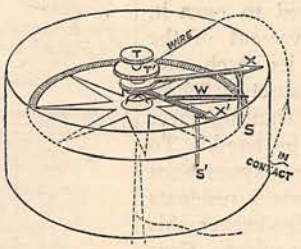
THE GATHERER.

A Standard Scale.

The standard pair of scales which has been recently completed for the International Bureau of Weights and Measures, Paris, is a masterpiece of mechanical skill. The scale is intended to compare the normal kilogram weights of all countries with the standard in the possession of the said Bureau, and to measure the difference, if any, between them. The weighings are performed in a vacuum, and the delicacy of the apparatus is such that the person manipulating it requires to do so at a distance of six feet, since at a shorter range the natural heat of the body would affect the instrument and vitiate the results. This wonderful piece of mechanism was constructed by Herr Paul Bunge, of Hamburg, in a period of eight months.

A Tell-tale Compass.

The accompanying engraving represents a detector mariner's compass which has been patented recently. An ordinary compass-card carries two magnetised needles on its lower surface, while attached to the centre of the upper surface is a metal bar W, that moves with the card. A couple of milled heads T T′, placed outside the glass lid of the compass-box, are fastened to the pivots that bear the index arms X X′, which are placed within the box. The free ends of these index arms carry heavy platinum wires S S′. The captain proceeds to set the tell-tale compass, having first, however, directed the course which he wishes to be followed by placing the arms X X′ at a greater or less distance from the bar W, according as he determines to steer loose or close. The point carrying the card is connected to one pole of a constant battery, and the milled heads (with the index arms and platinum wires) are connected with the other pole. A bell placed in the circuit rings whenever the motion of the ship brings the bar W in contact with one of the platinum wires, which are heavy enough to turn the card against the polarity of its needles. Consequently the bell—which is secured in the lid of a resonant box containing the whole apparatus—continues to ring with a sound that is audible in any part of the vessel above the vibration of the engines, until the ship has been brought into her proper course. It is clear that any carelessness on the part of the steersman in carrying out the captain's instructions will certainly be announced by a tongue that lieth not; and Mr. Severn's detective compass must prove of considerable value to masters of vessels.



A New Theory of Dew.

It is usually held that dew is formed by moisture in the air coming in contact with the colder surface of the earth, and thereupon condensing into films and globules of water; but Professor Levi Stockbridge, an American, has made a series of experiments which would imply that dew, in summer at least, is formed also by the converse process, namely, by vapour rising from the warm earth, and condensing upon meeting the cooler air above. The professor's experiments prove that in summer the surface of the ground is warmer than the air lying over it, and that the warmer soil parts with some of its moisture during the night. Hence it is, perhaps, that plants nearest the soil have most dew, and that dew is often formed under hay-cocks, boards, and other objects on the ground, which ought, according to the old theory, to screen the place beneath them from what is termed "dew-fall."

An Electrical Railway.

Applications of electricity as a motive-power continue to be made; and one of the most interesting contrivances at the Industrial Exhibition of Berlin this year is a small electrical railway, put up by the celebrated firm of electricians, Messrs. Siemens and Halske, the chief of whom, Dr. Werner Siemens, was recently awarded a gold medal by the German Emperor for his services to science. The railway is over 200 yards long, and it is traversed by three carriages, carrying twenty passengers in all. There is an electric locomotive to this tiny train, the wheels of which are driven by power derived from a dynamo-electric machine, which is rotated by the current from another dynamo-electric machine, driven in turn by a steam-engine.

A very promising electric motor has been recently constructed in France by M. Marcel Deprez, and a similar experiment is to be tried with this apparatus at the Palais de l'Industrie, Paris. By means of a Deprez motor, a power equal to the strength of a man can be obtained from the electric current drawn from twelve Bunsen elements, and its capacities are being tested in the control of captive balloons.

Hardening Plaster Casts.

