Imported Matches.

Residents and strangers in New York city must have noticed, during the latter part of the summer, the offering for sale on the streets of matches in boxes of foreign appearance, the price asked being lower than that of our domestic matches. These foreign matches are as different as their nationality, for they come from Switzerland, Bohemia, Italy, and Sweden. Those from Italy are especially attractive, being in reality miniature paraffine candles, having a fine cotton wick and being only about one and a half inches long. They burn with a clear, white flame, and last a sufficient time to light several lamps. They are put up in neatly embossed boxes with a sliding drawer that opens by a bit of concealed elastic cord, and closes by the same means on being slightly pushed back. The other sorts are similar to those manufactured here.

Why these foreign matches are now for the first time introduced in large quantities to this market is explained by the Act of Congress, by which the tax of one cent on each one hundred matches, whether domestic or foreign, was removed July 1. This tax was more onerous on foreign makers than on our home manufacturers, because, as the government required that the attaching of the stamps should be done while the goods were in bond, and by customs officials, it proved an expensive operation and generally necessitated the repacking of the small boxes by reason of the destruction of labels, wrappers, and oftentimes the boxes. The domestic manufacturers made a slight reduction in price on the removal of the stamp tax, but it was less than the amount of the tax. Although there has been no reduction in the duty on imported matches, there has been a change in the conditions and expenses attendant on their importation by reason of the removal of the stamp tax, that enables our merchants to import Swiss and Bohemian matches, and after paying the government the thirty-five per cent duty exacted, sell them to the dealers at a lower price than is asked for the domestic monoply matches.

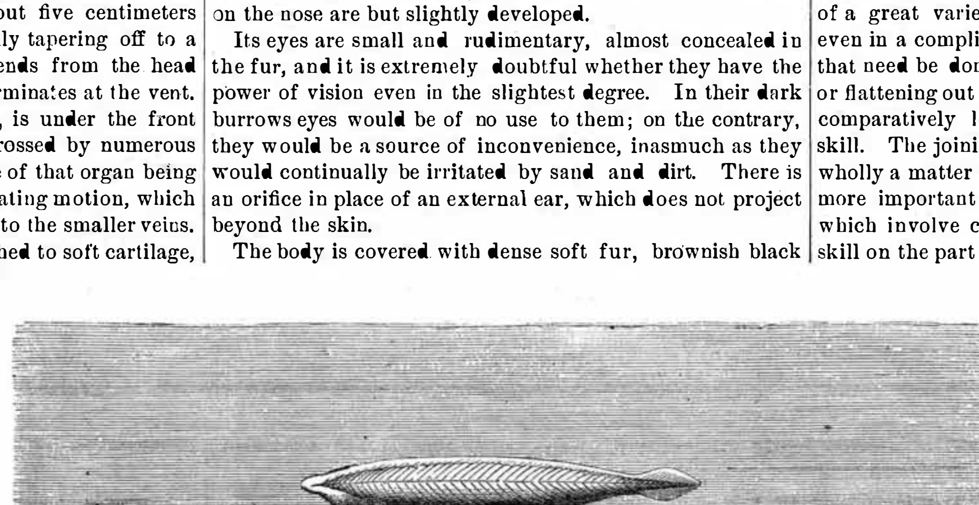
Cement for Milk Glass.

Waechter describes the following method of preparing a white enamel for joining milk glass:

Melt together three parts of red lead, two of white sand, and three of crystallized boracic acid in a Hessian crucible. The melted mass is poured out on a plate of metal and finely pulverized. This is mixed with gum tragacanth and applied to the glass and the pieces pressed together. Finally it is heated in a muffle, but not enough to entirely melt the enamel, but only soften it enough to make it unite with the glass.

THE LANCELET FISH.

The lancelet (*Amphioxus lanceolatus*) has so little similarity to other members of the fish family that for a long time it was undecided whether it belonged to the vertebrate or invertebrate class. Its body is about five centimeters long, slender and angular, symmetrically tapering off to a point at each end. A slender fin extends from the head around the extremity of the tail and terminates at the vent. The mouth, a mere longitudinal fissure, is under the front part of the body, and its orifice is crossed by numerous cirri. This fish has no heart, the place of that organ being taken by tubular vessels having a pulsating motion, which drives the transparent, colorless blood into the smaller veins. It has no bones, the muscles being attached to soft cartilage, and the spinal cord is not protected by a bony covering. The body is covered by a delicate skin without scales. It is found in the seas of the torrid and temperate zones. It lives in the sand, in which it buries itself, and being so nearly the color of the sand, it is completely concealed, and is often only perceived when the sand is washed through a fine meshed sieve. Probably, wherever it makes its appearance it is far more abundant than is generally supposed. If it is necessary for it to leave the sand, it swims through the water with a gliding, serpent-like motion, and with the quickness of an arrow, but in a short time it embeds itself again in the sand. Mr. Couch was the first captor of this fish on the British coast, and found his first specimen in the sand about fifty feet from the receding tide. He says that when swimming the head can hardly be distinguished from the tail.



