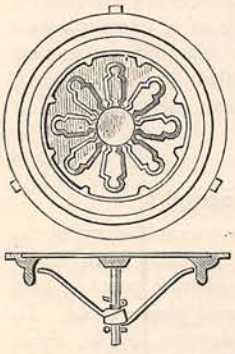
THE GATHERER.

Self-locking Coal-Plates.

Accidents sometimes happen from the dislodgment of coal-plates from the pavements, and we are glad to see that one has been devised which locks itself and cannot be displaced. As shown in the figure it consists of a circular plate, having a stud-pin projecting from beneath its centre. The pin carries two loose arms held in position by two split keys. When the plate falls into its hole, these arms fall against the sides of the stone, as shown, and prevent the plate from being lifted from without. In fact the plate can only be lifted from within by raising one of the arms and pushing the plate outwards. Washers are put on the central stud-pin to adjust the arms to holes of different size.



Paper from Bark.

Several kinds of Japanese paper are made from the bark of shrubs. The strongest and commonest of all is made from the bark of the *Mitsuma*, a shrub about 4 feet 6 inches high, which blossoms in winter and thrives on a poor soil. The stem is cut down and the bark taken, but new shoots sprout from the old root. A paper of superior quality is also made from the *Kozu*, a small tree of the mulberry family, imported from China. The inner bark of both shrubs is washed and dried, softened in steam and boiling water, and afterwards beaten soft with staves until a fine paste is formed. This paste mixed with water is then made into paper in the ordinary way. *Kozu* paper is built up of several thicknesses to make it equally strong in all directions. In this way very strong paper is manufactured, suitable for covering umbrellas. A transparent paper as strong as the *Kozu* is also made from the *Gampi* plant.

Soldering without an Iron.

By this plan, which comes from Germany, the parts to be joined are made to fit correctly by filing or the lathe. The surfaces to be soldered are then moistened with the flux or soldering fluid, and a smooth piece of tin-foil, or sheet-solder, laid between them. The pieces are then tightly pressed together and bound with wire ; and the joint is heated over the fire or a spirit-lamp, until the solder melts and cements the parts together. In this way two pieces of brass can be joined so as to show little or no joint. When several pieces have to be separately soldered, different solders can be used so as not to melt at the same temperature. One solder, for example, can be made of 2 parts of lead, 1 of tin, 2 of bismuth ; and another, melting at a different temperature, of 4 parts of lead, 4 of tin, and 1 of bismuth. In soldering brass, copper, or iron, a hard solder of equal parts of brass and silver may be used. A silver coin beat out thin makes a very good solder for iron, copper, or brass. The best flux for hard soldering is borax ; and that for soft soldering may be made by saturating equal parts of water and hydrochloric acid (spirit of salt) with scrap-zinc. This is a moist flux, however, and for electrical or other delicate apparatus it is better to use resin, which keeps dry.

Enamelled Cloth.

Enamelled cloth is now used instead of leather in America for covering carriage-tops, chairs, trunks, and waterproofing, or in general where a good appearance rather than strength is required. It is made of cotton cloth dressed with a composition of linseed oil, lamp-black, and resin, melted together. It is then smoothened with pumice-stone and varnished, until it resembles patent leather. While upon this subject we may mention that flexible mother-of-pearl patterns are produced in Germany in the following way : on a soft elastic base is placed a sheet of india-rubber, and over it a copper stencil-plate with the pattern cut in it. The cloth to be decorated is then laid over the copper plate, and a heater passed over the whole, so as to melt the rubber and press it through the stencil on the cloth. Powdered mother-of-pearl is then sprinkled over the cloth, and fixed to the rubber patterns by passing the heater over them. A protective covering of fine crape is laid over all, and attached with gum to the patterns.

Vinegar in the Sick-Room.

The following recipe for a refreshing sprinkler of the sick-room is said to have been first used during the great plague at Marseilles. Take of rosemary, wormwood, lavender, rue, sage, and mint, a large handful of each ; place the whole in a stone jar, and pour over it a gallon of strong cider vinegar. Cover closely and keep near the fire for four days ; then strain, and add one ounce of powdered camphor gum. Bottle it up and keep it tightly corked. It is of great value to nurses, and evidently wards off infection.

