through the fatigue of blooming. The ribbon that trims our model bonnet is shaded satin, for *ombré* effects are everywhere in our toilettes. The skirt opens on the left side to disclose some bouillonné flounces, and the tablier is embroidered; for the foulards and Satins Merveilleux are now embroidered in the style known in Paris as "Broderie Anglaise," which resembles Scotch work. Silk of various colours of the pattern in the foulard are used for overcasting the eyelets that go to form the design. The most ingenious effects are produced in these embroideries by drying them after dyeing. They are hung so that the colour runs off, and they shade thus from dark to light; the rage for *ombré* extending even to embroidery. The material of the mantelet may be either Satin Surah (which also goes by the name of Satin Merveilleux), cashmere, or diagonal, but it should be lined with coloured silk, and trimmed with chenille and jet fringe; the loops which terminate the ends are satin. The arrangement of these long loops should be marked; they are in clusters held at the top by a small traverse or strap.

The third figure wears a Directoire coat of black broché satin, embroidered with steel on the collar, fronts, and upturned cuff of the sleeve. The waistcoat (also embroidered) is fastened with steel buttons; and two large steel buttons mark the waist-line at the back. The dress is satin foulard, the tablier ornamented with embroidery, and the tunic caught back, curtain-fashion, with cords and tassels. The lace used for both jabot and sleeve ruffles is the new D'Aurillac. The hat is open lacé-straw with shaded feathers, fastened down with a steel aigrette. The gloves are *café au lait* Suèdes, fashionable but expensive wear, for they soil easily and clean unsatisfactorily.

The young matron to whom the last maiden is speaking, wears one of the mantles which French women affect this season, and which the English discard for the more close-fitting coat, and the æsthetics for more quaint flowing garments. The mantle in question is satin, gathered in the back, and trimmed with appliqués of bugled jet and deep bugled lace; bugles being richer and handsomer than beads. This gathered back is sometimes replaced by bugled net. The dress is Umritzur cashmere of terra-cotta shade, trimmed with shaded satin to match. These cashmeres are soft, clinging, and artistic, and are consequently in great demand. The trimmings of the hat recall those of the dress. It should be mentioned that the lace on the mantle and forming the ruffle round the throat is black Spanish, a lace for which there is quite a furore at present.

The young girl with a toque on her head, a round pelerine drawn in on the chest under a cluster of loops, has her costume made entirely of delicate sateen, as fine and glossy as satin. The front or tablier is prettily trimmed with the muslin embroidery known in Paris as "church lace," and "Irish point," and which is now produced in many delicate colourings, and, moreover, shaded. The toque is of the same fabric as the dress. The sateens are exquisite this season.

THE GATHERER.

A New Bronze.

Experiments made by Professor R. H. Thurston in the Laboratory of the Stevens Institute of Technology, New York, have resulted in the discovery of a new bronze or alloy of copper, tin, and zinc, of great strength, considerable hardness, and capability of being forged. It consists of 55 parts of copper, 43 of zinc, and 2 of tin. The colour is good, the texture close, and the surface takes a high polish. For purposes demanding great toughness allied to strength, Professor Thurston, however, finds that less tin is desirable, and he gives the proportions, copper 55 parts, tin 0·5 parts, and zinc 44·5 parts, as affording the best results. A rod of this alloy has a tensile strength of about 69,000 lbs. per square inch of area across. Another alloy of 58·22 parts of copper, 2·3 parts of tin, and 39·48 parts of zinc was found to make excellent bolts, and could be forged at a low red heat. These new bronzes are well worthy the attention of our engineers and mechanicians.

A Mountain Lift.

