

same manner as though they were brocades. Hand-painting has the advantage over embroidery for this purpose, in that it involves a less expenditure of time—a matter sometimes of importance when ladies embellish their own costumes.

In these days almost anything can be worn, so many styles being in vogue. Care should, however, be taken not to mix up eras or artistic forms, and it is only by exercising knowledge and judgment in these respects that any harmonious result can be obtained.

THE GATHERER.

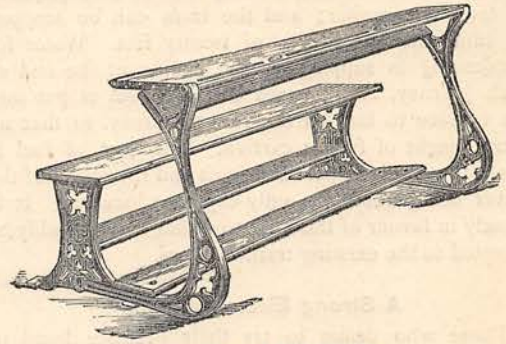
Tempering Metals in Vacuo.

It is well known that Mr. T. A. Edison, continuing his investigations, is at present engaged in perfecting an electric lamp in which a current of electricity is used to heat a wire to a state of dazzling brilliancy. The wires which he finds best suited to the purpose are of platinum or an alloy of platinum and iridium, because they can be raised to a higher temperature by the current before melting than other metals. But even platinum, though it does not fuse easily, is found mysteriously to disappear as if it evaporated like camphor, when heated in this manner, and especially when heated in a vacuum under a chamber of glass. In fact, the glass ultimately becomes coated with a film of platinum dust thrown off by the wire. Mr. Edison attributed this disintegration of the solid metal partly to the washing action of the air surrounding the wire, and partly to air or other gases contained in the pores of the latter, expanding by the heat and bursting the texture of the metal asunder in escaping from it. The truth of his conjecture has been borne out by the success of his remedy, which consists in tempering the wires in a vacuum by passing a gradually increasing electric current through them so as to heat them up by degrees, and thereby expel the air enclosed in the metal gently, and not explosively. Seen under the microscope, a wire thus treated shows no cracks like untreated wire; it is highly polished, springy, and as white as silver. It has a smaller diameter than before treatment, and is very difficult to melt in the oxy-hydrogen flame, as compared with common platinum. It is as hard as the steel wire used in pianos, and cannot be annealed at any temperature. The practical results of this important discovery of Mr. Edison will probably be various, but the most patent and to the purpose is the production of a prepared platinum burner for the inventor's electric lamp, which yields far more light without melting than one of ordinary platinum. With a prepared spiral of wire having a total radiating surface about the same as that of a grain of buckwheat ($\frac{1}{32}$ of a square inch) Mr. Edison obtains an electric light equivalent to eight standard candle-lights, whereas from unprepared platinum he can only get a light of one candle before melting. By the increased power of the tempered metal to withstand a high temperature he is enabled to produce a far more economical light. In fact, he states that he can now produce eight separate electric lights, each equal to sixteen standard candles, by an expenditure of less than one horse-power of energy. Iron tempered in the same way becomes as hard and elastic as steel,

nickel more refractory than iron; aluminium melts only at a white heat; and steel wire used in pianos becomes decarbonised, but remains hard and assumes the lustre of silver.

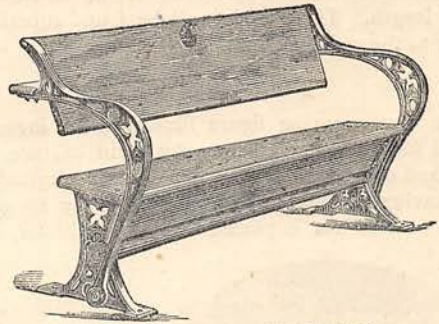
A New Desk and Bench.