An Electrified Lily.

A curious electrical effect was lately witnessed by M. F. Laroque during a storm at Montmaurin, in the Upper Garonne. Looking towards a clump of lilies he saw the highest plunged in a diffused violet light, which formed an aureole around the corolla for eight or ten seconds. When the light vanished, he examined the flower and found it entirely robbed of its pollen, while the neighbouring lilies retained theirs. This is a pretty instance of St. Elmo's fire.

A New Type-Writer.

A small and portable type-writer has been invented by Mr. Thomas Hall, of New York. It is illustrated

in the accompanying figure, and weighs only 5½ lbs. The printing mechanism is attached to a plate, A, which moves step by step in printing from left to right, as it is guided by the bar B. This bar is full of circular grooves, like the teeth of a rack upon a lathe, and the corresponding teeth of a small gear upon the

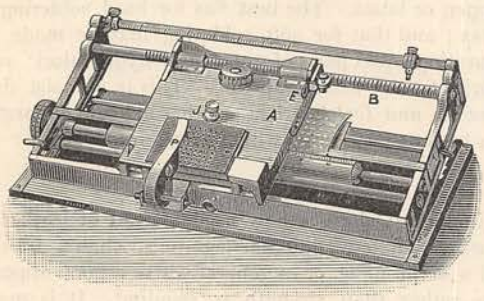


plate engage those of the bar so as to enable a coiled spring within the gear to propel the printing mechanism towards the right after each impression. When a line has been printed, the thumb-latch, E, at the right side of the plate is pressed, and disengages the spacing mechanism from the teeth of the bar, so that a new line can be commenced on the left. The operation of printing consists in taking the handle, P, in the right hand and pressing the pointer under it into one of the holes of the printing-plate beneath. In this way the corresponding type is brought under the post, J, and a slight pressure on J effects the printing. When the pressure is removed, two spring arms raise the type from the paper, and allow of a fresh letter being printed.

Glycerine and Glue.

A slight admixture of common glycerine is recommended as an ingredient of glue to improve its quality, and render it more easy to preserve.

A New Safety-Lamp.

M. Triest, manager of the Mons gas-works, has lately introduced a new safety-lamp invented by M. Lechein, which will burn safely in an explosive atmosphere, or one charged with smoke and carbonic acid like that of a burning theatre. It consists of a lantern of peculiar shape, fixed to a wall-bracket through which a supply of fresh air is brought into the lamp by a pipe leading outside. A lighted oil-lamp or taper is then placed in the lantern, and the air-valve connecting with the supply-pipe opens to feed the lamp with air. The cover fits by an air-tight sand-joint, so that no air can enter from without. Gas may also be used in the lamp, and lighted by electricity, or a fulminating capsule.

Wire Fences in Thunderstorms.

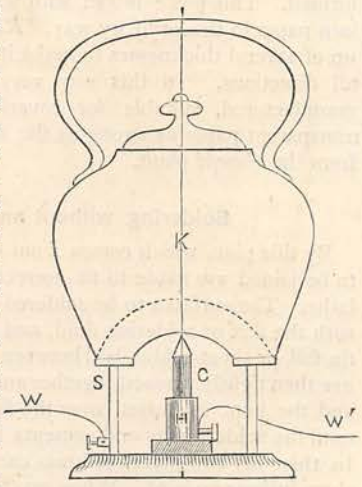
During a recent thunderstorm five sheep were killed on the farm of Cotland, in the parish of Tinwald, Scotland. Two of these happened to be lying at one end of a wire fence which traversed one side of the field, and the electric current had evidently traversed the fence, splitting the wooden posts, and discharged itself to earth at the end, thereby killing the animals. In an adjoining field, across a roadway, the fence was a stone wall having a wire running along the top of it. At one point the wire was broken, and an end touched the ground near where a drove of sheep were nestling. Three of these were killed. Wire fences, therefore, ought to be properly "earthed," like any other lightning-rod, in order to make them safe. They act as carriers for the electric current, much in the same way as a telegraph-wire or lightning-rod, and a good metallic connection should be established between them and the ground, either by metallic spikes or "earth plates," buried in damp soil or a pit of coke.

