even a bacon-bone that contains no fat. After the whole has boiled or simmered (for it does not matter allowing it to boil after the first two hours) for the best part of a day, let it boil away till there is only a quart of liquor left. Then strain it off into a basin, cover it over with a cloth, and let it settle. I would advise the cook now to add a quart of fresh water to what is left in the saucepan, and put it on, and make what is called a "second stock." When the quart of gravy that has been poured off is quite cold, it will be a firm jelly with a good deal of sediment at the bottom, but the top part will be bright enough for practical purposes after the fat has been removed. Of course it can be cleared with white of egg. The upper part of the stock should be used for the bright glaze, and the bottom part for the brown gravy. The brown gravy should be thickened with brown flour, or better still, flour made brown by being fried in butter, which is called brown roux. The clear gravy can be made sufficiently thick with a very little arrowroot. It is, of course, better to make it thick by boiling it away, but this is rather expensive. It will be observed that, although I have used knuckle of veal, I have not recommended any gravy beef. The reason of this is that extract of meat will be found cheaper and better when veal is used. The veal is sufficient to make the gravy a firm jelly when it is cold; the extract of meat gives it flavour and colour. When these two gravies have got cold and the fat has been carefully removed from both, the brown gravy should be the colour of Spanish mahogany. The bright gravy, or as I have called it, glaze, should have the appearance of bright golden sherry.

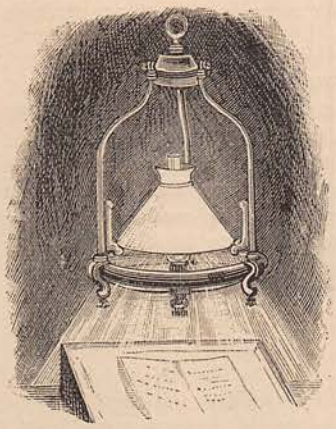
A brimming tea-spoonful of extract of meat should be added to each pint of gravy. When the brown gravy has been thickened with brown flour or brown roux, it should be passed, after boiling, through a fine sieve.

In large establishments, of course, extract of meat would never be required, as the stock which is made in very considerable quantity is boiled down to a glaze, and the glaze is allowed to acquire colour over the fire before water is added. Extract of meat saves housekeepers in small establishments this troublesome operation.

THE GATHERER: AN ILLUSTRATED RECORD OF INVENTION AND DISCOVERY.

Correspondents are requested, when applying to the Editor for the names and addresses of the persons from whom further particulars respecting the articles in the GATHERER may be obtained, to forward a stamped and addressed envelope for reply, and in the case of inventors submitting specimens for notice, to prepay the carriage. The Editor cannot in any case guarantee absolute certainty of information, nor can he pledge himself to notice every article submitted.

A Shadowless Hanging Lamp.



A pendent lamp which is designed to cast no shadow is illustrated by the accompanying woodcut. The design of the lamp, as may be seen, is such that the solid, opaque supports beneath the flame are reduced to a very small size so as not to obstruct the light of the flame below. The ring shown is the oil-holder, and the oil passes to the wick by the fine tubular supports of the central portion of the lamp. Brackets on the side of the framework support the shade. The lamp is intended to burn petroleum or other oils.

The Power of a Whale's Tail.

A Glasgow engineer, Mr. John Henderson, has calculated the horse-power of a blow from the tail of a large whale, and finds it to be 145 horse-power when the whale is propelled by it at the rate of twelve miles an hour. His calculations were based on a "finner" whale eighty feet long, and weighing seventy-four tons. The width of the tail, between the tips of the flanges, was about twenty feet. These great leviathans sometimes come into British waters, a well-known specimen being that seen at Longniddry, in Scotland. They are believed to attain a speed of twelve knots an hour. Greenland whales can go at the rate of eight or nine knots an hour.

Sheet-Brass Bells.

Small bells are now manufactured out of sheet-metal instead of being cast. They are formed by a single stroke of the die or press, and are quite as resonant as the cast-metal ones for household use and telephone call-bells. As many as twenty-five to thirty per minute can be turned out in this way, and, the surface being smooth, they require little polishing.

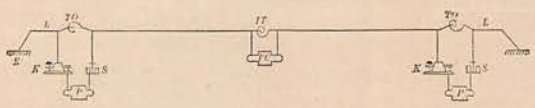
The Life of the Sun.

