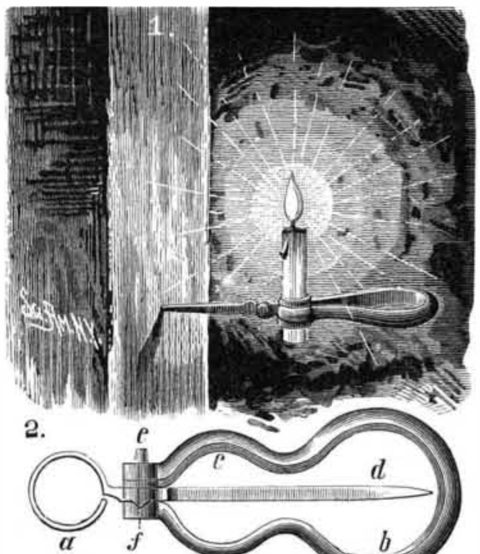
MINER'S CANDLESTICK.

The candlestick may be conveniently carried in the pocket when arranged as shown in Fig. 2; it may be secured to perpendicular surfaces, hung upon ledges, or placed upon flat or inclined places, the candle being held upright. The two sides of the handle-frame form a spring, and to the circular head of one side is secured a pin, which passes loosely through a hole in the other head which is made with a V-shaped groove as shown. Upon the pin, between the heads, are placed the hook, *c b*, and the point, *d*, which turn upon the pin. Upon the rear end of the point is a sleeve, *a*, for holding the candle, the sleeve being made as a spring for holding candles of different sizes.

On the point at the pin are V-shaped projections which fit in the V-shaped grooves when the candlestick is folded and also when the point is turned out parallel with the frame.



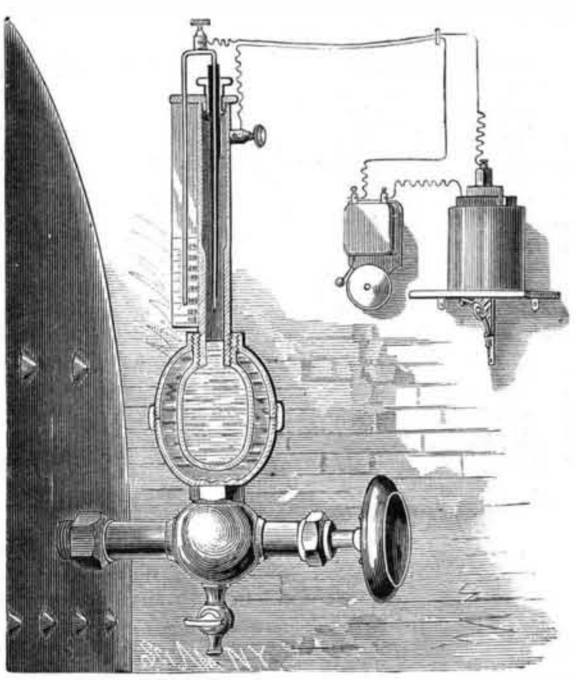
PATENEAUDE'S MINER'S CANDLESTICK.

The projections, when turned in any position not in the plane of the frame, spread the sides of the frame, thereby causing it to grasp the point and hook with increased force for holding them at any angle desired. When turned out the point can be thrust into perpendicular surfaces as shown in Fig. 1. The hook, *c b*, which, when folded, lies upon the inner surface of the frame, is adapted for suspending the candlestick from ledges of rock or other projections. By turning the hook downward the candle may be made to stand in a vertical position when the device is placed upon an inclined surface. It will be readily seen that the candlestick can be arranged to suit almost any position.

This invention has been recently patented by Mr. Cyrille Pateneaude, of Helena, Montana, and further information may be obtained by addressing D. P. Patenaude, of same place.

ELECTRIC ALARM FOR STEAM BOILERS, ETC.

