

Honigmann's Fireless Locomotive.

The fireless engine of Mr. Honigmann has created a considerable stir on the Continent, and has been hailed by some of our contemporaries as an epoch-making invention for which they predict a future more brilliant than that of electricity, as the new engine will run and work anywhere without any conductive connection with some station being necessary. When the boiler has been charged the engine is ready for use, and works like any ordinary engine; but after the steam has performed its ordinary duty in the cylinder, it supplies, by becoming condensed, the heat which produces a fresh portion of steam, and the more quickly the piston works the more force will be liberated. The engine thus appears to be its own source of power, and to savor somewhat of the *perpetuum mobile*. The limit of action, from want of coal in the ordinary case, here sets in with want of strong caustic soda, which by the continuous absorption of steam finally becomes too diluted.

When the engine has thus exhausted itself, both the water and the soda solution have to be drawn off, the soda to be concentrated again by evaporation, the boiler to be refilled with water of the required temperature. A continuous process is, therefore, with the present arrangement at any rate, impossible. To Mr. Honigmann is due the high merit of having ingeniously applied and rendered fit for commercial, and under certain conditions effective, use, a principle which, although known long before the idea of practically applying electricity was more largely ventilated, and although its utilization did not necessitate the removal of the numerous obstacles which barred the progress of its now so successful rival, has still remained undeveloped until now, when general attention seems to be rather diverted from the steam engine.

In England the first observation of the property of saline solutions to become by the absorption of steam heated up to their own higher lying boiling points, was probably made by Faraday. When about to publish his discovery in the *Journal* of the Royal Institution, Faraday was informed by Dr. Ure that, according to M. Clément, the fact was already known in France, and he decided in consequence to refrain from any publication in the *Journal* of the Royal Institution, but to send a detailed report on his researches to the *Annales de Chimie et Physique*. His communication was printed with some remarks from the pen of Gay-Lussac (then editor, together with Arago), which remarks Gay-Lussac trusted would not be interpreted by Faraday in an unfavorable way. Faraday held a thermometer in a current of steam until the mercury steadily marked 212° ; then when a little powdered niter was placed on the bulb, the mercury rose up to 234° . Various other salts, sugar, and also caustic potash gave similar results, the potash being particularly effective for two reasons.

Pure water has, under normal pressure, one fixed boiling point beyond which it cannot be heated. By adding particles of any soluble substances (the mere suspension of earthy matter, etc., would not make any difference), the boiling point is raised as these particles condense the vapor, and the heat thus liberated is capable of further heating the solution. The production of artificial cold by mixing snow and ice is due to the same cause, although the effect is the very opposite. In the case of caustic potash or sulphuric acid, this effect is increased by the heat generated by the chemical combination of the respective body with water. Whether there is really a difference in principle between an ordinary, physical solution of sugar, for instance, in water, and the chemical, combination productive of great heat, between potash and water, as Faraday then assumed, is still an open question; the majority at present perhaps deny such a difference.

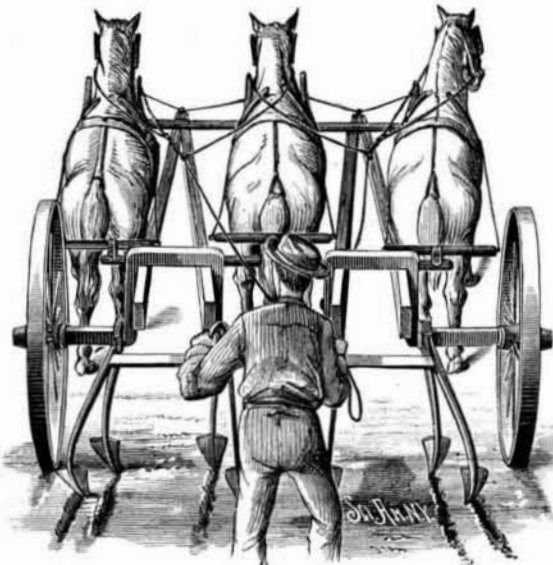
Faraday further observed that the same additional 22° , which may be imparted to a niter solution by steam of 212° , would also result from a similar treatment with overheated steam under high pressure; but he did not believe that this peculiarity of saline solutions would admit of any practical application besides, perhaps, heating sirups and lyes. He also mentioned that the ignorance of this fact had led to erroneous statements about the temperature of steam, which, in his opinion, was always 212° , no matter whether it arose from pure water or salt solutions; a thermometer placed above a boiling mixture might indicate higher temperature, because particles splashed on to the bulb would create an increase of temperature if the bulb was not carefully kept clean.