Sir William Thomson, the well-known physicist, has calculated, on the theory of Helmholtz, as to the maintenance of solar heat, that the sun has been capable of supplying heat to the earth sufficient to sustain life for twenty million years, and that it is capable of continuing to do so for ten millions more. The theory of Helmholtz is to the effect that solar heat is kept up

by the shrinkage of the sun as its glowing mass cools. Whether this is the true and only source of solar heat supply is, of course, not absolutely known ; and, until it is, any calculation such as the above must be accepted with reserve, however interesting it may be to attempt the reckoning. And even if the above result were approximately correct, as far as it goes, we cannot assume that in that vast space of time other conditions will not arise which would falsify the estimate.

The Phonopore Telegraph.

Experiments of a successful order have recently been made with the new telegraph of Mr. Langdon Davies, which is designed to operate on telephone lines simultaneously with the telephone, or on ordinary telegraph lines simultaneously with the ordinary telegraph, without interference. The apparatus has been tried for some time past between London and Folkestone. The phonopore, in its simple form, has been



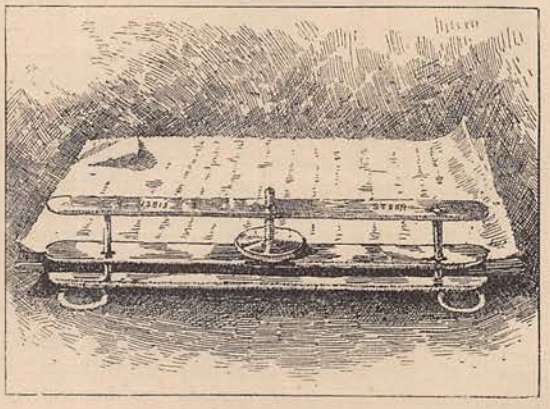
before referred to in the GATHERER. It can be made by taking two lengths, say 500 yards each, of No. 50 copper wire, covered with silk, and binding them side by side. The double wire is then wound on a bobbin, and if one is connected to a telephone, and the other to a telegraph line, the other ends of the wires being "free," or insulated, the telephonic message will pass between them into the line, although the silk covering insulates one wire from the other. There are other ways of making a phonopore, but this is the simplest of all. Its peculiar property is that while telephonic currents, and short vibrating currents, or electric impulses pass across it from one wire to the other, apparently as if there was a metallic circuit between them, continuous currents, such as the signal currents of an ordinary telegraph, do not pass. Hence Mr. Davies is able, by its means, to superpose telephonic and vibratory currents on an ordinary telegraph line, and thus make it convey these in addition to the ordinary telegraphic currents. The telephonic and vibratory currents are comparatively feeble, and do not interfere with the working of the ordinary telegraph instruments, while at the same time they are capable, by means of the phonopore, of actuating telephones and other telegraph apparatus specially made to receive and record the messages of the vibratory current. The figure shows, for example, a telegraph line, L L, working three sets of ordinary telegraph instruments, T O, I T, and T O, while at the same time there is working a vibratory or phonoporic telegraph, P P. The phonopore itself is inserted at P, P C, and P; that at P C being simply used to bridge over the telegraph instrument I T, and convey the vibratory currents beyond it. It will be seen that the phonopore acts like a "condenser," conveying vibratory currents and stopping steady currents. The telephone itself, as is well known, produces vibratory or undulatory currents, hence we need not dwell on the telephonic part; but we ought to say that the vibratory currents which work the phonoporic telegraph are produced by a vibrating reed interrupting the current of a small battery. These vibratory currents are passed into the line through a phonopore, and received at the other end in the coil of an electro-magnet, which in turn sets a similar reed into vibration in a well-known manner. This reed interrupts the current of a local battery in the electro-magnet of a relay which operates a "sounder," or other telegraph instrument, by means of another local battery. It is to be understood that the vibratory currents are broken into telegraphic signals by a Morse key. Thus if in the figure S represents the phonoporic apparatus generating vibratory currents, K will be the Morse key interrupting them, and E the "earth" connection. The apparatus is, of course, complicated, and we need not enter into the details which show how the feeble vibratory impulses are caused by means of the reed and relay at the receiving end to work ordinary sounders or Morse printers.

Teaching a Dog to Read.