THE LANCELET FISH.

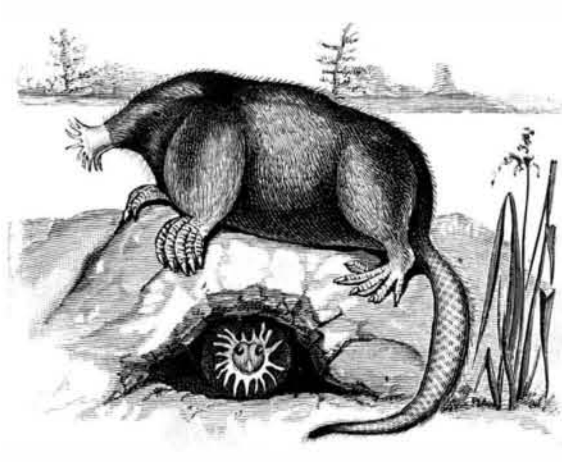
Mr. Wilde put one of these fish in a tumbler of water. "It moved around the glass like an eel, and, although no eyes were perceptible, it avoided the finger or any substance put in its way, stopping suddenly or turning aside from it." The mouth is surrounded by cilia, the motion of which causes the passage of water for food and for breathing.

These fish have a peculiar and remarkable power of attaching themselves to each other, sometimes clustering together, sometimes forming a string from fifteen to twenty centimeters long. In the latter case they swim in unison, with a serpent-like motion. When swimming in a line they adhere to each other by their flat sides, the head of one coming up about one-third on the body of the one before it, as seen in the engraving.—*From Brehm's Animal Life.*

THE STAR NOSED MOLE.

The star-nosed mole is strictly an American animal, and its genus is confined to America alone. Its great peculiarity lies in the strange formation of its nose, or rather its nasal appendages. The muzzle, which is a kind of cartilaginous disk, sending out about 20 fibers or feelers, when viewed from the front has the appearance of a star, hence the common name, "star-nosed." The two cartilaginous fibers situated beneath the nostrils are the shortest. The use of this radiating process has not been fully ascertained, but it is quite probable that it is extremely sensitive, and is used for detecting the presence of its prey. It always touches or feels an object with this "star" before swallowing it.

The star-nose is subterranean in its habits, and rarely quits the ground, at least during the day, and hence it is seldom seen. It is generally found in moist valleys along the banks of streams, and consequently does not damage gardens and lawns by digging furrows through them, like the common mole. Its food consists of earth worms, and the grubs of beetles, cicadas, and other ground dwelling insects. In captivity it will eat raw meat of any kind.



THE STAR NOSED MOLE.

During the breeding season the tail of the star-nose becomes greatly enlarged, and this form has been described as a *new* species. Its fore feet, like all the moles, are very powerful for the size of the animal, and are formed for burrowing in the ground. It makes rapid progress in soft earth, but upon the surface its movements are awkward and slow.

Its nest is large, and composed of withered grasses and leaves, and is mostly situated in an excavation beneath a stump or log. In the very young animals, the radiations on the nose are but slightly developed.

Its eyes are small and rudimentary, almost concealed in the fur, and it is extremely doubtful whether they have the power of vision even in the slightest degree. In their dark burrows eyes would be of no use to them; on the contrary, they would be a source of inconvenience, inasmuch as they would continually be irritated by sand and dirt. There is an orifice in place of an external ear, which does not project beyond the skin.

The body is covered with dense soft fur, brownish black above, a shade lighter beneath. The length of the body of the star-nose is about 5 inches, and of the tail 3 inches.

C. FEW SEISS.

A Natural Refrigerator.

It is a remarkable fact that while brewers expend an enormous amount annually on the construction, maintenance, and working of refrigerating machines, they have at hand an unlimited supply of natural cooling power, which might be obtained at a merely nominal outlay. The waters from very deep wells come to the surface at a temperature which altogether preclude their use for refrigerating purposes, and in London, where company's water is very frequently used, it is occasionally delivered at the brewery in summer time at 70° Fah., and upward. As brewers require to bring their worts down to about 55° Fah. prior to pitching, and subsequently have to use a large volume of water at less than this temperature for attemperating purposes, some artificial refrigeration becomes a necessity. Now, the earth at a certain depth has a constant temperature lower than those we have named; for about 24 feet down the temperature of the crust of the earth is influenced by the climate and the season, but at from 24 to 36 feet the temperature in all climates and in all seasons remains nearly constant, only varying about 5° Fah.; the temperature of the earth at 30 feet from the surface is always about 51° Fah., and this is the natural refrigerator we refer to. If water from a very deep well or from any other source where the temperature is considerably higher than 51° Fah. were conveyed down again into the earth to the depth of about 30 feet, and there run through a considerable length of thin metallic piping, it would necessarily give up its heat, and on being forced again to the surface would have a temperature closely approximating to 51° Fah. The construction of such a natural refrigerator ought not to be impossible or impracticable; the water should pass through a wide tube in its downward course, and at a temperature of about 30 feet be distributed through a number of smaller horizontal tubes made of some good conducting material, and then be collected again into a single tube of large diameter, made of or covered with some non-conducting material, by which the water would be forced to the surface again, and at a temperature very little in excess of 51° Fah. At this season of the year such a system of refrigeration would be invaluable, and the only expense after the first cost of laying down the pipes would be the cost of pumping. As the stratum of earth surrounding each horizontal tube would gradually acquire the temperature of the warm water passed through it, it would be necessary to provide a number of cooling tubes, so that while some were in use, others a little distance apart would be gradually acquiring the mean temperature of earth again.—*Brewers' Guardian.*