The object of this invention is to provide an electric alarm



ELECTRIC ALARM FOR STEAM BOILERS.

apparatus more especially intended for use as a low water indicator for steam boilers; it is also applicable to ovens, furnaces, and other contrivances where the heat within must be regulated. The device consists of a mercury bulb inclosed in a sectional globe which forms a chamber around the mercury bulb, as shown in the engraving which represents the device in vertical section and attached to the side of a boiler. The chamber communicates with the interior of the boiler through the valve stem, to which the globe is attached. In the plate which closes the upper end of the tube of the thermometer-like device, is fitted a thumb nut through which passes the insulated arm of a bent rod. The insulating material on the arm is threaded to match the screw threads of the nut, so that by turning the nut the bent rod may be raised or lowered to suit the temperature at which it is desired to have the alarm given.

The other arm of the rod is of the same length as the first, and reaches down in front of a graduated plate attached to the thermometer tube, thus serving as an indicator for setting the rod with reference to the degree marks on the plate. In the upper right hand corner of the engraving is shown the battery and electric alarm, which are connected by wires to the bent rod and mercury tube. When the water in the boiler stands above the low water line, the water entering the chamber through the stem will prevent the entrance of steam, and the mercury in the bulb will have the same temperature as the water, causing it to stand in the tube somewhat below the lower end of the arm. When the water in the boiler falls below the low water line, steam will enter the chamber, and, being of a higher temperature than the water, will cause the mercury to rise in the tube until it comes in contact with the end of the arm, when the electric circuit is completed and the alarm sounded. In the spindle is fitted a screw plug for cutting off communication between the chamber and boiler in case it should be desired to unscrew the apparatus. The upper end of the mercury tube is enlarged above the end of the rod in order to prevent all danger of overflow of the mercury in case of excessive heat.

These alarms are being manufactured by Messrs. McKenna & Carley, 12 Cortlandt St., N. Y. City.

Lines of Study in Electricity.

The Institution of Civil Engineers (London) recognizes the importance of discussing the subject of electricity, and in its list of papers to be received are the following topics: Electro motors, their construction, efficiency, and power; gearing for dynamo machine motors and other high speed engines; the transmission and distribution of electricity over large areas for lighting and for motive power, including electrical railways and hoists; electrical measuring instruments; submarine telegraph cables, their manufacture, laying and repair, including deep-sea sounding methods and appliances; telpherage, or the automatic transportation, by means of electricity, of goods and passengers.

Laboring and Managing.

Some old fashioned notions about the value of example have induced managers of mechanical establishments to become shop hands and to spend their time among their workmen as one of themselves, sharing their employments. To a certain extent such a practice, occasionally, may have a beneficial effect on the workmen without injury to the business. But there are cares and duties connected with the successful prosecution of any business that are not wholly those of the employes. A business must be managed as certainly as the work must be done, and it requires an unusually versatile man who can be one of his own workmen and their own manager at the same time. If to these dual duties he adds that of the proper oversight of his financial and general out-shop business, he must be a rare man to make a success. It may be a matter of personal pride to be able to boast like Bouuderby, Gradgrind's friend, but it may be a costly indulgence; for draughting, correspondence, the reception of customers, the overlooking of bills, and the supervision of books as much demand the care and eye of the master as the direct guidance of the workmen. This last can be delegated to a salaried foreman, or to a first class workman, with an addition to his pay for responsibility; but the others cannot be safely left to any but the proprietor himself.

MECHANICAL TELEPHONE.

The mechanical or acoustic telephone, herewith illustrated, will transmit and receive speech with great clearness and naturalness of tone. The mouth piece, *a*, has a central aperture for the passage of sound waves to the diaphragm, *c*, whose edges are secured within a rabbet of the mouth piece. The diaphragm is about 7 inches in diameter and is made of spruce wood, which possesses great sonorousness combined with strength sufficient to sustain the tension of the line wire. The mouth piece and diaphragm are held to the wall on a bed piece, *b*, by the tension of the line wire. The bed piece is recessed at both sides, *f g*, and centrally apertured for the passage of threads connecting the line wire to the diaphragm. The front recess, *f*, affords a space between the diaphragm and the center of the bed piece for free action of the diaphragm, promoting clearness of enunciation when the instrument is used as a receiver, and the rear recess, *g*, secures a small marginal support for the transmitter, thereby avoiding a large contact with the wall and preventing excessive vibration.