Sir John Lubbock, M.P., has succeeded in teaching a black poodle dog "a little light reading." He took pieces of cardboard and painted on them the words "food," "out," "bone," "tea," and so on. Then by associating food in the animal's mind with the card bearing the word "food," he succeeded in getting it to pick out the card bearing that word. Again, when asked if he wanted to go out, he fished "out" the card bearing that word, and so forth. The teaching took a long time, and, though to a large extent futile, it shows what may be done with some dogs by proper methods of training.

A New Paper Binder.

A simple but effective paper binder has recently been patented, and is illustrated in the accompanying woodcut, from which its form will be readily seen. It consists of three plates of brass about six inches in length, the two outer plates being connected by small brass guides on which runs the middle plate. To this moving middle plate is secured a screw which is



threaded in the top plate in such a manner that, by turning it one way or the other, the middle plate is raised or lowered. Papers being placed between the two bottom plates are tightly secured, without any damage to their edges, by screwing down the middle plate. A smaller form of the apparatus, acting on one corner of the papers to be secured, is made for the use of public speakers and others.

The Air-Brush.

A new artistic brush or colour applier has been invented in America, and won high recommendation from a Committee of Science and Art of the well-known Franklin Institute. The instrument does not make up for lack of artistic skill, but it shortens the time required to lay on colour in certain cases. The tints appear equally well whether the light falls on them from one side or the other. This is not the case with crayon colouring; but the air-brush throws the colour down into the pores of the paper. It consists of a spoon-like reservoir, which contains a little of the colour to be applied. Through this liquid a fine needle darts rapidly backwards and forwards; its wetted point projecting each time beyond the edge of the spoon. A strong current of air from bellows, which can be manipulated by the foot of the artist, blows past the point, and carries the paint in spray against the paper. If the needle-point is held near the paper, the result is a fine line on the paper, which, however, can be broadened by withdrawing the point from the paper. All the operations are said to be completely under the control of the colourist.

A DOUBLE-SEATED HANSOM.

A Double-Seated Hansom.

The above illustration shows a new type of hansom which has recently been introduced. It is intended to seat four persons, and is provided with two seats, while at the same time it includes the advantages of a hansom in point of speed, and so on. The driver sits behind, as in the ordinary hansom; but the passengers enter at the back from either side. The driver can open and close the doors without leaving his perch, or losing control of the horse. Communication with the driver is made through a trap in the roof.

A Perspective Microscope.

Mr. G. J. Burch has discovered that when two lenses are separated by a distance equal to the sum of their focal lengths, the magnitude of the image bears a constant ratio to the object, no matter where the latter is situated on the optic axis. The ratio in question is that of the focal lengths of the two lenses. A displacement of the object along the axis causes a displacement of the image in the same direction, but in the square of the ratio. Moreover, a picture taken with the camera lucida under these conditions has the perspective of the object magnified in the square of the ratio, when it is brought within proper distance of the eye. On these principles he has constructed a perspective microscope, which he recently exhibited at the Royal Society with a piece of moss under it, which, on being looked at, was seen in magnified perspective.

Artificial Pumice.

Prof. J. W. Judd, in a recent paper on the volcanic rocks of North-Eastern Fife, observed that natural glass, or obsidian, frequently contained enough volatile matter to bubble up into a pumice when subjected to the heat of the blowpipe. This happened to the "dacite" glass of Fife, and the obsidian of Krakatao, the volcano which erupted in August, 1883. The obsidian, in fact, became like the pumice which was thrown out by the volcano. This fact accounts for the round natural glass balls, or *lithophysæ*, of the Obsidian Cliffs in the Yellowstone Natural Park. They are probably natural glass bubbles.

Spiders and the Electric Light.

Some time ago electric lights were placed in front of the Treasury and other public buildings in Washington, and a curious result has been an extraordinary congregation of spiders' webs. These cunning animals have discovered that game, in the form of flies, moths, and so on, is very abundant near the electric light, owing to the attraction it has for some insects, and hence their webs are in some parts so thick that portions of the architectural ornamentation are no longer visible.

Natural Smelted Iron.

