

THE GATHERER.

A Lawn Tennis Signal Scorer.

A scorer for lawn tennis has been recently introduced. It is made with signals on each side, which, when set, point towards the different courts to mark the number of games won by the different players, provision being made in an extra signal for deuce and vantage games. It stands six feet six inches high, and from our illustration it will be seen that the signals turn back into the recesses of the upright when not in use. The signals below are for the purpose of scoring the setts as won. The small black board on the top is for inscribing the names of the players; but it can be removed if necessary without detracting from the appearance of the scorer.



The Phonograph and Languages.

An interesting experiment with the phonograph, which will be its first practical application, is about to be made by Drs. Zintgraff and Chavanne, two explorers who are about to visit the Congo region. They intend to fix the language and melodies of tribes they may meet with, and send the record home to Germany for the edification of scientific men there. The apparatus is being made by Herr Fuhrmann, of Berlin; and if the instrument is successful with the German language, it may well succeed with another.

Measuring Strong Lights.

Dr. Hammerl has overcome the necessity of putting a strong light at a distance from the photometer when comparing it with the light of a standard candle, by interposing a revolving disk between the light and the photometer. This disk is perforated with radial slits which allow the light to pass; but the opaque partitions cut it off, and the intensity of the light is thus reduced. Of course the disk revolves fast enough to make the source of light visible, but the amount of reduction in the intensity of the light depends on the velocity of the disk, and the number of open sectors in it.

A New Spherical Engine.

A very novel and remarkable little engine of the

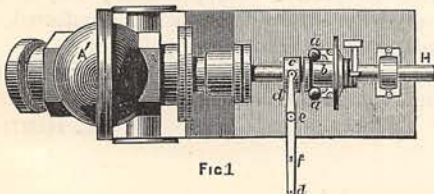


FIG. 1

high-pressure kind has lately been introduced. It is a rotary engine, and consists of a cast-iron sphere

forming a chamber in which the steam acts on properly arranged pistons, the power being taken off by a shaft revolving in a stuffing-box in the usual way.

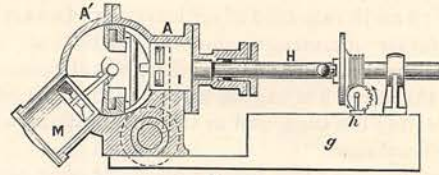


FIG. 2

We need not enter into all the details of the machine, which would require a very lengthy description; but the general appearance of the engine is shown in the accompanying illustrations. Fig. 1 is a plan, and Fig. 2 a longitudinal section, of the complete engine. The spherical casing, *A A'*, is divided at right angles to the axis of the driving shaft, *H*. The part, *M*, is a supplementary cylinder by which steam is admitted. The governor and oiling apparatus are shown on the right, *aa* being the governor balls, which, when extended by centrifugal force, cause the collar, *b*, to traverse horizontally and press against the collar, *c*. This is embraced by the forked end of the lever, *dd*, pivoted at *e*. This lever is connected at *f* to the throttle-valve, and at *d* to an adjustable spring whose tension determines the speed of rotation. The oiling apparatus consists of a reservoir, *g*, and a pump, *h*. The pump is actuated by a crank-pin on a worm-wheel, and injects the oil into channels provided for it, which carry the fluid to the working parts where it is required. The engine is particularly useful for electric lighting, as it goes into little space and can conveniently be coupled to the dynamo. A 7-inch engine will work a dynamo capable of supplying 200 incandescent lamps with the electric current.

Electric Light from the Seine.

The municipal council of Rouen are about to use the current of the Seine to drive a set of dynamo-electric machines, which will supply current to maintain a powerful electric lamp placed on the tower of the cathedral, and having its rays reflected downwards on the city.

The Centre-Cycle.

A new roadster, combining the speed and simplicity of the ordinary bicycle with the safety and stability of the tricycle, has been devised by Mr. E. Burstow. It has one large wheel like a bicycle, but that is supplemented by four smaller wheels, two in front and two behind the driving-wheel. The action is similar to that of a roller-skate, and the steering is ingeniously effected. Moreover the apparatus is at will convertible into an ordinary bicycle.

A New Balloon.