The Cost of Wrought Iron Framing.

It is a fact quite worthy of note in connection with the use of wrought iron bars and plates, in the more modern designs of roofs and other similar framed work in buildings, that the amount of what may be called blacksmith's work, or forged pieces, has steadily diminished in quantity and in complexity until now there is very little of it left. This fact does not by any means indicate that the fitting or joining of the parts has been slighted, or been done carelessly, but it is due to the constant study of those who plan such work to simplify the whole, so that the usual range of work called for may be reduced in cost to the lowest practicable limit, and also, an equally important thing, so that there may be the largest possible inducement for the use of such work in new directions.

This need of simplicity of construction and of reduced cost has led to the furnishing by many rolling mills of bars of a great variety of forms, so that in the use of them, even in a complicated piece of framing, the only hand labor that need be done is found to be the bending, or twisting, or flattening out of these bars, all of which can be done at a comparatively low heat, and by men of very moderate skill. The joining of such parts has come to be almost wholly a matter of the fitting of plain pins, turned for the more important work, and the driving of rivets, all of which involve care and skillful oversight, but no special skill on the part of the individual workmen themselves.

For some of the tension rods, and similar parts, of iron frames there will probably always be some welding needed, as these members are usually made of the best iron, and hence, to save cost, must be kept as light in weight as possible. Hence the need, in the ends of these parts, for joining them one to another, of a welded eye, so that the fullest strength shall be maintained for the size of bar used, or more correctly, so that the full strength shall be preserved throughout every part of it when made up into the finished form. In the forming and welding of these eyes the smith's work is of the most elementary sort, the bending of the end back upon itself, and the making of the simplest form of a scarf weld, being the whole of it.

The great care which has thus been given to these details of design, both in the ideas involved in the combination of parts, and in the putting of them into the forms of actual construction, has led to very large reductions in cost price of all such work, and hence to an expansion of the business of making wrought iron framed work which is nearly incredible, even to those who have been familiar with each step of this advance during its progress.—*P. Barnes, in the Industrial World.*

Now that the exploded boiler of the Riverdale has been thoroughly inspected, some one suggests if it would not be well for the boilers of certain other steamboats to be inspected before they burst; and we beg to ask whether it would not be well to have an examination made as to the capability and practices of some of the steam boiler inspectors.

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.

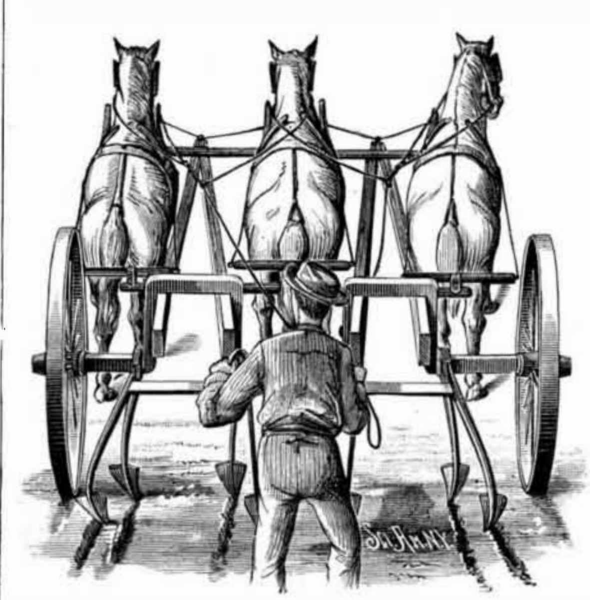
Faraday further observed that the same additional 22°, which may be imparted to a niter solution by steam of 212°, would also result from a similar treatment with overheated steam under high pressure; but he did not believe that this peculiarity of saline solutions would admit of any practical application 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 possibilty 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 schoolfellow 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.
"	Biliner sauerbrunnen	0·587	"
"	Carlsbad sprudel	0·546	"
"	Ems krahnchen	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 Sociéte de Navigation Aerienne, 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.