THE GATHERER.

A New Torpedo.

The torpedo having practically revolutionised the conditions of naval warfare, it can scarcely surprise us to find that inventors are turning much of their thoughts to developing the usefulness (that is, destructiveness !) of so potent a weapon. A Roumanian engineer has designed a new kind of torpedo, which in several points exhibits considerable orginality. Its chief peculiarity is that it can be managed under water for twelve hours at a stretch, acting at a depth of from one hundred feet in rivers to seven or eight hundred feet in the sea. By means of screws it can be made to rise or sink noiselessly, and either suddenly or by gradual stages. Its system of illumination is internal, and enables the officers to see for a distance of a hundred and thirty feet under water. While on the surface it is managed like an ordinary iron-clad vessel, but it can manœuvre in any direction. All this is very ingenious, but we devoutly trust that there will be no occasion for its use.

Public Barometers.

It would be a great advantage to shipping if every port had its standard barometer, with which masters of vessels could compare their ship's barometer before starting on a voyage. In this way their observations would be far more accurate than at present, and comparable with each other. The result would be a decided gain to the science of meteorology, and also to commerce. This plan was advocated as far back as 1854 by Admiral Sir F. A. Shadwell, but it is only being put in practice now. The Meteorological Office have designed a standard barometer for exposure at docks and other public places, so that private individuals and ship's officers will have an opportunity of comparing their own instruments with it, and finding out their index errors. The new standard will be cased in brass, with an enamelled glass scale, and the index error framed and glazed beside it. It will contain no wood to warp by the action of the weather, the tube will be of strong glass, and the cistern will be free from leather, which is apt to stretch or shrink with time. It will be a true standard, and vastly superior to the barometers very kindly presented to fishing villages and coast-guard stations by the Duke of Northumberland, and the Board of Trade and other institutions.

A New Exhilarant.

The extraordinary exhilarating power of "laughing gas" is well known ; but a similar property has just been discovered in a liquid mixture of phosphate of soda, and tincture of the ergot of rye. While treating a female patient with tincture of the ergot of rye for a painful affection of the knee, Dr. Luton, of Rheims, discovered that by adding a little of the phosphate of soda to the medicine, it sent the patient into uncontrollable fits of laughter, which evidently sprang from the merriest ideas. No effect was observed until three-quarters of an hour after the dose was taken ; and after the intoxication died away, the patient continued in the best of humour for some time. Experiments were then made on a number of persons, but it was found that females were the most susceptible to the influence of the potion. In the case of some men, only giddiness and a slight headache was the result. It is worthy of remark, in this connection, that rye-bread in wet seasons is apt to produce a feeble exhilaration of the same kind, perhaps because it contains a small percentage of the ergot. We trust that doctors and dispensers will be as sparing as possible in the use of this drug, so as to prevent its employment as a species of intoxicant.

A Refrigerated Store.

The great quantity of fresh provisions now imported into this country, in cooled chambers fitted up in ocean steamers, has necessitated the erection of refrigerated warehouses, in which the meat or vegetables can be stored to wait the market. Such a magazine has been constructed at the South-Eastern railway station between Upper Thames Street, London, and the river, where the waggons of the railway laden with produce can be lowered into the premises, while, on the other hand, the cargoes of ships can be received from the wharf. There are eleven apartments in the warehouse, and each of these is exhausted of air by a Beales' exhauster capable of abstracting 15,000 cubic feet of air per hour. The chambers are cooled by means of cold brine circulating in cast-iron pipes ; and the brine is cooled on Tellier's system by bringing it into contact with pipes containing methylated ether which has been compressed by a separate engine.

A Colour-Organ.

The different colours of the spectrum form a scale of light which has often been compared to the musical scale, and the idea has recently taken shape in what has been termed a colour-organ. This consists of a musical instrument, such as an organ or piano, combined with a set of coloured glasses having shutters behind them, which can be opened by playing on the keys. When a particular key is touched the corresponding shutter falls, and a beam of light shines through the exposed glass, illuminating it with fine effect. By touching different keys, different harmonies of colour may be produced. The whole tones and semitones in an octave are represented by the glasses as follows :—C, red ; C sharp, orange-red ; D, orange ; D sharp, orange-yellow ; E, yellow ; F, yellow-green ; F sharp, green ; G, bluish-green ; G sharp, blue ; A, violet-blue ; A sharp, violet ; B, violet or crimson. The play of colour during the performance of a quick air is said to fascinate the eye, and the observer gratifies two senses at the same time.