The following new process for giving plaster casts the exterior hardness and aspect of marble has recently been published by a German chemist:—Three pounds of alum are to be dissolved in 3½ pints of water, and the cast is to be steeped in the warm solution for from fifteen to thirty minutes. It is then to be taken out of the bath, and the liquid allowed to drain off. When cold, a concentrated solution of alum is to be poured over the whole, and the cast is then permitted to dry, after which it is to be polished with sand-paper, and finally cleaned with a piece of wet calico.

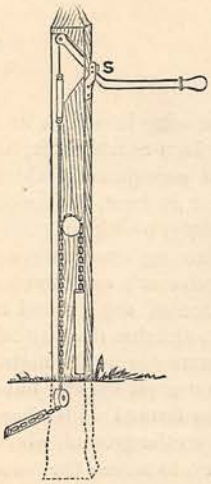


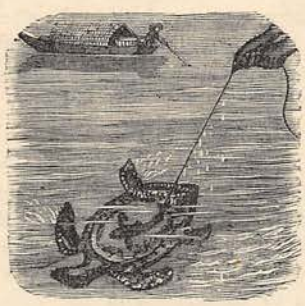
FIG. 1.

A New Self-swinging Gate.

It is to the Rev. R. W. Pound, Head-Master of Appuldurcombe School, Isle of Wight, that we are indebted for this useful gate, which can be opened by the driver of a vehicle, or a rider, without leaving his seat, or by a person on foot, by means of a lever resembling that of a railway signal, and which can also be shut after driving through. The lever (see Fig. 1) is mounted on a post situated beside the roadway, at some yards from the gate. For each gate there are four such lever-posts, two on each side of the gate, to serve for a going or coming vehicle. Each lever works a chain which, by an arrangement of pulleys, runs to the lower hinge of the gate, to which it is connected by a second short lever (see Fig. 2). The gate is opened and closed by working this second lever, through the medium of these chains. One of the levers on either side of the gate is used to open it, and the other to close it. The movement of the opening lever raises the gate out of its catch, and causes it to swing open steadily and surely. When open it cannot shut again until the shutting lever is acted on, unless it be pushed to by hand. To country gentlemen whose houses are approached by a succession of gates, or to suburban residents who keep a carriage but have no lodge-keeper, this contrivance is likely to prove very convenient. Four gates so fitted have been in constant use for months at Appuldurcombe, Isle of Wight; and the apparatus was exhibited at the recent Royal Agricultural Show, Kilburn.

A Curious Mode of Catching Turtle.

In the neighbourhood of Cuba, the briny deep is tenanted by a curious animal called the remora, or



sucking-fish, which has a peculiar kind of oval-shaped disc on the top of its head in the place where the scales ought to grow. The surface of this disc is crossed transversely by cartilaginous plates disposed like the laths in a Venetian blind. On the under surface of each lath are hook-like projections connected with the skull and backbone, while the upper surface is furnished with a saw-like edge of fine teeth. The office of this apparatus is partly suctorial and partly prehensile, and by its means the remora is enabled to fasten itself to rocks, ships, floating timber, and other fish (particularly sharks).

The natives of Cuba take advantage of this habit of the remora, and use the fish in catching turtle. A ring is attached to the tail of the revé, as the creature is also called, and held by a stout line formed from the fibre of the palm-tree bark. When the boatmen set out on a hunting expedition they take a number of the remoras with them in a tub, and as soon as the spoil comes in sight a revé is despatched. No sooner does the living fish-hook discover the turtle than it quietly fastens itself with a grasp so tenacious that it will allow itself to be torn in pieces rather than surrender its prey, though when the capture has been effected the remora by a peculiar manipulation is made to relax its hold. The revé catches turtles, but not for itself, and the mode of fishery is certainly barbarous.

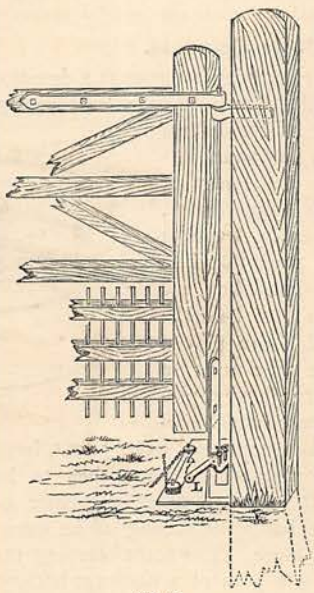


FIG. 2.

