and surveying purposes and also, when combined with a mirror, for determining the elevation of the heavenly bodies. For measuring distances the angle of depression of the object is determined. A bent tube *b*, *c* opens at both ends into a reservoir containing coloured liquid. The tube and reservoir are enclosed in a frame *d* with a straight top *g* which serves as a sight, or a telescope *i* may be used. The angle of depression will be indicated by the level of the liquid in the leg *c* on the scale. Knowing this angle and the height of the position of the observer, the range can be calculated, or a slide rule may be combined with the apparatus. A thumb-screw in a vertical slot keeps the apparatus at any desired inclination.

2020. Ramsten, H. July 18.

FIG.1.

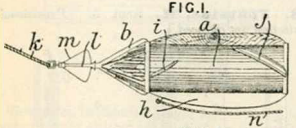
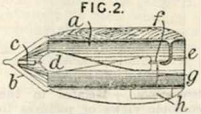


FIG.2.



Logs.—A cylindrical casing *a*, provided in front with a grating *b*, carries a screw *d* revolving between the sockets *c*, *e*. The screw is connected, through a pin *f* and rod *g*, to indicating mechanism placed within a box. The casing is kept in one position by a heavy keel *h* and is kept below the surface of the water by blades *i*, *j*. The tow-line *k* is attached to the casing at the front point, or to a shackle *l* on one side of which is a blade or steering plate *m* which acts as a rudder for keeping the apparatus away from the ship's side. The tow-line is attached to the forward end of the ship and the log may be readily hauled on board at the stern by means of a rope *n*. In a modification, the casing consists of two side plates connected by a pin which carries the screw. The plate *m* may be combined with any form of log, so that the same may be used at the side of the ship.

2105. Naysmith, J. July 26. [*Provisional protection only.*]

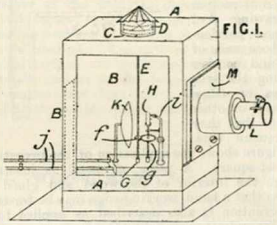
Bearings, instruments for determining; course indicators; compasses, magnetic; surveying instruments.—Relates to surveying and other instruments in which the magnetic needle is used for taking bearings or courses. To the usual movable dial is applied an inner circle divided in the same manner and able to revolve on the pivot of the needle. The inner circle is turned to the variation of the needle by a pinion on the outer circle which gears with a rack on the underside of the inner circle. They may be clamped to the outer circle by set-screws which move in slots. The outer circle is moved by a rack and pinion, as usual, for taking angles. The inner circle will give the meridional bearings in mariners' compasses. A graduated inner circle is fixed to the needle, and the outer circle, which is to be adjusted to the meridian, is graduated on its inner edge to correspond with the fixed part. The outer circle is movable around the inner circle in a groove and it may be fixed by clamps in any position. The outer circle will give the meridional bearings.

2163. Fileti, E. Aug. 3. [*Provisional protection only.*]

Compasses, magnetic.—To prevent or neutralize the effect of the local attraction of iron ships, independently of the effects of polarity which the iron may possess, several equal needles are arranged symmetrically in radial directions on the compass card. Such a combination will indicate the magnetic meridian but will not be influenced by unpolarized masses of iron. Instead of separate needles a steel star-shaped piece may have its different arms magnetized.

2202. Lacomme, J. M. A. Aug. 8.

FIG.1.



Magic-lanterns for advertising &c. A box with doors B has an opening C with an internal ventilator D which is mounted on an axis E pivoted at G and is rotated by the escape of heated gases at C. A cylinder L mounted in a frame M contains plano-convex flint and double convex plate-glass lenses, or two plano-convex lenses, and within the cylinder is an inner tube with two convex or meniscus lenses which can be focussed by a rack and pinion. The slides are inserted between the frame M and the box by hand, or they are mounted on a disc turned intermittently by clockwork, so as to bring and leave them in the required position for a time. The screen may be of white canvas, muslin, or varnished muslin, wetted and stretched on a frame; or a plaster or white papered wall may be used. The box is usually placed inside a building and the screen outside, but two screens may be placed at

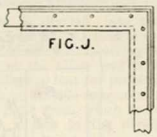
an angle and a lamp at each side. Or the screens may be on each side, and at right-angles to the wall and the lamps midway between them; the screens and lamp may, in this case, be suspended by wires in any open space. Any form of the apparatus may be mounted on a vehicle, fitted with screens, for travelling exhibition. The illumination may be by means of the oxyhydrogen flame, or an oxycalcium light, electric light, carburetted hydrogen, camphorated sperm oil, casseline oil, paraffin, or other illuminant may be used. The apparatus may be used for the decoration of the fronts of theatres and buildings with tableaux &c.

2237. Barker, R. E. Aug. 11. [*Provisional protection only.*]

Bearings, instruments for determining; measuring horizontal angles.—A magnetic compass is combined with a binocular field glass or with a telescope. The compass is fixed to the telescope or glass with the lubber's line parallel to the axis of the glass. When the glass is directed on an object, the compass card may be locked or not, and its reading noted.

2264. Stanley, W. F. Aug. 15.

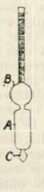
Straight-edges; squares. — Relates to the construction of drawing &c. appliances, particularly those made of wood, and consists in lining the true surfaces or edges with steel or other metal so that they may remain true.



The Figure shows the application of the invention to a set-square. A piece of metal is inserted through the interior of the wood and glued in place so that a hand working-edge may be formed. The invention is also described as applied to a T-square and other straight-edges.

2352. Linford, J. S. Aug. 27. [*Provisional protection only.*]

Specific-gravity estimating-apparatus. —Hydrometers are formed with three bulbs A, B and C, the middle one A being filled with the liquid to be tested. When the instrument is floated in water the reading on the stem will indicate the specific gravity of the liquid. In the case of liquids heavier than water, a fractional part of the whole is introduced. It is stated that the specific gravity is thus determined independently of the temperature.



2354. Clayton, T., and **Bailey, W. H.** Aug. 27. [*Provisional protection only.*]

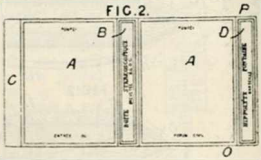
Pyrometers.—In the manufacture of oil-gas a metal rod, which expands and contracts according to the heat, is employed to control the oil-supply cock, so that when the heat becomes too great the cock is closed. In connection with this rod are a quadrant, pinion, hand, and dial arranged so that the temperature may be indicated.

2384. Chadburn, C. H., and **Chadburn, W.** Sept. 1. *Drawings to Specification.*

Compasses, magnetic.—Consists in the use of glycerine or of glycerine mixed with about one third of water for mariners' floating compasses.

2408. Fontaine, H. Sept. 3. [*Provisional protection not allowed.*]

FIG.2.



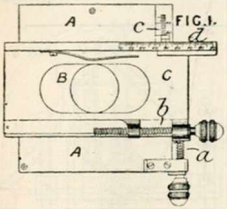
Stereoscopes. — Relates to the application of stereoscopic views or pictures to boxes or cases for holding various articles. Fig. 2 shows the application of the invention to a match box. The surfaces A, A of the box are occupied by the stereoscopic views and the parts B, C, D serve to form the sides of the case when the same is folded up. To obtain a printed or photographic view, a negative stereotype is made having its surface equal to the development of the surface of the box; this stereotype is then engraved and used for printing the views on sheets which are afterwards folded to form the boxes; or the proofs may be obtained photographically. When it is desired to look at the view, the strip C is unfastened or the case is cut along the line O, P, and the box spread out and inserted in the stereoscope.

2481. Rothnie, G. Sept. 15. [*Provisional protection only.*]

Thermometers. — A balanced thermometer is arranged to work an alarm, indicator, or other recorder by means of electricity. The apparatus may be used as a tell-tale for hot-houses and other buildings; or it may act in connection with an indicator for registering temperature. A glass tube in the form of a flattened coil is open at one end and closed at the other; the tube at the closed end contains spirit, above which mercury is placed. The coil is fixed to a scale or other centre,

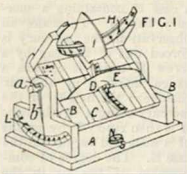
balanced on an axis, and to the scale is fixed a movable balance indicator which can be set at any desired degree on the scale. When the mercury moves past a certain point the equilibrium is disturbed, and pins on the apparatus come into contact with electrical wires and actuate an alarm. The sensitiveness of the apparatus is controlled by springs.

2486. Haseltine, G., [*Oliver, J. L.*]. Sept. 15.



Microscopes, mechanical stages for. The microscopic slides or objects are carried on plates B, C, which move at right-angles to each other on the stage A, the motion being effected by screws *a*, *b* or by merely sliding the plates. On the stage is engraved a scale *c*, and a similar scale *d* at right-angles to the first is engraved on the upper plate *c*. By the use of these scales an object in a slide may be easily found again when its position has once been noted. A reading glass may be combined with the scales.

2660. Haseltine, G., [*Trueg, L. I.*]. Oct. 7.



Latitude instruments.—Relates to an instrument for obtaining solar measurements of latitude and time, and which is called a "heliorama." The base A is fitted with a magnetic needle N, S so that it can be set with its short ends in the meridian. Side pieces B support the axis *a* of a revolving piece C, and have on them arcs L, one for latitude and the other for the height of the celestial equator. On the axis *a* are index fingers *b* moving over the arcs L. The piece C carries a graduated arc D and a gnomon E, at right-angles to each other. The sun's declination is found by setting the index *b* to the known latitude, and noting the shadow of the gnomon E on the arc D. The declination of the sun for each day of the year is marked on the board C and from this the latitude can be found. Allowance is made on the arc L for refraction. To find the time, a pin I casts a shadow on an arc H supported on the piece C. Mean time, that is clock time, is indicated, the arc H being adjustable by mechanism connected to an index moving over an arc showing the equation of time for any day. When used at sea, the apparatus is directed in the meridian by a large magnet.

2668. Newton, W. E., [*Spencer, R.*]. Oct. 8. *Drawings to Specification.*

Thermometers and pyrometers.—The Provisional Specification states that the bulb of a pyrometer is made of iridium and enclosed in a block or brick of refractory material. The bulb is connected by an iron rod to an indicating mechanism, such as used in wheel barometers or steam gauges. The brick is made with a flange so that it may be suspended from a hole in the crown of a furnace or kiln, so that the bulb will be exposed to the heat and will indicate the temperature.

2750. Dallmeyer, J. H. Oct. 19. *Drawings to Specification.*

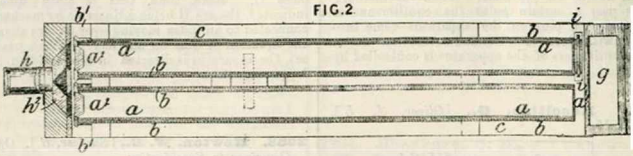
Telescopes and opera and field glasses. — To correct spherical and chromatic aberration and curvature of the field, the object glass is formed of two lenses cemented together, the denser refracting medium, as the flint glass, occupying the external position. The radii of curvature of the external surfaces are preferably as 1 : 12, and the refractive indices of the lenses 1 : 62 and 1 : 51. The concave eye lens has a focal length about one-fifth that of the object glass.

3027. Wilson, R. P. Nov. 18.

Colours, comparing and testing.—The colour of an oil or other liquid is compared with a standard colour and from this the colour, density, or quality is determined. On a frame *c*, which forms the hinged lid of a box, are fixed two glass &c. tubes *a*, of equal length and enclosed in protecting brass tubes *b*. Flat glass ends a^2 and a^1 are provided, the former being fitted into screw caps b^1. When an oil or liquid is to be tested, it is put into one of the tubes so as to fill it, and an oil &c. of standard colour is put in the other tube. The tubes are inclined at about 45°, being adjusted by a link and a screw, and any air bubbles will collect round the bevel edges of the glass ends a^2. Light is reflected by a mirror *g* through the tubes and is brought to an eye-piece *h* by prisms h^2. In a modification, the eye-piece *h* is removed or turned back on a hinge and the light enters at the top of the tubes and the colours are compared in the mirror *g*. In another modification, the tubes are looked through directly. Instead of filling one tube with oil of standard colour, that tube may have a

coloured glass end fitted in a frame *i*. The tubes may be graduated and only partly filled with liquid.

FIG.2



3056. Watkins, A. H. Nov. 22. [*Provisional protection only.*]

Eye protectors.—A combined respirator and eye protector consists of a bag, mask, or covering of india-rubber, leather, &c. applied and fixed to the face and fitted with glasses. The bag has a valve or valves which open by inspiration and close by expiration and are in communication with a tube leading to fresh air. The bag has another valve or valves which open on expiration and allow the expired air to escape.

3069. Thomson, Sir W. Nov. 23. [*Provisional protection not allowed.*]

Telescopes, driving-clocks for. In clockwork mechanism, stated to be applicable for moving equatorials, the speed of the main shaft is regulated by a special chronometric arrangement. The shaft may be driven by an electromagnetic motor of special construction, by weights, or by water power. The shaft drives by a pin-and-slot mechanism a second shaft resting on friction rollers which serve also to drive a sleeve on it. This sleeve drives by friction gearing a second sleeve, the motion of which is regulated by a dead-beat escapement with elastic teeth. In electric clocks, the escapement automatically closes regulating-circuits having resistances in shunt with the magnet of the motor. For weight-driven clocks, a centrifugal governor, working by friction, is actuated by screw-and-nut mechanism. In the case of water-driven clocks, the water supply is automatically regulated. A special form of compensation pendulum may be used.

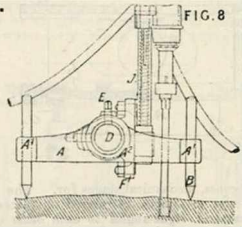
3131. Taylor, F. B. Nov. 29.

Stands for rock drills are made with two metal side plates A having sockets A^1 at each end fitted with steel bars B, which are held, after adjustment, by pinching screws. A tubular shaft D is held, by pinching screws E, in sockets A^2 in the plates A, and upon it is adjustably fitted a clamp having on one side a recessed disc F^1 in which is held an adjustable plate formed with sockets for receiving the supporting column &c. of the drilling machine.

(*For Figure see next column.*)

3131.

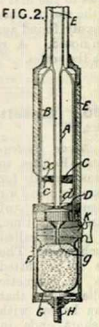
FIG.8



3280. Macneill, T. T. Dec. 15.

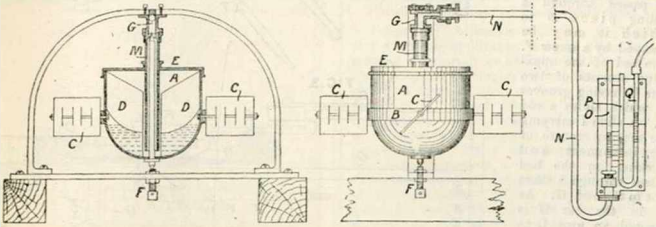
Barometers.—Relates to a portable form without a vacuum. The tube A is open to the air and passes through an air chamber B, which contains two diaphragms D and C with orifices *d* and *c*. The air chamber and tube are of glass, and are enclosed in a casing E, which is screwed to a case F containing a mercury bag G. To make an observation, the mercury is forced out of the bag by a screw H until it reaches a gauge mark *x* in the air chamber; the height of the mercury column in the tube A is then read off by means of a scale and vernier on the case E. The degree of compression of the air in the chamber B being known, the height of the mercury column in the tube A will depend on the atmospheric pressure. When not in use, the mercury is confined to the bag G by a cock K. In a modification, the case E is dispensed with and a scale is marked on the tube A; the gauge *x* consists of a point fixed to the tube A, and instead of the cock K a plug is screwed into the opening *g*.

FIG.2.



A.D. 1871.

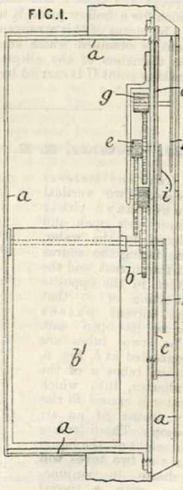
173. Cochrane, W., [*Guibal, T.*]. Jan. 23.



Anemometers.—A cylindrical vessel A, made preferably with a round bottom and with a cover E, is fixed on a vertical shaft supported on bearings at the top and bottom. A number of partitions D pass from the sides towards the centre of the vessel. A pipe M, passing nearly to the bottom of the vessel A, is connected by an elbow G with a siphon pipe N turned up at its end and connected to a gauge glass O. The vessel A is about half filled with water and the connections M, G, and N are filled with water, which will stand in the gauge O at the same level as in the vessel A. If the vessel is caused to rotate the liquid in it will by centrifugal force rise towards the sides and become depressed at the centre, and this depression will be indicated by a corresponding fall in the water level in the tube O, and it will be in a certain ratio to the velocity of rotation of the vessel A. The vessel may be fixed, and the liquid caused to rotate, by means of the divisions D. In applying this apparatus to indicate variations in the air currents of a mine, the vessel A is fitted with a band B carrying adjustable vanes C. Beside the gauge O is a water gauge P, the leg Q of which is connected with the return air shaft of the mine. If the mine is ventilated by pressure instead of exhaust, the connections must be altered accordingly. When at rest, the water levels in the legs O and P are made to coincide. Then the leg Q is put into communication with the mine; the water level in the gauge P will fall in proportion to the exhaust in the shaft. The vessel A being placed on the shaft, the vanes C are turned until the velocity is such that the level in the gauge O descends to that in P, any alterations in the conditions will now be shown. An increased resistance in the mine would be indicated by the level in the limb O being higher than in the limb P. A comparison of the two columns will thus show the state of ventilation, and the volume of air passing can be found by calculation. If the vanes are required in a horizontal shaft they are connected with the rotating spindle by gearing.

180. Houghton, T. M. Jan. 24.

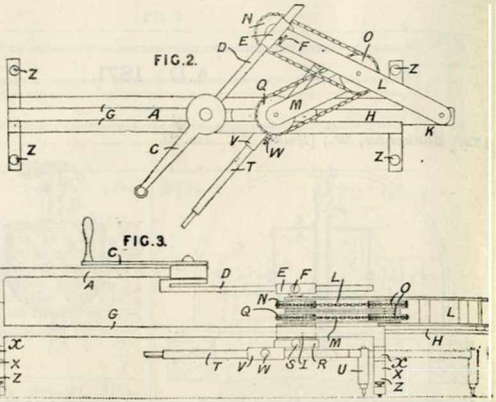
FIG. 1.



Levels and plumbing-instruments; clinometers.—A case *a*, which is fixed to a block of wood, contains a train of wheels, the first of which *b* has a weight *b'* on its spindle. On the spindle of the wheels *b*, *e*, and *g* are indices *h*, *i*, and *k* respectively; the first indicates every five degrees on a dial *c*, the second indicates degrees, and the third minutes. Two, four, or other number of indices may be used, and friction wheels may be used in place of the toothed wheels.

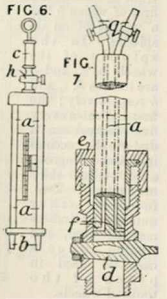
312. Burstow, E. Feb. 6.

Ellipsographs &c. — A form of apparatus for drawing elliptical and other curves is shown in Figs. 2 and 3. An arm A projecting from the frame carries a spindle on which is fixed a handle C and an arm D. The arm D passes through a sliding piece E to which it may be clamped by a screw F. The bed of the apparatus consists of two bars G having grooves in which slides a rod H. A slide I carrying the moving centre of the instrument and working on the bed passes through a short slot in the rod H. At K on the bar H is pivoted an arm L to which is attached a bar M; these two bars carry four wheels N, O, Q. The two wheels O are fixed on the same spindle, and the four wheels are geared together by a chain as shown or by bolts or gear wheels. The axis of the wheel Q passes through the slide I and terminates in a disc on which fits a hollow piece R with a clamping-screw S; by means of this arrangement a circular adjustment is obtained which enables the direction of the diameters of the ellipse to be varied. The marking point U is carried by a piece T clamped in a sleeve V by a screw W. The legs X of the instrument are cut away at *x* for the reception of the bar T, and the instrument is levelled by screws Z. When the handle C is turned, the arm L with the wheel N is moved round, thus causing the slide H to move in the bed G and the wheels Q to revolve. The combination of these two motions causes the marking point to trace out an ellipse. A modification is described in which the parts are differently arranged, the arm D being placed below the gear wheels.



423. Fletcher, A. E. Feb. 17.

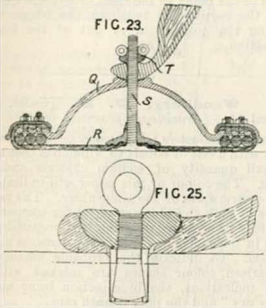
Current meters; logs.—Two vertical tubes have their lower ends open and placed in the water, one facing the source of the current and the other in the opposite direction or so that the current passes across its open end. The two tubes are connected at *b*, Fig. 6, to the tubes *a* of the indicator, into which water is caused to rise by means of an air pump *c*. The difference in height of the liquid in the two tubes will indicate, in conjunction with a special table, the velocity of the current. Fig. 7 shows an arrangement for determining the velocity of liquids flowing through pipes; into the pipe a cock *d* with a stuffing-box *e* is screwed. The before-mentioned tubes are formed in a flat piece *a*, which is thrust through the plug *d* down into the pipe until the orifices *f* are away from the sides of the pipe. The ends of the tubes *q* are connected to the indicator, Fig. 6. If the liquid in the pipe is under pressure the air pump *c* is not used, and by the use of the cock *h* some air is kept in the indicating tubes. Logs are made similar to the form shown in Fig. 7, but the tubes *a* pass through a cock, which is connected to the skin of the ship, so that the ends are in the water. A rack and pinion is used for moving the piece or tubes *a*. In case the speed of the ship is high, a U tube containing mercury is connected with the two tubes *a* to reduce the height of the water columns in the indicator. In this case one tube may be formed with a bulb so that the whole column will be in one tube. The instrument may be made to indicate on a dial, and may also be combined with registering apparatus, in which cases floats are used on the columns.