Along the banks of the North Saskatchewan River, near Edmonton, in the North-Western territory of

Canada, there are beds of lignite to be seen overlaid with clayey sandstone containing nodules of clay iron ore, which is probably a carbonate of iron. At some time or other the lignite has been burnt, and the beds are now, in part at least, turned into ashes and cinders, amongst which are found lumps of pure iron which have been smelted from the nodules of ore by the burning lignite. Some of these pieces weigh twelve pounds or more, and they are much rusted. A thicket of trees is now growing on the old lignite beds. The phenomenon may be an instance of how the reduction of iron was first discovered by primitive man. It reminds us of the old iron-workings of our Saxon ancestors in Sussex.

Glass-Paper.

Powdered glass is now used instead of sand for lining "sand-paper." The glass is pulverised by heating it red-hot and throwing it into water, then braying the grains in an iron mortar. It is then sifted, and fixed on the paper by a strong glue. Muslin is also used instead of the paper, and is said to last longer.

A New Life-Buoy.

Mr. Alexander Smith, President of the Arbroath Swimming Club, has devised a new life-buoy, which obviates some disadvantages of the old ring form. It can be gripped at any part by means of a hand-rope round it. The shape is longitudinal, and in the centre is a handle with a buoy at each end. These buoys are of an oval or other shape, and can be filled either by air or cork. The mode of using is to pass both arms over the centre until it rests under the armpits, and can there be to a certain extent controlled.

Measuring Irregular Solids.

Herr R. Kleemann, of Halle, has devised a useful little instrument for measuring the volume of bodies of any shape without bringing them into contact with water or weighing them. It consists, as shown in the figure, of a cylindrical copper box six centimetres high, and ten centimetres in diameter. A long graduated tube is jointed into the top of this, the diameter of the tube being three centimetres. It can be closed by an india-rubber cork. The base of the box is removable, and has a sharp point on it to support the solid to be measured. The apparatus is used as follows:—Fine sand is poured down the tube into the box until its level reaches the zero mark of the instrument. The cork is then put in, and the instrument inverted. When the solid is in place the sand is turned back again, and the difference of level reached gives the volume of the body, since it shows the displacement which the latter has produced.

A Telephone Palace.

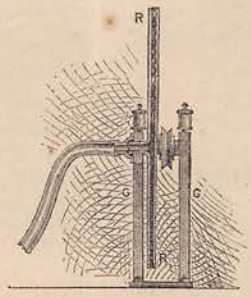
In Stockholm the telephone is much used, and a large central station is now in course of erection for this purpose. It is called "the Telephone Palace." It is intended to meet the wants of 4,000 telephone subscribers at present, and 7,000 in future. The main room is 110 feet long by 30 feet wide, and here the telephonic communications are made and unmade, enabling any part of Stockholm to speak to any other part. There are twenty connecting and disconnecting tables in the room, each comprising 16,000 connections; and there are no less than 160 Swedish miles of connecting wire within the room. The whole is worked by eighty clerks.

A Wooden Tower.

An international industrial exhibition is to be held at Brussels in 1888, and one of its features will be a gigantic tower 900 feet high, and built entirely of wood. The tower will be surrounded by three galleries, one of which will be used as a concert-hall and promenade. Seven lifts will convey people to the top, from whence a view for 72 miles round will be obtainable. It is estimated that the building of the tower will occupy 1,000 workmen for a year.

A Pneumatic Speed Indicator.

Captain Rung, of the Danish Royal Artillery, has recently brought out an ingenious pneumatic rotation indicator, which enables the speed of an engine to be read at a distance, and is thus useful on board ship. If a piece of india-rubber hose is swung round by hand, centrifugal force will cause the air in it to rarefy if the tube is closed at one end. This fact is made use of by the inventor. When the rotary hose is connected to a vacuum gauge the hand on the latter takes a fixed position when the speed of the hose is uniform, and the position of the hand bears a certain relation to the speed. The actual apparatus consists of two chief parts: first, a rotator, R (see woodcut), which takes the place of the hose, and consists of a hollow gas-pipe which revolves on an axis driven by a belt or cord from the engine-shaft. This is connected at the middle by a pneumatic tube, which is in turn connected to an indicator. The whole is mounted on supports, G G, and free to rotate. The indicator, or second part of the apparatus, is a pressure gauge of some kind, and need not be described in detail. Of course, the tube connecting the rotator and indicator may be of considerable length. Experiments have been made with the appliance on board a Danish war-ship, the distance between rotator and indicator being 100 feet; and a new iron-clad is being fitted out with eight of these attachments. They have also been successfully used for testing cream separators of high speed; and it is intended to make a special size for use in centrifugal dairies.