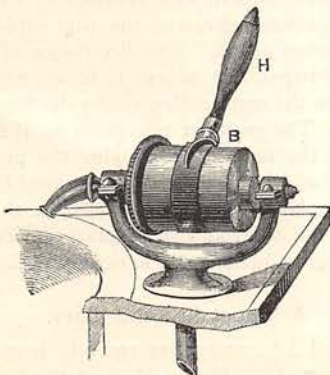
Mr. Charles F. Ritchel, an American, has invented a balloon which can be raised or lowered at pleasure, without either throwing out ballast or loosing gas. The balloon consists of a horizontal cylinder with square ends, to which is attached a netting six feet wide and as long as the balloon. Under this is a series of canvas shutters lapping over one another, and opened or closed by a screw propeller worked by hand. When the shutters are closed they offer resistance to the air, when open they allow the balloon to rise. The action of the propeller gives an upward or downward motion, according to the direction in which it is revolved.

Magnetised Watches.

Since the introduction of the electric light, a great many good watches, especially those with English lever balances, have been ruined as time-keepers by magnetism induced in their steel parts, through the wearer going too near the poles of a dynamo machine. Professor G. Forbes, an electrician, had a gold chronometer watch, which formerly kept excellent time, so far destroyed as to lose several minutes a day; and we hear of watches actually losing twenty minutes in the hour. Mr. Forbes investigated the cause of the losing rate, and found it due to the bar of the lever being magnetised, and also some iron screws in the works. Probably, too, the hair-spring was magnetic. The chronometer has been cured by removing the balance, spring, and screws, and substituting others of non-magnetic metal. The balance is now of platinum-iridium (platinum-silver being too soft and subject to shocks) and the spring is of gold. Brass may be used for the screws, provided it is found to be non-magnetic, but some kinds of brass are magnetic, perhaps through admixture with iron. We may also mention that cases of soft iron were sold at the Vienna Electrical Exhibition, for the protection of existing watches; the iron shell forming a magnetic screen or shield.

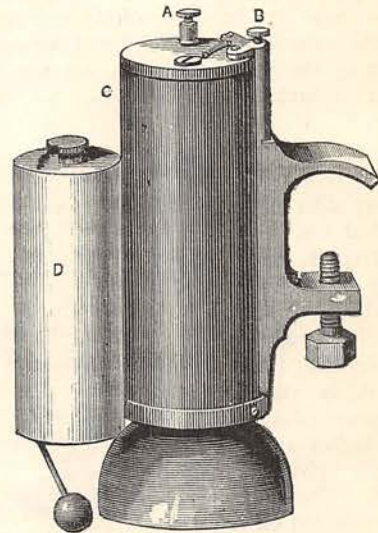
A Pigmy Pump.

Our illustration represents the outside of a very useful little pump called the "Invincible," which weighs



only a few pounds. The working of the handle, H, up and down produces alternately a vacuum and dis-

placement in each of two chambers into which the cylinder or barrel, B, is divided. There are four valves, two for suction and two for delivery. The figure illustrates the pump arranged to go on wash-bowl slabs, in places where the water does not rise to the bowl.



An Electric Bicycle-Bell.

The above figure illustrates an electric bell for bicycles, devised by Mr. Volk. The bell part of the apparatus is represented by D, the clapper showing below. The cell which actuates the bell is enclosed in the cylinder, C; and the terminals, A, B, are connected by a switch or key, which enables the cyclist to complete the circuit of the battery through the electro-magnet of the bell, thereby ringing the latter. The battery is a chloride of silver cell, such as we described in a recent GATHERER for use in producing electric "star" lights; but, as used for bell-work, it lasts a long time. The bell and battery are attached to the vehicle by the screw and clamp shown on the right-hand of the figure.

An Electric Microscope.

An interesting exhibition of microscopic views of objects projected on a screen by means of the electric light was recently introduced from Paris at the Crystal Palace. To show how much the views are enlarged, a section of a butterfly's wing occupied the whole screen which took up one side of the entertainment court. The eye of a fly is magnified no less than four million times its natural size.

A Circular Rainbow.

Dr. Tyndall has recently described various ways of producing artificial rainbows by means of the electric light and artificial mist, the rainbows being quite

circular. Dr. Fleming recently witnessed a natural rainbow of circular form from the summit of the Glydr-Vach in Wales. Standing on the pinnacle and looking into the valley where lies the lakelet Llyn Idwal, spectators saw their shadows projected on the mists, and surrounding the head of each were two concentric rainbows completely circular. The colours of the inner bow were in the order of the primary bow, those of the outer were in the order of the secondary bow. During the whole time the sun was shining brightly at the backs of the spectators.