447. Holmes, S. Feb. 21. [*Provisional protection only.*]

Optical instruments; microscopes; telescopes.—A prism or prisms, or a divided lens or lenses, are applied to the object of binocular instruments, to deflect the light by refraction from the right side of the objective into the left eye-piece, and *vice versâ*.

468. Macdermott, M., and **Williams, A. D.** Feb. 22.



Tripod stands or frames for rock drills. One leg of the frame is fitted with a metal cup Q, Fig. 23, having an india-rubber diaphragm R bolted to it, so as to be airtight, rubber packing being inserted between the diaphragm and the lip of the cup. By means of a screw S and nut T, the diaphragm may be drawn from the surface of the rock, thus creating a vacuum and securing the frame in position. In some cases, a circular lewis bolt is employed, as shown in Fig. 25, which is inserted in a hole drilled in the rock. The screw is then turned, its conical head causing the lewis bolt to expand in the hole.

471. Haseltine, G., [*Leggo, W. A.*]. Feb. 22. [*Provisional protection only.*]

Spectacles and eyeglasses; eye shades.—Shades are combined with spectacles or eyeglasses for stopping unnecessary light. The frame is fitted with a pivot carrying a screen which can be made to cover the upper part of the lens, the lower part being varnished or coloured, or left clear. The screens may extend above the pivot to prevent light entering the eye from above. In a modification, screens with a slot in the centre of each may be attached to the lenses, when required, by springs or screws. The lenses themselves may also be partly varnished or stained. Also frames without lenses may be fitted with such shades.

604. Wrench, J. H. March 7. [*Provisional to Specification.*

Magic-lanterns. mechanical slides for. The circular glasses of rotating slides are mounted in metal rings which are formed with holes or recesses in lieu of rack teeth, with which gear the pins of a pinion-wheel turned by a handle. Two glasses may be arranged to turn in opposite directions, one being placed on each side of the pinion.

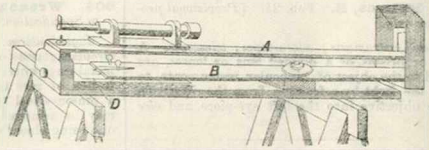
810. Thomson, Sir W. March 25. [*Letters Patent void for want of Final Specification.*]

Telescopes; heliostats.—Relates to clockwork stated to be applicable, among other uses, for moving equatorials or heliostats. A pendulum or other vibrator is employed, but the clockwork is given an approximately uniform motion independently of it. When the clock is adjusted to any speed within certain limits, and left to itself, it is so arranged as to augment its speed above the proper speed. By a movement like Graham's dead-beat escapement, a shaft keeps the pendulum vibrating, only one tooth passing for each motion of the pendulum. When not touched by the pallet, the escape-wheel is carried by a differential motion at a rate exceeding that of another shaft called the "chronometer" shaft, which is connected with the wheel train of the hands. The connection of the differential motion is a frictional one, so that by increasing or diminishing the resistance, the speed of the chronometer shaft is diminished or increased. In hydraulic clocks, the water supply is diminished or augmented according as the chronometer shaft gains or loses on the escape-wheel. In electromagnetic clocks, the differential motion diminishes or increases the driving power from one grade to another or to several others successively. The escapement-wheel and the shaft carry one a ring and the other a spring touching the ring. The ring is partly of insulating material and partly of metal insulated from the spring except when touched by it. The spring and ring are connected to two fixed conductors connected to the wire of the driving electromagnet in such a way as to introduce a shunt into the circuit or break the circuit when the spring makes contact with the metal of the ring. The electromagnet has a core of soft-iron wires varnished and pressed together. The pendulum used consists of a heavy weight attached to a bar of steel jointed at one end to a zinc rod and supported horizontally by a platinum wire attached to it at a point between that end and the weight; or knife-edges may be used for supporting the pendulum or springs made up of a number of fine round platinum or steel wires.

817. Innes, A. March 27.

Telemeters.—Relates to apparatus for observing and recording the magnitude and relative distances of objects, and, when applied for artillery practice, for registering the position of every shot which falls on the water around the floating target.

The apparatus consists of two telescopes, quadrant, eye-pieces, diaphragm, hood, and cross wires, mounted on a radial arm A, which is pivoted at a point exactly beneath the eye of the observer, and is acted on by an arm B pivoted on the bed. The register, of one or more sheets, is perforated by a steel point D acted on by a hammer and trigger. The instrument is sighted at the target and the index set at zero, the back-sight and cross wires being in collimation with the target. The line of collimation being then marked on the register, the index liberated and the hammer raised, the registering is effected by bringing the shot under the cross wires by moving the arm B or the index to the right or left and spotting it on the register by touching the trigger, thus marking the position in or out of the line of collimation.



820. Punshon, R. March 27. [*Provisional protection only.*]

Compasses, magnetic.—Relates to means for indicating the direction of the needle from the meridian. A toothed wheel, fixed to the centre of the needle, gears with an index-wheel mounted on the compass bowl, or the index-wheel may be fixed to the needle. From the movement of the index-wheel with the bowl and the ship, and the motion of the needle itself, the deviation will be indicated.

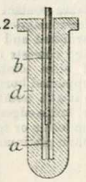
847. Solomons, B. March 29. [*Provisional protection only.*]

Compasses, magnetic.—In a prismatic compass, instead of a detachable cover the case is fitted with a glazed opening at the top, and to the circumference of the case the prismatic eye-piece and the sight vane are hinged; these fold down to protect the glass when the instrument is not in use. The end of the sight vane abuts against the hinge of the eye-piece by which it is held down.

907. Newton, W. E., [*Spencer, R.*] April 5.

Pyrometers.—The bulb *a* of the pyrometer is made of iridium and is enclosed in a block or casing *d* made of refractory materials. The bulb *a* is attached to an iron rod *b* connected to the indicating mechanism. The casing *d* is flanged, so that it may rest in an opening in the crown or other part of a puddling or other furnace &c. The refractory composition from which the casings *d* are moulded is composed of three parts of ground and washed fireclay, one of pounded and washed gannister, and one of "pulverized "calcined pot," mixed with lime water, to which may be added a little silicate of potash or soda to impart adhesiveness.

FIG. 2.



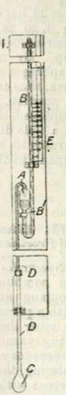
948. Woodbury, W. B., [*Smith, G.*]. April 11. [*Provisional protection only.*]

Weather indicators; hygrometers.—Paper is prepared with a salt of cobalt to which has been added a small quantity of sodium chloride and gum arabic. The colour of this paper will indicate the hygrometric state of the atmosphere. The various shades of pink and blue are added for comparison; they may be arranged in a ring, the prepared paper being in the centre; or other arrangements may be adopted. To indicate the probable weather, the comparison colour shades are marked with the usual indications, the blue section being marked "very dry" and the pink "much rain."

965. Siemssen, G. April 12.

Pyrometers.—An air vessel C of platinum or other suitable substance is connected by a tube D with a vessel A containing mercury, from the lower end of which vessel passes a sealed tube B. The expansion of the air in the vessel C causes the mercury to rise in the tube B and indicate the temperature on the scale E. For transporting, the mercury is kept in the tube B by a cock B^1, and the tube D is disconnected from the vessel A. The instrument may be placed in a case, one part of which, for the tube D and the vessel C, contains a refractory material; while the part for the vessel A contains a non-conducting material and a thermometer; it may also be formed with a steam jacket to preserve a constant temperature. The upper part of the casing has a slot and a scale for reading the height of the mercury in the tube B.

FIG. 1.



1240. Hoskold, H. D., and **Winspear, J. E.** May 8.

FIG. 1.

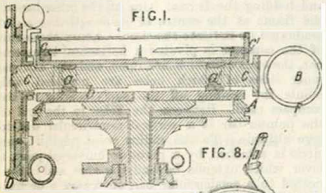
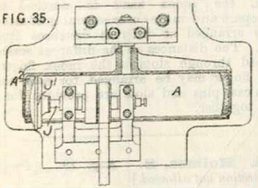


FIG. 8.

Surveying-instruments, angle-measuring instruments.—Relates to an instrument for measuring angles in field and underground work, and for connecting underground surveys to those on the surface; it may also be used as a transit instrument or a zenith telescope. The telescope B, the cross lines of which can be illuminated by a lamp, is attached by a ring F to an axis C in agate bearings a, a^1, so that it revolves in a vertical plane. On the same shaft is a vertical graduated circle D. Over the axis C is the compass box, resting in a recess in the inner divided circle c, c^1; the needle carries a card with a vernier at one or at both ends. A horizontal divided circle A with vernier plate b is also provided. Lenses are supplied for reading the circles, and each one is fitted with a window reflector so that the scale can be illuminated by means of a lamp. The different circles and verniers slide in grooves and are adjusted by screws. A micrometrical arrangement is used in the eye-piece of the telescope as a distance measurer and for measuring very small angles. As the telescope is not at the centre of the instrument, the station poles have double points at a distance apart equal to the distance between the axis of the telescope and the centre of the instrument. A miners' dial of similar construction is shown at Fig. 8.

1528. Robertson, J. June 9.

FIG. 35.



Lenses, grinding. The telescope or other lens is attached by pitch or other cement to a block J^1 mounted on a spindle J driven by belt gearing and is brought against the surface of a revolving grinding-wheel A as shown in sectional plan. The grinding-wheel consists of a wrought-iron ring attached to a cast-iron faceplate and enclosing the abrasive material A^3. This material may be loose and mixed with water or other liquid, being retained in position by centrifugal action, but it is preferably mixed with glue or other cement to give it a firm surface and cause it to remain steadily in its position.

1680. Davis, J., Ilbery, J. A., Isaac, B., and **Sullivan, J.** June 27.

FIG. 3.

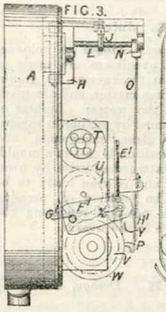
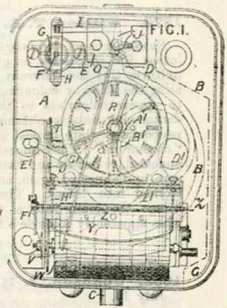


FIG. 1.



Specific-gravity estimating-apparatus; logs; barometers; thermometers; anemometers.—Relates to recording-apparatus for recording graphically the variation in steam, air, and other gas pressures, the pressure, specific gravity, and height of water, and other liquids, the speed and motion of ships, also the changes in the readings of barometers, thermometers, anemometers, and like instruments. In a case A is fixed a clock movement with the usual dial and hands R. Its centre spindle is connected by a worm s, or other mechanism such as a crown-wheel, with gearing T, U, V. On the axis of the wheel V is a removable drum W, which carries a paper or other envelope Y, or which winds paper off a reel. The paper is graduated by longitudinal and transverse lines. In front of the paper Y is hung a piece of carbonized or other marking paper Z carried on an axis z supported on crank arms F^1 on a shaft G^1, which is moved by a link E^1 operated by a lever C^1 counterbalanced at D^1, and actuated through a forked arm B^1 by an eccentric A^1 on the centre spindle of the clock. A pendulum-rod O is carried by a piece N on a shaft L. Its lower end carries a marking-point P which at fixed intervals presses the carbonized paper against the recording-paper Y. The motion of the eccentric A shifts the marking-paper and changes the surface presented to the marking-point. To press the arm O and point P against

the drum W at stated intervals, a wire frame H^1 is mounted on an axis I^1 and connected with the clockwork. The position of the arm O is regulated by the indicating-apparatus to which the recorder is connected. As shown, it is operated by a "Bourdon" pressure-tube B fixed at the bottom to a pipe C, and carrying at the top a cranked piece D connected by a link E with a spindle F, which passes through an aperture G in the cover of the case and through a lever H and link I and arm J, operates the arm O. A dial may also be fitted over which the arm O can work to show the pressure at any moment. The opening G is guarded by an india-rubber or other diaphragm to prevent breakage. When used on board ship, a dash-pot is used to prevent shocks.

1772. Willson, T. A. July 6.

Spectacles and eyeglasses.—Tinted or coloured lenses for spectacles or eyeglasses are made of uniform tint for different thicknesses by graduating the alloy or colouring matter, and are made to appear colourless to the wearer. Lighter or darker pink tints are obtained by mixing in various proportions white optical glass, "manganese," and "chromium." The composition is cast in a mould, annealed, re-heated and flattened endwise by pressure, and annealed again, and is then ready to be worked into lenses. The method of pressing brings the grain into a position rendering the glass apparently colourless to the wearer.

1852. Johnson, J. H. [*Derogy, E. E. N.*]. July 14.

FIG.2.

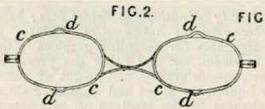


FIG.3.

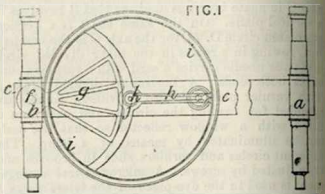
Spectacles and eyeglasses are fitted with achromatic lenses, which are secured in the frames by means of india-rubber bands. At the junction of the two glasses, on the periphery, is a groove in which is placed a band of india-rubber *b*. The frame *c* is formed at *d* with a spring to compress the rubber band and hold the glass in the frame.

1860. Bassnett, T. July 17. [*Provisional protection only.*]

Compasses, magnetic.—Relates to an instrument or compass corrector by which any deviation can be at once read off. The pivot of the card is on a weighted bar supported on gimbals, the ends of this bar being turned up at right-angles to form standards to which is pivoted a rectangular frame. On one axis of this frame is a loose pointer over a dial on the side of the frame for indicating latitude; the other pivot has a screw for adjusting and holding the frame. One of the other bars of the frame at the centre of its length has a dial graduated to indicate the time. Above the centre of the compass is pivoted a horizontal transverse bar, the ends of which are open, and the extreme inner sides of which holes are provided with points for reading off the sun's bearing on the compass card. Between the holes in the end of the pointer-bar is a vertical semicircular dial to give altitude. To the radius point of this semicircle is attached, by a pivot or universal joint, a lever which extends beyond the arch and is connected to a semicircular bar, on which a declination scale is marked, jointed to the radius points of the dial marked with the time index of the opposite bar. From the spring of the declination-bar extends an index moving over the time dials. The lever which works over the face of the declination arc carries a sight attached by a swivelling joint, so that the sight may always lie at the same angle in relation to the arc.

1993. Stephens, J. July 28.

FIG.1



Telemeters; range finders.—On a tripod is pivoted a base-plate *c* which carries a fixed telescope *a*, and a telescope *b* that may turn as a pivot *f*. Attached to the telescope *b* is a quadrant *g* which, by means of a rubber ring or disc *j*, or by toothed gearing, or a cord round a spiral disc, moves an axis *k* carrying an index hand *h* moving over a dial *i*. The telescope *a* is first sighted on a distant object, and then the telescope *b* turned until it sights the same object; the index *h* will then indicate the distance on the scale *i*. In a modification, the index hand is attached to the telescope *b* and moves over several graduated segments arranged at different distances from the pivot. The distances on the different scales may be read through slots in the index finger. An index finger may be arranged for each scale, in which case pins and slots are provided for fixing them together.

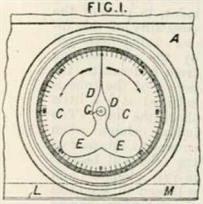
2184. Holmes, S. Aug. 19. [*Provisional protection not allowed.*]

Microscopes; telescopes.—The objective of a microscope or telescope is fitted with a prism or

prisms, or a divided lens or lenses, so that, by refraction, the light from the right side of the object piece is deflected into the left eye-piece, and *vice versâ*. The objective to be used for ordinary microscopes consists of a lens or lenses acting by reflection to form an image of the object in the direction of the prism.

2442. Wilde, J., and **Sinclair, H.** Sept. 16.

FIG.I.



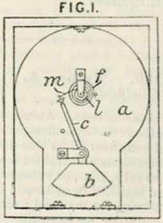
Levels and plumbing - instruments; angle-measuring instruments; theodolites.—Relates to a level and angle indicator which may act as a theodolite and is applicable for plumbing purposes, for levelling ceilings, for use in laying drain and water pipes, and for other purposes. A pointer D, mounted on an axis G and fitted with a weight E, moves over a dial C which is placed in a box or frame A, provided with a glass front and a hinged lid. A sight tube with cross wires is also provided to enable the instrument to be used as a theodolite. The underside of the box or frame A has a level surface.

2511. Verity, J. Sept. 23.

Reflectors for lamps and other purposes. A reflecting medium is produced by calcining mica in a retort at red heat until it has assumed the colour of molten silver.

2562. White, G., [*Delsarte, A. C. L.*]. Sept. 28. [*Provisional protection only.*]

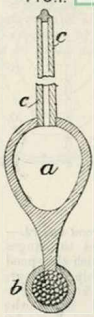
FIG.I.



Levels.—Pendulum or balance-weight levels are made with the indicating bands separate from the balance-weight rod. The rod *c* of the weight *b* is connected by a string *m* to a pulley *l* on the axis of the pointer which moves over the graduated face of the dial *a*. A spring *f* is attached to this pulley to lessen the oscillation.

2594. Blaise, L. Oct. 2.

FIG.I.



Specific-gravity estimating-apparatus; saccharometers.—Urinometers, saccharometers, alcoholmeters, acidimeters, lactometers, and similar measures of density are made of vulcanite, ebonite, india-rubber, gutta-percha, or similar substance. Fig. 1 shows a spirit hydrometer; the graduated tube *c* is screwed into the bulb *a* on to which is screwed the bulb *b* filled with shot. The index rods may be made flat and graduated on both sides. The weighted bulb *b* may be made of glass or metal coated with ebonite &c., and the scale rod may be of glass or ebonite.

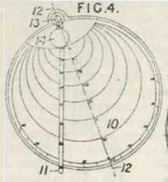
2596. Varley, T., and **Varley, F. H.** Oct. 2. *Drawings to Specification.*

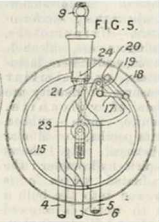
Barometers.—In connection with a governor for the driving-train of an electric telegraph instrument or for other purposes, a screw fan is employed which rotates in a box through which passes air or other fluid. A valve, controlled by a weight or spring, is arranged so that it may regulate the size of an aperture in the box according to the pressure therein. In the Provisional Specification it is stated that the valve may be employed to record barometric changes.

2685. Ross, T. Oct. 10. [*Provisional protection only.*]

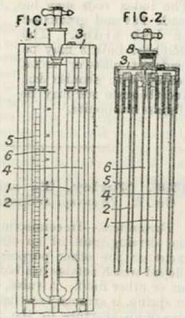
Magic-lanterns, slides for. Relates to instruments for producing pictures of bodies apparently in motion or of changing colours to be viewed direct or shown by a magic-lantern. On a disc of glass are painted or photographed say thirteen successive attitudes of the body in motion; in front of this disc and on the same axis is an opaque disc with a slot large enough to show one picture through it. These two discs are driven by a winch handle and bands and pulleys, in the same or opposite directions, at such speeds that while the opaque disc makes thirteen revolutions the other makes one. Colours may take the place of the pictures.

2775. Napier, J. R. Oct. 18.





Current meters.—Relates to gauges by which the speed of a ship or a current &c. is estimated from the pressure shown by mercury in a U-tube or by one or two Bourdon tubes, means being provided to facilitate the removal of the air in the apparatus. The upper ends of the legs 1, 2 of the U-tube, Figs. 1 and 2, communicate, through a casing 3, with pipes 4 and 5 fitted with the usual pressure nozzles at their ends. By means of a plug cock 8, these tubes are put into communication with a discharge pipe 6 carried low down in the vessel. In a steam vessel, the pipe 6 may be connected with the condenser or pump. In a modification, a passage is made, above the mercury, between the legs 1 and 2 of the U-pipe and can be opened or shut by means of a stop-cock, so that when a current flows from one pipe through the stop-cock, it forces the air before it out of the other pipe. This instrument may be hung in gimbals, but if fixed the readings may be corrected for angular movement of the ship by means of a fixed dial 10, Fig. 4, and a pendulum 11 pivoted at 13 and loaded with a weight 14 placed high to make its oscillations quick. The reading against the mercury column is observed on one of the circles on the dial 10, and the circle followed to the left-hand edge of the pendulum 11 on which is marked the correct reading. The circles have their centres all on the line 12 . . . 12 which is vertical when the ship is on an even keel, and their peripheries all pass through the point of suspension of the pendulum. In another arrangement, Fig. 5, the U-tube is replaced by two Bourdon tubes 15, which, through links 17, 18 and arms 19, 20, operate a spindle 21 carrying a sector in gear with a pinion 23 on the spindle of an index hand 24. The tubes 4, 5, 6 act, as in the previous case, under the control of a plug cock operated by a handle 9. In another form, only one Bourdon tube is used. This tube communicates with the tube 4 and is also subject outside to the pressure from the tube 5.



2805. Casella, L. M. Oct. 20.

Thermometers, maximum. In instruments with a mercury index, to prevent the possibility of this index being destroyed by the air escaping from underneath, the bore *a* of the tube is enlarged at *b* a little above the bulb. The index column when coming to this part of the tube will become more globular and will tend to keep this shape, thus preventing it moving nearer to the bulb. In some cases, the bore of the tube may be contracted at *c* immediately below the enlarged part.

3007. Brown, D. S. Nov. 8. [*Provisional protection only.*]

Barometers.—The tube of a barometer is made so thick in proportion to the bore as to enable a wooden frame to be dispensed with. A scale is fixed at the back of the tube, and the spaces between the inches are distinguished by various colours, or the tube may be coloured differently.

Thermometers.—The scale or tube of a thermometer may be in different colours, or the tube may be enamelled in some parts and not in others, so that particular temperatures may be readily distinguished.