Timing Bicycles by Electricity.

The timing of bicycle races by electricity is, we believe, to be practised by the Massachusetts Bicycle

Club. The device consists of a strip of india-rubber about 3 inches wide and $\frac{1}{16}$ inch thick, to be laid across the track, and having two thin strips of sheet-brass or copper sewed to one side, and these are to be connected with a voltaic battery and an electric bell. The whole is to be so arranged across the track that the pressure of the front wheel of the bicycle brings the two brass strips into contact, completes the electric circuit. and rings the signal bell. The device is operated both at the start and the finish of the race.

Puddling with Dry Clay.

A Scotch engineer has discovered that it is preferable to puddle reservoirs, in order to prevent leakage, with dry clay. The wet clay contains so much water that it is at about its full power of expansion. The dry clay is reduced to powder, then applied to the bed of the reservoir, or any place to be rendered water-tight. The clay absorbs water, expands, and is said to prevent filtration.

Mosquitoes and Trout.

According to a recent bulletin of the United States Fish Commission, mosquitoes are a deadly enemy to young brook trout. An observer states that in June, 1882, while sitting by the Tumichie Creek in Gunnison Valley, Colorado, where the water was clear and shallow, he saw a number of newly-hatched mountain brook trout swimming about. When one of these came to the surface of the water, a mosquito would fly at him and drive his trunk into the little creature's brain. When the mosquito flew away the little fish turned over dead. In the course of half an hour, the observer saw some twenty trout were killed in this way. The locality was near the snow line, and the water cold. It is possible that other infant fish may be killed by the same harpy.

Preserving Iron by Electricity.

Electricity has been applied by a French electrician to the coating of iron with a protective skin of magnetic oxide of iron. The iron is placed in distilled water at a temperature of 158° to 170° Fahr., and an electric current is sent through the water, sufficiently strong to decompose it. The oxygen unites with the iron to form black oxide, which in the course of an hour or two forms a skin on the iron, thick enough to be polished. The current must not be too strong, else the coat will not form. It is thought that the process will supersede the Bower-Barff process, and also galvanising to some extent. Even rusty iron subjected to the bath is said to have its rust converted into the magnetic oxide.

A Belgian Bone Cave.

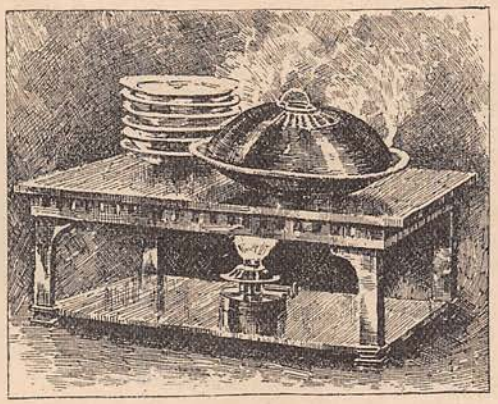
A bone cave of great interest was recently discovered in Belgium, near the Meuse. The floor consisted of several separate beds of clay and calcareous matter, containing flint weapons, fragments of pottery, bone weapons, and tablets of the mammoth ivory. Among these signs of the elephant, mammoth, and deer were also found human skeletons in one of the under beds of earth. They had evidently been laid there for sepulture. The shape of the skulls was similar to that of the famous Neanderthal skull, the bone being thick, and the ridge over the eyes marked. This type of skull is said to be not incompatible with a high degree of intelligence, and to survive in Europe until this day.

Wood-Wool.

Very thin, slender shavings of wood are now used in France, not only for packing, but for filling mattresses, littering cattle, filtering liquids, stuffing horse-collars, and so on. The material is known as "wood-wool," and when derived from resinous wood is said to be preferable to hair for bedding, the resin preventing it from absorbing moisture. In workshops the wood-wool is even replacing cotton waste for cleaning machinery, as it costs far less.

A Table Heater.

A universal heater for plates, liquids, food, and so on, is illustrated in the accompanying woodcut. It is made in the form of a small table, on which the thing to be heated is placed. A lamp below serves as the source of warmth. The heater consists essentially of a hot air chamber, which distributes the heat. This is supported on non-conducting feet, so that it can be set upon an ordinary table, without injuring the latter. The lamp supplied is a methylated spirit lamp of the safety order, so as to prevent fire risks. The heater is made in several metals: for instance, electro-plate, nickelled copper, copper, and tin, the price of the apparatus, of course, varying with the material and size.