Visitors to South Kensington Museum must have been struck with the imposing array of school desks of every device that occupy the corridor of one of the entrances. Each of these, doubtless, claims its



POSITION 1.—FOR THE SCHOOL.

own special merits. Another reversible school desk, which, to mark its back-folding action, is named the "Replex," has recently been patented. Its speciality consists in its having solved the problem of combining the two conditions—1. That there shall be a free entrance and exit at each end, when it is



POSITION 2.—FOR THE PUBLIC MEETING.

used as a desk. 2. That, when used as a bench, it shall still face in the same direction. Other merits claimed by this invention are the simplicity of its structure, and the ease with which the transformation is effected. The difference of stature between the children of the school and its adult occupants when it

is used as a bench is provided for by the introduction of a footboard, which disappears when it is not wanted. A book-rest behind the bench is a further advance towards the completeness of this article of parish furniture. The illustration will sufficiently explain the *modus operandi*.

Steam Tram-Cars.

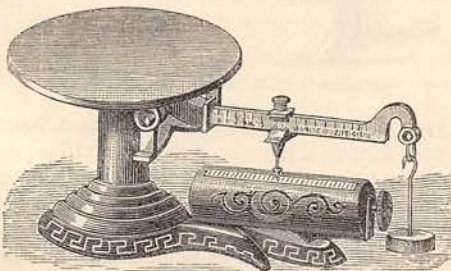
An interesting trial of tramway-cars drawn by a steam locomotive of peculiar construction has been made at Liverpool. The special merit of the engine is that all the noisy puffing of railway locomotives is wanting, and a very small quantity of vapour is given off by the funnel, hence its suitability for public thoroughfares. This advantage is secured by conveying the exhaust steam back to the condenser, and consuming the smoke. The engine is about the length of a horse, and its weight about five tons. A speed of ten miles an hour can easily be obtained, but the Board of Trade limit the pace to eight miles an hour. Only one man is required to tend the engine; and the tram can be stopped by him within a length of twenty feet. Water for condensing is supplied to the engine at the end of each journey, and enough coke for fuel is put into the furnace to last for the return journey, so that no extra weight of fuel is carried. The cost of fuel is about two shillings per diem, this and the wages of the driver being about the only expenses incurred. It is greatly in favour of the invention that it can readily be adapted to the existing tramway-cars.

A Strong Electro-Magnet.

Those who desire to try their 'prentice hand in experiments in which electricity plays a leading part, without laying out much money upon apparatus, may themselves readily make an electro-magnet, which shall be as cheap as it ought to be strong. Take a piece of wrought-iron pipe about 3 inches long by 1 inch in diameter. File away one side until it is through, and then, after softening the tube in the fire, wind it round with cotton-covered wire in the direction of its length. This magnet will be found superior in power to the ordinary ones.

A Price-Balance.

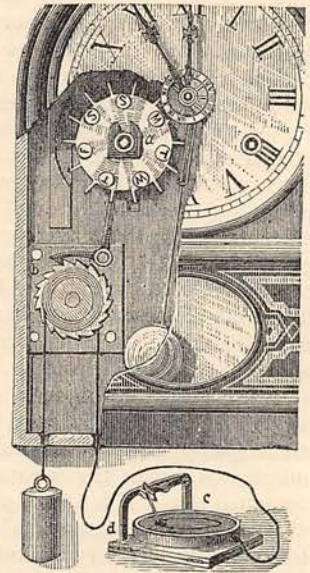
The accompanying figure illustrates an ingenious utensil known in America as the tariff balance. To the stand of an ordinary balance is fixed a cylindrical box having a longitudinal opening along its upper part. In this box is placed a second cylinder, upon



which are inscribed, according to scale divisions, the progressive numbers indicating the price per ounce or pound of several determined commodities. The weight, which glides along the arm of the balance, is furnished with a pointer, which points to the figures marked on the cylinder. When, for example, it is desired to know at once the price of a pound and a quarter of sugar, the cylinder is turned until the row of figures corresponding to the word "sugar" is visible through the opening of the box, and the particular figure to which the pointer points will be the price required. The price-balance, therefore, not only saves time, but also prevents mistakes of calculation.