Moonlight Photographs.

A valuable new process of photographing on stone and printing off with ink has recently been introduced. It is termed the "ink photo" process, and copies oil paintings, drawings, and photographs. In preparing drawings for reproduction by it, there should be no pure blue tints: blues for shadows and skies must have Indian ink mixed with them. Drawings in sepia and black give excellent results. Very clear and well-defined photographs are now taken by moonlight. Scenic effects of wood and water have a peculiar soft and rich appearance, which is quite novel and more enchanting than that of garish daylight photographs.

An Electric Kettle.

In the stall of the Duplex Electric Light Power and Storage Company at the exhibition of gas and electric lighting at the Crystal Palace, there is an electric kettle which operates in the way shown in the figure. It has been devised by Dr. S. H. Emmens, and consists of a copper kettle, K, which rests on a metal stand, S, and is provided with a very thick bottom made hollow underneath. Into the hollow and touching the bottom is pressed a carbon rod, C, pointed at the end, and such as is used for electric arc lamps. It is contained in a metal holder, H, which encloses a spiral spring that pushes the carbon up against the bottom of the kettle. Wires, W W, convey the electric current to the apparatus, and the electricity passes up the carbon to the kettle and completes its current through the metal standard, S. In flowing it heats the point of the carbon white-hot, and thus makes a small but very intense fire beneath the kettle.

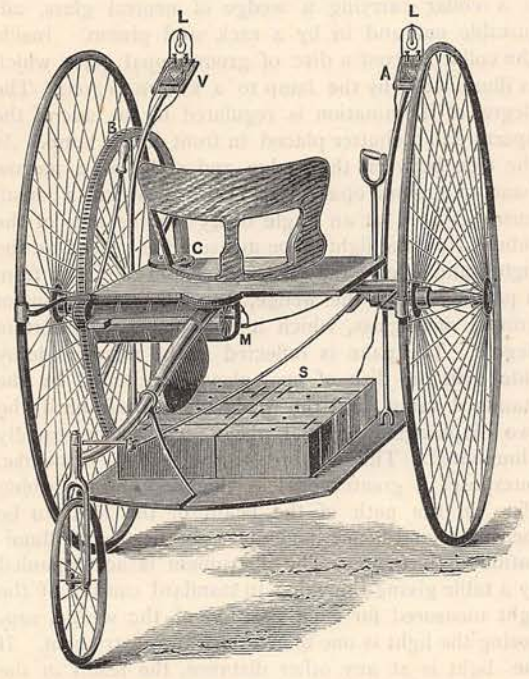


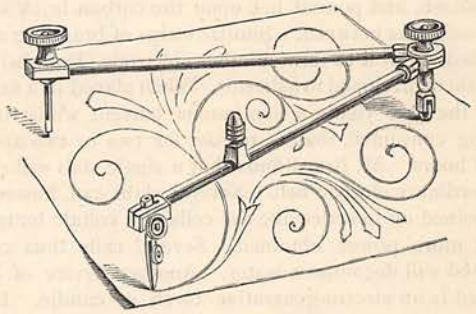
Aluminium in Plenty.

It is stated that a new process has been discovered whereby aluminium can be manufactured at half its present cost, and if so we may expect a very useful future for this metal, which is remarkable for its lightness, and makes an excellent alloy with copper or with tin. Its specific gravity is only ⅓ that of iron, and its conductivity for the electric current is eight times greater. It is likely therefore to be of great use in the electrical industry now springing up.

An Electric Tricycle.

