The first figure, standing inside the room, wears a costume that may be made in cotton, in fine woollen, such as nun's veiling, or in satin, provided a strong contrast of colour is used. In the model, the puffed sleeves, the lining to the ruches and the skirt, are all light poreclain-blue; the remainder is the shade of brown known as "café au lait." The seated figure wears a painted dress; the bretelles, the demi-long sleeves, and the borderings to the double tunic are ornamented with painted tulips. This is essentially an evening dress.

The coat on the next figure is broché satin, and the skirt is trimmed with puffings of steel net—the new bouillonné arrangement described above. In delicate pink satin and white lace this proves a youthful and pretty-looking dress. The last young lady in the group wears a combination of cashmere and shot silk. The gathered plastron is silk outlined with lace, the panels are silk, so is the satchel that hangs at her side.

The second engraving shows two figures arranged for walking—one wearing a broché mantle lined with striped blue satin, for gay linings of plush and satin now form quite a feature in mantles. The black dress is embroidered with straw, and the bonnet is of fancy Tuscan straw lined with blue satin; the strings are shaded blue satin worked with straw.

On the other figure, the new shaded satin is displayed both as a scarf drapery in front, as a tunic at the back, and in the lining of the hood. This *ombré* or shaded satin is of one colour, and is shaded across the breadth from one selvedge to the other.

The remaining single figure in outline shows how the Bayadère satins are utilised for trimming; this brightly-striped fabric proves most effective on self-coloured Siciliennes and fine woollens. When flowers are worn either as bodice bouquets or in millinery, they are shaded, so are feathers; in fact the *ombré* effect is a feature in present modes.

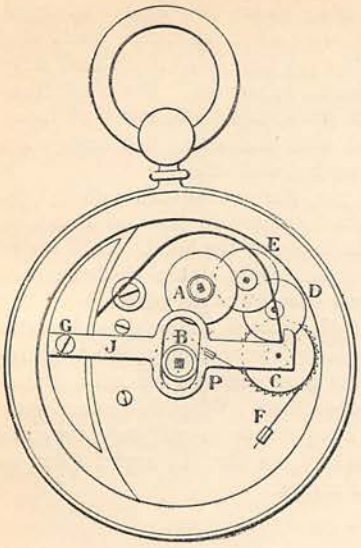
THE GATHERER.

Harmonic Telegraphy.

The system of sending several telegraphic messages along the same wire simultaneously, by means of several distinct musical notes, has lately been brought to practical success by Mr. E. Gray, of Chicago, an inventor whose name is associated with the history of the speaking telephone. Gray's harmonic telegraph is virtually an application of the musical telephone, whereby a musical note can be transmitted to a distant place electrically. In short, he causes no less than five musical notes of different pitch to be sent by wire simultaneously, and each of these notes is broken up into long and short sound signals by a telegraph clerk in the ordinary manner. Thus each distinct note conveys a distinct message, which is sent and received by separate clerks; but, such is the wonderful structure of matter, all the notes traverse the line-wire together at the same time without conflicting. Each note is sent by means of a vibrating tuning-fork connected up between the electric battery and the line in such a way as to interrupt the current flowing into the line. Every vibration of the fork causes an interruption of the current, and thus there are as many pulses of current sent into the line per second as there are vibrations of the fork per second. The intermittent current so produced is received at the distant end of the line by an electro-magnet which attracts the prongs of a similarly pitched fork, and sets it into corresponding vibration. In brief, the regularly interrupted current sent by the first fork starts the receiving fork into audible vibration, and the continuous hum it gives out is further broken up into long and short signals by the telegraph clerk at the sending end of the line. Each particular current can only set into vibration a receiving fork of the same pitch as that by which it was sent, and hence, though as many as five separate harmonic currents may be combined in the same wire, they can be made to deliver five separate tones, on five separate forks, because each fork will only respond to the elementary current set up in the line by its fellow-fork at the sending terminus. Mr. Gray's apparatus has been tried recently between New York and Boston with practical success, and the Western Union Telegraph Company of America have adopted it. No less than 2,100 messages of twenty words a-piece have been sent by it over a single wire in an hour, and as there are five operators required at each end of the line, this is at the rate of forty messages per man. Moreover, this number could be doubled by working on the "duplex" system.