An Automatic Fire-Lighter.

A novel device for automatically lighting fires at any stated time has recently been invented. By reference to the engraving it will



be seen that the lighting mechanism is controlled by a clock, which carries on its hour-hand arbour an adjustable disc, bearing an arm capable of engaging the pins which project from the rim of the wheel *a*. The pins of this wheel, *a*, correspond to the seven days of the week, and are arranged so as to disengage a pawl from the ratchet wheel, *b*, at any settled time or of the day. The ratchet, *b*, is fixed upon the shaft of a small windlass, which is propelled by a weight when the pawl releases the ratchet wheel. This windlass winds a cord that may be extended in any direction to the stove or furnace, where there is placed a light, *c*, consisting of a horizontal wheel, round whose periphery the cord is wound, and on whose upper surface there is a coating of sand-paper. The wheel is protected by an iron cover, which also supports a clamp, *d*, for holding one or more matches so that their heads press lightly on the sand-paper. A piece of paper or other combustible extends from the match to the kindlings in the grate. At the prescribed time the pawl is released by the clock, the weight drops, the sanded wheel revolves, and the fire is lighted. If it is desired to pass over a day or two, the corresponding pins in the wheel *a* are to be removed.

Making the Diamond.

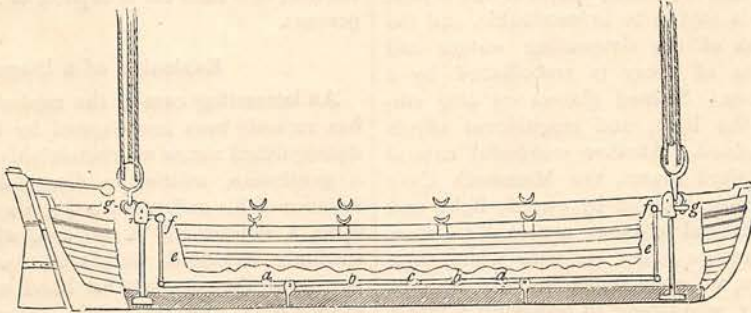
Most of our precious stones have been forced to yield up the secret of their growth to the subtle

scrutiny of the chemist; rubies, sapphires, and emeralds can now be made in the crucible, but until the other day the diamond had baffled all his efforts. At a recent meeting of the Philosophical Society of Glasgow, however, Mr. James Mactear, a chemist in that city, announced that, after many years of assiduous attempt, he believed he had at last succeeded in making crystals of carbon perfectly pure and transparent, having all the refractive power of the diamond, and resisting alkalies, acids, and the intense heat of the blow-pipe, like that gem, as well as in scratching glass. The stones have been shown to Professor Tyndall and other authorities, and are now in the hands of Mr. Maskelyne, of the British Museum, who, however, has declared them to be nothing more than crystallised silicate.

Cats as Carriers.

The wonderful instinct of locality which the cat shares with the carrier pigeon has been put to some practical use in Belgium. Thirty-seven cats, residing

is the automatic detaching gear of Messrs. Sample and Ward, of Low Quay, Blyth, Northumberland. This consists, as shown in our illustration representing a boat hanging at the ship's "davits," of two levers, *b b*, running along the bottom of the boat, and jointed at *c*, while free to turn round fulcrums or pivots at *a a*; these horizontal levers connect with vertical ones, *e e*, which in turn connect with short arms, *f f*. These arms, *f f*, when the weight of the boat is either wholly or partly borne by the lowering tackle, act as detents to the hooks, *g g*, which catch the lowering pulleys. But when the boat is quite water-borne, and not until then, the heavy levers, *b b*, sink at their point of junction, *c*, and thrusting up the vertical rods, *e e*, liberate the points of the hooks, *g g*, from the detaining arms, *f f*, and free the boat from the lowering pulleys at stem and stern simultaneously. Should the boat happen to be water-borne only at one end, say by the crest of a wave, the levers, *b b*, still keep their straight position, and the boat remains attached to the lowering tackle.