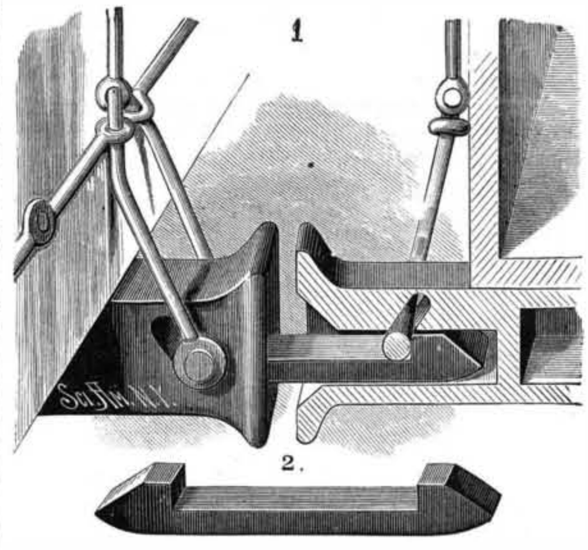
To avoid indistinct articulation and the ringing sounds common to acoustic telephones, the line wire is connected to the diaphragm by silk cords, which are twisted about the end of the wire to obtain a firm connection therewith, and which diverge into three or more strands that are secured to a metal ring, *c*, between which and the diaphragm a rubber or leather ring, *d*, is interposed. The line wire is made of strands twisted together and coated with varnish to bind them and prevent them rubbing upon one another. This construction of the line wire makes it strong and protects it from the weather, and, combined with the silk cord connections, aids largely in clear transmission over line wires of considerable length.

This invention has been patented by Mr. A. G. Miller, of Leyden, New York.

CAR COUPLING.

The drawhead is provided with the usual longitudinal opening, and in each side with a short slot which is inclined from the bottom to the top, and from the front to the rear. A bolt passes through the drawhead and through the slots. The ends of a stirrup having an Λ-shaped top are mounted on the ends of the bolt. Coupled to the top of the stirrup is a rod passing through suitable guide eyes on the end of the car and extending to the roof. Two levers, pivoted on the end of the car, extend to the sides of the car and have their inner ends coupled to the top of the stirrup. The drawbar has its ends beveled, and its top provided with a recess extending to near the ends, thus forming a head on the upper surface of the bar at each end.

When the drawbar is held in one drawhead and is inserted in the other, its beveled end will strike the bolt in the latter,



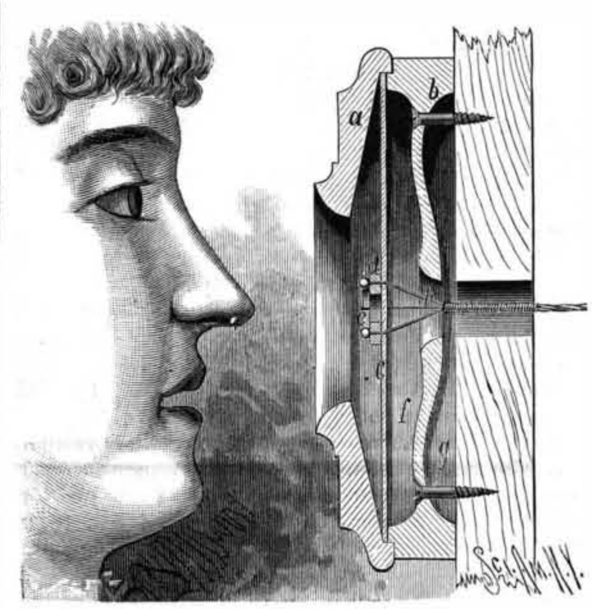
TAYLOR'S CAR COUPLING.