A novelty in mountain transport is about to be introduced at the town of Cauterets in the Pyrenees. This place is much frequented during the summer season by visitors, who go there to get the benefit of the sulphurous baths for which it is justly celebrated. Some of the thermal springs are situated on the side of one of the mountains at a height of 125 mètres, or 400 feet, above the town. To bring the mineral water in pipes to the town would be to allow it to cool very considerably from its normal temperature of 39° Centigrade, and hence it is found advisable for the bathers to resort to the springs themselves. At present they are transported in sedan chairs; but M. Edoux, a French engineer, has conceived the idea of erecting a hydraulic lift in stages, to overcome the vertical height, and level tramways between, to traverse the horizontal distance. His plan is to erect five towers, each containing a hydraulic elevator capable of lifting a carriage full of passengers. The motive-power is supplied by a waterfall on the hillside, and the car runs along the level tracks by its own gravity from one tower to the next. Brakes to prevent dangerous excess of speed are added to the car.

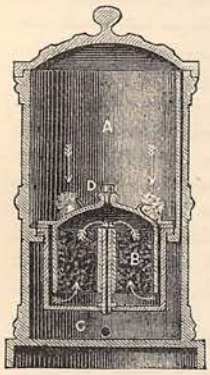
Vanilla Sugar.

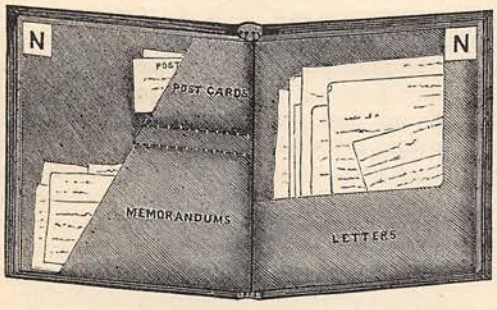
Vanilla is an exquisite aroma; but the high price of the natural bean is a great drawback to its general use in cookery. An economical substitute for it has,

however, been introduced of late in the form of vanilla-scented sugar, which, when added in a small quantity to puddings, creams, custards, jellies, &c., is said to give them a rich and fragrant savour of vanilla.

A New Filter.

The deposit of silt on the carbon of the ordinary carbon filter is a source of trouble, and it is satisfactory to find it obviated in the filter by the recently introduced Silicated Carbon Filter. The interior of this useful appliance is illustrated in the figure. The water is poured into the chamber A at the top; but it does not percolate downwards through the carbon as in the older forms, and leave its impurities on the upper surface. It passes down, as shown by the arrows, through two side inlets, plugged with sponge or asbestos, then *ascends* through the carbon B, and overflows into the bottom chamber C, from whence it is drawn off by a tap. To clean it, the small india-rubber plug D, at the top of the cell enclosing the carbon, is withdrawn, and a current of water sent backward through the carbon. This cell can also be bodily removed from the filter, and transformed into a pocket filter by putting the plug into the bottom of the middle or outlet passage, so as to stop it up, and fixing an india-rubber pipe with mouthpiece on the nipple at D. When the cell is thus arranged it can be lowered into impure water, and the filtered supply sucked through the tube. This is an advantage which should prove useful to families visiting the seaside, and objecting to take with them the entire apparatus.



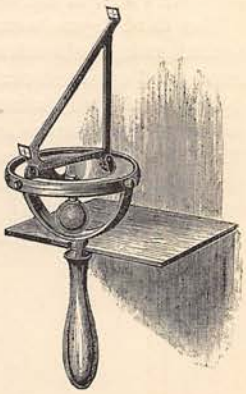


A Letter Album.

This letter-file, or rather album, is designed to sort, bind, and index letters, cards, or other documents, either alphabetically or in the order of their date, while leaving each paper readily accessible without disturbing the rest. No springs or screws are employed, and the papers are neither perforated nor endorsed. The album consists of a folio, like an ordinary leaf or blotting-paper holder, but having four strings at the joint. Through these strings are slipped a series of double leaves, bearing in each corner a letter of the alphabet, as shown in the woodcut, or day of the month, and on each right-hand page a partial pocket, like the letter L in reverse, which is intended to hold letter-sized papers. On the left-hand page is a diagonal pocket, divided into two compartments, the upper one for post-cards, and the lower for memorandum forms. Each set of pockets is intended to last for a month, or longer, according to the amount of correspondence; and when full it is withdrawn from the strings, and stored up for future reference, and its place supplied by a new set. When the alphabetical file is used the papers should be slipped into the file one behind the other in order of date.