Professor W. E. Ayrton, F.R.S., has applied the Faure accumulator to the propulsion of a tricycle by means of a new electric motor devised by Messrs. Ayrton and Perry. The Faure accumulators, shown at S in the accompanying figure, were charged with electricity from a dynamo-electric generator, then placed on the foot-board of the vehicle. The electric motor, M, was conveniently fitted up under the seat, and derived its driving current from the accumulators. By means of a commutator, C, seen on the left hand of the seat, and worked with the left hand, the number of accumulators in circuit with the electro-motor can be varied at will, and the speed of the tricycle varied accordingly. B is the handle of the ordinary brake, which can be applied with the left hand after turning off the current with the commutator, C. The full power of the accumulators can only be turned on after lower powers have been applied, hence there is no jar to the rider on starting. A is an ammeter, and V a voltmeter, which enable the rider to tell the horse-power being used at any moment. L and L are two Swan lamps to light the vehicle. The total dead weight added to the tricycle by the motor, M, and accumulators was 1½ cwt. This is a large addition to the weight of the machine itself, which is about ¾ cwt., and it does not look very hopeful for the future of electric tricycles. Possibly, however, a much lighter accumulator will be invented; and if the electric power is employed merely as an aid to human force in going up hills, for instance, and for lighting the tricycle lamp, we may expect success in this direction.





Horizontal Compasses.

The ordinary beam compasses used by draughtsmen are always more or less difficult to adjust, and troublesome on account of their lack of stability. A form of Brook's horizontal jointed compasses has recently been introduced, which bids fair to overcome these drawbacks. It is constructed, as shown in the woodcut, of two tubular arms, giving strength combined with lightness, and jointed together like the ordinary compass-legs, but with the addition of a thumbscrew which enables the draughtsman to fix them at any angle. The apex of this angle rides on a small castor as shown. A needle-point is fixed to the extremity of one leg, and a pen or pencil to the extremity of the other. The instrument is shown in the act of striking a circle. When very large circles are to be struck, the arms are made telescopic so as to enable their lengths to be altered.

Electrical Fuel.

Some interesting experiments have recently been made by M. Brard, of La Rochelle, with a view to obtain electricity from the combustion of carbon under a high temperature, produced by the oxidising action of nitrate of potash or of soda. His object was, in fact, to construct an electric battery operating by heat, and to this end he has constructed what he calls an "electro-generative slab," which, when thrown into the fire, produces electricity by combustion. The slab is about six inches long, two inches wide, and one inch thick. The outer casing is of asbestos, which does not consume in the fire; and two brass ribbons act as electrodes for conveying away the current generated. The filling consists of a prism of carbon and a prism of nitrate of potash, separated by a plate of asbestos, just as the two metal plates of the ordinary voltaic cell are separated by a porous clay diaphragm. The carbon is made of a quantity of coal-dust kneaded into a paste with tar or molasses, and moulded in a die, along the bottom of

which have been laid several strips of brass, which become embedded in the mass, and serve to conduct the electricity to an electrode. This die is also contrived to form holes in the mass of the carbon to facilitate combustion, and multiply the points of contact of the carbon with the nitrate; and it is pitted on its upper surface to prevent the melted nitrate from flowing into the fire. The upper prism of the brick is formed of three parts ashes mixed with one part nitrate of potash, and poured hot upon the carbon brick with the asbestos between. Similar strips of brass are also embedded in it to form another electrode. Both bricks are then enveloped in asbestos. When placed in a fierce fire the slab yields a continuous current whilst it is being consumed, that is to say, for two or two and a half hours. M. Brard finds that a single slab will ring an ordinary electric bell. Several slabs can, however, be joined up in series like the cells of a voltaic battery, and more power obtained. Several cells thus connected will decompose water. Another device of Dr. Brard is an electro-generative torch or candle. It is prepared by making a paste of coal-dust and molasses and moulding it into a stick, which serves as the inflammable wick of the candle. This rod is then covered with asbestos paper, and dipped into fused nitrate of potash until a good thick coating of the latter adheres. Ashes are mixed with the nitrate to make the candle burn more uniformly. On the wick being ignited it burns away; and a current of electricity is drawn from the candle by wires inserted into the nitrate and the coaly wick.

The Dove Flower.

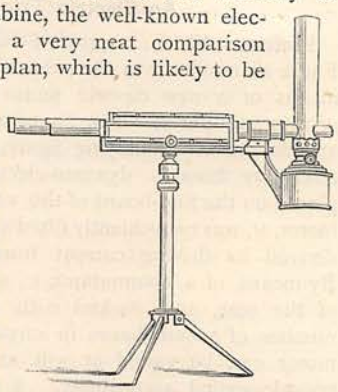
The beautiful exotic which we illustrate herewith is a native of Central America, where it is venerated by the inhabitants as a holy symbol, and is known as "el Spirito Santo," from its likeness to a white dove with extended wings. Its botanical name is *Peristeria alata*. The flowers are white and spotted, the central portion resembling the flying dove. The particular specimen we have figured was grown by Mr. L. M. Stone, of Brooklyn, New York.