Guy-Lussac disagreed as to the temperature of vapors. This is another not quite settled question; in general, however, Gay-Lussac's views are at present indorsed, and have been confirmed also by the more recent investigations of Mr. Magnus, who found that the vapor above a liquid becomes continuously hotter with the liquid itself, though probably not to the full degree, the vapor remaining a little the cooler of the two. Gay-Lussac held, both on theoretical and experimental evidence, that the temperature of a vapor must be that of the liquid film with which it is in immediate contact. So long as the steam is not formed in abundance it will not show a temperature higher than 212° , because it is easily cooled again, having a comparatively low heat; if all cooling, however, is prevented and steam is produced in abundance, the above law will be proved correct. In a water column 33 feet high, capable of balancing the atmospheric pressure, vapor of 251° can be formed in the lower part; in entering higher strata with less pressure this vapor will become dilated and cooled; and finally escaping at the surface, it will only have the temperature of boiling water.

Saline solutions, however, capable of condensing steam in proportion to the molecular affinity of the respective salt, will yield steam of their own temperature. With regard to the historical side of the question, Gay-Lussac adds that he, as well as Clément and Desormes, had made Faraday's observations a dozen years previously; none of them had written about it or more minutely investigated the matter, as this peculiarity was a necessary consequence of the power of salts in solution to retard ebullition; and because it would follow that the temperature to which a saline solution might be raised by absorption of steam must be that of its own boiling point, a fact which Faraday's experimental table published on this occasion confirmed. We cannot say that this peculiarity has been forgotten, as the experiment is not unfrequently made in physical laboratories; yet none before Mr. Honigmann seems to have perceived how easily and effectively it can be rendered useful.—*Engineering*.

IMPROVED CULTIVATOR.

On the axle, which is arched twice, as shown in the accompanying engraving, are hung four double plows, or four sets of double shovels similar to those used in ordinary cultivators. These are united in pairs by connecting rods, so that one handle attached to each rod serves to raise or lower both plows of the pair, thus making it necessary to have but two handles. To the arches of the axle are connected two shafts arranged for using three horses. On the shaft near the axle are double whiffletrees, and upon the outer ends of the shafts are neck yokes, the use of these being to equalize the load. With a cultivator of this description two rows of corn can be operated on at once, and with

**FLOWERS' IMPROVED CULTIVATOR.**

less time and labor than with two ordinary corn cultivators. This cultivator has been patented by Mr. William J. Flowers, of Rondo, Mo.

Mr. Cromwell Fleetwood Varley, F.R.S.

We regret to announce the death of Mr. Cromwell Fleetwood Varley, which took place September 2, at his residence at Bexley Heath, Kent. For some years past Mr. Varley had been incapacitated by failing health from the active pursuit either of business or science, and consequently the prominent place which he once held in the scientific world has been filled by others, and his name had dropped out of the catalogue of those to whom the public looks for "light and leading." But those of our readers who can recall the intense national interest which was evoked by the early attempts to lay a submarine cable between this country and America, will remember the prominent position which "Varley the electrician," as he was often called, then held in the general esteem. The first cable was a failure, and the confidence of investors was shaken in the possibility both of successfully accomplishing the undertaking and of turning it to commercial account, even if completed. Before the project for the second cable was published, it was referred to a committee consisting of Stephenson, Fairbairn, and Varley to report as to its capabilities and the probability of its success. It was at this time that Mr. Varley struck the idea of making an artificial line, composed of resistances and condensers, which should exactly represent the working conditions of a submarine cable. The resistances corresponded to the copper conductor, while the condenser reproduced the induction which takes place between the two sides of the di-electric, and thus by aid of the artificial line it became possible to predicate the speed of signaling through any proposed cable, and a subject which up to that time had been much obscured, was placed upon a scientific basis. As a result of his experiments and calculations Mr. Varley offered to guarantee that the proposed cable should transmit fifteen words a minute, but in deference to a cautious suggestion from Mr. Stephenson he publicly announced that the rate would be at least twelve words; events showed that his first estimate was by no means too high. Afterward Mr. Varley read a paper at the Royal Institution upon this subject, when his lucid explanations and practical demonstrations contributed greatly to the restoration of public confidence in Atlantic telegraphy, and to the renewal of that most important enterprise.