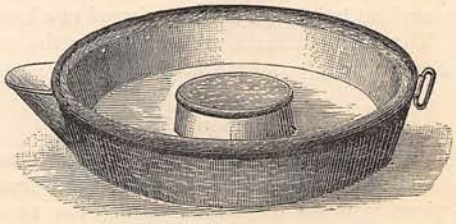
The Hypsometer.

A useful little instrument, called the "hypsometer," for measuring the vertical height of walls, timber, trees, and spouting, and therefore valuable to surveyors, builders, and artisans, has just been introduced. It obviates the necessity of getting to the summit of the object to be measured and dropping a tape line to the bottom. As will be seen from the engraving, it is a trigonometrical instrument, but it is quite free from adjusting screws, degrees of arc, or the need of calculation, and hence it can be used by all. The suspended ball below the horizontal circle is a weight for automatically keeping the base of the instrument horizontal. To find the height of any object, the hypsometer is simply held by the handle, and the eye is applied to the inclined sight-vane shown, while the observer advances or recedes until the point whose height above the ground is wanted is seen to be intersected by the cross-hairs in both sight-vanes. The distance from his position to the base of the object, added to the height of his eye above the ground, as measured by a tape line, gives the altitude of the point.



A Pedestal Sponge-Bath.

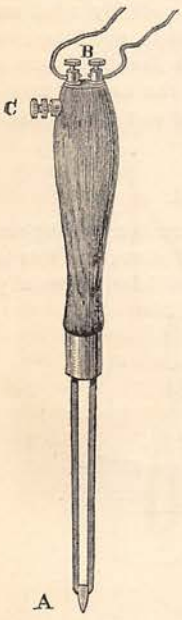
The use of the sponge-bath is now so common that any improvement in it will be welcome to many. As



they are ordinarily made, the bather has to stand with his feet immersed in the cold water during the sponging operation; and for some persons with defective circulation the dry pedestal or stand for the feet, arising from the middle of the basin, as shown in the figure, will recommend itself. The platform is about a foot in diameter, and covered with cork, which is comfortable for the feet, and in cold weather may be warmed by pouring on it a little hot water.

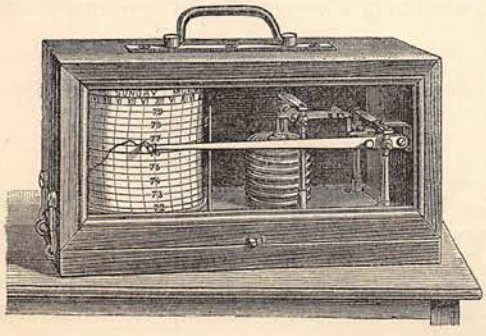
An Electrical Soldering-Iron.

The annexed figure illustrates a new soldering-iron, heated by the electric current, and capable of melting all kinds of solder, from those used for jointing gold and silver, which have hitherto required the fervent heat of a blowpipe to melt them, to the more fusible alloys used in making tin utensils. The "iron" is formed of two strong metal stems, running through the handle, and connected at the point by a tip of platinum, A, or other refractory metal. The electric current is brought by means of wires to the binding-screws, B, at the end of the haft, and as these are in connection with the stems, it circulates through the metal tip, and heats it up to redness. The flow of the current is, however, regulated by a spring-button, C, in the side of the handle, which, on being pressed in by the hand, bridges over a gap in the left-hand stem within the handle, and thus completes the circuit. When the button is allowed to spring back, the circuit is interrupted, and the current no longer heats the soldering-tip. When electricity is "laid on" to work-shops and dwelling-houses like gas or water, this tool, which is the invention of an American, will probably be serviceable; but at present it can only have a very restricted application.



A Recording Barometer.