Sound-Mills.

Miniature mills driven by sound form a new kind of philosophical toy, devised by Dr. Dvorák, of the University of Agram in Croatia. Long ago Dr. F. Guthrie, following a French *savant*, showed that a tuning-fork in vibration had the power of attracting light bodies such as cards freely pivoted or suspended. The attraction was explained on difference of air-pressure, set up by the sound-waves issuing from the fork as a centre. One of Dr. Dvorák's apparatus (which are based on the same phenomenon) is shown in Fig. 1. It consists of a cluster of four glass balls, suspended from cross-arms, *a b*; each ball having a small nipple, pierced with a hole, blown into one side. The framework is pivoted on a needle-point which rises from a stem or support, *s*, as shown. Now, when this little mill is presented to the open mouth of a resonance box, on which is mounted a vibrating diapason, the balls begin to turn slowly round. The vibration of the fork is best kept up by means of electro-magnetism. Fig. 2 represents such a resonance box, the mouth being shown on the right. Another sort of mill with four vanes, *h i k*, in place of the balls, is shown before it. These vanes are represented on a larger scale in Fig. 3, where at *D* and *E* are shown light cardboard flags pierced with a number of needle-holes. The whirl of the flags is promoted by intervening a brass ball, *a b* (Fig. 2), with open nipples, between the resonator and the mill. The action of this hollow ball is to concentrate the wind on the flags, and the puff it makes is quite sensible to the bare hand, and will blow out a lighted match. Another form of mill or turbine is shown in Fig. 4. It consists of a hollow box of paper, with projecting ears, *f g*, open to the outside. The box is suspended by a silk thread, *h*, before the open mouth of the resona-

tor, and begins to turn like the balls when the note of the tuning-fork is loud enough.

A New Police Whistle.

The whistle recently supplied to the Metropolitan Police force, as a means of calling in the aid of brother officers to one in danger or need of help, may now be bought by the general public, to whom it is likely to prove useful. The note of the whistle is quite distinct from that of any other in use, and is very penetrating. If a policeman should be anywhere within range when the new whistle is sounded he would, for his own sake, we should think, make an effort to find the cause, for the noise is almost ear-splitting.

Sinking Shafts by Freezing.

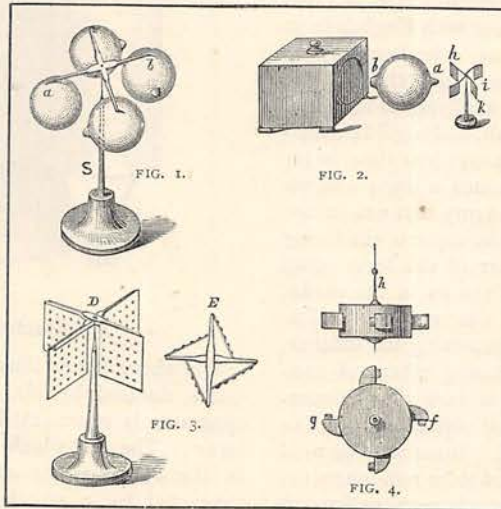
An ingenious mode of sinking shafts in quicksand or other shifting ground has been devised by Herr Poetsch, and is being introduced into this country. It consists in freezing the soft ground hard by a freezing mixture and then excavating it in the ordinary way. The refrigerator is of the ammonia type by preference, but any sort will do; and the temperature employed is about 15° below zero Fahrenheit. When the quicksoil is frozen hard the excavation is carried on in the usual manner, and a masonry or iron-tube lining is given to the shaft-hole.

Fairy Rings.

The dark green circles of grass known as "fairy rings" have long attracted the notice of scientists, but Messrs. Lawes, Gilbert, and Warington, of Rothamstead, have probably given us the true explanation of the phenomenon at last. The luxuriance of the grass is due to nitrogen, that potent fertiliser, which is abstracted from the surrounding soil by the fungus plants in the ring. The grass in turn feeds on the minerals collected by the fungi, thus obeying the principles of the rotation of crops. It was not proved before that any kind of plant could feed directly on the organic nitrogen of the soil; and the explanation of the fairy ring may lead to advances in agricultural chemistry.