AUTOMATIC DETACHING GEAR.

in the city of Liège, were recently put into bags and then taken a long way into the country. Here they were liberated at two o'clock one afternoon, and at a quarter to five on the same evening one of them returned home, while all his companions arrived there within twenty-four hours after being set free. It is, therefore, proposed to establish a regular system of cat communication between Liège and the neighbouring villages by means of cats. This is a somewhat novel part for Pussy to play, and, if it be feasible, we hope that she will be properly protected in it.

Detaching Ships' Boats.

All those who have seen the exciting and arduous operation of lowering a boat from a ship's side in a heavy sea will appreciate the advantages of a contrivance designed to facilitate it. What with the plunging of the ship and the tossing of the waves under the boat, serious mishaps are apt to occur, and valuable moments to be lost, at very critical times, when the freeing of the water-borne boat is left to sailors acting simultaneously in her stem and stern. One of the best devices for automatically freeing the boat from the lowering tackle after it has reached the water,

Raising Sunken Ships by Balloons.

The interesting experiment of raising a submerged vessel by means of balloons was recently made on the Plotzer Lake, near Berlin. The method, which was devised by Herr Eidner, of Vienna, consists in attaching empty balloons to the vessel and then suddenly inflating them with carbonic acid gas, made on the spot by breaking a vessel of sulphuric acid surrounded with Bullrich's salt, which is inserted inside the balloon. The mixture of these two chemicals generates the gas, the balloon rises, and the vessel is raised. In the experiment in question, a sunken boat weighing several hundredweight was raised, and also five heavy sand-bags, from a depth of fifty feet.

The Various Kinds of Milk.

According to Dr. Brush, the difference between the milk of ruminating animals, as the cow and sheep, and that of non-ruminating animals, as the ass and mare, might be more frequently emphasised and observed than is commonly the case. Owing to the variety of casein contained in the milk of cud-chewers—which in process of digestion coagulates into hard masses—it is less diffusible and therefore less nutritious than the milk of non-cud-chewers, and

on this account many persons have experienced considerable difficulty in thoroughly digesting cow's milk. Human and equine milk, on the other hand, does not coagulate into a hard mass, but rather into small granular masses. There is in the milk of non-ruminants a large amount of sugar and small amount of caseine, while the very reverse is the case in that of ruminants. For this reason the former should always be preferred for children who are unable to obtain their natural supply.

Novel Uses of the Electric Light.

The Falls of Niagara, when suddenly illuminated by a flash of lightning, are said to present a scene of awful grandeur; but the spectacle is one rarely witnessed by the passing traveller, since lightning discharges only take place occasionally by night in those regions. The recent employment of the electric light by the Americans for lighting the Falls will, however, supply an artificial substitute always at command. Revealed by a number of powerful electric beams directed upon the great cascade and the toiling waters of the rapids, the weird display is said to be indescribable, and the dazzling whiteness of the descending waters and ascending columns of spray is embellished by a variety of rainbows. Stained glasses are also employed to tinge the light, and magnificent effects of colour are obtained. Another wonderful natural feature of the United States, the Mammoth Cave of Kentucky, has just been lit by electric light, and the alabaster aisles and grottoes are said to show to increased advantage under its pure white rays. The cave has now, we understand, become the property of a company, who intend to transform it into a kind of subterranean city.