3339. Tylor, A. Dec. 11. *Drawings to Specification.*

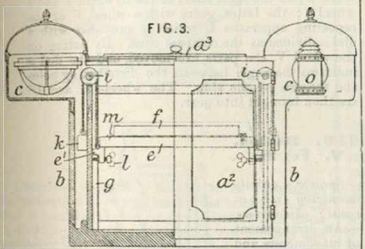
Anemometers.—An air meter similar to that described in Specification No. 1411, A.D. 1871, [*Abridgment Class* Gas distribution], but of larger dimensions and lighter materials, is used in mines. The sails, fans, or vanes can be furled or diminished and inclined or reduced; they may be made of non-inflammable material; and each is connected with a counting or recording apparatus, a dial, and an

apparatus for checking the velocity of the fan &c., so as to record the quantity of air passing. Vanes are attached to or near the moving parts to regulate their speed, or are placed so as to reflect regulating currents of air. Drag plates &c. are used, when desired, in connection with the moving vanes &c. which partly descend into or move in a trough or receptacle containing water &c. A more delicate apparatus for measuring the quantity of air consists of two flys or vanes, one being connected with a counting-apparatus or to a spring or weight and the other suspended from or situated close to it. The first fly is made to rotate at the same speed as the second, and may be suspended by a torsion wire or mounted on pivots so as to move on its centre almost without friction.

A.D. 1872.

33. Low, J. Jan. 4.

FIG. 3.



Compasses, magnetic; binnacles. — Relates to means for compensating errors due to the local attraction of iron ships. The binnacle *b* is provided with two compass bowls *c* placed some distance apart and arranged both in the centre line of the ship, and also with a magnet *f* carried on an adjustable platform *e* placed between the compasses. The two needles are brought to correspond with a compass on land by adjusting the magnet *f*, which is preferably enclosed in a copper case. The magnet may be adjusted on the platform *e*, and then fixed by screws *m*. The platform may also be adjusted by means of cords passing over pulleys *i*, and attached to weights *k*; it is guided by brackets e^1 engaging guides *g*, and is fixed by screws *l* pressing against the guides. The binnacle is provided with doors a^2 and a^3, and lanterns *o* are fitted to the compass boxes.

72. Vale, H. Jan. 9. [*Provisional protection only.*]

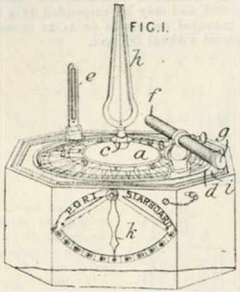
Eye-protectors, frames for. The frame and its joint are made from one piece of sheet metal. A sheet metal blank is cut having the outline of the frame before it is bent in an elliptical form. One end of the blank has an ear, from which the middle knuckles of the joint of the frame is made, and the other end has two ears for the side joints. By dies and pressure, the edges of the blank are raised at right-angles to the other part. By another process, such parts are cut away as will leave only a trough-shaped beading or frame having at its ends the pieces for the joints. Wire gauze of the shape of the unbent frame is inserted, and the trough sides closed upon it. The joint pieces are shaped into eyes. The flat frame is bent round a mandril to the elliptical figure of the protector frame. The unconnected ends are joined together by bringing the eyes together and passing a pin through them.

256. Clark, R. D., and **Jobson, R.** Jan. 25. [*Provisional protection only.*]

Compasses, magnetic; bearings, instruments for determining.—Errors due to local attraction are ascertained by observing the bearing of the pole star by the aid of a special instrument. The instrument or apparatus consists of a dial, supported on gimbals, which has its east and west points reversed and its north and south points fixed in a line with the ship's keel. A pointer moving over the dial carries a vertically-slotted vane at each end and a central socket for holding a pointed rod. For taking the bearing of the pole star, one sight vane and the central rod are used. Bearings of

lights &c. may be taken by means of the two lines.

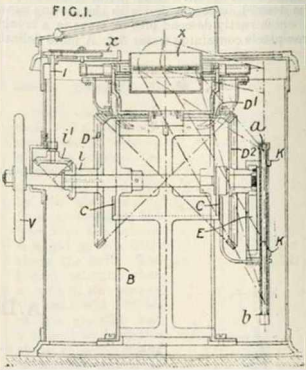
265. Middleton, J. Jan. 27.



Compasses, magnetic; bearings, instruments for determining.—Relates to an instrument for adjusting and connecting ships' compasses by taking observations of celestial or terrestial bodies. The instrument consists of a divided card *a* which revolves in a ring *d*, and may be clamped by a piece *c*. The ring *d* carries a sight vane *e* with cross threads, a sight *f* with glass shades, and a telescope *g*. The card may also be fitted with a tall sight vane *h*, and with time or latitude circles. The ring *d* turns in another ring *i*, and the whole is supported on gimbals and provided with a balance weight. An indicator *k* is provided for indicating the amount the ship heels. The instrument may be fitted on a binnacle stand and be provided with lamps &c. The instrument may be used for "adjusting the compasses of iron vessels "on an improved system, the compensation being "non-permanent magnets."

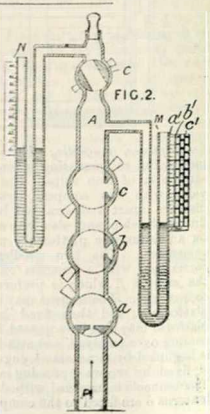
312. Johnson, J. H., [*Arson, L. F. A.*]. Jan. 31.

Compasses, magnetic.—Relates to apparatus for correcting and compensating for variations, by means of a single vertical magnet which may be moved to or from the needle, which apparatus is an improvement on the corresponding apparatus described in Specification No. 2705, A.D. 1869. The compensating magnet consists of a number of wires in a sheath *a b* which is connected to the frame K of an eccentric or cam E, attached to a bevel-wheel D^2. The wheel D^2, to which the eccentric E is attached, is arranged to make two revolutions while the ship makes one, so that the eccentric makes one revolution while the ship moves from north to south, and the magnet *a b* is nearest the needle of the compass X when the ship is east or west and farthest from it when north or south. To regulate the apparatus, the axis of the wheel D^2 is brought to make the same angle with the axis of the ship as that made by the plane of the disturbing poles; regulation is effected by moving the ring C, carrying the wheel D^2 and eccentric E, on the case B. The wheel D^2 is then moved out of gear with the wheel D^1, and is then held in such a position that the eccentric is at the



bottom of the stroke. The wheel D^1 gears with a wheel D, on the same shaft as the flywheel V and a wheel *i*; the latter gears with a wheel *i'* of the repeating apparatus I, which is provided with a dial *x* divided as the compass card. By acting on the wheel V, the parts are moved, and the dial *x* indicates the angle between the distributing poles and the axis of the ship. The wheels D^1 and D^2 are then brought into gear.

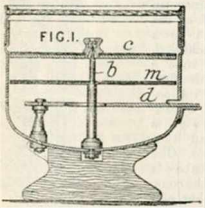
616. Bablon, V. Feb. 28.

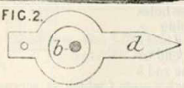


Specific-gravity estimating-apparatus; photometers.—An arrangement of manometers and cocks for determining the flow of gas in gas burners and for use in photometry &c. is stated to be also applicable to measuring the density of gas "by "reason of the "affinity existing "between the "density of a fluid "and its co-efficient "of flow." Separate manometers N and M are connected with the burner and with a

chamber A between the burner tap C and one or more regulating-taps *a*, *b*, *c*, formed with varying orifices. The apparatus is supplied with gas by a pipe P under a constant pressure derived "from a gas meter or pressure gauge." To graduate the instrument, the taps *a*, *b*, *c* are opened in succession, and the rates of flow in litres per hour corresponding to different positions of the tap C are marked on the three successive scales a^1, b^1, c^1 corresponding with the three taps *a*, *b*, *c*. Instead of three taps, one tap of the ordinary construction may be used and the graduation effected in three or more fixed positions of the same. The manometer N shows the actual burner pressure at any time. The apparatus thus shows (1) the delivery at a fixed pressure, (2) the burner pressure at fixed delivery and in conjunction with a photometric test, (3) the lighting power at fixed expenditure, (4) the delivery for fixed lighting power.

698. Glover, H. March 7.

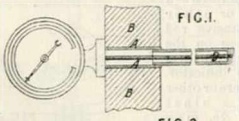


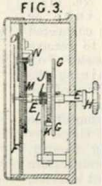


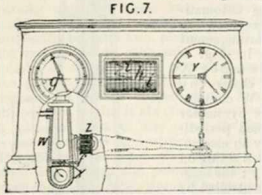
Compasses, magnetic.—Relates to an instrument for indicating any variation in the compass needle due to local attractions, such as that of iron ships. A fixed magnet *d* is so adjusted, horizontally and vertically, that it will always hold a pivoted needle *c* in a line with itself, providing there is no force due to local attraction. If there is any local attraction, the deviation of the compass needle due to that cause will be indicated by the needle *c*. The magnet *d*, through which the pivot *b* passes, projects out of the case for adjustment. In a modification, a sleeve on the magnet *d* embraces the pivot *b* and can be fixed to it, at any position, by a set-screw. The action of the magnet may be lessened by placing a sheet of non-conducting material *m* such as glass or mica between it and the needle. This sheet may carry the pivot for the needle *c*.

949. Bailey, W. H. March 30.

Pyrometers.—Relates to various improvements in pyrometers or apparatus for indicating heat, principally of the class in which temperatures are indicated by the difference in the expansion of two tubes or rods of different metals or other materials. Fig. 1 shows a form in which only the portion of







the stem which is actually within the furnace is utilized for pyrometrical purposes. The tube A which passes through the wall B is made of the same material as the rod D (in this case wrought iron), and into it is screwed a copper tube C. The stem D is fastened at one end to the tube C, and at the other to a quadrant for actuating the index spindle. In another form of pyrometer for ascertaining the temperature of acids &c., a platinum wire is fixed at one end to an enclosing metal, glass, or earthenware casing, and at the other to the index quadrant. To enable the index finger F, Fig. 3, to be adjusted and brought back to zero in case of permanent expansion of the rods or tubes, the spindle E to which it is fixed is actuated through a loose pinion and ratchet wheel I, J and a pawl K carried on a disc G fixed to the spindle. The quadrant L gears with the pinion I, and a knob H for adjusting is fixed on the spindle E. A small finger O for indicating fractions of a degree is provided; it is rotated from the spindle E through the gearing M, N, and is arranged to make one revolution for each degree indicated by the finger F. The expansion of pans, boilers, cupolas, crucibles, retorts and other vessels into which it would be inconvenient to introduce a pyrometer, is utilized for ascertaining the temperature of the contents. A

bracket is secured to each side of the pan &c.; one bracket carries the indicator while the other carries a wooden or other non-expansive rod for acting on the usual quadrant arm of the indicator. The tuyère or other pipe of a blast furnace &c. may have a tube or casing connected thereto to receive a pyrometer for ascertaining the temperature of the blast or other fluid. The bottom of the casing is closed by a sliding damper. The temperature of the hot blast &c. may be automatically recorded by the arrangement shown in Fig. 7. The damper X which closes the casing W containing the pyrometer is opened periodically by an electro-magnet Z acting on a lever *f*; the magnet is controlled by a clock Y which closes the electric circuit at the desired times and rotates a drum *i* carrying the paper. The recording pencil *h* is carried by a rack *g* gearing with a pinion on the indicator spindle. Fig. 8 shows a form of portable blast pyrometer. An outer sheath or tube *j* of metal, earthenware, &c., is provided with a handle *l* and perforations *m* so that a current of air may pass over the pyrometer tubes or bars *n*, *p*. The metal tube *n* terminates in a sphere and the inner rod *p* is preferably of earthenware. The rod *p* is pressed against the bottom of the tube *n* by a spring *q* acting on a needle *r* which rests on a cylindrical guide piece *s*. In another form, a helix formed of two metals soldered together is caused, by its expansion and contraction, to rotate a central spindle which imparts motion to the index finger through bevel gearing. Or the tube or stem *n* may open into a chamber communicating with a Bourdon tube, the whole being filled with air, oil, or mercury. The outer casing or sheath *j* may be used with any form of pyrometer which may be removed for other purposes.

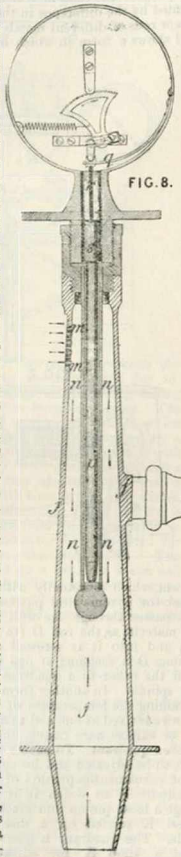


FIG. 8.

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984. Casartelli, J. L. April 3.

Pyrometers. — A pyrometer for measuring the temperature of hot air for blast furnaces, high pressure steam &c., consists of a tube *a*, fastened at one end into a metal cone *b*, formed with a number of transverse holes *c*, and at the other end to a flanged socket *d*. A smaller tube *e* fits within the first tube, and its co-efficient of expansion by heat is greater than that of the tube *a*. One end of the tube *e* is screwed to the cone, and the other end has transverse holes *f*, and a plug *g*, into which is screwed one end of a rod *h*. The rod *h* passes through a stem *i* which is screwed and adjusted on the flanged socket *d*, and then held firm by the nut *k*. A case and dial are fixed to the stem *i*. The other end of the rod *h* is in contact with a block *n* pivoted to an arm of the toothed segment *p*. The segment gears with a pinion on the spindle *q* and an index hand moves with the pinion. By inserting the cone *b* into the socket of the hot-air tube, the current passes up the inner tube, through the holes *f* at the top, and down again between the two tubes, thus causing expansion of the tubes and a consequent motion of the index hand. A non-conducting cover *t* is coated with cloth, and fitted to the outer tube. A solid rod may be used instead of the inner tube, and transverse holes formed at the top of the outer tube. The hot air then rises through the annular space and escapes at the top.

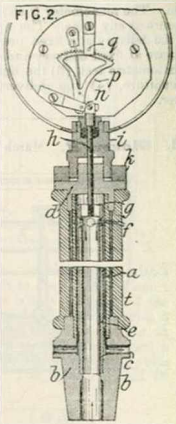


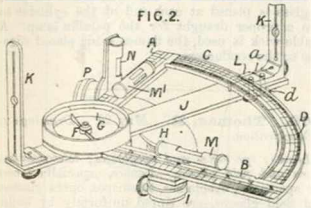
FIG. 2.

1019. Lake, W. R., [*Bigge, U. F.*]. April 5.

Theodolites. — The instrument consists of a quadrant with two bases A, B, and an arc C,

which is graduated so that the outer divisions D represent rods, and the inner divisions represent degrees. At the centre F of the arc is a compass G, and the pivot of a transit bar J carrying sights K. The bar J is supported by a guide-plate L

FIG.2.



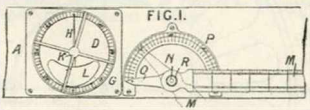
and clamping-screw *d*, and carries the hair line *a*. A socket I is attached to an arc H for fixing the apparatus in a horizontal position, and another socket P for fixing in a vertical position. Levels M, M', N are provided for the adjustments. To measure the height of an object, the instrument is placed vertically, the object sighted, and its elevation noted. The instrument is now raised vertically until there is a difference of declension of one division on the scale D. The product of this elevation and the first reading will give the height of the object. Measuring horizontal distances is effected in a similar manner; the instrument in this case being horizontal. The instrument may also be used as a compass, transit, quadrant, level, or clinometer.

1186. Davies, G., [*Busby, A. G.*, and *Woodbury, W. B.*]. April 20. [*Provisional protection only.*]

Magic-lanterns.—Two or more sets of burners and lenses are placed directly over one another, and are separated by double horizontal partitions, the heat from each set of the lower burners being led away up a side chimney. A rectangular casing contains the sets of burners, and blocks carrying the condensing lenses are hinged to the front of the casing, the front lenses being arranged on adjustable arms projecting from the blocks, for focussing all the sets of lenses on the same points. When lime-light is used, a "dissolving" cock is fixed on the oxygen and hydrogen supply pipes, by means of which these gases are admitted to one set of burners as they are shut off at the other, thus producing a dissolving-view effect. The lime pencils are adjusted in the act of putting in or taking out the slides or by turning the dissolving cock. The pencils may be operated by the slides, in which case a wire extends across the slide space, and the insertion of a slide depresses the wire, which is arranged to drive a ratchet. A spring is fastened to one of the pipes of the burners, instead of the base, so that the burner may be easily removed. A simple pawl and ratchet movement may be used for raising the pencil. For tilting purposes, hinged strips are fixed to the front and back edges of the bottom of the box. Blocks are screwed at the rear of the front lenses with hinged arms carrying plates of coloured transparent glass for tinting, or some opaque material for darkening, the picture.

1198. Johnson, S., and **Johnson, A.** April 22.

FIG.1.

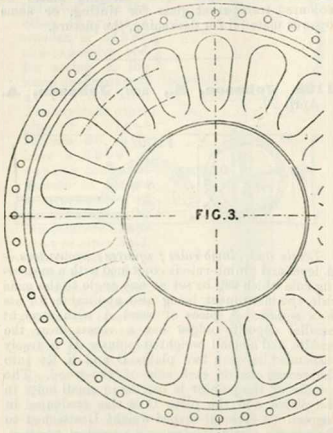


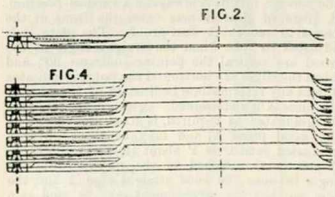
Levels and plumb-rules; squares; protractors.—A level and plumb-rule is combined with a measuring rule which can be set at any angle to the main rule, the instrument being also applicable for use as a square. A piece of wood A with straight parallel opposite edges has a recess near the middle, and a small weighted pointer H is freely suspended between two plates D and K let into the recess, one on each side of the wood. The spindle of the pointer is carried in small holes in the plates, and the plate D is also graduated in degrees. A crescent-shaped weight L attached to the pointer retains it always in a vertical position. A plate of glass G may cover the front of the recess to render it dust-proof. The plate D is adjusted so that when the straight edges of the wood are vertical the pointer indicates 90°, and when the edges are horizontal the pointer indicates 0°, and any intermediate inclination of the edge of the piece A is determined. A supplementary rule M, graduated as required, is fixed at one end to the wood piece A, and may be moved over a graduated semicircle P about its fixed centre N. A pointer O attached to the rule indicates the angle between the wood straight-edge A and the rule, so that the arrangement may be used as a protractor or a square. A thumb-screw R grips the rule in any desired position, and recesses are made at the graduations into which a pin passing through O may fit. A spring below the thumb-screw R serves to lift the fixing pin out of the wood piece when the thumb-screw is slackened. A slide rule may be inserted in the supplementary rule for striking out ordinary centres.

1332. Lake, W. R., [*John, F. C.*]. May 2.

Specific-gravity estimating-apparatus. — Metallic springs used for cylinders and for other purposes are formed of steel plates in the form of truncated cones having flanges on both edges and radial corrugations as shown in the Figures. The flanges serve to join the different plates together. If two such plates are fastened together, or if several such pairs are fastened together by screws, an

stic cylinder is formed, and such cylinders can be used in steam engines, hydrometers, and the like.





1388. Engel, L. May 7. [*Provisional protection not allowed.*]

Thermometers.—A thermometer is attached to the handle of an umbrella, parasol, stick, whip, fan, &c. The thermometer is of any pattern or size to suit the handle to which it is attached.

1471. Hubbard, W. A. May 15. [*Provisional protection only.*]

Level.—The level consists of two short transparent tubes, preferably of glass, held vertically and connected together by a flexible tube. The apparatus is filled with fluid which is kept in, when the apparatus is not in use, by closing valves at the ends of the glass tubes. The glass &c. tubes may be protected by metal cases with slots.

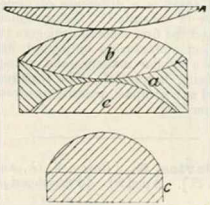
1563. Woodbury, W. B., [*Marcy, L. J.*]. May 22. [*Provisional protection only.*]

Magic-lanterns.—In order to economize space, the body of the lantern is made cylindrical and of the same diameter as the condensers. A plate of glass is placed at each end of the cylinder to give a proper draught for the paraffin lamp. A double wick is used, the flames being placed edgewise to the condensers.

1570. Thomas, R. May 22. *Drawings to Specification.*

Lenses; spectacles and eyeglasses; telescopes and opera and field glasses.—Lenses, especially lenses for spectacles, eyeglasses, telescopes, opera glasses, and field glasses, are tinted uniformly by building up the lens of two pieces or lenses ground to fit and cemented together by a tinted cement, preferably Canada balsam tinted with Prussian blue.

1640. Wenham, F. H. May 30.



Microscopes. — Achromatic object glasses are formed of a triple combination of lenses set in three separate cells. The middle lens has a flint glass lens *a* between two crown glass lenses *b*, *c* for correcting the four crown glass lenses of the combination. The front lens C is thick for correcting spherical aberration.

1702. Northcote, G. B. June 5.

Proportional instruments; scales.—A proportional scale applicable for dividing areas of circles and lengths, and measuring parts of regular figures, is shown as used for measuring the contents of casks and other vessels. A bevel gauge E is placed against an adjustable graduated scale G formed by strips F joined in lazy-tongs fashion. The graduations on the right-hand side of the scale are for rectangular or cylindrical vessels on end, and those on the left-hand side for cylindrical vessels on their sides.

(*For Figure see next page.*)

1702.