A Cancelling Stamp.

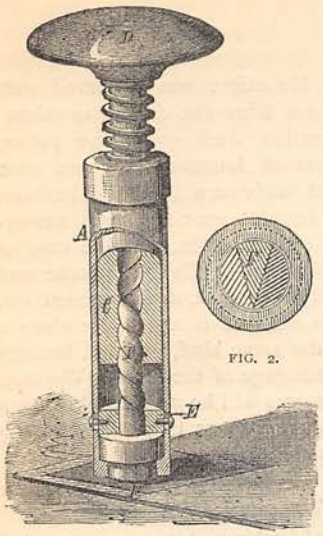


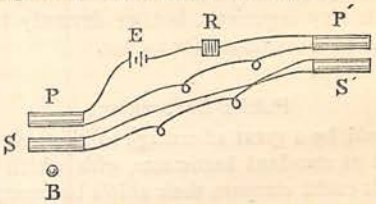
FIG. 1.

FIG. 2.

It has often been said that the British and other Governments lose a considerable amount of money every year by the re-use of cancelled stamps. Whether or not the perforated stamp is an all-sufficient safeguard against such malpractices, the appliance represented in the annexed engraving cannot but be effectual. The body, A, of the canceller contains a sliding nut, C, which is secured to the handle, D, and receives the screw, B, fastened to the revolving cutter-head, F, which is held in its position by an internal flange at the bottom of the handle, and by an inserted collar, E. Between the handle and the top of the case, A, there is a spiral spring which serves the purpose of returning the various parts to their normal position. The cutting-head (shown in detail in Fig. 2) is marked filewise in different directions, so that when it is revolved by the engagement of the screw B, and nut C, the surface of the stamp is abraded. As the cutter-head has previously been inked, the ink will be absorbed into the roughened surface, and, the obliteration being perfect, the stamp cannot possibly be restored to its pristine condition. The canceller can be applied almost instantaneously, so that this method has also the advantage of involving no delay.

A Painless Probe.

We have already described the electric probe of M. Trouvé, by which a bullet or fragment of metal in a wound is made to indicate its position by completing an electric circuit across the sharp point of the probe and ringing an electric bell. This probe in its general features is like an ordinary surgical probe, and requires to be introduced into the wound. Besides causing pain in the operation, it is therefore subject to the usual disadvantages of a penetrative instrument. The wound, for example, might be of such a nature that it would be dangerous to rifle it. Quite recently, however, an absolutely painless means of detecting the location of a bullet has been suggested and devised. This is a modification of the Induction Balance of Professor Hughes, which we have already illustrated in the GATHERER. This instrument is extremely sensitive to the presence of small masses of metal in its immediate neighbourhood, and can be used for telling a base coin from a good one by virtue of this property. Accordingly Professor Graham Bell, the inventor of the telephone, conceived the happy idea of applying it to determine the position of the missing ball in General Garfield, the American President, and Professor Hughes devised a special form of the apparatus for the purpose. Trials with it have been quite successful, and the bullet has been located at a point above the groin, without the instrument even touching the patient. We are not yet aware of the precise nature of the arrangement used by Professor Bell; but a possible plan is illustrated in the figure, where P and P′ are two primary coils, connected by wires with an electric battery, E, and a rheotome, or rhythmical interrupter, R; S, S′ are two secondary coils in circuit with a telephone. These two latter coils are so wound and adjusted that the induced currents in one can be made to balance those in the other, thereby producing absolute silence in the telephone. When, however, this balance is disturbed by the neighbourhood of a piece of metal to one of the secondary coils, the rhythm of the rheotome is heard in the telephone. If, then, the two opposed coils P′, S′,



are sheltered from disturbance, and the other two, P, S, are moved about in the region where the hidden bullet, B, is lodged, the presence of the inducing metal will disturb the balance, and sounds will be audible in the telephone. By trying with a bullet of the same weight and make, the distance of the bullet from the secondary coil, S, may be approximately ascertained. We may add that this plan was suggested last year as a means of prospecting for gold nuggets and other metalliferous ores.

A Useful Lesson in Physics.

An American scientific journal describes an experiment which ingeniously illustrates the instructions that have repeatedly been published, as to how a person in danger of drowning may prevent the body from sinking. It is a well-known fact that if the hands and arms be submerged, and the lungs be kept filled with air, the body must float. Unfortunately, too many people become panic-stricken when exposed to risk of this kind, and, throwing their arms wildly above their heads, almost immediately go under water. Perhaps they do not clearly appreciate the scientific principles upon which the precautionary conduct referred to is based; if so, the experiment already spoken of will explain

Fig. 1.