raising and keeping it raised until the head has passed, when the bolt drops and the cars are coupled. When the cars are to be uncoupled, the bolt is raised by means of the vertical rod or the levers extending to the sides of the car. The draw bar can then be withdrawn. Fig. 1 shows the device with the draw bar in position; Fig. 2 is a side view of the drawbar alone.

This invention has been patented by Mr. Benjamin Taylor, of Morrillton, Arkansas.

Sewers and Sewer Gases.

At a recent meeting of the Medical Society of the County of New York, Dr. Stephen Smith, as a member of the Committee on Hygiene, criticised the Department of Public Works for the little it had done in the way of ventilating the sewers, and the wrong principle on which they were operating. "Practically," he said, "it is equivalent to having open sewers running through the streets of New York," to have the perforated covers to the manholes in the streets, as we now have them, for a means of ventilation. The Doctor



MILLER'S MECHANICAL TELEPHONE.

suggested that "the gases should be drawn out by the action of forces which are constant and altogether independent of atmospheric changes, and delivered into the external air at an altitude to render it impossible for them to penetrate any room occupied by human beings at any time."

Instead of this plan the suggestion has been advanced with considerable potency, that the city should provide pumping machinery at suitable stations on the North and East Rivers, wherefrom water could be furnished in abundance for flushing the sewers periodically, as well as for use in large fires. It is not in the very distant future, we trust, when the sewage of all large cities will be utilized for agricultural purposes, in which way it can, in most places, be made to pay the most of the expense of removal. But we don't want to wait until that time for some radical improvement in the New York system.

Xerotine Siccative and Gas in Coal Bunkers.

The report of the committee appointed by the Lords of the Admiralty to inquire, in connection with the loss of Her Majesty's ship Doterel, into the subject of explosions of gas in coal bunkers, and as to the explosive power of xerotine siccative, has been published in the form of a Blue-book. The committee report that the solvent which has been employed in the liquid driers known as xerotine siccative consists of the more volatile products of the distillation of petroleum, commonly known as petroleum spirit, or kerosene. This liquid product is composed of a mixture of light petroleum oils, the most volatile of which evaporate freely at temperatures varying between 50° and 80° (Fahrenheit). If, therefore, this liquid be exposed to air at ordinary temperatures, inflammable vapor will escape readily and rapidly from its surface, and if it be thus exposed in a confined space, the air which the latter incloses will become impregnated by the inflammable vapor with a rapidity proportionate to the prevailing temperature, and to an extent sufficient to produce in a more or less brief period a rapidly inflammable mixture or an explosive mixture, if the quantity of liquid which evaporates bears the necessary relation to the volume of oxygen contained in the inclosed atmospheric air. The explosive mixture produced is, in fact, quite analogous in its nature and behavior to a mixture of coal gas or of fire-damp and air, and is capable of producing similarly violent and destructive explosions. The experiments which the committee made led them to the conclusion that the explosion which resulted in the loss of the Doterel had been brought about by the production of such a large body of flame as had ignited the powder in the magazine of the ship.

Egyptian Mechanical Methods.