Turning to more practical purposes, we find that the electric light is of great service in selecting diamonds by night, and is constantly used in this way. A diamond that is decidedly "off colour" will under ordinary gas-light pass as a white stone, and in fact often seems more brilliant than one of a first water; but the electric light enables even a tyro to detect the lightest straw tints so familiar to us in Cape diamonds. This advantage of the electric light will therefore be felt both by the public and the jeweller, who will now be able to buy and sell after nightfall.

Quite recently the German military were trying submerged electric lights in the Rhine for detecting torpedoes moored under water. A transparent globe enclosing an electric lamp was sunk 60 mètres below the surface, and by means of a current from a generator on shore, it served to illuminate the surrounding water and bottom. For engineering surveys, and for attracting fish, as well as for torpedo work, these subaqueous lights may be of considerable service.

One of the most successful and distinctly advantageous applications of the electric light which have yet been made is, however, the employment of it on board cable steamers during the laying of submarine cables. The new French Atlantic cable

just laid from Brest to Cape Cod, and the new Mediterranean cable from Marseilles to Algiers, were the first cables deposited by the new light; and so effective did it prove, that all the operations of cable-laying in the tanks and on the deck were carried on by night as effectually as they were by day.

The Cable Railway at Geisbach.

This novel means of transport has been erected between the Geisbach hotels and the Lake of Brieng for the convenience of sight-seers. The line is 400 mètres long and very steep, the rise being one foot in every three and a half. No steam or other engine is required to work it; the cars are attached to the two ends of a wire cable, which is wound on a large drum at the top of the line, and motion is imparted to them by making the descending set of cars heavier than the ascending set. This is done by the introduction of water into a special reservoir fitted to the trains. There are two cars and two luggage vans on the line, and each car is capable of holding forty-eight persons.

Explosion of a Diamond.

An interesting case of the explosion of a diamond has recently been investigated by Professor Leidy, a distinguished *savan* of Philadelphia. It appears that a gentleman, wearing a diamond mounted in the solitaire of his cuff, was leaning his head on his hand upon a window-sill in the sun, when the diamond suddenly exploded with such force as to drive a portion of the gem into his hand and forehead. On examination, the fractured surface following the cleavage plane was found to exhibit the remains of a thin cavity such as may occasionally be seen in quartz crystals. A conspicuous particle of coal was also exposed. Professor Leidy inclined to the opinion that the explosion was due to the sudden expansion of some volatile liquid contained in the cavity. In this connection it may be mentioned that Mr. Rudler, the able curator of the Geological Museum in Jermyn Street, has discussed the natural history of the diamond in a very interesting article in *Science for All*. Mr. Rudler explains, among other things, how it is possible to burn a diamond, and to him the explosion above alluded to would not seem at all "phenomenal."

Dephosphorising Iron.

A short time ago we heard of a new process for ridding iron of the small quantities of phosphorus which impair its strength. This method of dephosphorising has, we understand, rather disappointed expectations at home, when brought to trial, although it is said to be in operation at several Continental works. Other plans are proposed to effect the same end, both by American and foreign chemists, and probably the most successful of these is a process which is now being tried on a practical scale in South Wales, in conjunction with the Bessemer process of making steel. By this process the pig-iron is taken in a molten

state direct from the blast furnace, where it is reduced from the ore, to the Bessemer converter or crucible. Here it is subjected to a very high temperature, kept up by a powerful air-blast forced into the liquid metal. The iron is by this means purified from silicon, manganese, and carbon; and the further process of Mr. Bull to extract the phosphorus consists in injecting a blast of steam into the mass. The steam being dissociated into its component elements, the oxygen combines with some of the iron to form a little rust, and the free hydrogen combines with the phosphorus to form phosphuretted hydrogen. In fine, it will be seen that Mr. Bull's process aims at completely purifying the iron by the joint agency of air and steam, and if as successful as is expected, it will give a great impetus to the iron trade of South Wales, for it will be possible by its means to convert Welsh ore into iron equal in quality to the best Swedish brand.

The proposed Canal between the Sea of Azoff and the Caspian Sea.