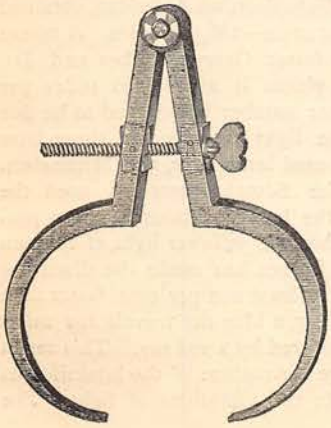
them. Fig. 1 represents a short-necked, square-shouldered bottle, with a brass-headed nail securely fastened on each side by means of a rubber band. Let the bottle be ballasted with sand so that it will just float when the nails are turned downwards, as in Fig. 1. After this has been satisfactorily done, turn the nails upwards, as in Fig. 2, and it will be at once noticed that the bottle will be either forced under water, or tipped over so that the water will enter the mouth, when it will speedily sink. This experiment speaks for itself, and its great practical value will impress itself upon all young people who see it performed.

Another New Thermograph.

In a recent number of the GATHERER we described an ingenious, but somewhat complicated, apparatus for recording continually the temperature of the human body. A simpler contrivance for the same purpose was recently brought before the French Academy of Sciences by its inventor, M. Marey. It consists of a thermometer-tube of brass, filled with oil, and connected by means of a capillary passage with a Bourdon tube, which changes its curvature according to the expansion of the liquid in its interior. The rise of temperature is thus made to alter the curvature of the Bourdon tube; and the latter being connected to a marking stylus, a permanent record is obtained of the fluctuating temperature of the body to which the thermometer is applied.

Improved Callipers.

In using callipers—as the compasses are styled which are used in measuring cylinders, balls, or other round surfaces—there is sometimes a risk of the instrument slipping and giving a lot of unnecessary trouble. By a useful invention—represented in the woodcut—this annoyance is rendered impossible.



The improvement consists in an adjusting device, by means of which the callipers may be opened or closed, and held securely in any position. A bearing in one leg of the instrument, and a nut in the other (both working on a swivel), receive the adjusting screw, which is prevented from moving longitudinally by a groove in the shank, and by the insertion of a pin through the bearing and through the groove. It is obvious that the bearing and nut of the screw must always be parallel to each other in any position of the callipers.

A Life-saving Umbrella.

The figure illustrates a combined life-buoy and umbrella, which will recommend itself to persons unable to swim when about to go upon the water. The inflated buoy is shown at A A, and when the

umbrella is folded it occupies a position surrounding the stick. The latter is made strong, and hooked so as to be easily grasped; and a light netting is sometimes added to the outside of the cover, to allow of the umbrella being readily clung to while floating. Yachtsmen will probably find the new rain-shade of service while at sea.

The Sun Lamp.

A beautiful and novel electric light has appeared in Paris within the last few weeks. It is called *la lampe soleil*, from the likeness of the light to sunshine, and is the joint invention of MM. Clerc and Bureau. It is produced by taking a small marble brick, and boring two holes into it in a slanting direction towards each other. The ends of these holes very nearly reach the bottom of the brick, and are separated from each other by a wall or partition of the stone. Into the bore-holes are inserted two rods of the fine carbon prepared for electric lamps, and their upper ends are connected to the poles of the dynamo-electric machine or generator. The current, in passing from one carbon-point to the other through the separating wall of marble, heats it up white-hot, and an intense but mellow light is emitted by the bottom of the brick underneath the carbon points. The marble becomes calcined, and the light is therefore a kind of Drummond lime-light, produced by electricity instead of the two gases oxygen and hydrogen. The price of the new lamp is small, for the carbons feed themselves as they are burned by the action of their own gravity, and no expensive mechanism is required. Moreover, the cost of maintenance is reckoned at only a halfpenny per hour, as the carbons consume very slowly. *La lampe soleil* has already been intro-

duced with success into several of the shops and cafés of Paris.

Colour Photographs.