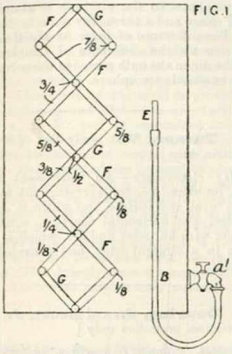


FIG. 1

1789. Browning, J. June 13. [*Provisional protection only.*]

Photometers.—One or more reflectors are fitted in a tube and so arranged in connection with apertures that the light from two flames is received into an eye-piece at the opposite end of the tube. Outside the apertures are arranged one or more revolving sockets, one containing a tinted wedge of glass, which may be slid in or out until the illumination from the two lights is equal. This wedge-piece is graduated to indicate the relative brilliancy of the lights. The other socket is fixed and carries a glass of the same tint. Ground glass &c. may be used at the apertures to soften the light. The reflectors in the tube may be mirrors or total reflector prisms, or they may consist of one prism reflecting from two faces.

1842. Henderson, A. C., [*Pillet, J.*]. June 19. [*Provisional protection not allowed.*]

Stereoscopes.—To allow for adjustment, the lenses are fitted in tubes which are moved by a rack and pinion, the two pinions being in a horizontal shaft with knobs at their ends for turning it. Pressure on a spring at the side of the apparatus near the bottom allows the removal of the pictures.

1899. Chappuis, P. E. June 24. [*Provisional protection only.*]

Reflectors.—Sheets of polished glass are made with broad corrugations of from $\frac{3}{4}$ to $1\frac{1}{2}$ inches in width and silvered at the back.

1950. Yule, G. June 27. [*Provisional protection only.*]

Rulers.—To prevent the blotting and smudging of the surface which is being ruled, the ruler is kept out of contact with the surface for the greater part of its length. In cylindrical rulers the ends are made of greater circumference than the body; or there is adjusted on each end a ring, so that the body cannot touch the surface to be ruled. Flat rulers have a block or equivalent fixed or formed at each end.

1970. Spahn, E. P. June 29.

Stands for cameras. The camera is supported on a table D hinged on the top of a vertically-sliding bar B, which can be held in any position by a clamping-plate H operated by a screw L. The weight of the table and camera is balanced by weights *x*, *y* or by springs. The table can be set at any inclination by means of a stay *c* adjusted by a screw F.

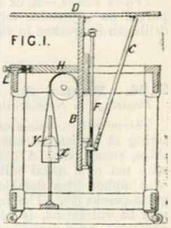


FIG. 1.

1989. Rabone, J., [*Kenyon, W.*]. July 2.

Levels and plumbing-instruments.—Spirit levels are constructed so that they may be readily adjusted. The bubble tube *a* is cemented in a case *b* which is hinged at one end, by a joint *d*, to the top plate. The other end is connected to the top plate by an adjusting-screw *e* with a spring *g*.

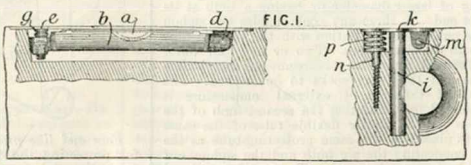
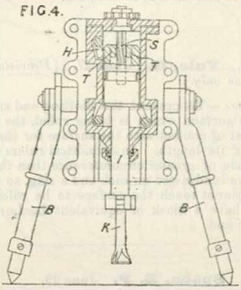


FIG. 1.

In a modification, the joint *d* is dispensed with and a screw used at each end; or the joint may be placed in the centre and underneath, and the two ends provided with screws. In a plumb level, a glass is cemented in a case *i*, the top plate *k* of which is hinged to the stock. A screw *n* with a spring *p* also connects the plate to the stock. The joint may be dispensed with and two screws used.

2008. Le Gros, E., [*Silva, W. d'*]. July 3. *Disclaimer.*

FIG 4.



Tripod stands.—Rock and other drills are supported on adjustable tripod legs B, so that the drills can be worked in various positions.

2164. Payne, R., [*Read, J. A.*]. July 19. *Drawings to Specification.*

Thermometers.—Relates to apparatus for registering at a distance the temperature in holds of ships, rooms, &c. A glass bulb surrounded by a wire net or a metal bulb is connected to one tube of a siphon by a flexible tube of india-rubber or gutta-percha &c. The flexible tube, which in ships may be vulcanized, is of small bore and may be protected by a larger metal or vulcanized india-rubber &c. tube, wired inside if desired, an air space being left between the two tubes. The siphon is attached to a graduated scale, and is partially filled with coloured sulphuric acid or similar liquid, the arm attached to the flexible tube being of larger diameter or having a bulb at its lower end. A three-way cock enables the siphon to be put in communication with the flexible pipe or with the atmosphere. Two or more air bulbs in different rooms may be connected by flexible tubes and three-way cocks to one siphon. The effect of variation of external temperature is eliminated by connecting the second limb of the siphon with a similar flexible tube of the same length placed in the same protecting-tube as the tube connecting the air bulb and the siphon, but sealed at the other end. To provide an equal resisting force when the air is confined in the second limb, a globe of non-conducting material equal in volume to the air bulb is attached by a metal T-piece and a three-way cock to the second limb. The difference of level of the fluid in the siphon denotes the difference of temperature between the air in the bulb placed in the compartment and the external atmosphere.

2226. Turner, W. July 25. [*Provisional protection only.*]

Levels; clinometers.—An instrument for carpenters, builders, &c. for carrying out work at a uniform level and incline, and which is applicable to vertical and horizontal surfaces, consists of a pendulum with an index and arc, which is let into a recess in a straight edge, and provided with a glass front.

2310. Douglas, J., and **Scott, J.** Aug. 2. [*Provisional protection only.*]

Compasses, magnetic; bearings, instruments for determining.—Relates to a method of and apparatus for adjusting ships' compasses, and taking bearings. It consists of a vertical rod passing through the binnacle and having at its lower end an indicator near the glass of the compass. On the top of the rod is a glass for sighting an object, the bearing of which will be shown by the indicator.

2393. Barton, S. Aug. 10.

FIG. 1.

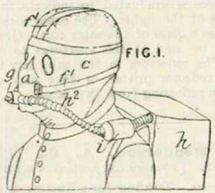
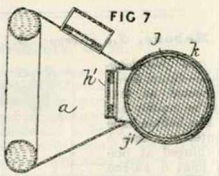


FIG 7



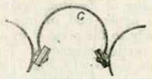
Face and like protectors.—Relates to apparatus for protecting the face and head and allowing respiration in atmospheres of noxious gases, vapours, or smoke. A cover *a*, Fig. 1, preferably

of soft metal, is fitted over the mouth and nose and adjacent parts of the face. A tubular pad of vulcanized india-rubber filled with water is attached to the edges of the cover. The cover is attached to a hood *c* which fits closely over the head, face, and neck as shown, and is preferably made of textile material coated with vulcanized india-rubber. The front of the hood is provided with glass eye-pieces, and the eyes are further protected by a tubular pad of vulcanized india-rubber filled with water and fixed inside the hood to bear on the forehead and upper parts of the cheeks. The cover and hood are secured by straps f^1. The cover is fitted with a three-way tap *g* and valves, and may be connected to a portable or fixed air reservoir, or to an air pump, or to any space containing pure air. An air filter *i* may be placed in the air outlet tube when the air is circulated, or the air may be drawn into the cover through an air filter directly from the surrounding atmosphere. The cover may be used without the hood.

2493. Haseltine, G., [*Moses, J.*]. Aug. 22.

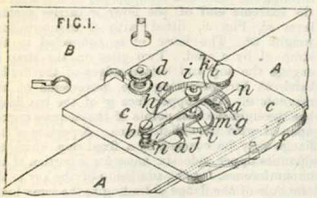
Spectacles and eyeglasses. — A small electric battery is combined with a pair of spectacles or eyeglasses for the purpose of administering electricity to the head. The battery may be attached by a rivet to the outer ends of the temples or bows of the spectacles or to the nose-piece C, Fig. 3, so that plates of opposite polarity come in contact with the skin. A receptacle carrying an exciting fluid for the battery may be attached to the apparatus.

FIG.3.



2585. Johnson, J. H., [*Bergner, T.*]. Aug. 30.

FIG.1.

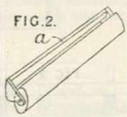


Parallel rulers; section-lining apparatus. — Relates to apparatus for ruling parallel lines such as occur in section-lining and in flat-tinting. Upon a fixed blade A slides a movable triangular blade B, which is secured to a plate *c* by a screw *d*, the plate B being held against the blade A by a spring *f*. The movement of the blade B is effected by a pawl *g* hinged to an elastic bar *h*, which is attached to an arm *j*. On pressing the knob *l*, the bar *h* is depressed and the pawl moves on its fulcrum; the motion is limited by the fulcrum of the pawl coming against the plate *m*. On releasing the bar *h*, the spring *n* causes the pawl to take a hold on the blade A, so that the plate *c* with the blade B will be moved through a definite distance, regulated by a screw *k* which limits the upward motion of the bar *h*. The screw *k* is fitted on a stud *i* passing through the bar *h*, and it can make a half-turn on its axis, so that the instrument may be worked in either direction. An opening *a* in the plate *c* allows the pawl to turn with the axis *i*. In a modification, a single bent spring takes the place of the bars *h*, *j*. In another modification, the pawl is hinged to a swinging rigid lever provided with a spring. The piece *c* may be dispensed with, and the mechanism attached to the blade B. To prevent the instrument from shifting while in use, the under surface of the blade A is covered with india-rubber.

2811. Yule, G. Sept. 24. [*Provisional protection only.*]

Rulers. — An ordinary rolling ruler is fitted with a loosely-pivoted guard *a* which is used as the ruling edge, and thus prevents blotting.

FIG.2.



2820. Reynolds, W. F. Sept. 24.

FIG.7.

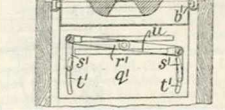
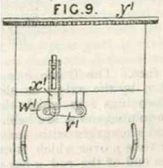


FIG.9.



Compasses, magnetic. — An apparatus for adjusting ships' compasses consists of toothed gearing in combination with a false card *t*, Fig. 1, over which a pointer *s* is caused to move. The compass bowl is suspended within

the compass box a, Fig. 1, in the usual manner. The lower part f of the bowl has screwed into it a socket g on which a pivot h is fitted for carrying the compass card i having two magnets on its

FIG.1.

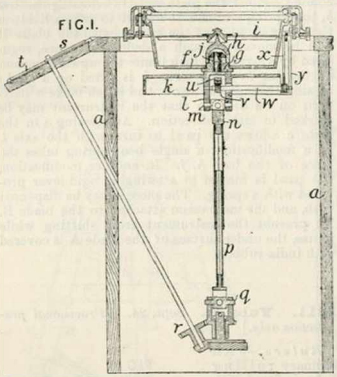


FIG.3.

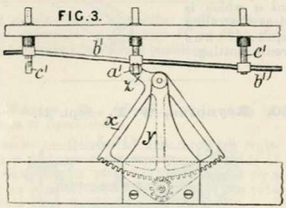
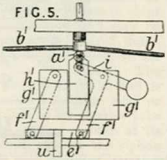


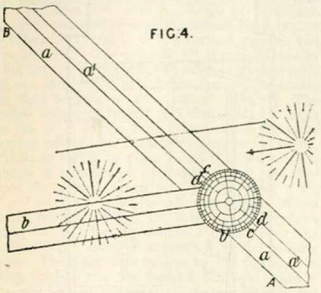
FIG.5.



under face. The frame k is suspended from the socket g by the axle j as shown, and is formed with two lugs l in which the axle ends m of a double-jointed rod n are held. The lower part of the rod n engages with another square-sectioned rod or tube p over which it can slide freely. The bottom end of the rod p has a double joint q, the lower part having bevel teeth in gear with a pinion r on a rod fitted so that, when the pointer s on its upper end is turned it will communicate a rotary motion to the central rod p. In the space between the lugs l a rod of metal u, supporting two magnets having their like poles together is fitted to slide horizontally, the lower face having teeth upon it for gearing into a pinion v on a spindle w the outer end of which has another pinion upon it in gear with a quadrant x, which is pivoted on a pin projecting from the upright y forming part of the frame k. A lug z, Fig. 3, on the pivot end of the quadrant carries a roller a^1 which bears against a flexible band b^1, so that, as the bowl card moves to follow the action of the magnet u, the roller follows the undulations of the flexible band which is held to the bowl by eight screws c^1 corresponding to the eight cardinal points of the compass. For adjustment, the ship is placed on any point of the compass for which there is a corresponding screw, and the pointer s on the false card t is set at that point. The screw is then turned by means of a key, so as to elevate or depress the flexible band until the compass shows correctly the course of the ship. The process is repeated for each point at which there is a screw. A vertical correcting magnet u, Fig. 5, is attached to a sliding plate e^1 connected by links f^1 to a vertical plate g^1 in the centre of which a plate h^1 is guided. The plate h^1 is raised or depressed by a roller a^1 bearing against the flexible band b^1. The upper end of one of the links is attached loosely to the plate h^1 by an arm i, so as to actuate the vertical magnet u. For adjusting the compass cards, the bowl e, Fig. 7, is supported within a box j^1 capable of rotation by a button k^1 operating the toothed wheels l^1, m^1, n^1, the wheel n^1 gearing into teeth on the surface of the box j^1. A vertical plate q^1 is attached to the bottom of the box j^1, and has a pin or stud upon it for carrying a lever r^1 from the outer ends of which correcting magnets v, with their ends reversed, are attached; the magnets u rise and fall according to the undulations of the flexible ring b^1, the two magnets being moved up and down so as to bring one or the other into magnetic contact with the compass-card magnet. The magnets u are kept in a horizontal position by links s^1 fitted with pins working in curved slots t^1 in the plate q^1. The lever r^1 passes through the plate and is supported by a bracket u; the extreme end of the lever r^1 carries another lever v^1, Fig. 9, fitted with a counterbalance weight w^1. The lever v^1 is connected to the strap x^1 by a stud. Two pins on the strap x^1 engage the top and bottom edges of the flexible band b^1 for governing the movements of the magnets u. The upper face y^1 of the box flange has the eight cardinal points of the compass marked upon it with the sub-divisions. A portion of this flange may be covered by a fixed ring which has upon its upper side six holes for a portion of the circumference, for the admission of the key to the one hole of the flange y^1 leading to the screw heads of the flexible band b^1, the other portion of the circumference being open for enabling the points and marks on the box flange to be seen.

2852. Ramsten, H. Sept. 27.

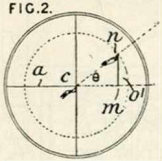
FIG.4.



Bearings and courses, plotting.—An apparatus for laying out courses, bearings, or a ship's position upon a chart is shown in Fig. 4. An index rule *b* with a graduated circle b^1, preferably at one end, is pivoted so as to turn freely on the slide *c* which works in a groove a^1 in the hard-wood or metal bar *a*. To mark a ship's course between two places such as A and B, the edge of the bar is placed over these two places, and the index rule *b* and slide *c* are adjusted so that the edge of the rule is in a North-South direction. A central line *d* on the slide indicates on the graduated circle b^1 the bearings of the line joining the places A and B. The graduated circle b^1 may be fixed to the rule or to the slide.

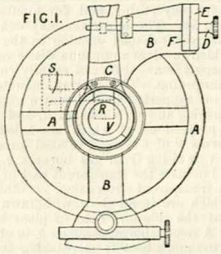
2909. Eckhold, C. A. C. Oct. 2.

FIG.2.



Telemeters.—For directly measuring the distance of an object of known length, a telescope V, Fig. 1, is fitted with a prism R between the object glass and eye piece, and fixed to an index arm B which moves over a circle A. The arm B is provided with a one-armed index C moved by a tangent screw D provided with a divided disc E and fixed vernier F. For measuring altitudes, the prism can be moved into a vertical position by a key S which is in connection with a level. The telescope being directed towards the distant object, the point of intersection of the cross hairs is made to coincide with the top of the object, and the prism is then rotated until the bottom o^1, Fig. 2, of the refracted image *n m* stands on the horizontal cross hair *a*. The divergence *c n* as measured by the angle is proportional to the distance. If the object is in an inclined plane from the eye, the distance may be found by knowing the angle of altitude. The angle of altitude is measured directly if the instrument has a vertical circle. If a vertical circle is not provided, the altitude can be measured by bringing the prism into a vertical position or by a prism or mirror placed outside the telescope. In a modification, two mirrors are placed opposite one another so as to reflect an object in front of them to the eye behind them, or by substituting for the prism a piece of ordinary glass with cross lines marked on it and movable with the index. In another modification, the angle is measured by means of a microscope fixed on the index B.

FIG.1.



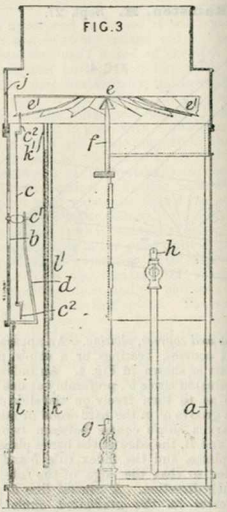
2926. Gedge, W. E., [*Fayel, C.*]. Oct. 4. *Drawings to Specification.* [*Provisional protection not allowed.*]

Stereoscopes.—The arrangement of the apparatus admits of twice the usual number of stereoscopic cards being exhibited. The cards are arranged in suitable sequence, back to back, two on each of the frames which are riveted to a chain for drawing the cards across the field of view. The box containing the apparatus is sawn across so that the lower part carries the working parts of the apparatus and the external knobs for working the chain, and the upper part carries the eyeglasses, ground glass, and parts necessary to the vision. The saw-cuts are shaped so that the top of the box may be reversed end for end. A glass at the back of the apparatus admits light, and the top is formed of two hinged parts, one of which carries a reflecting glass for additional light and is operated by a rack. After the chain has been drawn across the field of view, the top of the box is reversed end for end so that the cards previously at the back are exposed. In a modification, the upper part is divided by a perpendicular cut so that one division carries the eyeglasses and the ground glass. These divisions slide on grooves made in the lower part of the box, and their positions may be interchanged. In this case, each part of the hinged top carries a reflecting glass and is actuated by a rack.

3020. Spong, J. O. Oct. 14.

Chromatropes; kaleidoscopes.—Relates to apparatus for producing changes in representation, adapted for advertising, and for amusement or instruction, &c. The apparatus may consist of a case *a* with a star-shaped opening in the front *b*, behind which revolves an opaque disc *c* containing a transparent star that can exactly correspond with the opening. The disc is mounted on a short axis c^1 supported in the centre of the star-shaped opening and on a bracket *d*, and bears on its edge projections c^2 which are acted on by inclined arms e^1 of a wheel *e* rotated on a pivot *f* by the hot air rising from gas burners *g*, *h*. The burners illuminate the transparent part of the disc as well as transparent advertising, or other effects at *i*, *j*, which are inserted or withdrawn through grooves at the side and held in place by spring catches. A removable glass screen *k*, in grooves k^1, prevents too much heat from reaching the disc *c*, and grooves l^1 may support coloured glass. Chromatrope and other varying effects and other forms than the star may be used, and the relative positions of the revolving and fixed parts may be changed, and two or more discs may be placed on the same or different sides. The disc may be replaced by a revolving cylinder or by a number of surfaces giving the required effect, and the motive power may be obtained by other currents of gas or vapour, or by clockwork or otherwise.

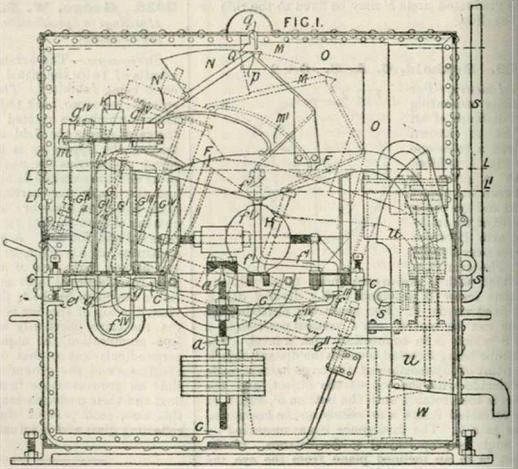
FIG. 3



3086. Lake, W. R., [*Benardaki, N.*]. Oct. 18.

Specific-gravity estimating-apparatus.—Relates to a balance instrument for determining and registering the quantity of a substance such as alcohol dissolved in water, the balance being set in motion by the flow of liquid, and its rate of oscillation depending on the velocity of flow and the density of the liquid. The beam C of the balance is supported on two pivots *a*, its swing to the right and left being limited by the stops e^1 and e^{11}. It carries a vessel F and a double weighing-funnel M, M^1 and N, N·

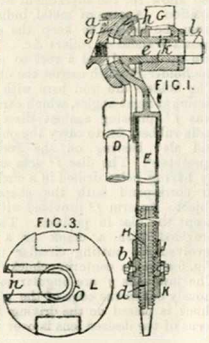
FIG. 1.



connected with a trough f which is connected by two pipes f^{I} to a second trough f^{III}, and this again by two pipes f^{IV} with a trough g. This last trough is connected through the balance beam to four cylinders G^{I}, G^{II}, G^{III}, G^{IV}, a vertical pipe G, and a regulator K. The cylinder G^{4} is surmounted by a flat box g^{IV} at the side of which is a pipe leading to a small box m which has openings to enable the fluid to pass to the vertical pipe G. The double weighing-funnel also communicates with the box g^{IV}. In the four cylinders are floats of varying weights for different strengths of liquid. The liquid enters by pipes S and O to a trough Q whence it is delivered by pipes q into the five pipes M; it then passes through the pipes f, f^{I}, f^{I}, f^{IV} and g into the four cylinders G^{I} &c. When the liquid has reached the level L, it overflows from the cylinders by orifices l^{I}; and from the trough f into a vessel F supported by the balance beam. The beam then swings to the right; in so doing, the liquid in the vessel F and the liquid in the cylinders to the level L^{I} passes through the orifices l^{I} and tubes f^{I} &c. to the vessel u, and thence to the still by a pipe W. At the same time the liquid is supplied to the other side of the partition p of the double funnel M, N and flows through the pipe N^{I} into the box g^{IV}, vertical pipe G &c., and brings the beam back to its original position. With the same velocity of flowing liquid the solution of highest density produces more frequent oscillations. To compensate for temperature, the liquid passes through a vessel H, inside which is a second vessel containing a bi-metallic expansion apparatus connected with a weight, the movement of which regulates the volume of liquid supplied according to the temperature. The apparatus for regulating the amount of alcohol &c. or solid matter in solution that has passed through the balance is actuated from the swinging beam. In a modification of the apparatus, for solutions heavier than water, the cylinders are placed on the right of the beam.