Petrie, who is the author of a treatise on ancient metrology, has lately turned his attention to ancient Egyptian processes. Though much labor has been bestowed on the literary remains of Egypt and the description of monuments, little attention has been given to finding out the tools and methods by which their results were reached. The first conclusion to which Mr. Petrie comes is that the stone cutting was performed by means of graving points far harder than the material to be cut. These points were bedded in a basis of bronze; and in boring, the cutting action was not by grinding with a powder, as in a lapidary's wheel, but by graving with a fixed point, as in a planing machine. From discovering spiral grooves in diorite and granite, at least $\frac{1}{100}$ of an inch in depth, the author supposes that an instrument was used of sufficient hardness to penetrate the material that far at a single turn. In this, however, he was corrected by Mr. Evans. The simplest tool used was a straight bronze saw set with jewels: but there is proof of one circular saw which must have been 6½ inches in diameter. For hollowing the insides of stone objects, the inventive genius of the fourth dynasty exactly anticipated modern devices by adopting tubular drills varying from $\frac{24}{100}$ of an inch in diameter and $\frac{2}{100}$ of an inch in thickness to 18 inches in diameter. Other drills, not tubular, were used for small holes, one measuring $1\frac{2}{10}$ inches long and $\frac{8}{100}$ of an inch in diameter. But this is surpassed by the Uaupes of South America, who drill holes in rock crystal by the rotation of a pointed leaf shoot of plantain, worked with sand and water. The writer of this note has seen, in Porto Rico, stone beads of the hardest material, 2 inches long, bored longitudinally with an orifice $\frac{1}{16}$ of an inch in diameter. The Egyptians understood rotating both the tool and the work. For the finishing of vases, a hook tool must have been used; but the early Egyptians were familiar not only with lathes and jewel turning tools, but with mechanical tool rests, and sweeping regular arcs in cutting. In addition to the tools mentioned, are to be noticed those for dressing out drilled cores, stone hammering and smoothing, saws with curved blades, mallets, chisels, adzes, and bow drills. For marking and indicating the plane of the stone, red ocher paint was used in a variety of ways, well studied out by Mr. Petrie. Rock excavation, both for saving the stone and for the creation of vaults and chambers, was altogether an affair of drilling. Granite bowlders were utilized in the pyramids, but the best stones were taken from quarries. The method of handling these immense masses is not known. Mr. Petrie concludes with a sensible remark upon the oft alleged inhumanity of the pyramid and temple builders. To require a man every six years to serve upon the public works, during the season when he could do nothing else, would certainly not be a great hardship.—*Science, from Journ. Anthrop. Inst.*, xiii., 88.

THE MAGNETIC STATION AT THE SAINT MAUR PARK OBSERVATORY.

Mascart's Registering Magnetometer.—It is well known that terrestrial and magnetic force frequently undergoes irregular and sudden variations in its direction and intensity, so that observation, even repeated, of the direct reading apparatus is not all-sufficient in times of disturbance. For the con-

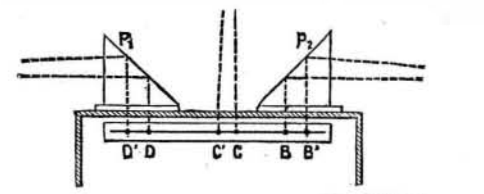


Fig. 3.—THROWING THE IMAGE ON THE SENSITIVE PAPER.

tinuous registering of magnetic phenomena, Mr. Mascart has called in the aid of photography, the extreme sensitiveness of gelatino-bromide of silver allowing such a result to be obtained in a manner that is at once sure and economical.

The most widely used registering apparatus is the one known by the name of the "Kew magnetometer," and this, up to recent years, has been almost exclusively em-