Some approach to the solution of the great problem of photographing an object in its natural hues has just been made by two French photographers, MM. Cros and Carpentier. The process consists in taking three photographs of the object, as seen through screens of orange, green, and violet liquid respectively, that is to say, three photographs of the object with its blue, red, and orange rays quenched in turn. These proofs are taken on glass, and the parts corresponding to the quenched light are left opaque, whereas the parts influenced by the rays become transparent. A second set of three plates is then prepared by coating them with albumenised collodion on which albumen is coagulated by the action of alcohol and bromide of cadmium. After being allowed to imbibe bichromate of ammonia, this coating is exposed for some minutes to a diffused light coming through one of the transparent images already taken with a coloured screen. The transparent parts of the latter allow the light to pass and cause the albumen to contract, while the opaque parts screen the light. The result is that, when the plate is immersed in a colouring bath, the albumen absorbs the colour in those regions protected by the opaque portions of the first image, and rejects it in the other regions which contracted under the light passing through the transparencies of the image. This process is repeated for all three images obtained by the coloured screens, and thus by employing three separate baths of red, blue, and yellow for the images got by the green, orange, and violet screens, the quenched lights are re-combined in one picture of the object. The liquid screens are made of solutions of chloride of cobalt for the violet, sulphate of copper for the blue, and bichromate of potash for the orange; and when the electric light is employed they are simply placed before the lamp, and the object bathed in the coloured light transmitted through them is photographed direct.

Electricity in the Balloon.

The new means of storing electricity has already made itself useful in ballooning, although not yet in the way suggested by Mr. Martin Tupper. That well-known writer proposes to urge balloons through the air by electric power, stored in a Faure "secondary battery," and the idea is ingenious; but the intrinsic weight of these batteries will require to be very much reduced ere they can be serviceable for this purpose. Nevertheless, on a recent balloon trip, made at Paris by M. W. de Fonvielle and M. Lippmann, a store of electricity was taken in a Planté accumulator sufficient to keep a safety-lamp on the electric incandescent plan burning whilst they read their thermometers and barometers, or made a note of observations on the sky. Lamps of this kind will be as safe for aëronauts up in the air as for miners in the bowels of the earth. Moreover, we understand that M. Fonvielle has designed a special compass for balloonists, illuminated by the electric light.

Composite Portraits.

Mr. Francis Galton has obtained some curious results by combining several portraits so as to get a general resemblance or typical face. The individual photographs are taken on glass; the typical features being got by superimposing these on one another and throwing the general image on a screen. In this way he has prepared typical faces of persons afflicted with diseases which, like consumption, show a characteristic physiognomy. He has also obtained a generic photograph from seven criminals, and it is easy to see how the plan can be made of scientific and even artistic value. Types of different races, families, and professions can be produced, which will prove not only interesting but instructive. The combination of a number of faces from the same family so as to form a true "family likeness" is often found to be very curious, and it is a difficult matter to say which member of the family it most resembles.

The Autocopyist.

A modification of the chromograph, giving copies of letters in the black ink of lithographers, has been invented by M. Lelm. It consists of a frame on which is stretched a sheet of parchment paper, coated with gelatine. The manuscript to be copied is written with a special ink sold with the apparatus, and containing a base of perchloride of iron. It is laid face downwards on the gelatine, pressed by the hand, and the ink thereby transferred to the gelatine. After this a roller charged with lithographic ink is passed over it, and the letters will be seen to absorb the ink, so that if a piece of clean white paper be pressed over it, a copy of the writing in black will be obtained. Fresh copies can be made by passing the roller over the manuscript as before, and laying a clean sheet of paper over it. Instead of parchment paper, a glass plate coated with a thin film of gelatine, hardened by alum, can be employed.

The Velocity of Light.

The velocity of light has been measured more than once by different methods, although the experiment is a very difficult one. M. Cornu made it 186,700 miles per second, and Mr. Michaelson, an American, obtained a result very nearly the same—186,500 miles. A recent determination by Professor George Forbes and Dr. Young, of Glasgow, places it at 187,200 miles per second, but this higher number is believed to be due to the quality of the light employed in these later experiments. Cornu used lamp-light, and Michaelson sun-light, whereas the Scotch observers used the electric light. Now the latter contains a greater proportion of blue rays than the yellower light of the sun or oil, and Professor Forbes has made the discovery that blue light travels at least one per cent. faster than red light. That is to say, a blue ray travels 101 miles for every 100 miles covered by a red ray. This result is calculated to change our notions of the luminiferous ether which transmits the vibrations of light. The

experiments were carried on at Wemyss Bay, down the Clyde, by the well-known method of Fizeau modified in the direction of greater accuracy.

Fans in the House.