A "Perpetual" Watch.

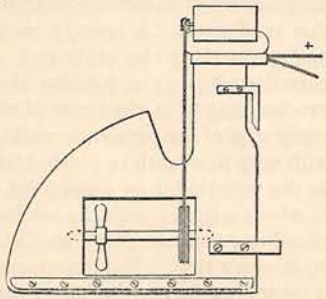
In this ingenious contrivance the principle of the ordinary pedometer is employed, and the stepping of the wearer is made to wind up the watch. It is the invention of Herr Loehr, of Vienna, and is designed to obviate the use of any sort of watch-key whatever. The engraving shows the mechanical device by which this is effected. A lever, J, weighted at one end, G, and pivoted at the other end, C, is kept by a long curved spring in the position shown, that is, between two banking pins, the lower of which it hits against at every step of the person in walking. A ratchet wheel with very fine teeth is pivoted at the same centre, C, as the weighted lever; and fixed to the lever is a pawl, P, which engages with the ratchet wheel and turns it round one tooth at every oscillation of the lever, that is, at every step. The movement of the ratchet wheel is communicated to the barrel arbor, A, of the watch-works by a train of wheels, D E. A second pawl, F, prevents the return of the ratchet wheel. To provide for the setting of the hands in case of error, there is a disc, B, which has a milled surface, slightly hollowed



out to suit the points of the fingers. As regards the action of the time-piece, it is said to keep a very good rate, owing to the small range of main-spring it requires. In this connection we may mention a proposal which has been made to establish in London a system of testing and certifying watches. Such a practice has been carried on by the Swiss Society of Arts at Geneva since the year 1872, and it might appropriately be undertaken by the City Clockmakers' Company. Any person, by taking his watch or time-piece to the Geneva society, can have its rate tested and certified for a payment of two francs if it does not come up to a certain standard of efficiency, and ten francs if it does. At present we can get our plate tested at the Goldsmiths' Hall, our thermometers and barometers tried at Kew, and the Admiralty chronometers are proved at Greenwich; but we have no authorised place for testing watches, and the loss is felt in the number of inaccurate watches which are sold and worn. Did a place of the kind exist, it would be to the interest of watchmakers to get their watches certified there, and to the advantage of their customers to buy a watch which had received that sanction.

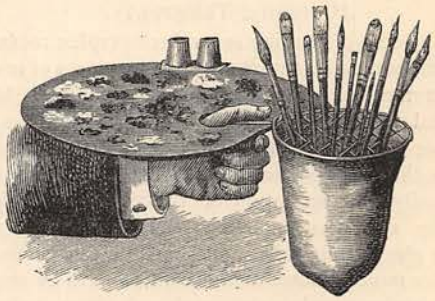
A New Electric Motor.

A little electric motor of great power, considering its size, has been devised by M. Trouvé, the well-known Paris mechanician. It is so constructed as to produce no "dead-points," or periodic slackening of the rotation of the driving wheel, which can readily attain a velocity of 200 revolutions in the second. It is, of course, driven by the current from a galvanic battery, and is designed chiefly for milliners and others who require a small but constant power to drive sewing machines, or for watchmakers and amateur mechanics for their lathes. It is capable of actuating an ordinary sewing machine with the current from a few cells of Bunsen's, or Daniell's cleaner and more wholesome battery. The figure shows the manner in which the inventor has applied it to the propulsion of a small boat. The motor is fixed on the stern of the boat, and connected by a flexible metallic belt to the shaft of the screw, which revolves in a cavity of the lower part of the rudder. The armature of the motor, being rotated by the action of the current from a small battery contained in the stern-locker, communicates its motion to the screw by means of the belt, and the boat is urged forwards or backwards, according as the screw revolves to the right hand or the left—that is, according to the direction given to the electric current by the person on board. For several months M. Trouvé has employed his motor to drive a boat 18 feet long while shooting wild-fowl on the Seine, and there being no noise of oars the game can be approached very closely. The highest speed attained was four and a half miles per hour.