A New Underground Telegraph.

Overhead lines of telegraph are liable to many interruptions from storms upsetting the posts, or rubbish collecting on the wires, and there is at present a movement in favour of wires laid underground in trenches. The German Government are rapidly substituting these subterranean lines for aërial ones throughout the empire, and they are found to be remarkably free from interruptions in the traffic.

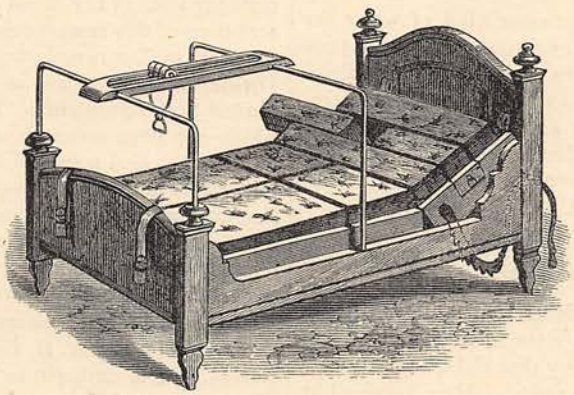
The Western Union Telegraph Company of America also employ underground lines to a considerable extent, especially in and about New York, and they have recently adopted the form of wire invented by Mr. David Brooks, an American electrician. This consists of an iron pipe filled with paraffin oil, in the middle of which a copper conductor for carrying the electrical message is insulated by means of a padding of cotton waste, to keep it out of contact with the metal pipe and secure a covering of oil all round. The ordinary underground wires are coated with gutta-percha or india-rubber, like submarine cables, but the new method while being cheaper is also a very serviceable one.

Animal Rubber.

An insect which produces a species of india-rubber has been recently discovered in the district of Yucatan, Central America, by an American explorer. It is called *Neen*, and belongs to the *Coccus* family ,which feeds on the mango-tree, and swarms in these regions. It is of considerable size, yellowish brown in colour, and emits a peculiar oily odour. The body of the insect contains a large proportion of grease, which is highly prized by the natives for applying to the skin on account of its medicinal properties. When exposed to great heat the lighter oils of the grease volatilise, leaving a tough wax behind which resembles shellac, and may be used for making varnish or lacquer. When burnt this wax produces a thick semi-fluid mass, like a solution of india-rubber, and it is expected that this glutinous liquid will be very valuable for cement and waterproofing.

A New Invalid Bed.

A bed specially designed for the use of invalids comes to us from that modern home of inventions, the United States. On referring to the engraving it will be seen that the appliance is, at all events, characterised by great ingenuity. The bottom of the bed is made in several compartments. The head section may be raised or lowered, and is retained in any position, by a curved ratchet bar that works upon a pin, projecting from the inner side of the bed-rail. The central portion of the head section is divided into two pieces that can be drawn apart, to admit of ventilation and a readier treatment of bed-sores. The middle compartment is in two parts, to allow of the use of the bed-pan without interfering with the patient's position. The foot section is divided lengthwise to give a separate support to each leg, and it also may be raised or lowered, being kept in position by folding legs. Above the foot section are raised two stout bars that carry a "truck" for a roller holding a stirrup for the support of either or both legs of the patient. A pulley, provided with a locking device to retain the leg with safety for any desired period, may also be attached to the footboard for the suspending of the leg by means of a cord and counterweight. This invalid bed would appear to be particularly well adapted to cases of fracture in the lower limbs, paralysis, and to persons who are unhappily compelled to maintain a recumbent position for a great length of time.



Wire Belting.