3125. Johnson, J. H., [*Rand, A. C.*, and *Waring, J. B.*]. Oct. 23.

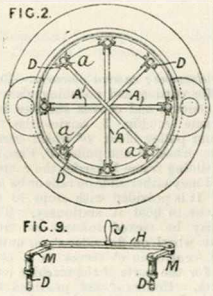
Stands for rock drills are constructed with four or six legs which are capable of independent movement on the ball-jointed hinges g, h, &c., Fig. 1. The length of each of the legs E, D, G is adjustable by means of a screw H working in a nut I fixed to the tube E. The screw is turned by a collar K, which is supported on the pins b and is provided with a small fits in the groove d, and moves the The hinges g, h, k are secured by a bolt l. The legs E, D rest on the ground and are provided with heavy spherical weights to prevent the stand from being displaced by the percussive action of the drill, the leg G being used for supporting the stand from a wall. Fig. 3 shows one of the weights for the legs. The passage n leads to a circular cavity o in the upper half of the weight L, which slips over a collar on the leg of the stand, and is thus held.



3137. Nicholls, H. Oct. 23. *Drawings to Specification.*

Specific-gravity estimating-apparatus.—Relates to hydrometers, and like instruments. To render the instrument more easily readable, a layer of enamel is applied to the stem. The edges of the stem project beyond the edges of the enamel to protect the latter, or the enamel may be let into recesses in the stem. The enamel may be coloured, or it may be white with black graduations or *vice versâ*.

3360. Vaughan, E. P. H., [*Ripamonti, L.*, and *Ripamonti, D.*]. Nov. 12.



Compasses, magnetic, regulating and adjusting. Fig. 2 shows a plan of the binnacle containing horizontal bar magnets A which are carried by the nuts a of the vertical screws D. The vertical screws work in suitable bearings and have square heads on which fit keys M, Fig. 9. Two keys M are linked together by a bar H with a handle J so that the opposite ends of a controlling magnet may be moved simultaneously.

3365. Lake, W. R., [*Woodbury, W.*]. Nov. 12. [*Provisional protection only.*]

Kaleidoscopes.—The glass discs between which the objects are placed are fitted in a separate

revolving head which may have a milled rim or projections for its adjustment. The body of the instrument remains stationary and is provided with a stand to which it may be pivoted. The objects used are gems, stones, &c., or small glass tubes containing coloured liquid.

3415. Bousfield, G. T., [*Lewis, C. W.*]. Nov. 15.

FIG.2.

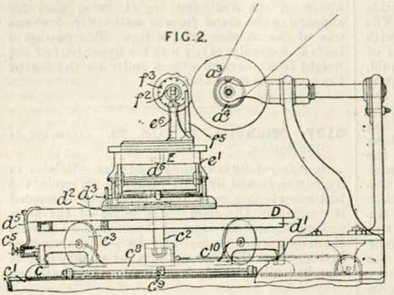


FIG.3.

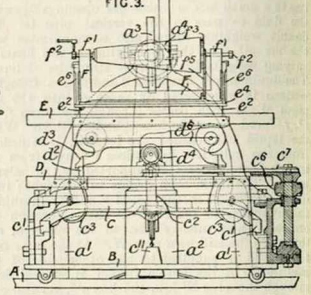


FIG.6.

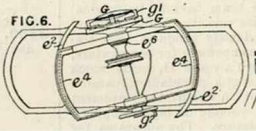
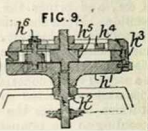


FIG.9.



Lenses; telescopes; camera obscuras.—Relates to apparatus for cutting and polishing glass and for producing concave and convex surfaces in lenses &c. A frame A, Fig. 3, carries the machine, stand a^1, and pulley block a^2 which carries the grinding &c. wheel a^3 and pulley a^4, Figs. 3 and 2. The lower sliding frame B carries the central platform C, and may either slide on rails or be mounted on rollers. It is provided with stops to regulate its motion, or to hold it stationary. The platform C may be moved towards or from the grinding &c. wheel on flat sides c^1, or antifriction rollers. A centre-pin c^2 serves as a centre of revolution for the parts of the machine resting on the platform. Rollers c^3 are provided to carry the turntable D. A portion of the circumference of the platform is graduated and carries sliding stops c^5 provided with set-screws. The reciprocal circular motion may also be produced by a pulley drum c^6 and adjustable crank c^7. The rectilinear motion of the centre bearing platform is regulated by guide-bars c^8, rings c^9, and stops, and may be automatic when effected towards the cutting wheel by means of a rope c^{10} and weight c^{11}, Fig. 3. To cut a convex curve, the object is placed between the centre and the cutting wheel, while to cut a concave curve it is placed beyond the centre. The turntable is a circular frame D provided with a flat ring with two flanges forming a groove d^1 which runs upon the rollers c^3. It carries a fixed slide d^2 for the adjusting frame d^3 to rest on. The frame is adjusted by the regulating screw d^4. It is provided with an index d^5. The adjusting frame d^3 is provided with four bearing-wheels d^6 upon which slides longitudinally the bearing carriage E. The carriage sides e^1 are flanged and slide upon rollers d^6, the upper surface being provided with segments e^2, and set-screw to receive segments of the bearing frame e^4 and allow for the adjustment of the frame in any position. Aprons of metal, india-rubber, &c. hang from the sides e^3 to keep the sand from falling upon the slides or rollers &c. The frame e^4 has two uprights e^5 and a rest to receive and secure the holder F which carries the object to be shaped. The holders are iron bars with two arms f^1 projecting at right-angles, which carry screwed centre-pins f^2 pressing against discs lined with lead, india-rubber, &c. to carry the object to be shaped, and also bearing on the forked end of the uprights e^5. The disc f^3 acts as a dividing plate by having holes drilled in a circle round its centre to correspond with the shape desired on the object. An arm f^5 provided with a pin and spring keeps the disc in position. The centre-pin f^2 is provided with a crank or a pulley which is revolved for cutting circular forms on objects. Fig. 6 shows a centering chuck for holding lenses. The jaw ends g^1 are angular to fit a groove previously cut in the edge of the glass disc G. The chuck is placed on the driving frame so that the focus of the desired lens is over the centre of the

turntable, and the disc is fastened in that position. The turntable being vibrated each way and the crank g^2 revolved, a spherical surface is produced on the glass, the axis being perpendicular to the plane of the groove round the glass. By reversing the glass in the chuck, a corresponding curve is cut on the opposite face, and the groove is utilized when the lenses are fitted in telescopes, camera obscuras, &c. for use. The wheel used for grinding lens faces has a part of its periphery bevelled. It is keyed to the end of a shaft which may be made to penetrate inside a ring or cylinder by prolonging it. The shaft runs in pillar blocks mounted on a pivoting platform bolted in its centre to the frame, to allow the wheel to be placed in any diagonal position. A chuck for cutting rings in one or more pieces to be polished on all their surfaces consists of a main plate h^1, Fig. 9, screwed upon a shaft h^2 which holds it on the carrying frame and is furnished with a crank and pulley to cause it to revolve. Adjustable jaws h^3 for holding the ring in position are screwed on the periphery of the plate. A movable polygonal disc h^4 with exterior projections is placed in the interior, and is centered by the short shaft h^5 and turns with the main plate h^1 by means of the pin h^6. The glass ring is placed upon the main plate, centered, and cemented in position. The jaws are removed and the exterior surface shaped. The flat surface is next ground, then the jaws are tightened in position again, the polygonal disc and cement are removed and the interior periphery is shaped by a wheel smaller than its own interior diameter, fixed on a projecting shaft. The ring, when made in sections as in lighthouse lenses, is fixed by cementing, and the flat face may be ground first. The objects after being cut are taken to the smoothing and polishing machine, the process being the same as that of cutting &c.

3432. Vaughan, E. P. H., [*Daguin, E.*]. Nov. 18.

Ruling-pens; compasses, drawing. — Consists in the formation on, or application to, drawing pens of a thin blade or spring to enable fine, thick, or tapered lines to be drawn in one stroke of the pen. The branches *a* and *b*, Fig. 3, have springs a^1, b^1 twisted in opposite directions, and each inclined at 30°-45° to the plane of the axis of the setting screw. By varying the pressure of the hand the nibs or branches may be separated or brought closer together. The screw *c* determines the maximum thickness of the line, and the screw *d* the minimum thickness. For tracing straight thick lines, the branch *b* may be fitted with a rigid bar *f*, Fig. 3, which, acting as a guide against the rule, allows the point of the pen to open freely to the required extent. The pen may be converted into an ordinary pen by removing the screw *c* and using the screw *d* for adjustment. In a modification, shown in Fig. 4, the outer branch *a* is thinned near the top, at *g*, and the nibs opened or closed by the pressure of the hand. In this case the screws *m* and *k* determine the maximum and minimum separation of the nibs. The arrangements are also shown applied to a compass pen.

FIG. 3.

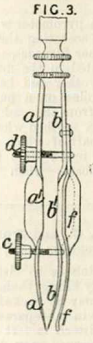
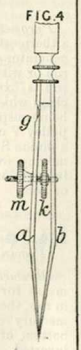


FIG. 4



3591. Foveaux, H. J. F. H. Nov. 29.

Thermometers.—To prevent the rolling of clinical thermometers when placed on any surface, the tube is made with a flat surface on which the scale is engraved, or a projection may be fitted on the tube, either in one piece with it, or as a triangular or other shaped collar of vulcanite &c. The projection may be prolonged and used as a handle.

3702. Newton, W. E., [*Woodbridge, W. E.*]. Dec. 6. *Drawings to Specification.*

Pyrometers.—In soldering coiled wire for the manufacture of ordnance &c., the temperature of the metal &c. is determined by means of pieces of bronze having the same melting-point as the solder to be employed. They are enclosed within the tube on which the wire is wound, and support two vertical rods which extend to the top of the gun so as to be visible. The rods may be enclosed in a glass case to prevent access of air. When the proper temperature for soldering is attained, the bronze pieces melt, and the rods fall. More than two pieces of bronze may be used, and may be situated at different points &c. in the tube under operation. The ends of the rods may have different forms to distinguish them from each other.

3769. Hatch, J. V. Dec. 12. [*Provisional protection only.*]

Magic-lanterns, slide holders for. The slides are caused to travel in a continuous series. The top and bottom of the slides are retained in grooves in the slide holder, the slides themselves being carried on an endless band passing over rollers, worked by a handle. Rack or pinion or other movements may be used.

3921. Brydon, R., Davidson, J. S., and **Warrington, T. A.** Dec. 26.

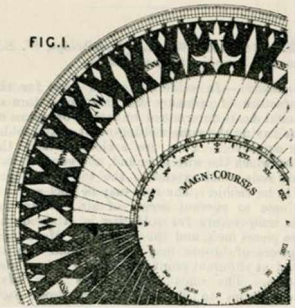
FIG.5.

Tripod stands for rock drills. Two of the legs are jointed to cheeks *q*, which engage with the ends of the tube *r*. The cheeks are slotted to engage the arms *s*, which form a fork on the third leg. The bolt *t* secures the parts firmly together.

A.D. 1873.

5. Paget, F. A., [*Kalmar, A.*]. Jan. 1.

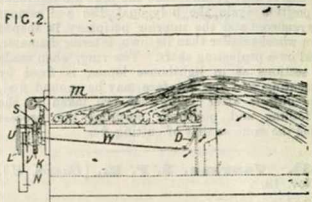
FIG.1.



Compasses, magnetic.—To enable the steering to be effected without referring to tables for the deviation, the card is formed of two concentric discs, the outer one indicating the courses to be steered and the smaller inner one the corresponding magnetic courses resulting from the deviations. Lines are drawn connecting the magnetic courses of the inner card with the appropriate compass courses on the outer card, as determined by swinging the ship or otherwise. The northern half of the card is shown as it would be printed when the light is above, the southern half when the light is below.

111. Stell, S. Jan. 11.

FIG.2.



Pyrometers.—A pyrometer which forms part of a thermostat for actuating the dampers of steam generator and other furnaces, consists of a metallic rod or wire *m* fitted in the flue. One end of the rod is fixed, the other end being connected to a chain which is coiled on a pulley V, a weight N being suspended from the end of the chain. The pulley V carries a toothed wheel which gears with a pinion S, the shaft of which carries a pointer U moving over an index plate L. The pointer, by its motion, indicates when the flues are hot or cool.

224. George, C., and **Porter, H.** Jan. 18. [*Provisional protection only.*]

Barometers.—Relates to cistern barometers and means for readily filling them, so that, when not in use, the tube may be packed in a case and the mercury carried in a separate receptacle. The bottom of the cistern is left open, so that, when inverted, the mercury may be poured into the

tube. A twisted cord with a brush at the end is rotated or worked about in the tube to get rid of air bubbles when the mercury is introduced. When the tube is full, the bottom of the cistern is closed by an india-rubber stopper and the instrument inverted to its proper position, the stopper, through which the tube passes to the cistern, being loosened to admit air.

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276. Grey, E. Jan. 23. [*Provisional protection only.*]

Microscopes.—The magnifying power is increased by the use of an additional eye-piece, with two or more lenses, in a draw tube for magnifying the image formed by the compound microscope.

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310. Bonneville, H. A., [*Schenck, Baronet, & Hayek*, administrators of *Weiss Cement Actien-Gesellschaft*]. Jan. 27.

Pyrometers.—In burning magnesium limestone to obtain cement, a pyrometer consisting of zinc and antimony is used to indicate temperature. The zinc melts while the antimony remains unmelted at the required temperature of 408° C.

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504. Norris, J. Feb. 11. [*Provisional protection only.*]

Mathematical drawing - instruments. — Relates to the manufacture and construction of compasses, bow pens, bow pencils, straight pens, and the lengthening-bars and loose parts or "half "sets." The parts are cast of malleable or annealed cast iron or steel. The points of the legs are case-hardened, or steel points may be put in the moulds before casting. The articles, when of cast iron, are annealed by heating them with iron oxide; when formed of cast steel they are annealed in the ordinary way. The parts are then polished and electroplated with german silver. The loose parts or "half sets" of drawing-instruments are screwed at their ends to enable them to be screwed into the short legs of the compasses for attachment.

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652. Simmons, G. A. Feb. 20. [*Provisional protection only.*]

Barometers.—To render instruments having bent tubes for containing the mercury or other indicating-fluid portable without having to be re-set, the plug for closing the short limb of the tube is worked from the outside of the case by a rack and pinion, screw, or other mechanical device.

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686. Bolton, F. J., and Webb, T. Feb. 24. [*Provisional protection only.*]

Photometers.—Relates to a method of and apparatus for obtaining photometric measurements. The principle applied in the construction of the apparatus is "that certain bodies when exposed "to light of greater or less intensity become "changed in their electrical conductivity or re-"sistance." The body to be acted upon by the light is placed in an electric circuit together with an electrometer or other electrical resistance measurer. The light being directed on the body, the measurement of the electrometer is taken as a measurement of the intensity of the light. The comparative transparency or density of translucent substances can be measured by allowing the light to pass through them before it is directed on to the body in the electrical circuit.

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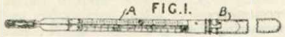
777. Arnold, J. March 4.

FIG. 1.



Thermometers. — Clinical and other pocket thermometers are constructed and arranged so that their cases will serve as handles when the instruments are in use. In the arrangement shown in Fig. 1, the thermometer part A is secured into the case part B in either position by a bayonet joint. The bayonet joint may be replaced by a screw. Or the part A may push or screw into the part B by means of arrangements such as are used for pencils. The case is formed with milled or polygonal edges or flat faces to prevent rolling on a smooth surface.

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802. Brown, T., [*Dodé, E.*]. March 5. *Drawings to Specification.*

Reflectors. — In order to make glass mirrors from rough plate or sheet glass without first grinding and polishing the glass, a platina enamel is used of such a nature that, when spread over the surface of a sheet of rough glass and fused in a furnace, it fills the hollows in the glass and presents a surface suitable for platinizing. The enamel is made by fusing together red lead, borax, and pounded glass of the same composition as the mirror glass, granulating the fused mass by pouring it into water, grinding, separating the finest powder by lixiviation, drying, and mixing with essence of lavender and platinum chloride prepared as described below. The mixture is applied with a brush, and after being dried is fused as in burning-in vitreous colours. In order to platinize the glass thus prepared, it it thinly coated with a mixture of litharge, borate of lead, and auriferous platinum and heated to a dull red. In the case of optical reflectors &c., a second coating may be added. In preparing the auriferous platinum, pure platinum is dissolved in a mixture of hydrochloric and nitric acids in

a flask heated by a sand bath. The solution is poured into a large bowl of porcelain or glass. After cooling, distilled water is added and then ammonia. The precipitate is collected and washed and re-dissolved in rectified hydrochloric and nitric acid. Hot water is added and the solution evaporated down. The platinum chloride thus obtained is dried and pulverized. Gold chloride is then obtained by dissolving laminated gold in rectified hydrochloric and nitric acids, and the solution is evaporated till it becomes purple. Hot water is then added and the solution cooled. Sulphuric ether is then poured in and shaken up with the solution. The gold is taken up by the sulphuric ether and comes up to the surface. The water is then run off by means of a glass funnel provided with a tap, the auriferous liquid being retained. The latter is then added to the platinum chloride and the ether allowed to evaporate. The mixture can then be used for platinizing.

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937. Deacon, G. F. March 14.

Current meters.— For measuring the velocity and flow of water in pipes, more particularly for detecting waste, a ball *c* is interposed in the pipe. The water flows from the inlet end *a* through a perforated diaphragm *b* and passes round the ball *c* which is suspended in a conical part of the pipe by by a wire *d* which passes up through a stuffing-box *e* and is connected by a chain *f* to the segmental head of a lever *g* working on knife-edges. When the ball is in its highest position, a weight *k* on an arm of the lever hangs in a vertical position and a weight *j* on the lever exactly counterbalances the lever and appendages, if the ball is immersed in still water. Immediately the water begins to flow, the ball is moved downwards more or less according to the velocity of the water. A pencil *l* marks a disc *m* which is caused to revolve by clockwork. A small pipe *t* drains the water from a small chamber below the stuffing-box. In another arrangement, the wire, after passing through the stuffing-box, is carried up through a tube and connected to a long annular float which dips into a vessel containing mercury and carries the pencil. The downward movement of the ball causes the float to displace a quantity of mercury which varies with the velocity of the water. In a third arrangement, a disc is hung in a horizontal pipe from the end of the pendulous lever which is connected by a link to a lever fixed to a shaft carrying a weighted lever and an arm with a pencil. Instead of using a weight on a rigid arm or displacing mercury, a weight may be hung from the periphery of a cam, so that the leverage of the weight may be increased with the velocity of the water; or a spring may be used. The clockwork may be dispensed with, and the apparatus may be arranged to register the maximum and minimum flow, or the minimum only. The minimum reading of the apparatus during a few days and nights will show the waste due to leakage.

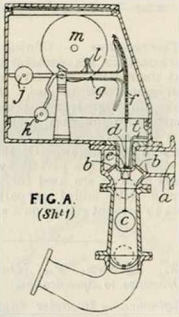

FIG. A.
(Sht 1)

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977. Croudace, W. S. March 17,

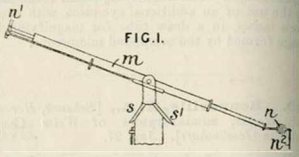


FIG. 1.

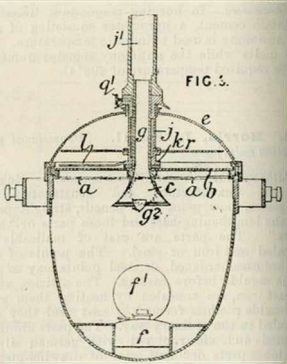


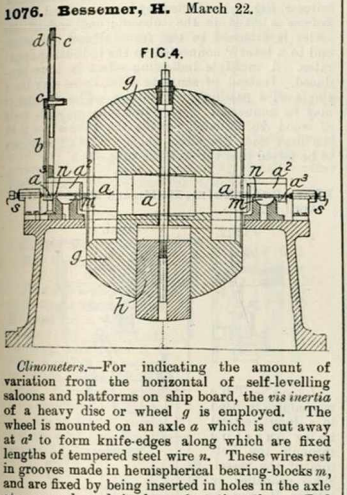
FIG. 3.

Compasses, magnetic; bearings, instruments for determining. — Relates to "dumb compasses" whereby bearings at sea of any celestrial object or of a light on the coast may be taken at night. The compass card *b* is formed of frosted glass or mica and is fitted with a circular rack *a* which gears with two pinions *c* on the axes of the thumbscrew. Inside the binnacle is a lamp *f*, with reflector f^1, the chimney *g* of which passes through the card, and is provided with a conical guard g^2 to prevent any down-draught affecting the flame. A door and window in the bowl serve for reading tables at night &c. Over the card is a hollow standard consisting of two parts *j* and j^1 connected together by pins. The lower part *j* passes through the glass dome *e* and carries at its lower end a collar *k* with an indicator *l*. At the top of the upper part j^1 is a pointer *m*, Fig. 1, with a spherical

lens n, having an eye screen n^2, to which lens light passes through an opening in a screen r above the card. At the other end of the pointer m is a jointed mirror n^1 which throws light along the pointer, thus enabling it to be seen at night. Chimney guards s, s^1 are placed at the top of the standard. For observing the bearings of a star, the compass is placed with the lubber's point in a line with the ship's keel. The screw q^1 is then loosened to turn the standard round till the indicator l shows the bearing of the star, as found by tables, on the card; the standard is then fixed, and the card turned, till the star comes in a line with the pointer m. The card b will then show the direction of the ship's head. Bearings are taken from the sun or a terrestial object in a similar manner, a style being hinged to the standard j^1 for use if the sun's altitude be high.