A very neat and portable barometer for recording the pressure of the atmosphere has been devised by M. Richard, of Paris. As shown in the engraving, it consists of a wooden case fronted with glass, and containing within it a small expansive aneroid chamber, something like the bellows of a concertina. The top of this chamber is connected by a series of levers to a multiplying index, which carries a fine pencil or marker at its extremity. A band of paper wrapped round a revolving cylinder is marked with the hours of the day, and cross-lines for the degrees of the barometer scale. The aneroid chamber, being sensitive to the pressure of the atmosphere, contracts or expands according as the latter is greater or less, and thereby actuates the index, which moves up and down across the cylinder of paper. The paper is turned by clock-work, and the pencil consequently leaves a linear trace upon its surface. The same device has also been applied by M. Richard to the thermometer and the hygrometer. For amateurs in meteorology the apparatus appears to be well adapted, and its price is small.



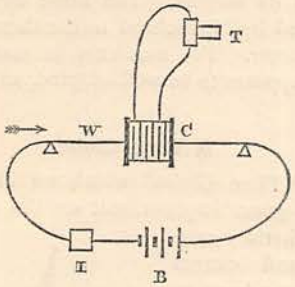
A Time Globe.

Juvet's "Time Globe," which we illustrate herewith, is a great improvement on the ordinary still globe hitherto constructed, and cannot fail to prove a boon to teachers, as well as an instructive acquisition to the library or the office. It is really a miniature earth, turning once round its axis in twenty-four hours, by means of clock-work concealed in the interior of the globe. The motion is indicated by a clock-face with hands under the glass, and the works are wound up every four days by turning the feathered end of the arrow which serves for the terrestrial axis. The equator is surrounded by a zone, marked in hours and minutes, so that the time at any place on the earth's surface can be told at once by travelling along the meridian of the place until this equatorial circle is reached. One-half of the zone is darkened in different shades, to show at a glance which parts of the world have night or daylight, sunrise or sunset. The map itself contains a great deal of useful geographic information, and altogether the instrument will be a capital help to students.

Electrical Torsion.

The most recent discovery in electrical science is the existence of what we may call electrical torsion, a fact which throws a new light on the passage of the cur-

rent through a wire, and on the essential nature of electricity, about which absolutely nothing certain was hitherto known. Professor D. E. Hughes, the distinguished inventor of the microphone, has proved that when a current is sent through an iron wire the molecules of the wire are actually twisted, and the twist for a positive current is opposite to that for a negative current. If we suppose the current from the zinc pole of the battery, B, sent through the iron wire W, in the direction of the arrow, the molecules will be twisted from right to left across the wire ; the observer being supposed to look in the direction of the current. Professor Hughes discovered this important result by means of a telephone, T, connected in the circuit of a



hollow coil, C, surrounding the middle of the wire. The current entering the wire was regularly interrupted by a clockwork interrupter, I, and the corresponding current *induced* in the coil made itself heard in the telephone. But he had previously found that the wire could induce no current in the coil unless it was twisted, and thus it followed that the passage of the current twists the wire. Moreover, if a twist in the opposite direction was given to the wire by hand, the torsion of the current was neutralised, and the telephone was dumb.

A practical outcome of his experiments is a new and simple telephone receiver, which consists simply of the taut iron wire, W, with the current passing through it. When the battery is sufficiently powerful, the interrupted current causes the wire to resound with a distinct musical tone, of a pitch and timbre depending on the nature of the wire and the number of interruptions per second ; and if a good microphone is substituted for the interrupter, the wire gives out articulate speech.

The Mékarski Air-Locomotive.