A Mountain Laboratory.

A chemical laboratory has recently been installed on the summit of the Pic du Midi, in the Pyrenees, at an altitude of nearly 9,500 feet above the sea. It stands between the dwelling-house and the well-known obser-



SOUND-MILLS.

vatory of the summit. The chief object of this unique scientific step is to test the quality of the air from day to day in order to find the proportions of carbonic acid, ammonia, or other gases in it. The sal ammoniac formed by lightning, and carried down by rain-drops, is also examined; so is the amount of ozone present. The proportion of carbonic acid found at this altitude is 0.00286, which is much the same as that found on the plains below. Ammonia, too, appears to be pretty evenly distributed in the proportion of 1.35 milligrams to 100 cubic metres of air.

Heat and Dust.

Recent experiments by Mr. Aiken and also Dr. O. J. Lodge prove that when a body is warmer than the air it tends to keep dust from settling on it. It was long ago observed by Dr. Tyndall that there is a dark space above a body when strongly illuminated. This dark space is now shown to extend all round the body when free in air, and to be due to the warmed body drawing away the dust from the layer of air immediately surrounding it. It follows from these researches that a room heated by a fire is likely to have its walls freer from dust than one heated by a stove, because in the one case the walls are hotter than the air, and in the other the air is hotter than the walls.

Cedar-Paper.

A strong aromatic paper is now made from cedar-bark at New Bedford, Massachusetts, United States. It is serviceable for putting on the floor under carpets, and the odour is found to keep away insects.

Electricity and Tunnelling.

The value of the dynamo-electric machine for use in tunnelling has recently been demonstrated. The drill is coupled to the spindle of the dynamo, and the electric power brought by wires into the tunnel. The same current serves to light the scene of operations and fire the blast. Moreover, it could be employed to draw out the trucks with earth and rock, and with economy, provided the power were supplied by some waterfall or stream in the neighbourhood.

Inoculating for Hydrophobia.

M. Pasteur, the celebrated French biologist, who has succeeded in vaccinating for chicken-pox, dog distemper, and other contagious diseases, has now added hydrophobia or rabies to the list of his triumphs. The experiments are still in progress, but he feels confident that the results already obtained are reliable. He has now in his keeping a number of dogs which are proof against hydrophobia from bites or inoculation, because they have been inoculated with the virus. The virus used is of a particular kind, and is in reality a mixture of virus obtained by a special process, which at present is not divulged. The dogs are inoculated under chloroform, so that the operation is painless. The discovery is important to mankind, for in Dr. Pasteur's opinion no case of hydrophobia in man or dog is spontaneous, but originates in the bite of an infected

animal. Inoculation of dogs for rabies may yet become general, and the measure would practically root out the evil.

Vegetable Tallow.

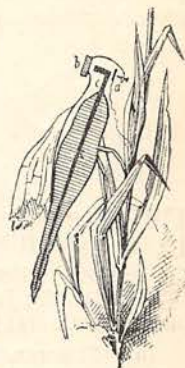
Vegetable tallow, which is obtained from a tree of the genus *Hopea*, growing in the south of Borneo, has been recently studied by Mr. Fielding, and found to keep solid at a temperature of 18.5° Centigrade, and melt at 44.4° Centigrade. It dissolves in cold ether and in hot acetone, alcohol, and turpentine. It is obtained from the fruits of the tree by germinating them in a humid place and then drying them in the sun, and boiling out the grease. The tallow thus made in Java and Sumatra is now used for greasing machines, and in the manufacture of candles. It also yields glycerine and soap.

A Handy Cork-Drawer.

It frequently happens that the whole of the contents of a bottle are not used when it is first opened. In such cases some new corks fitted with loops of strong twine, and which have lately been patented, will be very useful. The loop of twine is fastened to the cork by machinery and holds it very tightly. When the cork is in use, the loop hangs over the neck of the bottle, and a very slight pull will draw out the cork. The great advantage of this system is that no hole is made through the cork used for re-stopping the bottle, as must necessarily be the case when a corkscrew has been passed through it. In the case of ink and medicine bottles, as well as for sauces and pickles for table use, these new corks will be found of great service.