An Artist's Brush-Holder.

We are not aware that any artist has ever complained of his being compelled to hold his brushes in his hand beside the palette while engaged in his professional work, but however that may be, a contrivance has been invented which is intended to relieve him from any such inconvenience as the practice alluded to may be considered to involve. The woodcut almost explains itself, but we may just say that the brush-holder consists of a bag, securely attached to the palette, across the mouth of which runs a wide-meshed net-work of stout wires. Instead of holding his brushes in his hand, as he generally does, and sometimes with difficulty, the artist would insert them handle downwards in separate meshes of the wire frame.



Lime-preserved Wood.

Lime has been found successful as a wood-preserver. The method, which is French, consists in piling the planks in a large tank, then covering them with quicklime and slaking them with water. The timber requires about a week to be thoroughly impregnated with the lime-water, before it is taken out of pickle and slowly dried. The entrance of the mineral particles into the grain also renders the wood harder and denser than before. Beech-wood, for example, becomes like oak, and without losing the elasticity that fits it for tool-handles, is far more durable than oak.

An Electrical Fire Tell-tale.

When it is reflected that the early moments of a fire's life are precisely those when it is most vulnerable, and that almost any fire could be extinguished by a bucket of water thrown on it were the outbreak discovered soon enough, the great importance of having some reliable apparatus for warning the inmates of a house, or the watchman on duty, when a fire originates on the premises, will be apparent to all. It is somewhat surprising that fire tell-tales are not more common than they are, but the reason of this probably lies in the fact that a fire is regarded by most people as a remote contingency. The automatic fire detector under notice has a good deal to recommend it. It will act whether the rise of temperature caused by the outbreak is sudden or slow, and it contains no parts likely to get out of order or require careful attention. As will be seen from Fig. 1, which represents the sensitive part, it consists of two long thin blades, A B, composed of two strips of different metals soldered together. The object in having them composite is that, when the temperature rises, the different expansion of the two metals may cause each bar to curve after the well-known manner of the metallic thermometer. These parallel blades are fixed at one end, where they are in metallic communication with a pair of binding screws, E F, to which are brought the wires of a voltaic battery. The blades are free at the other end, and in their normal state are in contact there by means of a small screw contact, G (see also Fig. 2) carried by the blade A. The pressure of this contact is regulated by two adjusting screws, C D, which bear upon the blades near their fixed ends. A metal cage, J J, surrounds the blades and protects them from mechanical injury, while at the same time it allows the heated air to play freely around them. The end of the cage where the contacts are is accessible by a lid, H, and the detector is fixed into position by the hook I, which fits into a socket placed in any convenient place in the apartment to be watched, say the wall or ceiling. The blades, being of the same construction, are equally liable to curvature under the influence of heat when they are both bare, but one of them, the blade A, is clothed in a sleeve of paper or other non-conducting fabric, so that it is less sensitive to a sudden rise of temperature than the naked blade B. The result is that, when the fire causes a sudden rise of temperature, the bare blade is curved away from the sheathed blade and contact is broken between them. Now, since the wires of the battery are connected to these blades by the terminals E E, the electric current circulates through them both, so long as there is contact between their ends; but as soon as this contact is broken, the current is interrupted. This interruption is made to announce the fire by means of an electro-magnet in the circuit. While the current is flowing through the blades and the electro-magnet, the armature of the latter is attracted to its poles; but when the current stops, the armature falls and in the act drops a disc which indicates the number of the room, and at the same time rings an alarm-bell. This part of the apparatus need not be described in detail, as it differs little from the ordinary devices for electric bells; but we have yet to consider the case in which the outbreak of fire causes a slow and gradual rise of temperature in the room. Then the two blades curve equally, for the sleeve of paper does not sensibly retard the penetration of the heat, and as a consequence the contact between them is maintained. But only for a time. As soon as a certain predetermined critical temperature is reached, the sheathed blade, A, is arrested by the point of a set-screw, K, Fig. 2; and since the naked blade, B, still continues to curve itself outward under the rising temperature, the contact is broken between them, the indicating disc falls as before, and the alarm-bell rings. Thus, whether the outbreak of fire be slow or sudden, it will be advertised by the detector.

