading, and to give a it lively appearance.

Clean rain water has no lime or other saline impurities in it, and therefore should always be preferred to well and spring water for making ink. The rain that falls in the first part of a shower, after a dry time, is not so clear as what comes afterwards. Water is the only fluid necessary, but the substitution of a small proportion, say one-fourth part of vinegar, will do no harm. A large proportion makes the ink strike too deep into the paper, and disposes it to spread. Stuff, called vinegar, sharpened with oil of vitriol or the like, is of course destructive to ink.

When the ink is made strong, there is a less proportion of sediment than when diluted. To prevent ink from moulding, add two grains of corrosive sublimate to each pint, previously dissolved in a little spirit. Arsenic, I suppose, would do as well, as both of these poisons are destructive of vegetation (mould).

For a permanent black ink, I suppose the following recipe is equal to any:—

Blue galls, pulverized, 8 ounces.

Gum arabic, 4 ounces.

Green sulphate of iron, 4 ounces.

Rain water, 6 pints.

An ink which I have made for several years, and found to give very general satisfaction, is as follows:—

4 lbs. galls, bruised. 2½ lbs. copperas. ¼ lb. extract of logwood. 1½ lbs. gum arabic. 8 gallons of rain water. All put together in a non-metallic vessel, and shaken or stirred with a wooden stick several times a day for two or three weeks; then, after settling, decanted and poured into bottles and tightly corked. If the ink is warm when put in the bottles, they may be filled up so as to leave very little air in them without danger of their breaking.

When first poured from the bottle this ink is quite pale; but, on exposure to the air, it soon acquires oxygen, thickens up, and becomes black; and, at the same time, the blackness is disposed to separate from the liquid, and settle to the bottom; hence Japan ink, or ink already black, is not the best for writing with, for the coloring matter, instead of being in solution, is precipitated, or merely suspended in the liquid by means of the gum arabic, and unless it is frequently shaken, a considerable portion of the strength is at the bottom of the inkstand. It is therefore better to write with the ink in its pale or unoxigenized state, as from its thinness and clearness it flows freer, makes a cleaner mark, and looks better on paper. In a few hours after the writing it shows a strong color, and in a few days it is perfectly black, and you are assured of its remaining so, for the whole strength of the ink is there. All you want at the time is color enough to see to write by, and there will always be peroxide of iron enough in the copperas for that.

Blue Ink.—Much of the prussian blue of commerce will not make blue ink, unless it is digested in muriatic acid and washed. The right kind is now called Paris blue; it is of a deep, rich, purple color, when dry; 1 oz. of it, and ½ oz. oxalic acid, and 3 pints of rain water shaken together, will at once make a good blue ink. I have found gum arabic worse than useless, as it causes a sediment.

Red Ink.—If you can get the right article of Brazil wood the following will make a pretty ink.

Boil 4 oz. of ground Brazil wood in two pints of good vinegar down to 1 pint, strain, and add ½ oz., each of powdered alum and gum arabic, and if you wish it still more glossy, ½ oz. loaf sugar.

A pale green ruling ink is made of 1 oz. powdered verdigris, ½ oz. cream tartar and 8 oz. water. A. D. Sprout.

Chillicothe, Ohio.

Curious Effects of Excitement.

"My head is gray but not with years."

"A young man, twenty three years old, came from the mines to San Francisco, with the intention of soon leaving the latter place for home. On the evening of his arrival, he with his companions, visited the gambling saloons. After watching for a time the varied fortunes of a table, supposed to be undergoing the process of 'tapping' from the continued success of those betting against the bank, the excitement overthrew his better judgement, and he threw upon the 'seven spot' of a new deal, a bag which he said contained $1,100, his all—the result of two years' privation and hard labor—exclaiming, with a voice trembling from intense excitement, 'My home, or the Mines.'

As the dealer slowly resumed the drawing of the cards, with his countenance livid from fear of the inevitable fate that seems ever attendant upon the tapping process when commenced, I turned my eyes upon the young man who had staked his whole gains upon a card; and never shall I forget the impression made by his look of intense anxiety, as he watched the cards as they fell from the dealer's hands. All the energies of his system seemed concentrated in the fixed gaze of his eyes, while the deadly pallor of his face bespoke the subdued action of his heart. All around seemed infected with the sympathetic powers of the spell—even the hitherto successful winners forgot their own stakes in the hazardous chance placed upon the issue of the bet. The cards are slowly told with the precision of high-wrought excitement. The seven spot wins. The spell is broken—reaction takes place. The winner exclaimed with a deep drawn sigh, 'I will never gamble again,' and was carried from the room in a deep swoon, from which he did not fully recover until the next morning, and then to know that the equivalent surrendered for his gain was the color of his hair, now changed to a perfcet white."

[The above is from the Boston Medical Journal, which would not surely publish a fiction. We have heard of a number of such cases, but have always been skeptical about them, because we never saw a person who was so transformed.

Great Discovery of Lead Ore.

The Galena (Ill.) Advertiser gives an account of the discovery of lead ore, which promises to surpass anything of the kind on record. It was made about two miles north-east of the Linsipheur Mound, is two miles distant from any other diggings, on a farm in the prairie, and was made by a boy finding mineral in a creek. "On examining the bottom of this creek, it was found to be almost a solid mass of lead ore for some ten or twelve feet in width. Some three or four holes have been sunk about four feet in the clay, on each side of the creek, and specimens of large block mineral taken out, weighing from fifty to one hundred pounds. This ore lies between the clay and rock, forming a horizontal floor, and has been proven on one side of the rock for fifteen feet in width. This discovery may be considered as a new feature in the development of the resources of these mines—it being in a district of country that has been laid open, on the prairies, till the last few years, and was not considered as mineral ground by a majority of the old miners, and it adds another evidence to prove how little is known of these mineral formations. It is impossible to estimate the probable value of this discovery. There is none of that change of ground on either side of this discovery, which has invariably terminated the veins of ore throughout these mines, and there is reason to believe it lies immediately between Hazel Green and North Fairplay diggings, and that it is an east and west vein, forming a link in the subterranean network of veins, connecting these two mining districts.

By the latest news the Crystal Palace was still standing and many hoped it would be permitted to do so.