1076. Bessemer, H. March 22.

FIG.4.



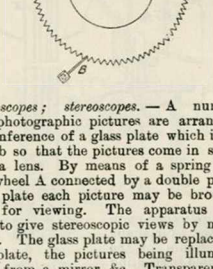
Clinometers.—For indicating the amount of variation from the horizontal of self-levelling saloons and platforms on ship board, the *vis inertia* of a heavy disc or wheel g is employed. The wheel is mounted on an axle a which is cut away at a^2 to form knife-edges along which are fixed lengths of tempered steel wire n. These wires rest in grooves made in hemispherical bearing-blocks m, and are fixed by being inserted in holes in the axle at one end, and in lugs a^3 at the other. End motion is prevented by set-screws s. An arm b connected to the axle carries a toothed segment gearing with a pinion c carried by framework connected to the saloon &c., and this pinion works a pointer d. To prevent the friction of the bearings from altering the position of the disc g, a block h is arranged to slide within the disc as shown, so as to give a preponderating mass below the bearings.

1090. Clark, A. M., [*Carpenter, J. H.*]. March 24. [*Provisional protection only.*]

Angle measuring instruments; clinometers; levels.—Relates to a combined apparatus serving as a guide for sawing mitres and bevels, and for setting levels and determining angles. A semicircular table or plate is fixed to the top of a column or pillar of a tripod or stand, and a sawing-table or platform bar is pivoted to a plate attached to the side of the column or pillar. This bar turns on its pivot and is provided on its under edge with a graduated circle and set-screw, so that it can be set at any desired angle to the horizontal table, which is also graduated. The table supports the saw guide, the base of which, at one end, is connected with the centre of the column or pillar by a pivot, the other end extending over the edge of the table and being fitted with a hanging lip and fastening screw therein. The guide consists of two uprights, between which slides a back guide which descends as the cut proceeds and keeps the saw steady. The platform bar has a platform at each end, above which a portion of it projects, thus forming angles in which the wood to be cut is laid and held in position by suitable clamps. By this apparatus simple or compound bevels, for roof, ship, or bridge building, may be cut. The platform bar carries a spirit level and sight guides for levelling and striking angles in the operations of buildings, laying out foundations, improving grounds, &c. The horizontal table may be fitted a transit, provided with sight guides, which traverses the top of the table by means of a central pivot and can be set by a set-screw; a line at any angle with the line of the bar can thus be obtained.

1143. Gedge, W. E., [*Dallemagne, A. J.*, and *Triboulet, L.*]. March 27.

FIG.2.



Graphoscopes; stereoscopes. — A number of reduced photographic pictures are arranged near the circumference of a glass plate which is rotated by a knob so that the pictures come in succession opposite a lens. By means of a spring B and a toothed wheel A connected by a double plate C to the glass plate each picture may be brought into position for viewing. The apparatus may be arranged to give stereoscopic views by making it binocular. The glass plate may be replaced by an opaque plate, the pictures being illumined by reflection from a mirror &c. Transparent proofs may be fastened upon a transparent card such as mica. The card may be rectangular and may be made to slide horizontally instead of being rotated.

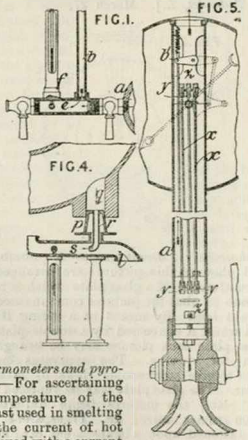
1240. Cory, J. M. April 3. [*Provisional protection only.*]

Centrolineads.—An instrument for use in perspective drawing consists of an adjustable bow, the chord of which is graduated to indicate the distance of the centre of the circle of which the bow is a segment. Points are provided for attaching the instrument to the drawing-board. The bow is bent till the reading of the scale on the chord corresponds to the distance of the vanishing point, and the bow is then placed against the edge of the drawing-board. A T-square is used within the bow for drawing radial lines.

1246. Morgan-Brown, W., [*Camozzi & Schlösser*]. April 3. *Drawings to Specification.*

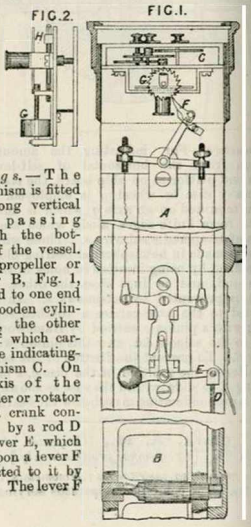
Clinometers. — Upon a travelling-gauge for measuring the distance apart of the rails of a railway or tramway is fitted a pendulum, the lower end of which passes before a fixed horizontal scale on the vehicle in order to indicate the height of one rail above the other. The upper end of the pendulum may be sector-shaped and toothed, to engage with the corresponding toothed end of a lever, the other end of which travels over a scale. A pendulum may be used to indicate the gradient of the railway &c. A revolving cylinder of paper may be rotated from one of the wheels, and a pencil attached to the pendulum then traces a record of the height of one rail above the other or of the gradient.

1271. Hobson, H. April 5.



Thermometers and pyrometers.—For ascertaining the temperature of the hot blast used in smelting iron, the current of hot air is mixed with a current of cold air and the temperature of the mixture is measured; the instrument is graduated to show the temperature of the hot blast directly. The apparatus is also applicable for ascertaining the temperature of heated gases. In the arrangement shown in Fig. 1, the hot blast is turned on from the main *a* and the cold air enters by a pipe *b*, so that the gases mix in the chamber *e* before reaching the thermometer *f*, or other instrument. In a modification, the thermometer is detached from the apparatus and is only applied when a reading is to be taken. In the form shown in Fig. 4, the cold blast is dispensed with, and the apparatus is shown applied to the sight hole of a blast furnace. A plug *p* fits in the sight hole *q*. The blast passes into the chamber *s* through the tube *r* and induces a current of cold air from the atmosphere. A pyrometer for general purposes and for measuring the temperature of the hot blast directly, or mixed with a current of cold air, consists of a series of wires *x*, Fig. 5, connected by levers *y* fitted in the frames *z*, fixed in the tube a^1; one end of the series is attached to the frame z^1 and the other end to a lever b^1 connected to the indicating-apparatus. A multiple indicating effect is thus produced. Instead of separate wires, there may be a single wire passing over pulleys. The frames *z* may be connected to an outer tube, or with rods of wood &c. situated outside the tube a^1, so that the heat does not affect them. The air currents to be tested pass through the tube a^1.

1394. Cederholm, H. S., and **Peterson, C.** April 17.



Logs.—The mechanism is fitted in a long vertical tube passing through the bottom of the vessel. The propeller or rotator B, Fig. 1, is fixed to one end of a wooden cylinder A, the other end of which carries the indicating-mechanism C. On the axis of the propeller or rotator B is a crank connected by a rod D to a lever E, which acts upon a lever F connected to it by wires. The lever F

works a ratchet-wheel G connected with the indicating-mechanism, which has three wheels for indicating the knots, and two adjustable wheels for regulating the motion, if required. These wheels are adjusted by a screw H, Fig. 2, which enables the index wheel to revolve faster or slower, according to the position it has been set to the centre. The propeller B may be rendered inactive by raising the apparatus in the pipe. The speed may also be shown at various parts of the vessel by electrical communication with the main log.

1423. Morgan-Brown, W., [*Ripamonti, L., and Ripamonti, D.*]. April 19. [*Provisional protection only.*]

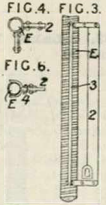
Barometers.—In aneroid barometers two indicating-dials are used, the first for the usual indications and the second for indicating fractions of the first. The index of the second dial is worked from the spindle of the first by wheels &c.

1461. Haggett, W. April 23. *Drawings to Specification.*

Reflectors.—Blocks or sheets are built up of layers of glass &c. corrugated or undulated and arranged to interlock. Sheets with radial or other undulations may be used for reflectors.

1621. Lish, J. J. May 5.

FIG.4. FIG.3.

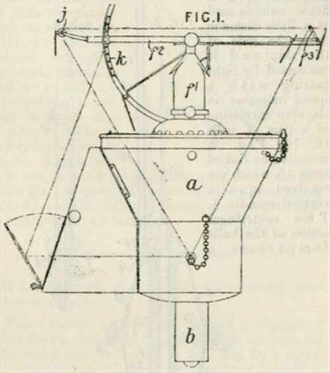


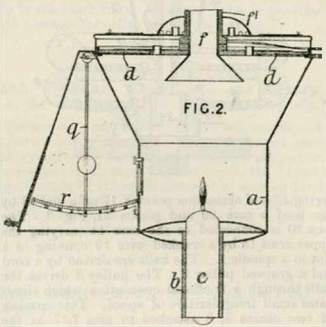
Plumb-rules.—For adjusting a vertical screw E used in a special method of concrete building, two rules 2, 3, Figs. 3 and 4, are secured at right-angles to each other by metal strips. Or a single rule 2, shown in plan in Fig. 6, carries a strap 4 at each end to embrace the screw E.

1679. Croudace, W. S. May 9.

Bearings, instruments for determining.—To enable ordnance to be aimed at night an instrument is used for determining the position and elevation of the object aimed at. The instrument may be mounted on the gun to be aimed, or, when used as a collimator or object-finder, on a tripod or other stand; in this case the stem *b* is made circular to allow the instrument to be turned. A candle *c*, or a suitable lamp, is mounted in the lower part of the casing *a*. On the top of the casing are mounted the dial *d*, chimney *f*, and hollow standard f^1, the standard supporting the pointer f^2, mirror f^3, and lens *j*; these parts are similar to those described in Specification No. 977, A.D. 1873. The elevation of the object is

FIG.1.





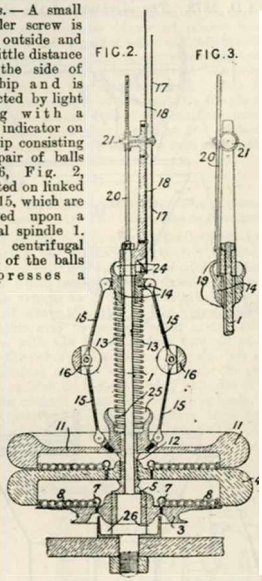
observed by means of the graduated quadrant *k* and its bearing by means of the dial *d*. The pendulum *q* enables the apparatus to be set in a horizontal position before making the observation.

1852. Imray, J., [*Fayol, H.*]. May 22. [*Provisional protection only.*]

Eye-protectors for use in foul atmospheres consist of an elastic band passing round the head, the front part being widened out and provided with two conical openings which are fitted with glasses.

1878. Hearson, T. A. May 24.

Logs.—A small propeller screw is fitted outside and at a little distance from the side of the ship and is connected by light gearing with a speed indicator on the ship consisting of a pair of balls 16, 16, Fig. 2, mounted on linked arms 15, which are revolved upon a vertical spindle 1. The centrifugal action of the balls compresses a



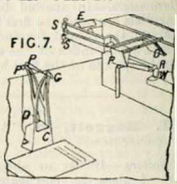
spring 13 and actuates a pointer 17 on a dial 18 by means of a rack 20 and pinion 21, Fig. 3. The rack 20 is connected to the boss 14 carrying the upper arms 15 by a cranked wire 19 running in a slot in a spindle 1. The balls are driven by a cord and a grooved pulley 3. The pulley 3 drives the balls through a frictional connection which eliminates small irregularities of speed. This consists of two chains 8, 8 attached to pins 7, 7 on the pulley 3, with their ends free to bear against the internal rim of a flywheel 4. The friction of the chains against the flywheel 4, due to centrifugal action, drives the wheel 4 without transmitting small irregularities of speed. A second flywheel 11 driven in a similar manner from the first flywheel may be added and the ball arms driven therefrom. The pulley and the flywheels have steel bushes running loose on the spindle 1 and separated by steel washers 5 and 12. The parts are lubricated from oil cups 24, 25, and 26. The pulley and the flywheels may be locked by a pin passed through them in order to check the readings. The lengths of the chains are adjusted so that correct average readings are obtained.

2038. Leslie, J. B. June 9. [*Provisional protection only.*]

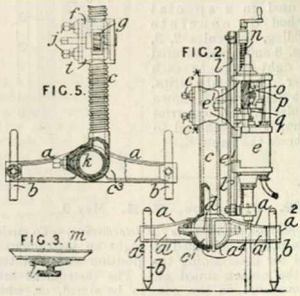
Current indicators.—An instrument for indicating the direction of ocean currents consists of a tube having on its end a movable vane or "indicator" and a compass. The tube is let down vertically from a ship to any depth, and on locking the indicator and compass the direction of the current is shown on raising the apparatus. The locking-apparatus consists of a weight capable of sliding down the tube, and provided with a toothed clutch which takes into a corresponding toothed clutch at the top of the indicator.

2232. Varley, F. H. June 27.

Camera lucidas.—A "gyrograph" or rotary reflector, for enabling a telegraph clerk to see the image superposed on the paper upon which he transcribes the message, consists of a circular plate of glass, partly silvered and partly unsilvered, which is rotated in a plane at an angle of 45° with those of the dial and transcribing paper, by means of a band and pulleys P, D from clockwork in the base C.



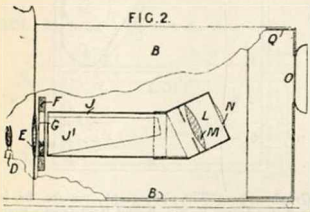
2263. Lake, W. R., [*McKean, J. A.*]. June 30.



Tripod stands.—An adjustable stand for supporting the air or steam cylinder of a percussive rock drill is shown in Fig. 2. A hollow sphere c^1 cast on the lower end of the column c of the stand works freely in two hemispherical sockets a^4 in the base a having four arms a^1, each with an adjustable pointed rod b fitted in a socket a^2 and secured by

screws. A bolt *d* passing through holes in the sphere c^1 secures the two parts of the base together, the holes being large enough to permit adjustment. The column *c* may be a smooth bar, and the cylinder is then secured to it by clamping-screws *c*. In large machines, the cylinder is attached to a sleeve *f*, Fig. 5, provided with a toothed pinion *g* gearing in a circular or spiral rack on the column *c*×, the sleeve being secured by a pinching-block *i* and screws *j* after adjustment. A pawl engaging with the teeth of the pinion *g* prevents accidental slipping of the sleeve. In a modification, a boss c^3 at the lower end of the column *c* is adjustably fitted on a cross-bar *k* connecting the two halves of the base. Flanges e^1, Fig. 2, cast on the cylinder *e* slide freely on a bar *l* shaped as shown, and the cylinder is operated by a feed-screw *n* passing through a screw nut secured between two brackets on the cylinder. A face-plate *m*, Fig. 3, formed on the bar *l* is held by screws with V-shaped heads in a socket on the sleeve so as to form a swivelling joint.

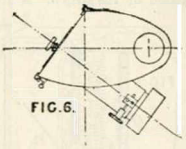
2290. Pritchard, O. July 2.



Kaleidoscopes.—Consists of a new optical instrument, called a "kaleidograph," for producing designs for art manufactures and other purposes. The cell G carrying the objects is mounted, so that it may be rotated by toothed gearing, in an adjustable slide F placed in front of a lens E and lamp or oxyhydrogen light D. In front of the cell G is a tube J containing mirrors J^1, and at an angle with this tube is an adjustable tube L fitted with lenses M, N for throwing an image on the ground-glass screen O, where it may be seen by a number of persons or may be copied. The front Q of the enclosing case B may slide in and out for adjustment. The apparatus may be arranged in any portable form; it may be used without the external case and may have oxyhydrogen or other light.

2347. Tenac, C. L. van. July 7. [*Provisional protection only.*]

Magic-lanterns and like projecting-apparatus.—Images of small opaque bodies are formed upon a screen by an apparatus consisting of light placed at the focus of an internally-polished shell forming a system of reflectors, and a projecting tube containing optical glasses, arranged at an angle of 45° with the axis of the reflectors. The plan of the body to be projected is perpendicular to the axis of the projecting tube, as shown. The reflectors may be of different shapes such as ellipsoidal, ellipsoidal and conical, or cylindrical, parabolic and conical, or cylindrical, and may be fitted as a globe to oil, gas, oxyhydrogen, or arc lamps. Magnesium light can be used by providing proper ventilation and a glass to prevent the smoke from interfering with the picture. Two reflectors may be combined so as to fit on two lamps.



2371. Mayer, J. July 9. [*Provisional protection only.*]

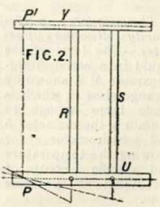
Thermometers.—The outer case of a clinical or other thermometer is provided with an internal tube which may be moved in and out by a screw between the two. The thermometer is held in a clip in the inner tube; the outer tube is provided with a polygonal collar to prevent rolling.

2445. Cooke, E. J. W., and **Emary, J. L.** July 16. [*Provisional protection only.*]

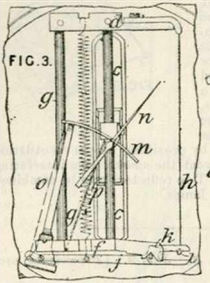
Telescopes; microscopes; optical instruments.—A concave lens is placed between the object glass and eye-piece to increase the magnifying power. To prevent diminution of the light, the object-glass is made of larger diameter or of shorter focal length than usual. The arrangement is stated to be applicable to telescopes, microscopes, "cameras," "and other optical instruments."

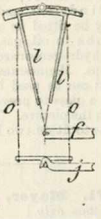
2671. Smith, T. J., [*Soc. Tremeschini et Cie.*]. Aug. 11.

Thermometers.—A unimetallic thermometer is provided with a compensating frame constructed upon the principle shown in Fig. 2. If a bar of steel R and another of brass S are rigidly attached to a crosshead Y and pivoted to another U at their other ends, there will be two points P and P^1 the distance apart of which remains constant at all temperatures. In the thermometer shown in Fig. 3, the bars of steel



and brass C and *g* are connected to brass crossheads *d* and *f*, and a brass strip *h* is attached to the crossheads so that the changes in the position of the point *i* are due only to the expansion or contraction of the strip *h*. A lever *j* pivoted to the





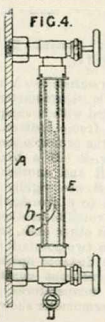
crosshead *f* at the point *k* is moved by the strip *h*, and pulls upon the rod *o* so as to turn the toothed sector *m*. The sector *m*, being held in gear with the pinion of the pointer *n* by the spring *p*, rotates it and gives an indication of the temperature of the strip *h* and the surrounding air. In some cases, the rod *l* is divided as shown in Fig. 5, the two rods *l* being then held apart by a spring and provided with sliding vernier scales. The lever *j* then acts upon a crosshead to which the rods *o* are attached. The reading is taken by means of a microscope.

2796. Nickoll, J. J. Aug. 25. [*Provisional protection only.*]

Lenses.—Coloured lenses for signal lamps and other purposes are made of white glass covered by a thin film of coloured glass.

2834. Maitland, W. H., [*Hoffman, O. C.*]. Aug. 28.

Thermometers; specific-gravity estimating - apparatus.—The level of the liquid in a carburetting-apparatus A is shown by a gauge-glass E, which is made large enough to contain a thermometer *b* and a hydrometer *c* for showing the temperature and specific gravity of the liquid at the same time.



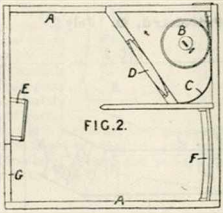
2892. Lüdeke, J. E. F. Sept. 3. *Drawings to Specification.* [*Provisional protection only.*]

Proportional compasses.—The legs of the instrument extend outwards from the pivot in both directions, and, when the longer pair are set to the diameter of a circle, the shorter pair give the side of the square of equal area to the circle.

3091. Negretti, H., and **Zambra, J. W.** Sept. 20. [*Provisional protection only.*]

Thermometers. — Relates to thermometers in which the bulb is enclosed in a vacuum, and consists in fitting them with vacuum gauges to indicate the state of the vacuum.

3102. Cumine, J. A. Sept. 22.



Graphoscopes.—The photograph, picture, &c. is placed in a frame E, Fig. 2, and light from a lamp B is thrown on to it by a reflector C and lens D. In front of the picture is a concave mirror F in which the magnified image is viewed through a hole G in the box or case A. The box may be provided with a daylight reflector at the top. In a modification, the picture is placed in a frame in front of a concave mirror and the image is viewed through a hole in the frame. In another modification, two picture frames are placed in the case, a reflector facing each; the concave mirror is mounted on a pivot so that it can be turned towards either picture.

3130. Casey, T. H., and **Liddon, J. J.** Sept. 25. [*Provisional protection only.*]

Compasses, magnetic.—Relates to means for filling the bowl of liquid compasses with liquid free from bubbles of air or other gas, and to the construction of the needle. Inside the bowl are two corrugated chambers connected by a tube to the outside. A screw is fitted in the tube for expanding or contracting the chambers. To fill the bowl, the chambers are contracted and the liquid is poured in through a hole in the bottom; when full, a

plug carrying the pivot is screwed into the hole. The needle is fitted with a float to take part of the weight off the pivot.

3152. Woerteler, E. O., [*Marshall, W. M.*]. Sept. 27.

Reflectors.—Relates mainly to a process for silvering mica for use in the construction of reflectors and reflecting shades, and for the manufacture of reflecting letters. Sheets of mica, cleansed by treating with nitric acid and washing with water, are placed in pairs in a vat containing a solution formed by adding ammonia to a solution of nitrate of silver, containing one oz. to the quart, until the solution becomes clear, and then adding an equal quantity of water containing one oz. of glucose (grape sugar) to the quart. When the mica is sufficiently coated it is rinsed, dried, and coated with spirit varnish, if desired. Reflectors are made by placing the prepared mica in frames made of tin, sheet iron, paper, or plastic composition.