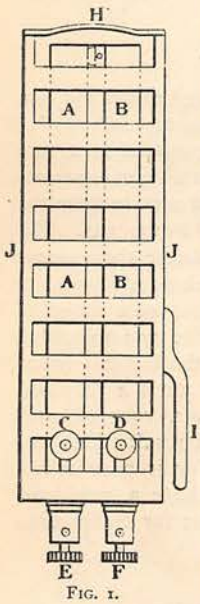


FIG. 1.

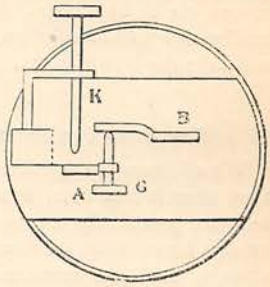
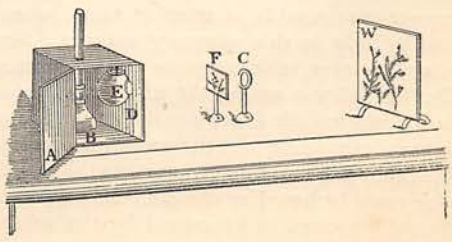


FIG. 2.

A Simple Magic Lantern.

The pictures of the magic lantern may be made so instructive and amusing, that a cheap and simple means of producing them will interest many. Such a makeshift apparatus is exhibited in the engraving, where A is an ordinary wooden packing-box; B, a kerosene hand-lamp having an argand burner; E is a common gold-fish globe of small dimensions; and C, a burning-glass or plano-convex lens. In one end of the box A, a hole D is cut large enough to admit a portion of the globe E, which should be hung within the box. The globe is to be filled with water from which the air has been expelled by boiling, and the lamp, B, is set close behind it. If now the surface of a piece of window glass is moistened with a strong solution of sulphate of soda, or even common table salt dissolved in water, and placed vertically on a little stand at F, so that the light of the lamp will be focussed on it by the globe of



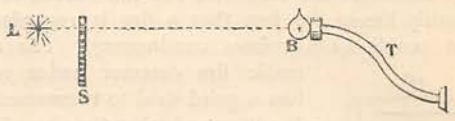
water, the image of the glass will be projected on a blank wall or the screen of white cloth, W, provided that the lens, C, is so placed in the path of the beam as to bring the image to a focus on the screen. In a few minutes the salt will begin to crystallise on the glass, and ferny plumes will seem to grow upon the screen as if by magic. By adding a few drops of aniline dye to the solution on the glass, the crystals will take the hue of gems.

Why Bees Prefer to Work in Darkness.

We all know the appearance of honey, and we know that after it has been strained it will crystallise and become practically sugar. An experiment has recently been made to ascertain the reason of this change, and this experiment has led up to the discovery why bees work in the dark. It had heretofore been suspected that the change in the appearance and consistency of honey was owing to "photographic action"—that is, to the same agency which affects the iodide of silver on the plate in photography. Mr. Scheiber's experiment confirms this view. This gentleman enclosed some honey in flasks well corked; some of the bottles he excluded from the light. The honey in the flasks exposed to light soon crystallised; that in the bottles in darkness underwent no change, and continued liquid. Now as the existence of young bees depends upon the liquidity of the food, the instinct of the bee is made manifest in excluding the light, and this is the reason why bees work in the dark—if they did not obscure their hive windows the food would be useless.

Musical Gases.