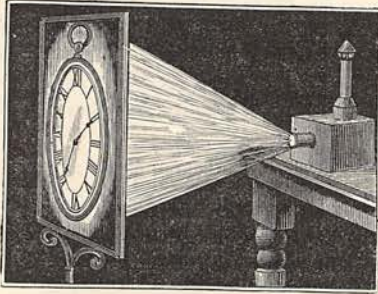
An Electric Insect.

An amusing toy, in the shape of an artificial insect which moves by means of electricity, has been devised by a French mechanician. The internal arrangement of the fly is shown in the figure, which represents a cross-section through its body. The body of the insect is formed by a small electro-magnet with a core of soft iron, *c*, running through it. This core is bent up at the end as shown, and in front of it is a small armature of soft iron, *b*, forming the head of the insect. This armature is mounted on a spring under the back and wings of the creature, and when pulled towards the core of the electro-magnet, it agitates the wings. The current in the electro-magnet is interrupted by the contact spring and screw at *a*, after the manner of an ordinary "trembler" electric bell; the iron spring vibrating between the pole of the electro-magnet and the contact screw. The current is led to the electro-magnet by fine silk-covered wires let into the artificial flowers on which the insect is mounted, and also by the legs of the latter. The flowers can be put into a vase, in the body of which is the battery cell which supplies the current.



Marbleising Glass.

Glass is now given the appearance of marble by applying a mixture of varnish and oil to the surface of a basin of water, and blowing or spraying it with dry coloured powders to represent the mottled or veined aspect of marble. The glass after being coated on one surface with varnish is placed face downwards on the water-film, which immediately adheres to the plate and is fixed by the varnish.

**A Watch-Clock.**

An ingenious way of turning an ordinary watch into an illuminated clock, for showing the time by night, has been arranged by M. Joyeux. As shown in the illustration, it consists in projecting an image of the clock-face on a screen, which may be semi-transparent. The lamp is an ordinary oil one, and it is placed in a small box fitted with an object-glass which can slide out and in a little, in telescopic fashion, to adjust the focus. The size of the reflected image of the watch, which is hung within the box behind the object-glass and illuminated by the lamp-light, is determined by the power of the lens and the distance of the screen.

A Pocket Coat and Hat Rack.

Our engraving illustrates a very compact and handy little device, which answers as a portable hat and coat rack. One hook carries the coat, and a spring clamp holds the hat, while the whole is suspended by a second hook as shown. The contrivance, which folds up in order to go into the pocket, will be very useful to cricketers and others when compelled to go to the ground in ordinary costume.

**Manure from Slag.**

A process has been recently introduced for making phosphoric acid and mineral phosphates from slag—especially the slags produced by the Bessemer and Siemens processes. These phosphates are of course valuable as manure, especially since guano is said to be becoming scarcer.

PRIZE COMPETITIONS.

The announcement of a New Series of Prize Competitions, open to all readers of the Magazine, will be made in our next issue.

THE FAMILY PARLIAMENT.

The Debate upon the question, "Should the State Provide Healthy Homes for the Poor?" will be continued in our next issue.

"SUMMER DAYS."

TO OUR READERS.

THE EDITOR has much pleasure in announcing that, owing to the cordial reception of "PALMY DAYS," the Extra Holiday Number of the Magazine for last year, the Proprietors propose to issue a Holiday Number for the present year. On the 26th of May, therefore, will be published, together with the ordinary Monthly Part for June, but quite independently of that Part, and sold separately, the second Extra Holiday Number of CASSELL'S MAGAZINE, under the very appropriate title of "SUMMER DAYS."

In "SUMMER DAYS" will be found repeated the varied attractions which secured the success of its predecessor last year. The Number will comprise several complete stories by well-known writers, pleasant papers descriptive of holiday tours, and of holiday amusements. A special feature of the Number will be an article on "Amateur Landscape Photography," by one who has achieved great proficiency in this art.

The Illustrations to "SUMMER DAYS" will be of the highest character, and will include a beautiful Frontispiece drawn by GEORGE L. SEYMOUR, and numerous other woodcuts by well-known and popular artists.

The opening chapters of a New Serial Story, entitled "John Ford: his Faults and Follies, and what Came of them," by FRANK BARRETT, Author of "Hidden Gold," &c., will appear in the next issue of the Magazine.