3232. Bylandt, Count A. de. Oct. 6.

FIG. 1.

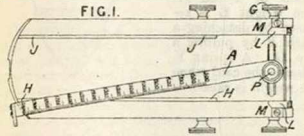


FIG. 2.

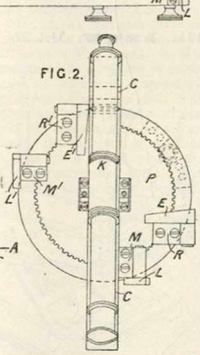
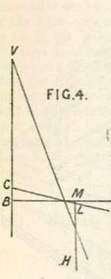


FIG. 4.



Telemeters; theodolites; angle-measuring instruments.—Distances, heights, or depths, are measured by forming triangles on the instrument similar to those formed by the positions of the observers or objects. The instrument consists of a brass plate which can be turned by means of a screw, horizontally on an axis. This axis is supported on another axis fixed to the base. A graduated arm A, Fig. 1, can be turned round an axis with a sight and moved at right-angles to two parallel lines H, J, on the plate, by a screw G.

FIG. 5.

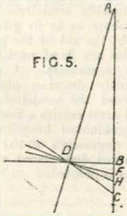
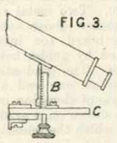


FIG. 3.



The graduated arm is provided at the ends with lenses, the lenses and the sight being in line. On the front of the plate are two brass pieces M carrying an axis with two "armatures" L which may be turned up. A speculum square consisting of two mirrors placed vertically at an angle of 45° is used with the instrument, and above each mirror is a window. The square is placed in a hollow cylinder round which a cord of known length is wound. In measuring, for instance, the distance of a gun from a given point V, three observers, A, B, C, are required; A fixes the instrument to the wheel and B with the square sets himself so that V B A, Fig. 4, is a right-angle. The third observer C stands in line between B and V and at a known distance from B, determined by the length of the cord. A places the graduated arm against one of the pieces M and turns the plate until B is sighted; he then lowers the "armature" L and sights C by turning the screw G, the arm resting against the "armature" L. He then directs the arm on the object and the distance will be given by the reading of the graduated arm on one of the lines H, J. In a modification, a circular plate P, Fig. 2, turns horizontally on a central axis by means of a screw. An arm C supports a telescope K. Two small pieces of brass M, M^1, with "armatures" L, L^1, are fixed on the plate, so that in placing the arm first against one and then the other a right-angle is obtained. Two other small pieces of brass R, R^1, with "armatures" E, E^1, are also fitted to the plate. For measuring the height and distance of the point A, Fig. 5, the instrument is placed at a point D arranged so that A B D is a right-angle. The arm is placed against the piece M and the point B sighted; the "armature" L is then lowered and the arm placed against it, a pole being placed at H on the line A B in the direction of the telescope. The instrument is then arranged to sight the point A with the arm against one of the pieces; the arm is then turned through 90°, so as to obtain the C at which a pole is placed. The instrument is again arranged to sight the point A, and the sliding piece B, Fig. 3, on the arm C is raised till it meets the telescope. The instrument is then turned in the direction of B,

the "armature" E^1 is raised, and the arm placed against it. The telescope then sights in the direction of the point F at which a pole is placed. By measuring the distances B C, B H, and B F, the distances A B, A D, D B, and the height of the object may be found. In another modification, a brass plate supports a movable semicircle with divisions similar to a protractor, so as to give the measurement of an angle by the aid of the graduated arm. Two metal rules are fixed parallel to one another above the semicircle. A small movable board for instantly drawing plans is supported by guides between the semicircle and the rules The graduated arms carries a telescope and also at one end a graduated hinged plate. The angle of elevation or depression of the telescope is shown on a graduated dial placed on the axis on which the telescope is pivoted.

3281. Finlay, H. Oct. 10. [*Provisional protection only.*]

Compasses, magnetic.—For ascertaining the deviation of ships' compasses, a compass is towed in a water-tight case at a considerable distance astern. While in this position, the card is fixed by releasing a spring; the bearing of the compass card is then compared with the ship's compass. The case is kept within a certain distance of the surface by a buoy.

3299. Cluzet, W., and **Simon, A.** Oct. 11. [*Provisional protection only.*]

Parallel rulers; compasses, drawing.—For drawing straight lines at definite distances apart, an ordinary flat ruler has a slot in its centre in which is placed a roller. To regulate the parallel motion, one or more plates with regulating-screws are fixed crosswise to the roller; the motion will thus be stopped every time the plates come in contact with the rule. For curved lines, a plate with a ruling edge is fixed to the edge of the rule. The rule may be used as a beam-compass by fixing a pin at one end and a pen or pencil by a clip to the front of the rule.

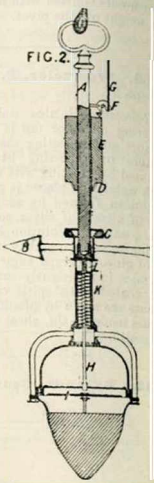
3309. Fleury, A. Oct. 11. [*Provisional protection only.*]

Sounding-apparatus.—For determining the course or direction of bodies in air or water, a rectangular plate is connected by adjustable rods of unequal lengths to a weight and to a float, so that in the position of equilibrium the plate will be oblique, and, on being left to itself, will follow a rectilineal and inclined trajectory, which can be calculated previously. For taking oblique soundings, the weight causes the apparatus to descend obliquely through the water, and, on reaching the bottom, it either unhooks by its own weight or is released by a cord.

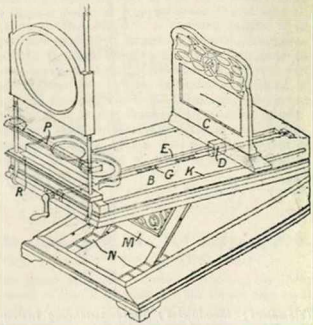
3352. Leslie, J. B. Oct. 16.

Current indicators.—An instrument for indicating the direction of ocean and other currents is formed of a compass I and an indicator B; when let down from the ship &c. into the water to obtain an indication, the two parts are locked, by dropping a weight E, before the instrument is raised. The indicator B turns on a rod A and is provided with a rubber ring C; it is locked by clutch teeth D on the sliding weight E, engaging the rubber ring C. The weight E also presses down the indicator and a slide L, and locks the compass card by means of a rod H. The weight E is released by detaching a catch F by pulling a line G. A spring K releases the card when the weight is raised.

FIG. 2.



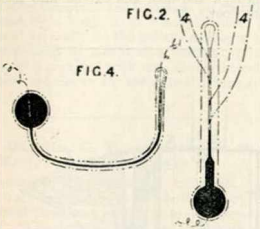
3421. Lack, W. Oct. 22.



Graphoscopes. — The picture is focussed by a screw G working in a nut D on the holder C. The nut slides in a groove E and the holder is guided by rollers running on the small rails or

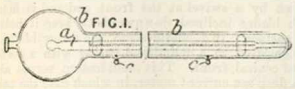
beads K at the side; a piece of leather or cloth may be used instead of the rollers. The holder may be folded down on the top B. Folding pieces may be attached to the holder for larger pictures &c. The top B is supported by a piece M the feet of which rest in racks N. The lens is supported and slides on two rods which fold under the top. The rods are held in position by a sliding piece P fitting over pins R.

3482. Symington, R. S. Oct. 27.



Thermometers. — A mercurial thermometer is fitted with platinum wires in circuit with a battery and an electric bell so as to give an alarm at a certain temperature. One wire communicates with the lower part of the mercury, and the other is placed in the tube so as to be reached by the mercury at a certain temperature. The tube is enlarged near the bulb, and an enlargement is also made at the upper end of the tube. A number of separately-insulated wires 4, Fig. 2, may be fixed in the tube and connected to an alarm apparatus so as to give alarms at different temperatures. The tube may have a bend, Fig. 4, so that, if the bulb bursts, the remaining mercury will still complete the circuit. If the apparatus is to act as a low-temperature alarm, the mercury is combined with alcohol &c. in which one wire is placed so as to be reached by the mercury when the temperature falls to a certain point, the other wire being always in the mercury.

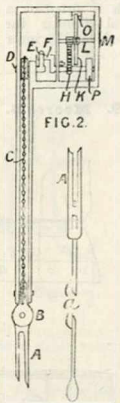
3647. Hicks, J. J. Nov. 8.



Thermometers.—Relates to means for testing the vacuum in the chamber *b* in which a solar radiation thermometer *a* is sealed. A platinum or other wire *c* is fused into the chamber and the ends connected with a galvanic battery; the character of the electric light produced will indicate the degree of vacuum. In another method, a piece of tinfoil is wrapped round each extremity of the chamber, and round each of these pieces a wire or strip of copper is wound. On passing a current through the wires, the degree of vacuum will be indicated as before.

3823. Poole, G. A. Nov. 22. [*Provisional protection only.*]

Sounding-apparatus.—A pendulum A is suspended over the side of the vessel so that it swings in the plane in which the vessel moves. The lower part *a* of the pendulum slides in the upper part A pivoted upon a hinge B, round a pulley upon which passes a chain C connecting it with the pulley D in such a manner that the pulley D is rotated when the pendulum touches the bottom and is deflected from the vertical. A pin E upon the axle of the pulley D drives a crank F formed on the axle of the segment wheel H; this wheel H when revolved causes the arms K on the shaft L to pass between springs O, making connection in an electric-bell circuit. A pointer M moving over a dial indicates the depth of water under the vessel. A spring P is provided for bringing back the indicator M when the pendulum is again vertical. By using bevel-gearing the indicator M may be fitted upon the top of the indicator-box. A loose wheel and crank are provided in conjunction with the crank F, so that the indicator may be used on either side of the vessel.



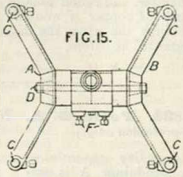
3842. Wirth, F., [*Dauthendey, C.*]. Nov. 25. [*Provisional protection only.*]

Graphoscopes.—Consists in an apparatus for illuminating and viewing pictures &c. in such a manner that they appear to be transparent. The picture is placed in a square frame with its back to a strong light (*e.g.*, a window), and in a front round frame opposite to it is placed a disc of rough coloured paper, which reflects diffused light on to the picture. The picture is viewed through a hole in the disc. The frames are supported on a pedestal.

3901. Lake, W. R., [*McKean, J. A.*]. Nov. 28.

Stands for rock drills are constructed with two parts A, B having legs or supports C and fitted together at the centre and secured by a bolt D. A column, upon which the machine is mounted, has a boss which is fitted on a central tubular bar formed by the inner or adjacent portions of the parts A, B. The boss turns on this bar and may be secured in position by pinching-screws F.

FIG. 15.



3903. Pinney, A. Nov. 29. [*Provisional protection only.*]

Thermometers for bakers' and other ovens. The portion of the thermometer containing the scale is arranged so as to be placed on the outside of the door or other part of the oven, and the mercury is contained in a long tube, which is bent so as to pass through the door and extend into the oven near the floor.

3939. Moore, B. T. Dec. 1.

FIG. 4. (Sht. 1)

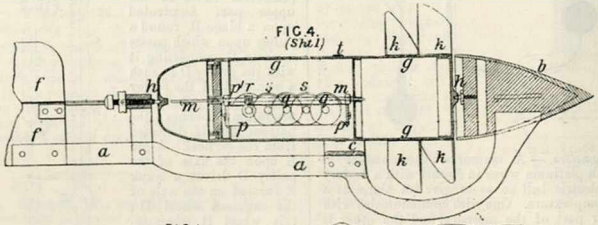


FIG. 1. (Sht. 2)

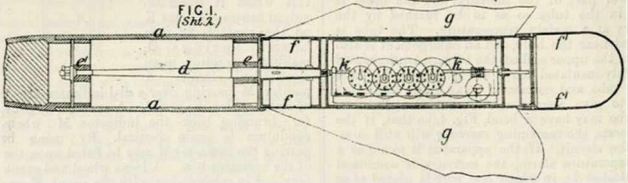
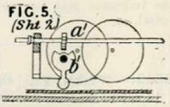


FIG. 5. (Sht. 2)



Current meters; logs.—A form of current meter is shown in Fig. 4, in which a hollow case *g* is rotated between pivots *h* by means of the screw blades *k*, the number of revolutions being recorded by wheelwork hung inside the case. The case is held in a frame *a*, *c* with a front shield *b*, and plates *f* at the back, so that the apparatus sets itself in the direction of the current. The recording-apparatus is mounted in a frame *p* which hangs on bearings p^1 in the case so as to retain its vertical position as the case rotates. The toothed wheels *q* and dials *s* are actuated by a worm-wheel and screw *r*, which is fixed on a shaft *m* rotating with the casing *g*. A spring *t* grips the case while it is being let down and hauled in; the case is released by pulling the spring by a cord. A form of ships' log is shown in Fig. 1. The front part consists of a tube *a* pointed and weighted in front, and carrying a spindle *d* in bearings *e*, e^1. On the spindle *d* is a tube *f* with screw blades *g*. The recording-apparatus is similar to that of the current meter, the spindle *k* being supported by two discs, which slide and fit water-tight in the tube *f*. The log is drawn by a swivel at the front end and is fitted with blades inclined downwards to keep it below the surface. In a modification, the screw blades *g* are enclosed in a cylindrical casing with a perforated conical front. This modification serves also as a deep-sea current meter, in which case the tube containing the recording apparatus is filled with oil to prevent collapse. To prevent the instrument from recording when being let out or hauled in, the wheelwork is locked as follows:—On the spindle supporting the recording-apparatus is a toothed wheel a^1, Fig. 5, and below it is a

weighted disc b', which locks the wheel a' when the apparatus is not in a horizontal position. This arrangement may be used in place of the spring brake t shown in Fig. 1. The current meters and ships' logs are provided with stirrups attached to points of suspension which are so placed that the instruments hang horizontally or nearly so in still water.

4105. Souchard, S. H. Dec. 13. [*Provisional protection only.*]

Magic-lanterns and like projecting-apparatus.—A globe or other receptacle for objects to be examined or reflected by a lamp, as in "lampascopes," can be adjusted vertically on the gallery of a specially-constructed lamp by means of a rack and pinion. The support is provided with rods sliding in guides which have set-screws for securing the support in position.

4219. Casella, L. P., and **Denton, S. G.** Dec. 23. [*Provisional protection only.*]

Thermometers.—Maximum and minimum thermometers are constructed so that both registrations are obtained from, and both indices are moved by, mercury. The vertical stem and the bulb containing mercury, and the bend at the top and part of the downward part of the stem (parallel to the first part) contain alcohol, the lower part of the second stem also containing mercury. The end of the stem dips into a cup of mercury, and the bottom of the cup has a stem dipping into mercury contained in a lower cup, which is sealed up at a low temperature so that the air above the mercury will be under slight compression at ordinary temperature. The mercury column from the bulb moves the maximum index, and the other moves the minimum index in the second part of the stem. For greater sensitiveness, the stem may be placed horizontally, in which case the indices are not provided with the usual springs. The unit is preferably forked or double to give greater surface. This instrument may be graduated on the stem.

4264. Deacon, G. F. Dec. 29.

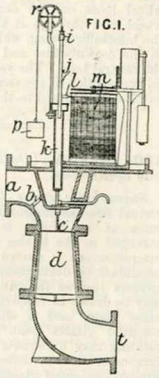


FIG. 1.

Current meters. — An apparatus for indicating the velocity of water in pipes consists of a conical chamber d, Fig. 1, in which works a disc c, as described in Specification No. 937, A.D. 1873, [*Abridgment Class* Hydraulic machinery &c.]. Liquid entering the inlet a passes through the contracted part b, and, depressing the disc c, escapes at the outlet t; the motion of the disc is transmitted by a fine wire to a cross-head i connected to a weight p by a cord passing over a pulley r, a rod j carrying a pen or pencil l and dipping into mercury in a fixed vessel k being suspended from the cross-head i. The disc c closes the smallest part of the pipe d. The graduated drum m may be actuated by clockwork to register either velocity or quantity, or the pen may travel over a fixed scale. The disc c may be replaced by a ball, and the plunger j may be omitted, the disc c being directly supported by the weight p alone, and the pen i provided with guides. The wire from the disc c exactly fits a hole in the framing, but any water finding its way past the hole is conveyed away by a small pipe.

A.D. 1874.

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6. Gottheil, R., [*Oesten, G.*]. Jan. 1. [*Provisional protection only.*]

Calorimeters; current meters.— An instrument for measuring the heat of fluids passing through a pipe consists of a combination of a current meter with a bimetallic spring. The instrument indicates the product of the velocity of the fluid and the number of units of heat; and if the velocity remains constant the indexes may be arranged to

indicate the units of heat. The fluid flows round a circular casing in which are hollow radial arms connected to a central boss. This central boss is connected by worm and wheel gearing to the registering-apparatus. Spindles passing through these arms carry vanes at their outer ends, and at their inner ends bevel pinions gearing with a crown-wheel loose on the central boss. The crown-wheel, and through it the vanes, are actuated by the bimetallic spring, which is attached at one end to the crown-wheel and at the other to a disc on the central boss. The velocity of rotation depends on the position of the vanes, whether perpendicular, parallel, or inclined to the plane of rotation.

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100. Ray, A., [*David, A.*]. Jan. 8. *Drawings to Specification.*

Stereoscopes; magic-lanterns. — For obtaining virtual life-like motion in drawn figures, two pictures of an object in different positions are arranged in the holder of a stereoscope, and an opaque screen is moved in front of them by a pendulum or other means, so that one picture disappears just as the other appears. The pictures may be drawn in coloured lines superposed on the same plate, and a sliding screen of similarly-coloured glasses used. The effect of a wheel rotating may be shown by painting the circumference in different colours and using a screen of similarly-coloured glasses. The arrangements are also applicable to magic-lanterns.

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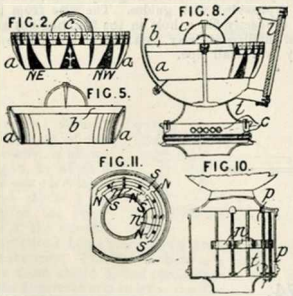
101. Reynolds, W. F. Jan. 8.



Compasses, magnetic.—Relates to the construction of liquid compasses, and also to means for regulating or adjusting compasses. The compass card *a* is made in the form of a deep ring with the points marked on the outside, and it is combined with a float *c* to make it buoyant; or the ring may be made hollow, as shown in Fig. 5, or fitted with tubes for the same purpose. The needles *b* are fitted across the top of the ring, either singly or in pairs, and they may be enclosed in the tubes. Fig. 8 shows a ring *a* with needles *b* and float *c* fitted within a bowl *i* containing liquid. The lubbers' point is a fixture in front of the window *l*. For adjusting or regulating compasses, magnets are arranged above, below, or level with the compass bowl and card. Figs. 10 and 11 show one method in which two curved magnets *n*, arranged with their opposite poles together, are mounted on right and left handed screws *p*, geared together by wheels *t* and turned by means of the squared end *r*. A second set of magnets is placed at right-angles to the first set to enable the adjustment to be made in all latitudes. The magnets are guided by vertical pins, and they move in opposite directions when the screws are rotated. Magnets may be placed in sets of tubes C crossing each other at right-angles, as shown in Fig. 8. Or magnets placed in single tubes, arranged at right-angles and crossing each other, or not, may be used. The Provisional Specification states that the lubber line is hung on a pivot and preserves a vertical position however much the ship rolls.

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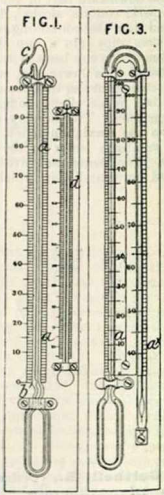
109. Negretti, H., and **Zambra, J. W.** Jan. 8.

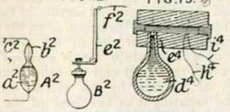


Thermometers for deep-sea soundings and other purposes. The tube *a*, Fig. 1, is formed with an obstruction at the zero point, and with a reservoir *c* at the top into which the mercury above the zero point passes when the instrument is inverted. In a modification, the reservoir takes the form of a tube *a*× graduated to show the temperature directly. A test thermometer *d* is arranged by the side of the other tube for reference. The instrument is mounted to turn in a case or frame, or on a centre-pin fitted with a wheel gearing into another wheel, the axle of which has a fan or blade. While the instrument is descending the blade points upwards, but immediately the instrument begins to ascend the blade is reversed. This movement of the blade causes the

thermometer to be inverted. Instead of a fan or blade a small vertical propeller may be used to drive the gearing; or the instrument may be inverted by means of a pulley with a weight, which may be released on touching the bottom. In using the instrument, a reading is first taken at the surface, the thermometer let down, reversed, and drawn up again; the reading of the remainder of the column is then taken, the difference giving the temperature of the bottom. The instrument may be used for meteorological observations, and may be connected with clockwork, so that it is inverted at any particular time.

298. Finger, L. Jan. 23.

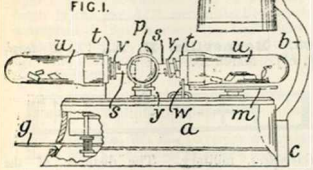
FIG.12 FIG.13.



Thermometers.—A heat-expansion device for operating a fire-alarm forms part of a thermometer. A bulb A^2, formed in two chambers a^2, b^2, contains mercury, which on expansion makes contact with the wire c^2 and establishes an electric circuit through an annunciator; or a mercury phial B^2 has its mouth covered with leather or other flexible material to act upon a lever e^3 and cause it to make contact with the wire f^2.

333. Adams, J. S., [*Collicatt, J.*]. Jan. 26.

FIG.1.