When the weather is close and oppressive, it is usually found that even though the windows be thrown wide open, the atmosphere feels only slightly less heavy than before. What is wanted is something to maintain constant circulation of the air, and as water-power is now being largely used for several household purposes, there is no reason why the rotary fans of the workshop should not be introduced into the home. Indeed they are now made specially to serve this end. They may be fastened either to the wall or ceiling, and driven by a round belt direct from the water-motor. The blades of the fan may be covered with paper or muslin of various colours, so that the appliance need not form an unsightly object in the dining or other room. The shaft of these fans runs in metal journals, and needs no oiling, which is a considerable advantage where they are put up over tables. By changing the angle of the blade, the amount of air can be regulated as required.

The Electric Light in Coal-Mines.

The recent researches of Professor Abel have established the fact that the atmosphere of a coal-mine is rendered inflammable when only a very small percentage of fiery gas is present, provided it be polluted, as nearly always happens, with coal-grime, or even ordinary dust. Since this is so, we need not be surprised at those mysterious explosions which every now and again shock the public sense; and the only possible preventive seems to be the compulsory use of a light which cannot set fire to the air. This already exists in those incandescent electric lights which burn in a vacuum hermetically sealed in glass bulbs. Recent experiments with a lamp of this kind, invented by Mr. J. W. Swan, have proved entirely successful in lighting the Pleasby collieries. These pits are ordinarily worked by naked lights, because the coal contains no free gas; but the electric lamps proved very much superior in point of brightness, and the safety of the latter even in the fieriest mine is assured so long as they are not broken. To prevent this contingency Mr. Crompton has designed a special lantern which guards them from ill-usage, and contains in itself sufficient air to burn up the incandescent carbon to ashes before it can ignite the outside air, should the vacuum bulb get broken. By immersing the bulbs in water there would also be little chance of the carbons igniting the air, should the bulbs themselves get broken.

The Transplantation of Bone.

The engrafting of flesh is a surgical feat which has been frequently accomplished with success; but the first known instance of transplanting a piece of bone from one living person to another was announced at a recent meeting of the Royal Society. In 1878 a young child was admitted into the Glasgow Infirmary with necrosis or mortification of the right humerus or bone of the upper arm. The mortified part was removed from the bone, but even after fifteen months no fresh bone had grown to fill up the gap. This extended to two-thirds of the entire shaft, and it became necessary to try and transplant a piece of alien bone into the place. On three several occasions portions of living bone were transplanted into the child's arm; the pieces being obtained from osseous wedges which had to be excised from the healthy bones of other patients. The pieces were divided into many small fragments before being applied, and in course of time they united together into a solid rod, thereby converting a helpless arm into a useful one. The operation is of great importance as demonstrating that a piece of transplanted bone is capable of living and growing on another system, to the benefit of the latter.

Celluloid.

This new material is becoming largely used for ornamental and decorative purposes. It can be made, by proper pigments, to imitate very closely such diverse substances as amber, jade, shell, coral, ebony, turquoise; and it can be moulded into any required shape. Celluloid is manufactured by preparing pyroxyline from cigarette paper treated with sulphuric and nitric acids, then combining this pyroxyline with camphor gum. The process is a long and complicated one, but the resulting material is very dense, and takes a high polish, while it can be impregnated with a variety of colouring matters. It has, however, the drawback of taking fire and burning brilliantly when a light is applied to it. Moreover, if heated to 363° Fahr., and then struck with a hammer, it will explode with violence. Therefore, although useful under ordinary circumstances, it is a somewhat risky and unstable substance to employ.

A Reservoir of Electricity.

A marked improvement in our means of storing up electricity for practical use has just been effected by M. Camille Faure, a French physicist. Until now, the best electric magazine was the secondary battery of M. Gaston Planté, which consists of two sheets of lead rolled up together without touching, and plunged into a vessel of water acidulated with sulphuric acid. The storage of this arrangement was considerably increased by coating the lead plates with oxide of lead; and a battery with plates six feet square could hold a sufficient quantity of electricity to heat a fine platinum wire, three inches long, white-hot for ten minutes. This success, however, was obviously not sufficient for electric lighting purposes, and M. Faure has made a great advance by coating the plates with a layer of red lead or minium. When this apparatus is charged with electricity from a battery or machine, the red lead on one plate is reduced to a per-oxide, and spongy lead is deposited on the other plate. The current absorbed by a battery of this kind weighing 165 lbs. is capable of

performing a horse-power of mechanical work for the period of an hour. Hence it is not unlikely that electricity will before long be distributed to consumers, not only in pipes, like gas or water, but in private reservoirs or holders.