Dr. Tyndall has been making some singularly interesting experiments on gases and vapours, in order to verify his former researches upon their powers of absorbing radiant heat. One of the discoveries made by Professor Graham Bell while inventing his "photophone," for transmitting speech by means of light, was that if a rapidly interrupted beam from a powerful lamp or the sun himself was allowed to fall on a thin disc of any kind of material—glass, metal, india-rubber, wood, and so on—the disc would be heard to give out a musical tone. The disc shape was effective, but it was not essential, for such unlike things as a cigar and crystals of blue vitriol gave out a note peculiar to themselves. Even tobacco-smoke, bottled in a glass tube and held in the path of the occulted beam, was found to be in tune, and Professor Bell did not hesitate to infer that all bodies whatsoever were capable of uttering sound when influenced by light in this vibratory manner. Several physicists, however, took exception to this conclusion, and Dr. Tyndall was among the number. It seemed to him that the audible effect was due to the heat-rays in the beam expanding and contracting the substance on which they fell, and thus giving rise to vibrations in it, which could be heard by the ear. In other words, he believed the sound to be caused by the substance absorbing fresh heat each time a flash of light fell upon it; and all his subsequent experiments have tended to confirm this faith. Moreover he was quick to see that in Professor Bell's arrangement he had a novel plan for enabling him to test the absorptive power of different gases, by the intensity of the sounds they emit when held in the track of the intermittent beam, and thus to verify his former experiments, which have been seriously questioned by other investigators. In the beam of a Siemens electric lamp, L, rapidly



eclipsed by a rotating screen, S, nicked round the rim, he placed one after another numerous samples of different gases and vapours, each confined in a thin bulb of glass, B; and by listening at a short ear-trumpet, T, leading to the bulb, he could readily hear the tones, if any, which were delivered by the gas. The result was that all the bulbs containing those gases and vapours which his earlier experiments showed to be the best absorbers of radiant heat were found to ring out loud and clear, whereas the non-absorbent gases were either silent or yielded the feeblest tones. In this way he has proved that dry air is a very bad absorber of heat, whereas moist air, charged with water-vapour, is a very good one, a result which has an important climatic bearing. For it must follow that countries and districts which have a humid atmosphere will retain the solar heat far better than dry regions.

A Vegetable Hygrometer.

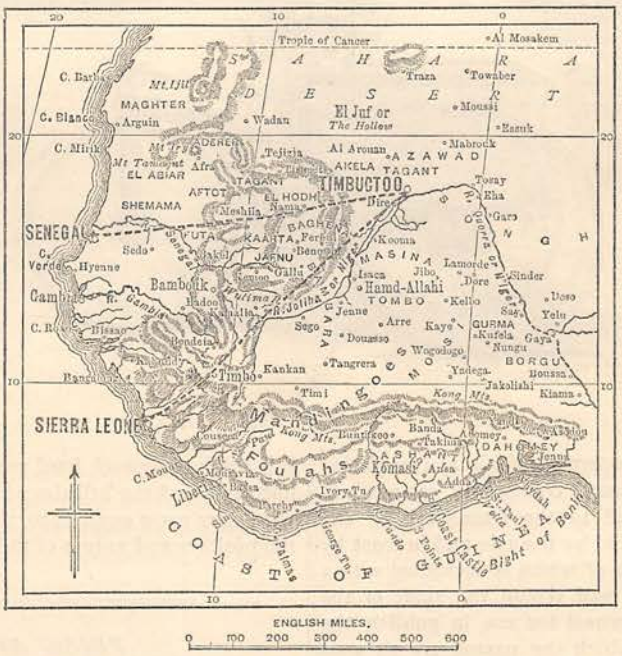
Prof. Bentley has recently directed attention to the interesting properties of the so-called Rose of Jericho. During the dry season it coils up into a kind of ball, and is blown about in the sandy deserts of Egypt and Syria for months. As soon, however, as the wet season sets in and the rain falls, its leaves open out and it begins life again. It expands in a like manner when placed in moist earth or sand or in water, and indeed is so sensitive to damp that the presence of moisture in the air may be at once detected by examining the changes in its leaves. Peculiar as this property is, its cause does not yet seem to have been definitely ascertained.

Beclouded Mirrors.

A cure for the dulling of mirrors by condensation of moisture on their clear reflecting surfaces is to be found in glycerine. This liquid has a strong attraction for water, and when it is lightly coated over the mirror it absorbs the vapours which tend to fall upon the latter, without diminishing the reflective power. The hint may prove useful to those living in damp and chilly houses, or to dentists who are troubled by the frequent clouding of their mouth-mirrors.