Time by Telephone.

At Ann Arbor, Michigan, the subscribers to the telephone exchanges get astronomical time signalled every morning at 9 o'clock by telephone. A telephone transmitter at the Observatory is placed close to a Morse sounder, which is actuated automatically by the standard clock. From 8.58 to 8.59 a.m., the sounder clicks once for each second, and from 8.59 to 9 o'clock twice for each second. At 9 o'clock it ceases. These clicks are heard distinctly in all the telephones connected to the system. The advantages of the telephone are paralleled by those of the telegraph. Quite recently an officer of the Eastern Extension Telegraph Company, stationed at Cape Bolimao, in Manila, took ten grains of sugar of lead in mistake for ammonia, and telegraphed for advice to Hong Kong. Dr. Nartigan, of that city, duly advised him by cable, and he recovered. The distance from Hong Kong to Cape Bolimao is 555 miles.

A Wedge Photometer.

Wedges of smoky or "neutral-tinted" glass have been used before now to measure the intensity of light; but Mr. R. Sabine, the well-known electrician, has devised a very neat comparison photometer on this plan, which is likely to be useful in measuring electric lights. It is illustrated in its portable form in the accompanying figure, and consists of a stand supporting a horizontal tube, at one end of which is an eye-piece, and at the other a paraffin lamp, which gives the standard light for comparison. The middle portion of the tube is cut away, and has slipped over it a collar carrying a wedge of neutral glass, adjustable out and in by a rack and pinion. Inside the collar is fixed a disc of ground opal glass, which is illuminated by the lamp to a known degree. The degree of illumination is regulated by the size of the aperture in a shutter placed in front of the lamp. At the side between the wedge and collar is a narrow pane of ground opal glass, behind which a small mirror is fixed at an angle of 45° to the axis of the tube. Now the light to be measured is placed on the right-hand side of the photometer, and the beam from it passes through the wedge, then falls on the pane of ground opal glass, which it illuminates to a certain degree. The pane is reflected in the mirror side by side with the disc of opal glass illuminated by the standard lamp, and the wedge is shifted until the two diaphragms of opal glass seem to be equally illuminated. The shifting of the wedge, of course, interposes a greater or less thickness of absorbing glass in the path of the beam of the light to be measured, and hence it changes the degree of illumination of the pane. The instrument is accompanied by a table giving the value in standard candles of the light measured for each position of the wedge, supposing the light is one mètre from the instrument. If the light is at any other distance, the result in the table has to be multiplied by the square of the actual distance.



Carrier Pigeons for Naval Use.

The Secretary of the German Navy has resolved to employ carrier pigeons as a means of communicating between lightships and lighthouses and the shore.

Experiments made during the last few years by the Prussian Government have proved the capacity of the bird for this work.

Jumping Seed.

A "jumping seed" which fidgets about has made its appearance in Butte County, California. They are small brown bodies, not unlike mustard-seed, and even keep up their movements when placed in a phial. This "seed" is really the cocoon or gall of a tiny insect (*L. cynips saltatorius*) and the chrysalis within causes its motion.

Wire Guns.

Cannon and other ordnance are now being made of iron wire by Sir William Armstrong, for trial at Woolwich. They promise to supplant the older iron and steel guns altogether. Iron or steel in the form of wire is very much stronger to resist a tensile strain than in mass; and, moreover, the wire coils can readily be shrunk on hot. The chief advantage of the use of wire is, however, that the strain throughout the entire gun-tube can be kept about the same; and thus there is less likelihood of the gun bursting than there is in the case of the steel-tube guns.

Removing Paint and Putty.

A mixture for removing old paint or putty is made by taking 1 lb. of pearlash and mixing it with 3 lbs. of quicklime slaked in water. The whole is beat to the consistence of paint, and applied to the putty or paint with an old brush. After twelve or fourteen hours the paint will be easily scraped off and the putty quite softened.