The Russian Government has authorised M. Daniloff to carry out his proposal for the construction of a canal between the Sea of Azoff and the Caspian. This project has frequently been considered, the chief obstacle being the want of water in the Manyteh river, which lies midway between the two seas. If the water communication can be kept open, little remains to be done but to work upon the natural lines of the Manyteh, which in places expands into good-sized lakes. The canal will be replenished by water drawn from the Malka and the Terek, and another feeder from the Kuban, near the Sea of Azoff. A cutting 540 kilometres long will connect the Manyteh with the Don, and another 370 kilometres in length will unite Astrachan, on the Volga, with the first-mentioned stream. Another branch has been proposed to go north to Serebrjakooska, on the Caspian. The depth there will be 2'88 mètres. The entire cost of this project is estimated at 50,000,000 roubles, or £7,500,000. Should M. Daniloff succeed in accomplishing his proposed plan, steamers from the Caspian will be able to reach Astrachan without transshipping cargo, and new fields of commerce will be opened up.

A Cure for Catarrh.

A simple, and apparently very successful, remedy for chronic catarrh has been discovered in sea-water gargling. Professor Mosler has treated numerous patients in this way, and records his experiences in a Berlin paper. Special rooms for gargling have been erected at some sea-side places, where directions are

given as to the mode of proceeding. One very necessary proviso is that the water should come in contact with the nasal cavity, but to those who can gargle this movement will not be attended with any inconvenience. A marked improvement in the malady will then quickly be perceived. We are not told that an artificial mixture of salt and water is likely to be effective. A few experiments, however, would soon establish the fact.

Paper Sheathing for Ships.

Some time ago a vessel was undergoing repairs in the Portsmouth dry-dock, and it was then observed that no barnacles or sea-weeds had adhered to her bottom at a place on which a piece of paper was found sticking fast. Further experiments in pursuance of this hint have ended in a patent being taken out for sheathing ships in paper. As the latter can be easily impregnated with poison, it may also be made to act as a guard against boring worms as well as ordinary fouling.

A Gas and Water Geyser.

As far back as 1833, a salt-well bored in the valley of the Ohio spouted up jets of water and gas, to a height of sometimes 100 feet, at intervals of ten or twelve hours; and, since then, a number of wells in the oil regions of America have kept throwing up

volumes of water; but the most marvellous of these artificial geysers is that recently broached in the valley of the Wilson's Run, near the town of Kane, on the Philadelphia and Erie Railroad. The Kane Geyser, as it is called, originates in a petroleum well drilled in 1878 to a depth of 2,000 feet, but abandoned because no oil was found. Since then the hole has continued to eject a column of mingled water and gas every thirteen minutes, to heights varying from 100 to 150 feet. During the sinking of the well, veins of water were passed through down to a depth of 364 feet, and after that a vein of gas was pierced at 1,415 feet below the surface, so that the water flows into the well on the top of the gas, until the pressure of the confined gas causes an explosion and it escapes from the orifice with great violence. The discharge lasts about a minute and a half. When the sunshine strikes the fine shower of water-spray and endues it with rainbows, or when the inflammable gas is fired at night, the spectacular effect is very beautiful.

Automatic Postal Indicator.

At the recent Sanitary Congress held in Croydon, there was exhibited a simple self-acting contrivance for indicating on pillar letter-boxes the time when the next collection will be made. By this system—which



has been in use for some time in both Manchester and Liverpool—a person is informed whether or not he is in time for the particular collection he desires his letter to go with. The indicator is worked by the postman in the act of closing the door of the box.