African Exploration.

The French are at present busily engaged in endeavouring to develop the productive tract of country which lies between the rivers Senegal and Niger, towards Timbuctoo. Their object is thus to establish a regular communication between their Senegambian provinces and the interior of Africa, whence great profits can be drawn. Their probable route is in an almost direct line to Timbuctoo. But the Governor of Sierra Leone does not relish the idea of our lively neighbours picking up all the crumbs of commerce, so he has determined to open up a rival route, by way of the Niger, to Timbuctoo. The assistance of a powerful king on the Upper Niger river has been gained, and an expedition will shortly set out. Mr. Joseph Thomson, the leader of the Geographical Society's East African expedition, has been named as the probable leader of the caravan. But at any rate the rivalry, friendly as it will be, cannot but be beneficial to both countries, and the explorations will no doubt add largely to our knowledge, of the interior of the vast African continent, of its immense resources and of its valuable products hitherto kept almost entirely out of our reach. We trust that no effort will be spared to gain the good-will of the native potentates through whose territories our caravans will have to pass to Timbuctoo.



MAP SHOWING PROBABLE ROUTES TO TIMBUCTOO FROM SENEGAL AND SIERRA LEONE RESPECTIVELY.

Patterns on Pearl Buttons.

A simple method of producing artistic patterns on pearl buttons has just been introduced. The invention consists in first painting or sizing on the surface of the button, with a substance that will not dissolve in a nitrate of silver solution, the design that is to be worked out. A solution of nitrate of silver has next to be applied with a brush to the entire surface of the button, and the button is then to be exposed to the light. The nitrate of silver will soon be changed by the actinic effect of the light into a light brown or darker colour, according to the strength of the solution and the length of the exposure. The size or paint being now washed off with spirits of turpentine, the pattern will be left clear in the natural colour of the button, and it may then be further elaborated by gilding or engraving.

Kindling Fires with Gas.

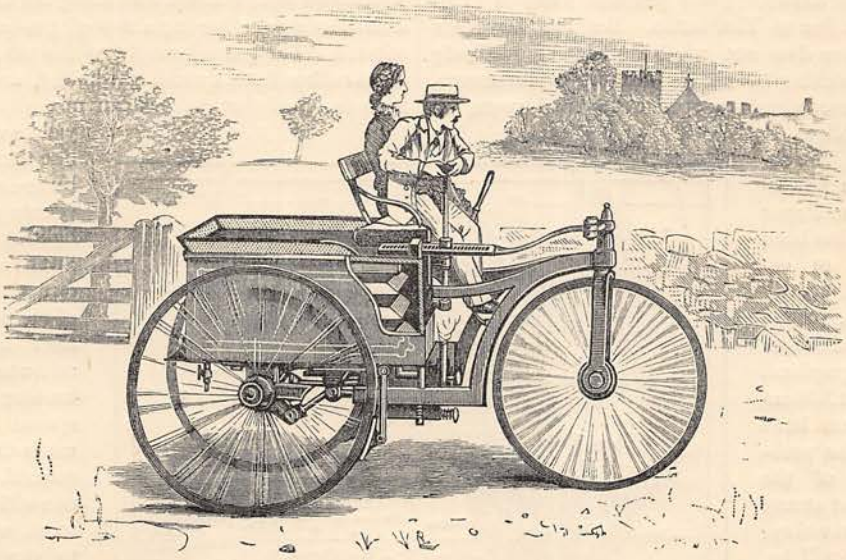
The practice of kindling the fires of locomotives with gas instead of wood is growing in Germany, and is said to prove economical. The plan followed is that of Herr Siegert, and consists in placing an iron plate into the grate from below, and building coal and anthracite above it in small lumps. The plate is then withdrawn and, without disturbing the fabric of coal, a horizontal tube having a row of gas-burners is substituted. The gas is brought to this tube by a pipe of india-rubber from a small gas-holder, and the burner is so designed that the gas can mix with air so as to yield a very hot flame, like that of a Bunsen burner. In about twenty minutes after lighting the jets, the anthracite which forms the foundation of the fire ignites, and after about twenty minutes more the burning coal may be spread out so as to make the combustion general. In connection with this improvement, we may allude to the new process for making gas from mineral oil which has been introduced into important engineering works at Glasgow. It is the invention of Colonel A. P. Chamberlain, and consists in feeding a supply of mineral oil, water, and air into three retorts, where decomposition takes place. The gas is purified, then stored in the gas-holder, and while giving a whiter, purer light than coal-gas, is not so injurious to gilding and pictures. It is particularly suitable for churches, schools, and mansions, and can be made at less cost than coal-gas.