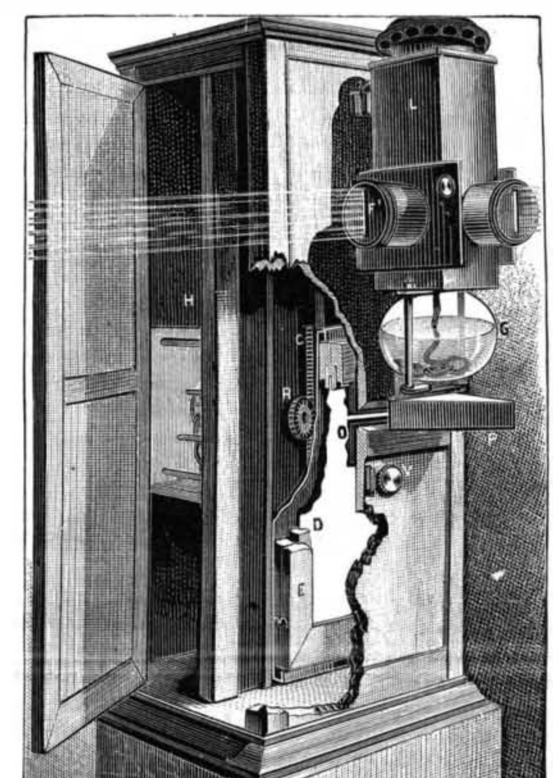


Fig. 2.—THE MAGNETIC REGISTER.

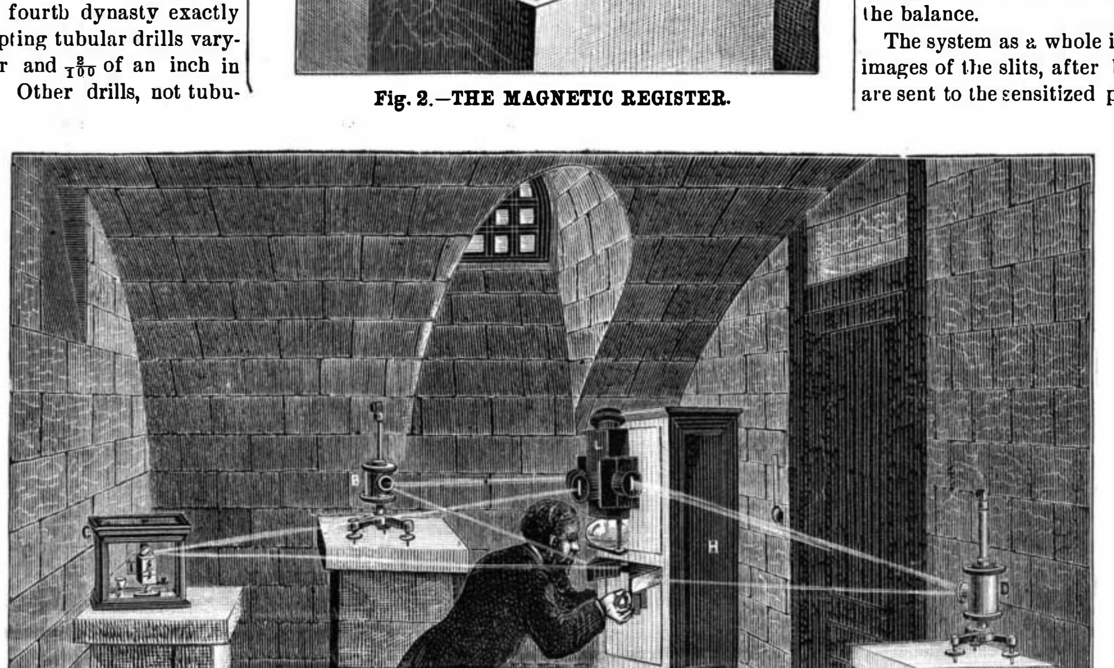


Fig. 1.—INSTRUMENTS FOR REGISTERING TERRESTRIAL MAGNETIC VARIATIONS.

ployed in those few observatories in which the study of terrestrial magnetism is organized in a complete way.

Mr. Mascart, without sacrificing anything to accuracy, which is an absolute condition in so delicate observations, has devised a registering magnetometer in which the cost of the apparatus is considerably reduced, and which permits of a reduction of the magnetic vaults to the least dimensions, of the use of one source of light for the three compasses, and of a registration of all the elements upon the same sheet of paper, thus facilitating a comparison of the different results.