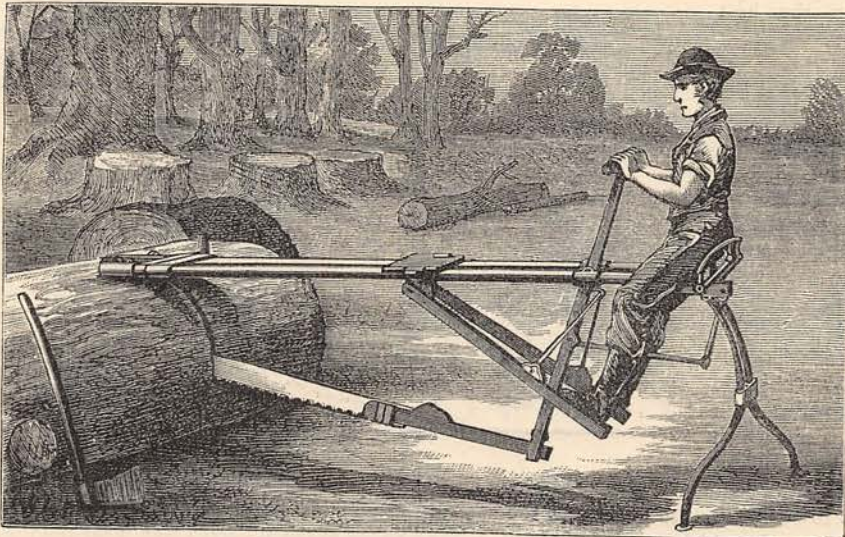
A Market for Useless Fungi.

There are several species of fungi supposed to be worthless, or even poisonous, which the Chinese consume in various ways; and New Zealand colonists export the fungus which grows on the decaying timber in their forests, and thereby make a considerable profit. Last year the value of the fungi exported amounted to £11,000, and this success may induce others to venture upon the exportation of the *Hirneola polytricha*, which resembles the "Jew's-ear" variety. The Chinese use these fungi as medicine to purify

terior, which has not been fully explored yet, is cool and pure, without motes or foulness. The cave contains several pools and chasms, and many fine stalactites and masses of alabaster. One stalagmite, named Washington's Pillar, rises 25 feet from the floor like a huge marble tusk.

Edible Ferns.

Most of the ferns found in our woods contain more or less starch, and when properly prepared are extremely palatable; so that we hear without surprise that an attempt has recently been made in France to popularise them as an article of food. The tender shoots of the common brake fern, when exposed above the soil to the air and sunlight, become exceedingly fleshy, white, and tender. A famous French painter is known to pride himself on his fern omelettes; and



NEW AMERICAN SAW.

the blood; they are also used in soups. Great care must, however, be taken to discriminate between the poisonous and non-poisonous kinds.

Soot-Water for Roses.

It is stated that a rapid growth of thrifty rose-shoots may be promoted by the use of soot-water. The application has, at any rate, the advantage of costing nothing. Some soot is to be collected from a chimney or stove, put into an old pitcher, and then hot water is to be poured upon the contents. When cold, the "mixture" is to be used for watering the plants every few days.

The Luray Cavern.

A remarkable cavern, which promises to be one of the world's wonders, has recently been discovered at Luray, in Page County, Virginia. The discoverers kept their secret to themselves, bought the land around the cave, fitted it up with boats, bridges, guards, and lights, then opened it to visitors. The air of the in-

the hill-tribes of Japan live on fern all the year round. In spring they eat the tender leaflets, and later in the season they eat the starch extracted from the roots.

A New American Saw.

Our engraving illustrates this ingenious saw so well that a very short description of it will suffice. It is an American invention, and is designed to cut through fallen trunks. The sawyer sits on a spring seat which lends itself to the movements of his body in the act of sawing. Thrusting with his feet upon the pedals, and at the same time drawing back the lever which he holds in his hands, the sawyer pushes the saw from him through the wood with considerable force, to which the weight of the body contributes. Then, easing his legs from the pedals, and thrusting the lever from him with both his hands, he draws the saw back again in the reverse direction. The whole implement is about eight feet long, and is said to work very regularly, the blade of the saw having a clear stroke of three feet.