A TABLE HEATER.

Prescribing by Cable.

The Atlantic Cable was recently used to prescribe treatment in a case of illness. A lady from New York, while travelling on the Continent, was taken ill

of fever in a German town, and her relatives being distrustful of the local medical attendance, cabled every day to the family physician in New York, and received in reply full particulars of the treatment to be pursued. On one occasion a consultation was held, and the result telegraphed. The patient recovered, and returned to America. This use of the telegraph deserves to be well known, as family doctors are more likely to inspire confidence and to know a patient's constitution than strangers.

A Clock Night-Lamp.

The figure illustrates a little night or day lamp provided with a clock. The clockwork is placed in the bottom of the lamp, and the hour spindle passes through the top and is secured to a plate which is revolved once in twelve hours. Resting on the plate and turning with it is a dome of white glass having the hours and quarters marked on it in a circle as shown. Fixed to the side of the base is a pointer which, as the dome revolves, indicates the hour. A second pointer above can be set in advance of the other to tell the time of an engagement or the administering of medicine. The lamp-flame within the dome illuminates it at night and serves as a lamp.

Projecting Microscopic Views.

Professor Stricker, of Vienna, has succeeded in projecting, on a white screen, the views of objects, as seen in the microscope, magnified from 6 to 8,000 times, according to the power used. It is done by means of an arc lamp, enclosed in a camera having powerful magnifying lenses. The light of the arc lamp, of 4,000 candle-power, is sent through the objects, which are placed on glass plates like microscopic slides, and by means of the lenses is projected on a white screen. In this way it is possible to teach to a whole class at once the secrets of anatomical structure, as disclosed by the microscope.

A Pouched Lion.

In the Wellington Caves of Australia, a fossil jawbone has been discovered, and submitted to Sir Richard Owen, the well-known palæontologist. He has pronounced it to be that of a lion, an animal which was not supposed to have existed on the Australian continent. The peculiarity of this lion is, however, one which belongs to that part of the world. It is believed to have been a pouched lion —that is to say, provided with a pouch, after the fashion of the kangaroo, in which it could convey its young.

An Explosive from Wood.

Wood powder has recently been introduced into the Belgian army instead of dynamite. The powder is made by treating ordinary sawdust with a mixture of nitric and sulphuric acids. It is afterwards formed into cartridges by powerful presses, and these are covered with paraffin paper to keep out the damp. The instantaneous production of gases in the explosion renders the substance a rival of dynamite.

Sponge in Water-Pipes.

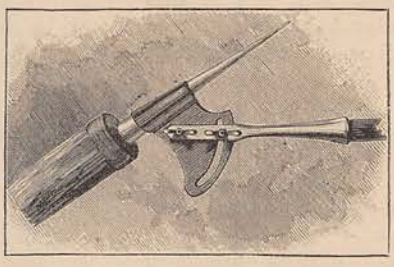
Mr. Desmond Fitzgerald has been making researches on the growth of the sponge, *Spongia lacustris*, in water-pipes. Pieces of this plant, or rather animal, find their way into the pipes from lake sources of supply in America, and by their propagation and decay give what is described as a "cucumber-fishy" taste to the water. Even large mains under a pressure of 100 feet have been filled up with masses of the sponge, which cannot be removed by flushing the pipes, but require the use of scrapers and wire brushes.

A Gigantic Flame.

A volcano of hot mud and earth recently broke out at Lok Batan, in South Russia, accompanied with flames estimated to have been 350 feet high. The whole country was lighted up like day, and the heat could be felt nearly a mile from the crater. The volume of muddy liquid ejected by the eruption has spread itself over a square mile round the crater, to a depth varying from seven to fourteen feet.

A New Brush-Holder.

The woodcut illustrates a new device for enabling places out of reach to be painted. The staff of the holder is fitted with a kind of adjustable sector, which carries the brush-holder as shown; and the sector enables the brush to be adjusted to any required angle by means of the slot and clamps which are provided. Such a device is more advantageous than the ordinary plan of tying the brush on the end of a stick.



£75 STORY COMPETITION.

The MSS. sent for this Competition are still under consideration, and the Award will be announced next month, if possible.