Steel wire has recently been applied to deep-sea sounding as a substitute for hemp rope, and now we learn that straps and belts for driving machinery are successfully made from it by a German firm. They are woven of the best crucible steel wire, in a transverse web or network of any desirable length or width. The two ends of the strap are joined in the middle, so as to make it endless. They are also formed with a leather or elastic covering outside, the interstices of the wire being filled up with gutta-percha.

Electric Lights from Gas or Coal.

The ordinary mode of producing the electric light consists in transforming the mechanical power derived from the combustion of coal or gas in a steam or a gas motor into electricity, by means of another engine or electric machine, such as the well-known Gramme, which we recently described. But as there is a great waste of power in each of these engines, due to friction, &c., it is a considerable advantage to suppress them; and this can be done by the employment of the generator known as the *thermo-electric pile*, in which the electric currents are directly produced from heat, without the intervention of machines with moving parts. The basis of the thermo-pile is the elementary fact that if two pieces of dissimilar metals, say zinc and copper, are made to touch like the sides of the letter V at one extremity, while being separated at the other, and if the junction where they touch is heated while the separate ends are kept cool, a current of electricity will tend to rise; and if the two open ends are joined by a conducting wire, the current will flow from one metal to the other through the wire. Single pairs of this kind can be connected up in series, after the manner of a W, and the resulting current of electricity multiplied in power, in proportion to the number of pairs. The hotter the heated joints, compared with the cool ones, the stronger also will be the current of electricity produced. The advantage of the thermo-pile for feeding electric lights in houses, shops, and halls, over the wasteful and inconvenient machines, is very evident; and French electricians, who are foremost at present in all that pertains to electric lighting, are giving themselves to the perfection of these contrivances. The two metals forming each pair are German silver and a secret alloy of bismuth, and they are soldered together at the hot junction.

The pairs are arranged like the spokes of a wheel round the gas-jet or lamp forming the source of heat. The outer junctions of the series are connected to flat bars of copper, which assist them in keeping cool by offering a large surface to radiation. These plates of copper may also be plunged into cold water, the

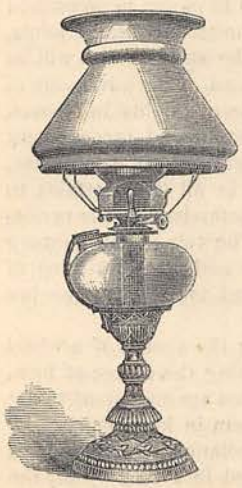
better to keep the outer joints at a low temperature, and increase the effective power of the pile. Other thermo-piles, made upon the same principle, are specially designed to work with coal and coke for fuel. That of M. Clammond feeds four electric lights, each having an illuminating power equal to 200 standard candles, by the consumption of 21 lbs. of coke per hour. This pile is about a yard high by a yard wide. In M. Sudre's the heat-source is coke or coal, but the junctions are indirectly heated by hot air, steam, or liquid circulating past them in flues. Three brilliant lights can be obtained from this pile at a cost somewhat less than that of gas. No attendance is required for these generators except occasional stoking, and for domestic purposes they are certainly an improvement on other electric machines.

Thread from the Hop Plant.

A process for obtaining long fine fibres of twine, capable of being spun and woven, from the stems and shoots of the hop plant has been invented by a German, Herr Nördlinger, of Stuttgardt. The process consists in boiling the raw stems and tendrils with a little soap and soda in closed vessels full of water for three-quarters of an hour, then rinsing them in pure water and stripping the fibres clean. These are again boiled for three-quarters of an hour in water containing a little wine-vinegar or acetic acid. The rest of the process is the same as that for other textile fabrics, and the waste material is found to make an excellent stuffing for sofas and chairs.

A Safety Lamp.

Accounts of horrible accidents from the overturning of oil lamps reach us from time to time, and we are therefore disposed to be very thankful when any new thing is invented for our safety. Here is the last patent of the kind: a self-extinguishing, non-explosive safety lamp for burning petroleum. The lamp (shown in the engraving) extinguishes itself when overturned, when dropped, or while falling. In fact, you may, while the wick is burning, throw it on the floor and kick it all round the room without fearing an explosion. It can be extinguished without blowing down the chimney, or without turning down the wick; and if you are so careless as to attempt to put oil in the lamp when the wick is lighted, the flame will be immediately extinguished. Also you may carry the lamp in your hand at any angle without putting out the light. The non-explosive feature consists of a wire gauze protector or tube, placed in the oil reservoir in such a way as to entirely surround the wick. It is said to be impossible to communicate flame through this tube to the oil or gas in the bowl.