Air-engines are likely to replace horses for drawing tramway-cars. They are free from the noise, ash, and smoke of a steam-locomotive, and can be readily stopped by the brakes. One of these, the Mékarski motor, was successfully tried on the Wantage tramway for three months last autumn, and has been working the Nantes lines for two years. The locomotive, which weighs 7½ tons, is fitted with a strong steel reservoir for the compressed air, which is supplied to it before starting on its journey. The air is in the first place condensed by stationary engines at the termini of the tramway. On starting the engine, the air passes through a reservoir of hot water and steam to the regulator, and thence to the working cylinders. The hot water raises the temperature of the air, thus increasing its volume and economising the store, while it further prevents the formation of ice in the exhaust passages of the cylinders as the spent air escapes, and in escaping cools. The moisture by which the air becomes charged also assists in the lubrication of the engine. The working pressure of the air in the cylinder is about 90 lbs. on the square inch, but this can be reduced or increased at will by the regulator. The engine is either attached to the tram-car or kept separate. While upon this topic, we may also mention that Col. Beaumont's air-engine, which is now working the Leeds tramways, was recently tried on the Metropolitan Underground Railway, and found to answer well. The question of cost is, however, here a drawback, which does not occur in the case of tramways, for these can be worked by air at a cheaper rate than by horse-power.

A New Tram-Rail.

In the ordinary tramway-rail, there is a guiding rut in which the flange of the car-wheel runs ; but this is often an inconvenience to other vehicles, especially

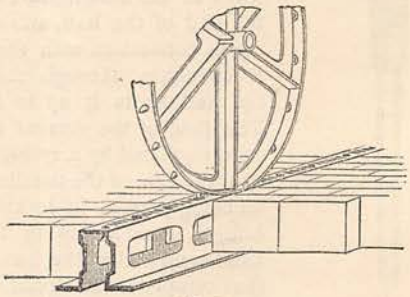


FIG. 1.

light spring-carts, for when the wheels get into the rut, it is difficult to get them out again without a shock disturbing alike to persons and to parcels in the cart. Mr. Edge, of Birmingham, has therefore invented the kind of rail shown in Fig. 1, which is free from the objection attaching to the rut-rail. Mr. Edge's rail is pierced at short and equal intervals with round holes, into which work conical teeth set round the tire of the tram-wheel, and between these holes the rail is furrowed crosswise so as to roughen it and prevent the wheel from slipping. Fig. 2 represents the form

FIG. 2.

taken by a branch rail at the "points." This contrivance has already been working with every success at the town of Brunswick in Germany for more than a year ; and it is, we believe, about to be introduced on the Birmingham to Aston tramway now being constructed.

Mr. Grubb's New Telescope.

The largest refracting telescope ever made has been lately manufactured in Dublin for the Austrian Government. Lord Rosse's gigantic reflecting telescope is the largest of its class, and very large instruments are in existence at Newcastle, at Melbourne, and at Washington, but Mr. Grubb's achievement has surpassed all former efforts. The history of this unprecedented tube would occupy more space than we can here afford, but we may sketch the circumstances under which it has been constructed. The Austrian Government appointed a commission to ascertain and report upon the work entrusted by that State to Mr. Grubb after a thorough investigation. The length of the tube is 33 feet 6 inches and the aperture is 27 inches in diameter. The great and almost insurmountable difficulty consisted in obtaining glass sufficiently pure for such an instrument. The discs were furnished by M. Fiet of Paris, but great delay and expense were caused, for it was believed almost impossible to procure discs of such a size free from defect. Three years after the mounting was completed, the discs remained to be supplied. But at last success crowned the work, and the great telescope is an accomplished fact. The instrument is fitted with all modern improvements, and with all the latest appliances that Mr. Grubb's ingenuity could suggest. The entire moving part weighs about seven tons, and yet the mechanism is so arranged that a child can turn the ponderous instrument. By a peculiar system of equipoise, Mr. Grubb has overcome the great difficulty of motion without reducing the diameter of the axes, which in this instrument are of perfect stability and of great solidity. In the reading of the circles also a very considerable improvement is observable, for by means of a handy reader-telescope—a dwarf beside the giant—all the circles can be read and the spectator need not move from his seat. Without going farther into the technicalities of the instrument, we may mention the results obtainable. It is assumed that refracting telescopes should bear a magnifying power of 100 for every inch in diameter they possess. Therefore this great telescope should render an object 2,700 miles away as distinct as if it were only one mile distant. The moon was viewed through the glass, and its mountains, valleys, and volcanoes—the so-called railway cutting, and the wonderful lunal rills with the craters standing out in relief—were all distinctly visible. We may now assume that the limit of telescopes has been reached, for the great difficulty of supplying discs even one inch more than those hitherto manufactured has scarcely now been overcome. Four anxious years were occupied in preparing suitable glasses, and the finished object-glass is worth £4,000. The massive settings of the frame will astonish many visitors. This frame is of cast iron and there are good-sized rooms at its base ; in one of the chambers is the clock-work movement to turn the instrument in the path of the heavenly bodies as they revolve. This, the greatest and latest achievement of its talented constructor, is really a triumph of art and skilled mechanism.