The Mascart registering magnetometer, set up at the Saint Maur Park Observatory, is placed in the easterly vault of the Magnetic Cottage. This vault is rectangular in shape, and is ventilated by three air vents of a structure such as is shown in Fig. 1. As the registering must necessarily be done in darkness, there is arranged vertically before each air vent, outside of the cottage and at about 8 centimeters from the wall, a shutter which, while it allows of the necessary ventilation, proves an obstacle to the entrance of the light. Besides this, black curtains hang freely in the interior, in front of each aperture, and render the darkness of the vault complete.

The general arrangement is shown in Fig. 1. The variation apparatus were constructed by Mr. Carpentier. They are the same as those that serve for direct observation, and which we have already described, and are, like them, fixed on masonry pillars. We shall advert to the fact that these compasses are three in number: the *declinometer*, D, for declination; the *bifilar*, B, for the horizontal component; and the *balance*, C, for the vertical component. Each apparatus is provided with a fixed mirror and with a movable one which follows the deviations of the magnetized bar. In the declinometer and bifilar the front aperture of the case contains a converging lens of a focal length of about 1·10 m. In the balance, this lens is replaced by a suitable curvature of the side of the prism that serves to right the images.

The registering apparatus (H, Fig. 1), properly so called, is represented in detail in Fig. 2. It was constructed by Mr. Duboscq. In order to allow its internal arrangement to be seen, a portion of the front of the clockwork case is removed in the cut. This case is divided lengthwise into two parts by a wooden partition. In the back part there is a clockwork movement, H, with pendulum and weights, and the front part forms a camera obscura for holding the photographic frame, E. This latter slides into a grooved holder, which, through the intermedium of a rack, C, and a ratchet wheel, R, actuated by the clock, is capable of descending its whole length during an interval of twenty-four hours.

The luminous source consists simply of a small gasogen lamp, G. When the combustible liquid is of good quality, and the wick is properly regulated, this lamp will burn with a sufficiently constant intensity for about thirty-six hours, and care being taken to fill it every day at a certain hour, regularity in the light is secured. The flame is situated in the center of a lantern, L, affixed to the side of the case, and provided on each of its three external sides with a metallic mounting carrying a field lens and a vertical slit, F[1], whose width may be modified at will. These mountings may be moved vertically or horizontally for facilitating regulation.

The clock is fixed in such a position that its pendulum swings in a plane parallel with the magnetic meridian. One of the slits allows a luminous ray to reach the declinometer, the second allows one to pass to the bifilar, and the third to the balance.

The system as a whole is so arranged that the luminous images of the slits, after being reflected from the mirrors, are sent to the sensitized paper.

Fig. 3 will give an idea of the arrangement. The reflected rays that proceed from one of the side instruments, the declinometer, for example, fall upon a right angled prism, P[1], which sends them to a narrow window (in the front side of the photographic frame) that may be closed at will by a shutter, O, actuated by an external screw, V (Fig. 2). By a proper regulation of the slit, the two images, D and D[1] Fig. 3), reflected by the fixed and movable mirrors, are made to form sharply upon the sensitized paper. The bifilar gives in the same way, through the prism, P[2], two images, B and B[1], of the corresponding slit. The prisms, P[1] and P[2], each covers a third of the width of the paper. The intermediate third remains free and receives the images, C an C[1], directly from the slit corresponding to the balance—these images having beforehand been refracted by the prism adapted to the apparatus. There are thus obtained on the paper six traces, three of which are datum lines of each of these elements, and the three others so many curves which gives their variations. The distance from one curve to the line that serves as a datum point to it is proportional to the angle that the two mirrors make with each other.

The hour is likewise registered upon the paper. The clockwork movement is so arranged that the paper holder shall descend exactly 1 centimeter per hour, so that the total length of the curves is 24 centimeters. The paper is held in the frame between two plates of glass, one of which (that against which the sensitized surface rests) is transparent, and carries 25 horizontal dashes, separated 1 centimeter apart. These present themselves by turns before the