A Stony Forest.

Probably the most wonderful region of the world is that district lying along the upper waters of the Yellowstone River, among the Rocky Mountains, which the Americans, in regard to its extraordinary richness in magnificent scenes and natural marvels, have set aside by Act of Congress as a national park, to be preserved from settlement, and dedicated to recreation and pleasure. For some years the United States geological surveyors have been at work there, ever discovering new wonders and objects of beauty—great geysers, cauldrons of boiling mud, and extinct volcanoes; cascades of alabaster, and enamelled basins of sinter; coloured precipices, and majestic waterfalls; lovely lakes, and tremendous glaciers; together with a thousand minor specimens of natural art, if we may use the term. Indeed, the whole region is a working laboratory of Nature's most interesting processes, a museum of her choicest works, an old curiosity shop of her rarest and oddest lumber. Descriptions of this remarkable country are to be found in the Earl of Dunraven's book of travels, "The Great Divide," and above all, in the several reports of the United States geologists. The latest recorded marvel which has been met with is a fossil forest—that is, a forest of petrified trees. Readers of Ruxton's charming tale, "Life in the Far West," may remember the weird account therein given by an old trapper of a forest of stone which he came upon, away up on the Yellowstone, and how he mistook it for real dead timber until the blade of his tomahawk broke against a rocky stem. This silicified forest appears to have recently been rediscovered by Mr. W. H. Holmes, of the United States Survey, who describes it as being situated in the valley of the East Fork River. The rocks of this valley are evidently of volcanic material deposited by water, and the steep sides of the mountains on either side abound in fossil trees, standing upright or levelled with the ground. The bleached trunks are in multitudes in some places, and resemble the shattered columns of a ruined temple; at others, they appear like a blasted forest stripped of its leaves. Some of the fallen stems are 60 feet long and 6 feet in diameter, while one giant actually measured 10 feet in thickness. The texture of the ancient woody fibre has in many instances been preserved in the stone, and several trees have been identified as magnolias, aralias, limes, ashes, and elms, while fern-remains have also been found intermingled with them.

A Useful Bow.

In view of the fact that a large proportion of wrecks happen within a few hundred yards of the shore, it has been well suggested that the bow and arrow should be impressed into the service of life-savers. All that is needful is a bow light enough to be readily carried, and strong enough to project an arrow with a line to a ship

in distress, or from a ship so situated to the land. It is calculated that a cord 3-16ths of an inch in diameter would be sufficient to drag off a line stout enough to carry a cable. Some such apparatus as that indicated seems specially adapted for bathing stations. The cost is trifling, no practice is necessary to familiarise beach attendants and others with the working of the appliance, while the line thrown might of itself be strong enough to bear the weight of a bather or otherwise imperilled person who had yet presence of mind to seize the proffered rope.

Diamondised Cloths.

This high-flown name is used to designate cloth or lace goods that are covered with bright pieces of metals, or with small crystals, or with bits of a gelatinous material that can be variously coloured, and pounded to suitable sizes. In the case of the last substances, they are generally applied direct on the cloth; but where metals or crystals are used, these are mixed with finely powdered gum-arabic, in order to give them the necessary adhesive properties. As the cloth travels over rollers the particles are strewn over it, and it is then passed over a steam-jet, that causes the gelatinous particles to become sticky. The stuff is next passed over another roller, which induces a more intimate cohesion of the particles and a drying of the material to which they are attached. The operations are concluded by shaking the material free of all particles that have not adhered. Steam is used to moisten the gummed particles in preference to water, in case the latter may injuriously affect the colour of the tissue.

The Oscillometer.