New Fishes.

A new edible fish of a very promising character has been taken from the Atlantic off Long Island. It resembles the red perch or Norway haddock, and runs from 2 lbs. to 3 lbs. in weight. Its scientific name is the *Sebastes dactyloptera*, and a similar fish is caught at Madeira, where it is known as "catseye." It is now taken in deep water by the trawl off the Long Island coasts. A very curious fish has also been taken by a French exploring vessel off the coast of Morocco. It was brought up from a great depth, and is of a deep black colour. Its length is about eighteen inches, and it has a very large capacious mouth, with an elastic bag like that of the pelican. It is believed that food is collected, and perhaps digested, in this bag. The fish has very small fins, and very little power of locomotion. It has been called the *Eurypharynx pelecanoides*.

A Princely Safe.

The great deposit safe of the new Nassau Bank, New York, is believed to be the finest of its kind yet constructed. It is made of welded chrome steel, iron, and franklinite, and is to all appearance absolutely fire and burglar proof. A flight of marble and iron stairs leads down to it from the interior of the bank. It is built in the centre of the crypt, or basement, to which the steps descend, and is founded on concrete and granite. The floor is laid with marble and mosaics. There are two massive iron doors at each end of the vault, the outer ones being the largest single doors ever made for the purpose. Outside these are other electric burglar-alarm doors, which cannot be tampered with without sounding a loud alarm bell. The whole vault is illuminated day and night by electricity.

Keeping Toilet Water Hot.

A simple way of keeping water hot all night for the early toilet is to fill a wrought-iron ball with boiling water, cover it with a cosy of wool, and allow it to stand on a chair during the night. Water thus protected cools very slowly, and what heat it loses goes to warm the bed-room.

Vegetable Butter.

Mr. Jepson, an English vegetarian, makes a good substitute for butter in the following way:—Four ounces of the finest Brazilian nuts are taken and pounded very fine in a mortar along with four ounces of pure olive oil. They are rubbed into a jelly with eight ounces of fine wheat-flour, and a quarter of an ounce of salt. The mixture is then rubbed into a smooth paste resembling butter.

Mosquito Oil.

A serviceable ointment for keeping off mosquitoes is made by taking oil of tar, 1 oz.; olive oil, 1 oz.; oil of pennyroyal, ½ oz.; spirit of camphor, ½ oz.; glycerine, ½ oz.; carbolic acid, 2 drachms, and mixing all together. The compound has to be shaken up before being applied to the skin.

Moral Education at Schools.

SIR,—You have kindly expressed your willingness to open your columns for the ventilation of subjects of general importance; I have no hesitation, therefore, in asking you to spare me a little space.

I suppose that it will be admitted on all sides that education—the education of the intellect—has attained to a high standard in these days of progress, and in this respect little fault can be found with our modern schools of all grades. But how about the moral education of the young? Has there been a corresponding advance? Or has there not rather been a sad falling off? My own opinion is—and I regret to say that it has been borne out by practical experience—that the education of the head is set far before the education of the heart, and that while intellectual and physical education are well looked after, *moral* education is almost entirely neglected. At all our schools the minds and bodies of our boys and girls are admirably exercised, but little, if any, attention is paid to the inculcation of virtue and the condemnation of vice. True it is that apparent faults—the deliberate asseveration of a lie, for example—are noted, and punishment is meted out, but there is little attempt on the part of some masters

and mistresses to set up a high moral standard for their pupils to aim at, and the enormity and evil consequences of moral offences are rarely pointed out. As has been well written—"Children are supposed to acquire good moral principles and habits in the same easy way in which they learn to walk or speak." And yet it can hardly be denied that, as one of Her Majesty's Inspectors of Schools has remarked, "more of our moral errors arise from ignorance than from any other cause." Surely the possibility of this should not be allowed to remain. Mental and physical education must not be allowed to oust moral and spiritual training from their proper place. All four should run together, helping one another at every stage of life; *but if not*, better a weak frame and feeble powers with a heart full of the love and fear of God, and overflowing with a sense of its duty to its neighbours, than a life whose sole gifts are powers of mind and body.