Anatomical Illumination.

The "polyscope" of M. Trouvé has been applied with marked success to anatomical demonstration by a French professor. This little instrument is really a small electric light of the incandescent sort, enclosed in a tiny glass ball or globe. The light is furnished by a fine platinum wire, rendered white-hot by the passage of an electric current through its mass, and the current is conveyed to this electric wick by slender copper wires insulated with gutta-percha. The physiologist above mentioned causes different kinds of fish and other semi-lucent animals to swallow the ball of the polyscope, and when the current is sent through the wire, the brilliance of the light is such that every internal organ, vein, and muscle is illuminated from within, and can be studied by the student. Like his electric probe, which we recently referred to, the polyscope of M. Trouvé is destined to prove of value in surgery and medicine, especially now that a more brilliant light can be obtained from a thread of carbon instead of a wire of platinum.

An Electrical Thermometer.

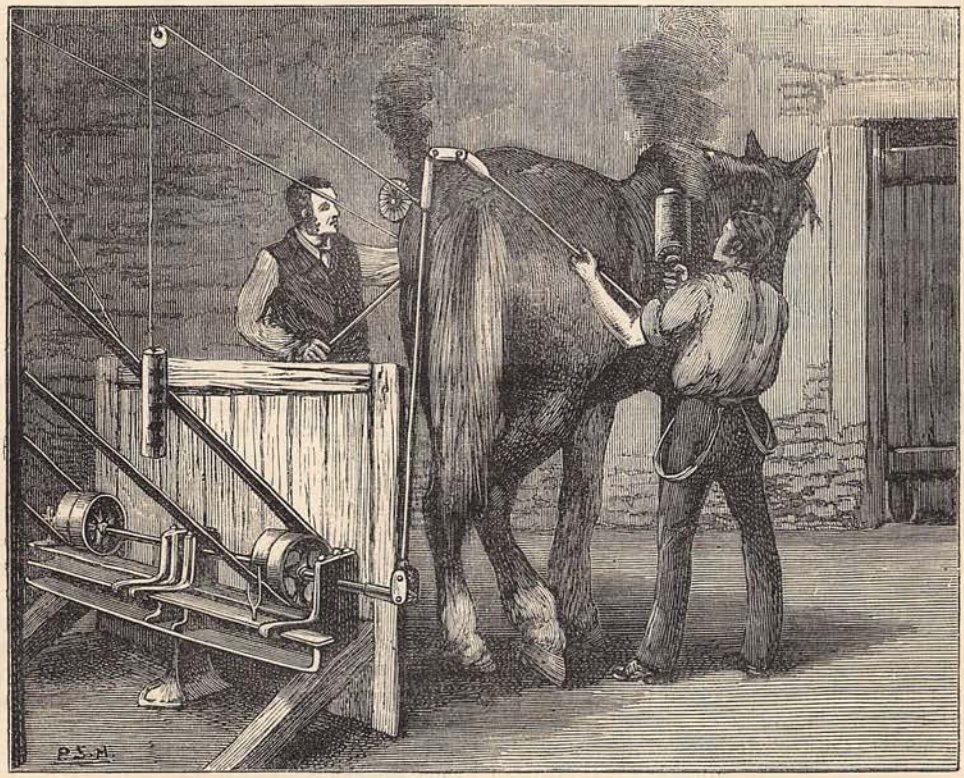
It is sometimes convenient to get the readings of a thermometer indicated at a place some distance from the instrument, and electricity is obviously the best means of effecting this. The electrical thermometer under our notice consists of the ordinary mercurial tube with a series of platinum contact wires fused into the stem at equal intervals of 3° Fahr., for any range of the scale it is required to obtain observations on. The bore of the tube above the mercury column and a bulb formed on the top of the stem are partly filled with glycerine. A platinum wire, fused into the mercury bulb, is connected to one pole of a voltaic battery, the other pole of which is connected to the "earth." If now we suppose a wire in circuit with an electric bell and "earth" to be rapidly drawn across the contact wires fused into the stem, the bell will ring if the circuit be completed by the mercury column. If, however, the column has not risen sufficiently high for this, the bell will remain silent. This passage of the bell-wire over the series of platinum contacts is effected by means of a dial and a revolving arm. The contacts are connected to a row of studs round the rim of the dial, and the bell to the arm, which revolves by clockwork. As soon as an observation is required, the arm is started, and passing rapidly in succession over the studs, the bell indicates what stud the mercury column has failed to reach, and hence the temperature.