Mr. Varley was born in 1828, and consequently had completed his fifty-fifth year. He was named after two of his ancestors, Oliver Cromwell and General Fleetwood, from both of whom he traced his descent in a direct line with exceedingly few intermediate links. Bridget Cromwell, the daughter of the Protector, married General Fleetwood, and one of their descendants, a Miss Fleetwood, was Mr. Varley's mother; it was therefore not without cause that her son bore two such distinguished names. His education was obtained at St. Saviour's, Southwark, where he was a school-fellow of the present Sir Sydney Waterlow. After leaving school he soon became connected with telegraphy, and through the influence of Mr. Fothergill Cooke, he was engaged in 1846 by the Electric and International Telegraph Company, with whom he remained until the acquisition of the telegraphs by government, when he retired into private life, spending his time in bringing out new inventions in connection with his favorite pursuit. During the early part of his business career he attended lectures at the London Mechanics' Institute, and in connection with his brother, Mr. Cornelius Varley, he inaugurated the chemistry class there.

The first improvement Mr. Varley introduced in telegraphy was the "killing" of the wire, by giving it a slight permanent elongation, which breaks out the bad places, and removes the objectionable springiness, which results from the drawing process. Next he devised a method of localizing the faults in submarine cables, so that they could be easily found and remedied; in 1854 he patented his double current key and relay, by which it became possible to telegraph from London to Edinburgh direct; then came his polarized relay, his English patent anticipating by two days the date of Siemens' German patent for a like invention. His next improvement was the translating system for use in connection with the cables of the Dutch lines, and by its means messages were sent direct from this country to St. Petersburg with the aid of two intermediate relays. In addition to these there were a multitude of smaller matters which, although of great importance in their day, have now been superseded, and to a great extent forgotten. In 1870 Mr. Varley patented an instrument which he called a cymaphen, for the transmission of audible signals, and it is claimed for him that it contains the essentials of the modern telephone. However that may be, a year before the date of the Bell patent, music was transmitted by this instrument from the Canterbury Hall in Westminster Bridge road to the Queen's Theater in Long Acre, over an ordinary telegraph wire, with complete success.

In 1865 Mr. Varley was elected a member of the Institution of Civil Engineers, and later a fellow of the Royal Society. He likewise took great interest in the establishment of the Society of Telegraph Engineers, of the Council of which he was a member. He was twice married, and leaves two sons and two daughters.—*Engineering*.

Solubility of Uric Acid.

An accumulation of uric acid in any part of the body brings with it serious results, among which may be mentioned gout, stone, gravel, etc.

The usual method of removing such deposits consists of the free use of alkaline mineral waters.

Jahn tested the solvent power of a series of salts in solutions of 1 part to 200 water. He found that one part of lithium carbonate would dissolve 3.51 parts of uric acid. Next in value to this are sodium bicarbonate (baking soda), sodium monocarbonate (sal soda), and borax, which dissolve 1.25, 0.98, and 0.83 part of uric acid respectively. The benzoate of lithium and borocitrate of magnesium have very slight solvent powers; sodium chloride and sulphate and lithium chloride had no effect on it.

Experiments were also made with natural mineral waters (European), with the following results:

200 c. c. of Vichy (Grande Grille) dissolved.....	0.765	grm.
" Biller sauerbrunnen.....	0.587	"
" Carlsbad sprudel.....	0.546	"
" Ems krahnenchen.....	0.515	"
" Marienbad (kreuzbrunn).....	0.471	"
" Wiesbaden (kochbrunn).....	0.243	"
" Distilled water, dissolved.....	0.0214	"

These experiments prove that the carbonates alone, both of the alkalies and alkaline earths, increase the solvent powers of mineral waters over uric acid. Also that when sufficiently diluted their solvent power is directly proportional to their percentage of these salts.—*Arch. Pharm.*, xxxi, 511.

Motors for Balloons.

In a late number of the *Aéronaut*, David Napoli, President of the Société de Navigation Aérienne, examines the comparative desirability of steam and electric motors for propelling long balloons. He found that a twenty horse steam engine, working for ten hours, would consume 200 kilogrammes of coal and 1,400 kilogrammes of water. An electric engine of twenty horse power, with all its supplies for ten hours' service, would weigh about 1,400 kilogrammes, which is less than the bare consumption of material in the steam engine, leaving out of the question the weight of the generator and of the mechanism of transmission.—*Chron. Industr.*

TAR may be readily removed from the hands by rubbing with the outside of fresh orange or lemon peel, and wiping dry immediately. The volatile oils in the skins dissolve the tar, so that it can be wiped off.