The best practical method hitherto in use of measuring the angle to which a ship swings over at sea, is that of fixing a straight wooden rod or batten to the ship's side, and noting its depression below a line from the observer's eye to the horizon; but a more scientific and accurate apparatus for the purpose has been constructed by Mr. R. Clarke. It consists of a modified surveying telescope, or theodolite, which is planted on the fore and aft centre-line of the ship. The angle of dip is got by first setting the line of sight of the telescope at right angles to the vertical axis of the instrument, then measuring the angle of dip of the telescope, as the ship swings, with respect to the horizon-line.

A Portable Meat Safe.

It is not unlikely that fixed safe-larders are not always the most useful. But however that may be, a new provision safe has been patented, of which the chief recommendation is that it may be either hung up by wires to the ceiling or placed on the floor of the room in which it is to be kept, and is under any circumstances capable of being readily carried from one spot to another. It is constructed in two parts, the upper being made nearly air-tight to hold bread and pastry, and to protect the victuals from the influence of the atmosphere and from insects. The lower section consists of a frame (with a door in one side) covered with wire gauze so as to allow free circulation of air and to prevent rats, mice, and insects from getting at the eatables or drinkables within, while it is supplied with two or more wooden shelves. This lower portion is intended to hold butter, meat, milk, and other such articles as require plenty of fresh air.

Glass Wicks for Lamps.

A wick for lamps is now manufactured entirely of glass, by Messrs. Voubriel and Beek, of Hanau. It is designed chiefly for use in petroleum and spirit lamps; and, with an equal amount of the wick turned up, it gives a much brighter light than cotton wick. In the spirit lamp, too, it is found to greatly increase the heat of the flame. No sparks are given off by this incombustible wick, nor does the light flare in draughts to the extent which it does with a burning wick; hence it makes the lamp safer. The smoking is also reduced, and it is stated that 10 per cent. of oil is saved by its use. Of course the disagreeable task of trimming the lamp is rendered unnecessary, for being of glass the wick does not consume, but wastes away very slightly by fusion.

The Shells of Commerce.

Few persons have any idea of the extent to which shells are used in industrial processes, or of the large number so employed. In the popular mind the pretty poetical conception of the "murmur" is generally associated with the "shell," but beyond this merely sentimental interest, little concern is as yet manifested either for conchology as a study, or for the practical purposes to which the tiny houses of their molluscous inhabitants are put. The shells of commerce may be conveniently classified under the following sections:— 1. Mother-of-pearl shells, for making buttons, card-cases, and other useful articles, and for ornamenting papier-mâché. 2. The different kinds of small shells extensively used for flowers, bracelets, head-dresses, and fancy groupings of various designs. 3. Shells used for carving cameos to set in pins, brooches, studs, &c. 4. Shells used for spoons, lamps, knife-handles, snuff-boxes, &c. 5. For manure, in the form of shell-sand and shell-marl, for making the finest sort of lime when calcined, and, when crushed, for glazing or enamelling pottery ware. 6. In various parts of North America, Africa, and India, shells are used as current coin, and also as counters in certain games. 7. To the painter and art designer shells afford suggestive studies in form and colour. 8. Some of the biggest are used for vases, fountains, fog-horns, and trumpets, while in China a particular kind is employed as a substitute for glass. These eight sections present at one view the different ways in which shells are made commercially useful, and it would only complicate matters to give examples under each heading, for in doing so we should have to introduce rugged names that would make our readers, like Quintilian, "stare and gasp."

Spurious Emeralds.

Public attention has been called by Mr. Bryce Wright, the well-known geologist, to certain sham emeralds which are being offered for sale. These differ from all former imitations in paste, and are made with flaws to imitate the real stone. Mr. Wright thinks that they are produced from alumina, by a process similar to that by which M. Pfeil created artificial rubies some time ago. The colour of these false stones is the true emerald-green; but they may be detected by their specific gravity, which is about 3·4, whereas that of the true emerald never exceeds 2·8. If placed under the dichroscope their ordinary and extraordinary rays are of the same colour, while in the natural gem the ordinary ray is bluish green and the extraordinay ray is yellowish green.