Tricycles for Telegraph Messengers.

Velocipedes are now being used in several parts of England for enabling postmen to convey letters with greater expedition, and the authorities of New South Wales are about to provide their telegraph messengers with tricycles instead of ponies. It is expected that this reform will effect a considerable saving to the colony for forage and saddlery per annum. The idea is a good one, and might well be adopted by our telegraph service in rural and suburban districts.

A Mechanical Groom.

The grooming of a large stud of horses employed in hunting, or for omnibus and tramway hauling, may be greatly facilitated by the use of the American horse-brusher shown in the engraving. As will be seen, it is simply an adaptation of the rotary brush which has been introduced into most of our hair-cutting rooms. The power is derived from a man, or perhaps a small gas-engine, and is communicated to the two brushes by means of endless belts working on a shaft, and jointed levers gearing into each other at the ends. When it is desired to stop the motion, the belts are displaced from the pulleys of the shaft. The weights of the transmitting levers are balanced by counter-poises hung over pulleys fixed to the roof, in order not to fatigue the grooms, who can give their entire care to the proper application of the brushes. The brush turns with an average speed of from 500 to 600 turns per minute, and so searching and vigorous is its action that a perfect cloud of dust is raised from the horse's skin.



Dishes from Shavings.

Plates and salvers are made from wood shavings by the following process, invented by Herr Heilmann. Flat shavings are steeped in a weak solution of gelatine for twenty-four hours, and then dried and trimmed. Sheets of the size of the dish to be produced are cut out of cardboard or stout paper, and moistened with a liquid formed of a feeble solution of gelatine and fusible glass. They are then shaped by pressure in a warm mould; and, after being dried, are covered on both faces with a glue composed of five parts of Russian gelatine and one part of turpentine. The prepared shavings are then applied over the card-board, and the whole pressed firm. The shaving acts as a veneer, and besides adding to the beauty of the platter, it increases its cleanliness.

A Reporting Machine.

A machine for reporting the debates in shorthand has just been introduced into the Italian Senate, where it is manipulated by young ladies. It is a small instrument, about one and a half feet long by one foot wide, and it is played with keys like a piano. The number of elementary signs is only six, but by combinations of these a total of seventy-four phonetic letters is obtained. The signs are neatly printed on a tape of paper running under the types, and a speed of 200 words per minute, which is rather more than the most rapid speaker can utter, is attainable. The characters can be read after a few months' practice, but it requires about a year to train the operator to report well. Persons of a quick hearing are best adapted for the work, and blind people are therefore eligible. The "stenograph" will record any language in the world, and it does not even require that the operator should understand what the speaker says, provided he does not articulate too fast.