Cement for Aquariums.

A cement which is highly efficacious for stopping leaks in water-tanks, or aquariums, and which is in successful use at the London Zoological Gardens, is made by taking litharge, fine white dry sand, and plaster of Paris, of each one gill ; finely powdered resin, one-third gill. These ingredients are to be thoroughly mixed, and made into a paste, with boiled linseed oil to which some driers has been added. The paste is then to be beaten well, and allowed to stand for four or five hours before using it. Glass cemented into its frame with this cement will hold either salt or fresh water.

A Carriage Driven by Gas.

Several appliances have now been put before the public for driving vehicles by other than animal power. Most, if not all of these, have proposed to utilise steam in various ways, but the carriage represented in our woodcut is driven by common gas,



mixed with a certain proportion of air and exploded in the cylinder in the manner common to gas-engines. This engine is attached to the framework of the carriage, supported behind by the axle and in front by a castor-wheel, the frame of which is furnished with a lever moved by a rack and pinion, the shaft of the latter carrying a hand-wheel for use in guiding the vehicle. The box on which the passengers sit contains a weighted bellows full of gas, which finds entrance into the cylinder by a valve at its forward end. The piston may be connected directly with a crank formed in the axle. The engine can be started or stopped at once, or its speed may be varied by varying the amount of gas admitted into the cylinder. As the working of the machine is very simple, the services of an engineer or other skilled attendant are not required.

An Electric Probe.

M. Trouvé, of Paris, has made several useful applications of electricity to surgical instruments, notably his polyscope, for illuminating the more inaccessible cavities of the body by means of a tiny electric light enclosed in a glass bulb. His electric probe is also worthy of notice, and may prove serviceable in military surgery. It consists of two metal stems ending in two sharp polished points, placed very close together, yet separated by a thin layer of an insulating material. These rods are connected in circuit with a small battery and an electric "trembler" bell. When the double-pointed probe comes into contact with a bullet or other metallic splinter in a wound, the circuit of the battery is closed and the bell is rung. Flesh or bone has too much electric resistance to complete the circuit and cause the bell to ring, but any sort of metal will do so. If the metal is lead, and part (say) of a bullet, the keen points of the probe enter it and the ringing of the bell is continuous; but if it is iron or any such hard metal, the contact is usually uncertain and the bell rings in a jerky fashion. In this way, after some experience, the surgeon can ascertain the position and nature of the intruding mass.

PRIZE AWARD.

The Editor has much pleasure in announcing that the Prize of Five Pounds offered in April last by the Proprietors of this Magazine, for the best specimen of Fancy Needlework, &c., has been awarded to MISS MARTHA BISHOP, *Drayton, Berks, for her originally-designed and worked banner-screen, in crewel-work on black cloth.*

The following receive honourable mention:—MISS ALICE SLANEY, *Newcastle, Staffordshire;* MISS EMMA KENNICOTT, *Tavistock, South Devon;* MISS MAUDE PILCHER, *Canterbury;* MISS JESSIE FIFE TRACY, *Ipswich (for the figure).*

Our readers are reminded that the Solutions of Prize Acrostics, for the best set of which a Prize of Two Guineas is offered, should be in the Editor's hands by March 31st at latest.

FURTHER PRIZE ANNOUNCEMENTS.

A NEW SCHEME OF PRIZE COMPETITIONS *in connection with this Magazine will be duly announced in our next issue (being the Part for May,* 1881).