Double Acrostic.

A classical hero, whose deeds oft told
Proclaim him wondrous strong and very bold;
E'en Pluto's guard himself resigns at length
The useless struggle 'gainst his conquering strength.

Now let us praise King Charles's reign
For one good act, I say;
A limit is set to the time at last
That a man in bonds shall stay.

A ghost did roam about my walls,
All honest folks filling with fright:
He feared but one voice, whose loud shrill calls
Drove him fast to the realms of night.

Swift as the wind it travels,
And as it spreads it grows;
Where it began one wonders,
Where it will end none knows.

A place where men do congregate,
Yet found in every pack;
In savage lands it often is
A weapon of attack.

C'est chez ma tante, the Frenchman says;
Not so John Bull doth name
The man at the shop where often goes pop
The question, "Now what will you lend?"

One stormy night he came no more
The Hellespont across,
Nor could the maiden thus bereft
Survive this crushing loss.

Ostrich-like bird, dogs follow in thy train;
What is it in thee makes their teeth refrain?

"Therefore by law thou art condemned to die,
Except a thousand marks remit the penalty."
What noble duke thus spoke, pray tell—
Yet at the last all ended well.

A New Railway Car.

When travelling through a beautiful country, many a passenger must have felt aggrieved that he could not get an uninterrupted and comfortable view of the lovely scenery through which he was being rapidly carried. It is to be hoped that at no very distant date some such carriage as has been introduced on a Continental railway (Rhein-Nahe) may be found upon our lines at home. This kind of carriage has a spacious verandah alongside the covered part of the vehicle, up and down which "promenade" a passenger can walk freely in the open air without the slightest risk of accident, for of course even the smallest chance of danger in this respect would far outweigh the advantage of an easy and unrestricted view of landscape beauties. The approach of winter does not render the carriage useless for travelling purposes, as by some slight alterations, such as the putting up of partitions and the consequent enclosing of the verandah, it is readily prepared for service during the cold months of the year.

A Chemical Volcano.

It was first suggested by Sir Humphrey Davy that volcanic action might be due to the violent chemical union of salts and minerals within the earth's crust. Davy was probably led to this idea by the explosion of the metal sodium, with evolution of heat and steam, when it comes in contact with water. An example of this kind of volcano has been discovered on the shores of the Missouri, about thirty-six miles above Sioux city, in the State of Nebraska. A large bluff stands at this part of the river-bank, and when the ear is laid to the ground near it internal rumblings are heard, flames are seen to issue from the earth by night, and steam by day. The upper part of the bluff is composed of carbonate of lime, while the under part contains potter's clay mixed with iron pyrites, and carbonate of magnesia and alumina. The decomposition of the iron pyrites (disulphide of iron) liberates sulphuric acid, and the percolation of water brings it into contact with the carbonates, thus developing great amounts of heat, steam, and carbonic acid.

"How Long have I to Live?"

It is not every one who asks himself this question, because, strangely enough, it is the belief of most persons that their lives will be exceptionally lengthy. However, life assurance companies are aware of the credulous weaknesses of those whose lives they assure, and have therefore compiled numerous tables of expectancy of life for their own guidance, which are carefully referred to before a policy is granted.

The following is one of these well-authenticated tables in use among London assurance companies, showing the average length of life at various ages. In the first column we have the present ages of persons of average health, and in the second column we are enabled to peep, as it were, behind the scenes of an assurance office and gather from their table the number of years they will give us to live. This table has been the result of careful calculation and seldom proves misleading. Of course sudden and premature deaths, as well as lives unusually extended, occasionally occur, but this is a table of the average expectancy of life of an ordinary man or woman:—

Age.	*More Years to Live.*	*Age.*	*More Years to Live.*
1	39	50	21
10	51	60	14
20	41	70	9
30	34	80	4
40	28		

Our readers will easily gather from the above tabulated statement the number of years to which their lives, according to the law of averages, may reasonably be expected to extend.