I am, Sir, &c.,

PATERFAMILIAS.

Why all this Smoke?

SIR,—Why indeed should there be all this smoke, when householders all over the country may burn *me* at less cost than ordinary coal? I am positively smokeless, and unlike my brother Anthracite, I need no special form of grate, and I throw out plenty of heat. If you want to lay a fire with me, place pieces of me—neither very large nor very small—upon a liberal supply of wood, apply a light, and you will see me burn up merrily. I shouldn't be stirred with a poker so long as the air can pass through me; but if the passage of the air should by any chance become obstructed, then you may push a poker into the bottom of the grate and quietly withdraw it. But perhaps I cannot do better than quote the conditions of burning me satisfactorily, as published by a friend of mine—the Chairman of the Committee of Council of the Smoke Abatement Institute :—

1. A good draught is required in the chimney; where the draught is deficient, or when the fire requires stimulating, a "blower" should be used.

2. The smokeless coal should be put on the fire lightly, in pieces about egg-size. Fires should be replenished with moderate quantities and before they get too low.

3. The coal should never be *stirred* with the poker. The ashes from the bottom of the fire should be gently raked out; the smokeless coals require as much air as possible.

4. For kitchen use, no saucepan or kettle should be put to rest on the fire; they should be rested just above the fire, as the smokeless coals will not bear weight.

5. Grates or stoves with fire-clay sides and back are best adapted for burning smokeless coals, but they will burn in ordinary iron grates with attention to the above rules.

6. The cinders of the smokeless coal can be used, and they make a bright fire if they are sifted quite free from ash. The cinders are particularly useful in lighting fires.

7. To light a fire readily with the smokeless coals alone, a good quantity of wood is required; a little of the ordinary description of coal to start the fire is useful. A red-hot iron or "salamander" taken from one fire and inserted under the wood of another kindles it very readily, a strong heat being required to light smokeless coals.

8. The above directions apply to burning the smokeless coals in closed stoves as well as in open grates.

Let these conditions be observed, and you will find no difficulty in burning me in the majority of the ordinary open grates. Of course, as I give out no flame, I am quite useless for those kitcheners in which you need a bright flame lapping over the oven or the boiler; but for all other purposes, I can only say—"Give me a trial." And if you hear people saying that I won't light, or that I give out no heat, depend upon it that those grumblers have been using pure Anthracite, which certainly does require a special stove for its combustion. To make my identification complete, I ought perhaps to say that I am sometimes known as South Wales Steam Coal.

Trusting that every householder who is desirous of breathing a little less smoke will follow my advice and try what he can do with me,

I am, &c.,

SEMI-ANTHRACITE.

Poem Competition Award.

Owing to the large number of competitors—142 *poems having been sent in—the task of making the award has been one of unusual difficulty, but the Editor has pleasure in announcing that the Judges have, after careful consideration, awarded the* PRIZE *of* FIVE POUNDS *offered by the Proprietors of the Magazine for the best poem on "Happiness" to*

(Miss) KATE THOMPSON SIZER, Moorlands, Great Bentley, Colchester, Essex, *whose poem will appear in an early issue of the Magazine.*

Honourable Mention is Specially Awarded to the poems by the following, in order of merit:—

(1) MARGARET MACRITCHIE, 4, Ceylon Place, Eastbourne.
(2) ELLEN J. ARTHUR, Tor House, Matlock Dale, Derbyshire.
(3) W. MAURICE ADAMS, care of Colonel Beachcroft, 11, Talbot Square, Hyde Park, W.
(4) Mrs. HART, Glen Alla, Ray, Londonderry.

While the poems by the following authors are Commended:—

(1) GEORGE B. BURGIN, 1, Victoria Villas, Victoria Road, Stroud Green, N.
(2) ANNIE CLEMENTS HOUSMAN, Perry Hall, Bromsgrove.
(3) MINNIE MOORSOM, 8, Onslow Crescent, S.W.
(4) LUCY E. WARD, Houghton House, Diss.
(5) CATHERINE CASTILE SCOTT, Mona Cottage, South Ossett, Wakefield.