A Hill-side Locomotive.

The ordinary locomotive will not grip the rails sufficiently well to pull a train of carriages behind it up a steep slope, and hence it is necessary in constructing railways to go to great expense in making détours and tunnels, or embankments, in order to avoid running up the steep slope of a hill. An ingenious solution of the difficulty has, however, been contrived by Mr. Handyside, whose locomotive is represented in Fig. 1. His plan is to make the locomotive act in the ordinary way when the railway is level enough to admit of it; and when it becomes too steep, to make the locomotive perform the part of a stationary engine working a drum and rope. On level parts of the line the locomotive draws the train

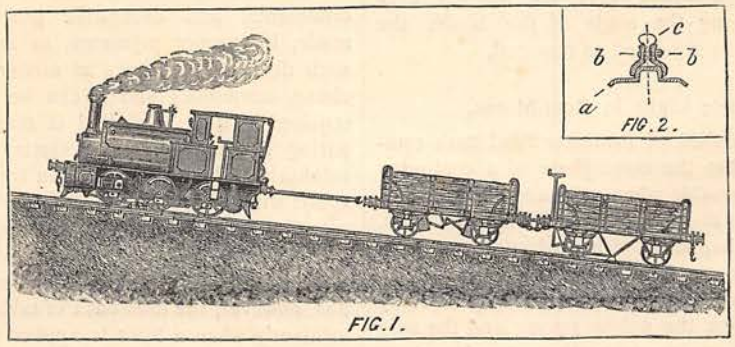


FIG. 2.

FIG. 1.

close behind it; but when it arrives at a steep gradient it leaves the train, and moves on to the top of the slope, paying out a traction-rope as it goes. When it reaches a favourable position it is made to grasp the line by special brakes, and then to pull the waggons behind it by means of the rope and drum. Handyside's locomotive is now employed at Hopton, on a slope of seven feet in the hundred. While upon this subject, we may mention that longitudinal iron "sleepers" are being introduced into Belgium and Prussia, instead of transverse wooden ones. They are the invention of MM. Hilfdt and Haarmann, and are made in lengths of about nine mètres, and of a cross-section like that shown in Fig. 2, where *a* is the sleeper, shaped like an inverted trough; and *c* is the rail, bolted to the sleeper by iron clamps, *b b*. The destruction of timber for railway sleepers is enormous, no less than two millions and a half of them being required for the repair of railways in 1878. It is therefore satisfactory to find that iron can be made to take the place of wood for such a purpose.

An Electric Speech Recorder.

There are a number of inventions which, although of no practical value, are nevertheless interesting, because they realise some ingenious idea. The phonograph of Mr. Edison as yet belongs to this class, for it has not hitherto received any practical application. So also does the speaking machine of M. Faber, recently exhibited in London. Some of our readers will perhaps remember this complicated assemblage of levers, which were manipulated by the operator in order to control the motions of an artificial mouth, tongue, and nose. Another invention must now be added to the list, and the object of it is just the contrary of M. Faber's machine. It is, in fact, designed to register the motions of the mouth involved in speech on a sheet of paper, by means of intermediate levers. Invented by M. Amadeo Gentilli, of Leipzig, the instrument consists of a framework of delicate levers, which enter the mouth and are actuated by the teeth, lips, tongue, and nasal breath. The levers, when raised, make electric contacts, which send currents of electricity through electro-magnets, like those in the Morse telegraph instrument. Each of these magnets attracts an armature of iron, which is attached to a marking disc well smeared with ink; and a mark in the shape of a "dash" is thereby inked on a moving band of paper. The dashes produced by the several levers constitute a group of signs which correspond to the vocal sounds uttered in actuating the levers. The use of such an apparatus cannot, of course, be conducive to persuasive oratory.

PRIZE ESSAY ON "TRUE ECONOMIES IN HOUSEHOLD MANAGEMENT."

AWARD.

The Editor has much pleasure in announcing that, after careful consideration of the Essays—to the number of ninety-six—sent in for this Competition, the PRIZE of £10 has been awarded to

LIZZIE HERITAGE, 19, Cherry Street, Coventry.

Special Commendation has been awarded to the Essays by—

William J. Lacey, High Street, Chesham, Bucks;
Amelia C. Tyler, 7, Queen Anne's Grove;
W. Pethybridge, 29, Methley Street, Kennington, S.E.; and
Marie Compston, 56, Bruce Street, Leeds.

The Prize Essay will probably appear in the November Part of the Magazine.