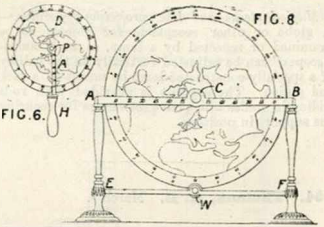


Kaleidoscopes.—The ordinary tube *d* constructed with reflectors is supported on a box *a* by a standard *b* fitting into sockets *e*, *c*. In the box *a* is clockwork for rotating an ornamented table *m* and tubes *u* containing bits of coloured glass &c. The tubes are mounted on four arms *s*, carried by a central hub *p*. The clockwork is set working by pulling a spring regulator *g* out from the gearing. The stoppers *t* of the tubes *u* are connected to the arms *s* by springs *v* and they are fitted with rods *w* which come in contact with a bridge *y* near the table *m* and thus shake up the contents of the tubes.

334. Tillman, S. D. Jan 26.

FIG.6.

FIG.8



Latitude and longitude instruments.—An instrument for readily finding the latitude and longitude of any place and for comparing local times consists of a flat disc D, Fig. 6, on the faces of which are drawn maps of the Northern and Southern hemispheres and which revolves between two arms A on a pin P. The maps are drawn with the poles at the centre and equator round the circumference, degrees of longitude and times being marked round the circumference, and degrees of latitude, preferably of equal length, on the arm, one of the edges of which passes through the centre. By bringing this edge against any particular place, the latitude and longitude, and time, compared for example with that of Greenwich, are found on the arm and circumference. The solution of geographical problems requiring the knowledge of latitudes and longitudes is thus facilitated. A larger form of the instrument is shown in Fig. 8. The cross bars or supports are carried by standards E and F, and the disc turns on the axis C and is supported by a grooved roller W; guide-rollers may be provided at the ends A and B of the cross-bars. For school use, the disc may be hung against a wall by a rope attached to the forked handle H, Fig. 6. The instrument may have only one map drawn upon it and is then specially suitable for use upon ships. Celestial maps may be used in place of terrestrial maps and the radial arm may carry an oval ring which exactly defines the limits of vision so that the stars visible at any time and place may be indicated.

412. Stanley, W. F. Feb. 2. [*Provisional protection only.*]

Compasses, drawing; dividers.—The points of dividers, bows, tube compasses, &c. are formed of steel wire, soldered in a groove on the inner side of the compass legs. For spring points, they are

soldered at the upper end only; in this case the adjustment-screw is tapped into the compass leg and presses on the point.

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773. Souchard, S. H. March 3. *Drawings to Specification.*

Magic-lanterns and like projecting-apparatus.—A globe or other receptacle for objects to be examined or reflected by a lamp, as in "lampascopes," can be adjusted vertically on the gallery of a specially-constructed lamp by means of a rack and pinion. The support is provided with rods sliding in guides which have set-screws for securing the support in position.

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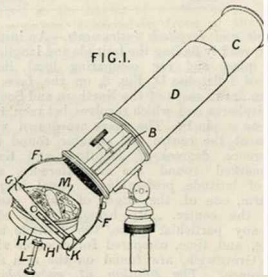
854. Thomas, A. E. March 9.

FIG. 1.



Kaleidoscopes.—The two mirrors are tapered, the widest ends being away from the eye-piece; they are enclosed in a tube C which slides in a tube D supported by a clip B. The open end of the tube D supports, by means of arms F, a ring G having slots on opposite sides for the reception of pins K, which screw into bosses on a disc H forming the background; by this arrangement the disc may be inclined in any direction. The object box M, which is supported and adjusted by a rod L passing through a friction tube H^1 on the disc H, consists of two thin watch glasses arranged in a frame so as to open like a watch case. A white or dark background is obtained by forming the face of the disc H of two thin discs, each with a radial slot, and slightly bent so as to form a screw; one is fixed to the disc and the other turns about the centre. In a modification, the ring G is dispensed with, and the adjusting-rod L slides through a socket on a jointed arm; the disc forming the background is also carried by a jointed arm.

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857. Lake, W. R., [*Beardsley, J. H.*]. March 9.

Face and eye protectors; eyeglasses.—In protective apparatus for the face and eyes of firemen, stokers, puddlers, coffee and spice grinders, &c, a duplex shell A, Fig. 2, of india-rubber &c. having a recessed portion *a*, is arranged to fit across the forehead and nose, a spring B of sheet steel &c. being inserted in the shell to strengthen it and secure it in position. Eye-pieces of glass or mica are inserted in elastic grooved sockets in the shell and may be removed by pressing down the elastic beads forming the outer rim of the sockets. A curtain D of woollen cloth &c. is attached to the lower part of the shell and is held round the lower part of the face by an elastic cord, an elastic band securing it to the back of the head. A sponge moistened with water is secured within the curtain by a pin so as to act as an air filter. The eye-pieces may be formed of magnifying-lenses, which, for certain purposes, may be coloured.

FIG. 2.

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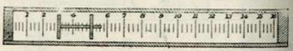
906. Cuffley [*known as* West], **E. J.** March 13. [*Provisional protection only.*]

Telescopes; microscopes.—The "lower" end of a telescope and a microscope (without stage &c.) are fitted in the opposite ends of a tube, which is provided with a lens at its centre. The telescope and microscope parts are adjusted for the focus separately; they may be carried by and both adjusted together by means of a ratchet arrangement. The image formed by the telescope is magnified by the microscope and "unlimited power of "magnitude" obtained.

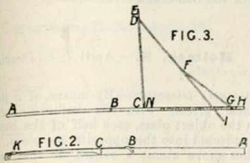
1003. Bonneville, H. A., [*Le Boulengé, P. E.*]. March 23.



Telemeters, military. The distance of the enemy is ascertained by observing the time between the appearance of the smoke of a gun and the hearing of the report. The instrument consists of a closed glass tube filled with liquid and containing an index. This index consists of two discs connected by a rod, and when the tube is held vertically it sinks slowly. The tube is graduated and enclosed in a case, as shown in the Figure. When the smoke is seen the tube is turned vertically, and when the report is

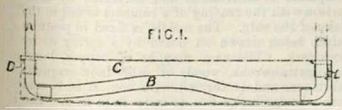
heard it is again turned horizontally: the reading of the index gives the distance. The instrument is corrected for temperature.

1047. Weldon, F. March 25.



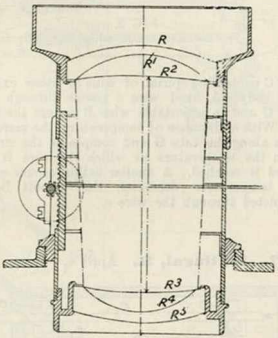
Range-finders.—An instrument for finding ranges and distances to inaccessible points consists of a graduated bar A B H, Figs. 2 and 3, to which are hinged a limb C D, Fig. 3, and a guide-rod F G. The free end of the guide-rod F G slides on an index-rod or indicator D I which is attached to the links C D by a hinge D. To use the instrument, a staff is set up at a point in a line at right-angles to the range through its accessible end, the perpendicular being determined by means of an optical square &c. The bar A B H is set up on a stand at a distance of, say, 50 yards from the accessible end of the range and perpendicular to the range, the fore and back sights H and B being aligned on the staff and the accessible end of the range. The limb C D is then turned until the sights E and H, or a telescope mounted on the limb C D, are aligned on the inaccessible end of the range or other distant object. The index-rod D I then indicates the length of the range on the graduations of the bar A H. The bar A H is previously graduated experimentally, using an accessible and divided range-line. The clasps B and K, Fig. 2, hold the rods together when the instrument is folded, the clasp B forming the back-sight of the bar A H, Fig. 3, when raised. The wire sight E points downwards and is received in a notch in the bar A H for protection when the instrument is not in use; the back sight N is similarly protected. A rifle may be fitted with a light lens, indicator and guide-rod adapted to close along the barrel.

1099. Gedge, W. E., [*Granjon & Combeaud*]. March 30. [*Provisional protection only.*]



Levels.—A level consists of two vertical glass tubes A, Fig. 1, containing liquid and connected by an india-rubber tube B. The two tubes A fit in sockets D at the ends of a box C fitted with a sliding bottom having a hole for fixing the apparatus to a rod. When not in use, the tubes may be packed inside the box which is then closed by the sliding bottom.

1124. Wirth, F., [*Steinheil, A.*, and *Steinheil, E.*]. March 31.

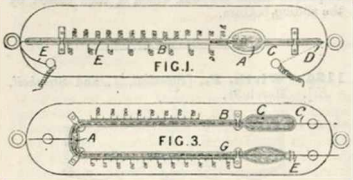


Lenses.—Relates to a combination of two compound lenses for use for optical purposes where bright &c. images are required. Each compound lens consists of two parts cemented together, and is placed at an adjustable distance from the other compound lens. The two exterior lenses are made of flint glass, and the two interior of crown glass. The interior surfaces R^2, R^3 of each compound lens are of equal, or nearly equal, curvature. The external surfaces R^1, R^4 of the crown glass lenses are of unequal curvature, the surface R^4 having the greater curvature, while of the external surfaces R, R^5 of the flint glass lenses the surface R has the greater curvature.

1147. Sparkes, A. L., and **Marsh, C.** April 2.

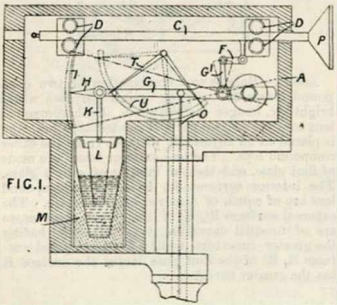
Thermometers, alarm. The bulb A, Fig. 1, of the tube B is partially filled with mercury, a bubble of air or other expansible body, such as carbonic acid or spirits of wine, being left above the mercury. A wire D leading from a battery passes through the end C and is in contact with the mercury. The other end of the tube is fitted with a similar wire E, the end of which may be adjusted to a particular temperature indicated by the graduations. When the mercury reaches the end of the wire E, the electric circuit is completed

and a bell is rung. Fig. 3 shows a form of thermometer in which the alarm is given when a maximum or minimum temperature is reached. The mercury bulb A communicates through the tube B with a



bulb C containing spirits of wine or other expansible body. A fixed wire *c* passes through the bulb C and an adjustable wire E enters the tube G. With an increase of temperature, the mercury flows along the tube G and completes the circuit when the temperature at which the wire is adjusted is reached. A similar action occurs when the temperature decreases, the circuit being completed through the wire *c*.

1177. Ballingal, R. April 4.

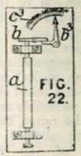


Anemometers.—The wind acts on a disc P attached to a rod C, the movement of which is resisted by a wooden plunger L dipping into a cup of mercury M. The rod C moves between antifriction rollers D, the motion being transmitted by a link F to the arm G^1 of a bell-crank lever. The other arm G of this lever is connected by a link K with the plunger L, and the end H moves over a scale I. The apparatus is contained in a box A mounted on a pole, a vane or other appliance being provided to keep the disc facing the wind. The pointer of a dial situated at the lower part of the pole is actuated from the arm G by a wire O or other connection. The pointer T of a tell-tale for indicating the maximum pressure moves over a scale U and is actuated by a stud on the arm G; the stud moves the pointer in one direction only. The times at which maximum and minimum pressures occurred are registered by a metal pencil or pen moving over chemically-prepared paper; the pencil or pen is connected with the positive wire of an electrical apparatus, and is acted on by the motion of the bell-crank lever.

1206. Holmes, S. April 7. [*Provisional protection only.*]

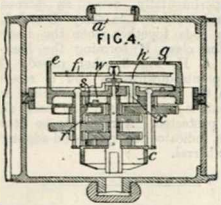
Microscopes; telescopes.—By means of a double achromatic prism, with its inclined surfaces towards the object glass, each half of the beam of light is reflected into the opposite eye-piece. The two tubes move about a centre, so that, on removing the prism, one may be used as a monocular instrument.

1225. Guest, J. H. April 8.



Thermometers.—A thermometer consists of a hard rubber rod or tube *a*, which, on expanding by heat, acts through a lever *b* upon a lever hand b^3. The hand b^3 records the temperature upon a dial c^3. The expansion of the rubber rod or tube may also release the clockwork mechanism of special alarm apparatus when a definite temperature is reached.

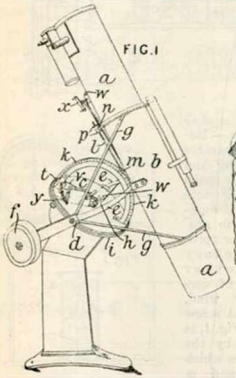
1232. Clark, J. April 9.

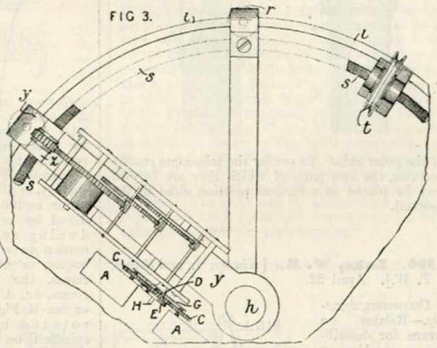


Compasses, magnetic.—The deviation of a ship's compasses is ascertained and corrected by comparison with the reading of a compass towed in the wake of the ship. The needle is fixed in position before being drawn on board by a spring or by clockwork. The case may be of copper, brass, zinc, gutta-percha, wood, or other non-magnetic substance, and is formed with conical ends and with a keel, ribs, or fins to keep it in trim. The tow line is attached at one end and is formed with a core of spiral copper wire, through which passes a copper wire for releasing the spring to fix the

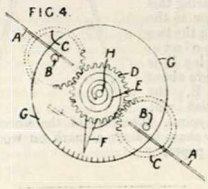
needle. Fig. 4 shows a section through the central part of the case fitted with a clockwork arrangement for fixing the needle. The motor spring, contained in a box *c*, drives a wheel *w* through the gearing shown. This wheel carries a cam *x* which presses up the spring *h* to hold the card against the frame *g*. A spring on a pinion presses against the case *s* and retards the unwinding. An eye-piece *a* is fitted at the top, and a sight *e* is provided for determining the bearing. In a modification, the card is fixed by a screw propeller extending through the case.

1353. Berthon, E. L. April 18.



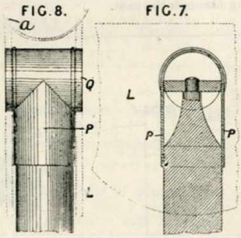


Telescopes, equatorial, counterpoising, mounting, and driving. In the form shown in Figs. 1, 3, and 4, the tube *a* of the telescope is carried in a cradle *b* which is supported by curved arms *e* and stays *g* from the trunnions *d* on the plate *c*. The plate *c* is held by a pivot *h* to a lower plate *i* parallel to the equator, the pivot *h* being arranged at the centre of gravity of the moving mass. On the ends of the arms *e* are fixed the two counterpoises *f*. On the upper disc *c* is the declination arc *k*, over which a vernier, attached to the cradle, moves, and to which is clamped, by a screw *m*, one end of the declination rod *l*. The other end of this rod passes through an eye on the cradle, fine adjustment in declination being made by two nuts *p*, *p*. The right ascension circle consists of a shifting band of metal on the circumference of the lower disc *i*. The slow motion in right ascension is preferably effected by a nut moving along a screw-rod bent in an arc. Revolving about the central axis *h* is a radius bar, Fig. 3, with a clamping-screw *r* to fix it to the lower disc, and on it is fixed the curved screw *s*. The grooved nut *t* which works on this screw is cut with a taper tap from both sides, to prevent backlash, and is mounted in bearings in the arc *k*. A cord *v* passing round the nut and round pulleys *w* enables the telescope to be moved in right ascension by moving the lever *x*. For obtaining automatic motion, clockwork is attached to the radius arm *y*, and gears with a nut *z* mounted in bearings on the arm and working on the bent screw *s*. The clockwork is regulated by a fly, Fig. 4, which opens or closes its wings according to the resistance. The wings A have wheels C on their axes which gear



with a centre-wheel D controlled by a spring E; the whole is supported on a plate G revolving with the spindle H. In a modification, there are cylindrical tubular joints both for the right ascension and declination movements, the two tubes being placed at right-angles. In a further modification, shown in Figs. 7 and 8, there is both a tubular joint and a pivot for the right ascension movement of large instruments, the telescope *a* being fixed to side plates L which revolve on short trunnions Q cast in one with the top revolving part P. This form of telescope can be moved in

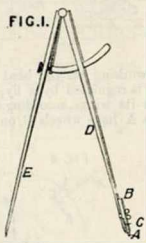
right ascension by means of a tangent screw or by the curved screw *s*. When the curved screw is used, it is carried between the ends of radial arms on a frame, which is clamped to the moving part



of the polar axis. To render the telescopes readily portable, the two parts of which they are formed may be placed in a vertical position close to the pedestal.

1395. Lake, W. R., [*Kinney, I.*, and *Smart, T. W.*]. April 22.

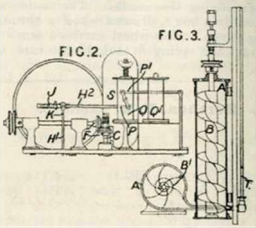
Compasses, drawing.—Relates to means for describing scrolls or spirals. On one leg D of a pair of compasses is mounted a stay B which carries a wheel A on an axle C. By placing this wheel askew to the line joining the two compass points, while the leg D is free to move about the leg E, the pencil point will describe a spiral. The edge of the wheel may be sufficiently sharp to leave a mark on wood, metal, leather, or paper.



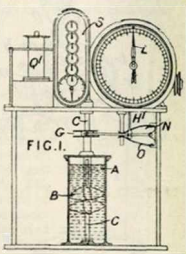
1416. Robinson, F. O'C. April 23. [*Provisional protection only.*]

Logs.—An open case fixed to the keel of the ship carries a turbine, fan, or water-wheel, connected to counting-mechanism on the deck. By use of a drum turned by clockwork and a pencil actuated by the counting mechanism, the speed is registered.

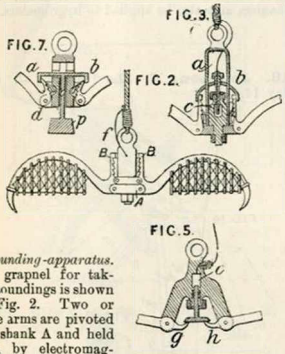
1459. Wier, M. A. April 27.



Current meters; anemometers.—Relates to apparatus for indicating and recording the speed of revolving machinery, or of rectilinear motion produced by or producing rotary motion in other bodies, or of carriages, the wind, rivers, &c. A screw or fan B, Fig. 1, is rotated by the spindle C, on which it slides and is maintained in a normal position, when at rest, by springs N, O acting through a lever on a collar G. The fan rotates in a cylinder A full of water, oil, or other suitable fluid, preferably glycerine or glycerine and water. The revolution of the fan causes it to ascend or descend on the spindle C, and to raise or lower the link H^1, Figs. 1 and 2, connected to a lever H^2 which, by means of a toothed sector J, rotates a pinion K on the arbor of the pointer L, Fig. 1. The spindle C is rotated by bevel-wheels F, Fig. 2, and may be fitted with a worm-wheel which actuates a counter S. Records may be made upon a sheet of paper, wound on bobbins Q, Q^1, by a pencil P^1 on the parallel motion P. The screw B may revolve in air. In a modification shown in Fig. 3, air is forced into or drawn from a tube T by a screw B or a fan B^1. The tube T forms a continuation of the bent tube of a manometer, and the difference of level of the mercury or other fluid in the arms of the manometer indicates the speed of revolution of the objects from which the screw or fan is driven. In a modification, the screw B rotates in a liquid in the chamber A, which is connected at the bottom to a vertical tube T, open at the top. The tubes T may be of metal, the level of the liquid and the speed of the revolving objects being shown on a dial by a pointer connected to a float in the tube. A light rod may be placed in the open tube, the lower end resting on the surface of the liquid, the upper end indicating the position of the surface on a suitable scale.

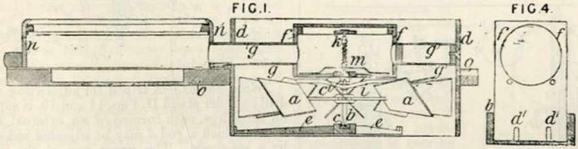


1559. Clark, A. M., [*Toselli, J. B.*]. May 2.



Sounding-apparatus.—A grapnel for taking soundings is shown in Fig. 2. Two or more arms are pivoted to a shank A and held open by electromagnets B excited by a current carried by a wire *f* passing through the suspending-rope, the water forming the return circuit. When the current is stopped, the arms fall together and enclose any object at the bottom. In a modification, a permanent magnet is employed to hold the arms in the open position, but is neutralized by an electric current in order to release the arms. To prevent the arms from opening after being closed, ratchet teeth on their ends are engaged by pawls on the shank. In another modification, the shank is provided with a cylinder *c*, Fig. 3, fitted with a plunger working through a stuffing-box *b*; water under pressure is supplied through a small tube *a* arranged in the rope and connected to the plunger which is thus forced from the cylinder and lifts a hood or ring engaging the arms of the grapnel, leaving the arms free to close. Fig. 5 shows a similar arrangement in which the plunger is lifted by exhausting the air in the cylinder *c*, the inner ends *g*, *h* of the arms resting on the cap of the plunger. In another modification, shown in Fig. 7, the arms are engaged by a hood *a*, *b* attached to a stem carrying a weight *p*. Before the arms reach the bottom, the weight *p* and hood are lifted, leaving the arms free to close. The arms may be connected to a second rope which holds them open during lowering but is released to allow the arms to close.

1567. Lowne, R. M. May 4.



Anemometers; current meters.—Relates to anemometers or other fluid meters for denoting the movement or velocity of currents of air, gases, or fluids. A fan-wheel *a*, having blades arranged at an angle of about 45°, is mounted on jewels *c*, c^1 within a tube *d* so that its rotation is proportional to the velocity of the current of air &c. The lower jewel *c* is carried by three arms *e* and the upper one c^1 by the bottom of a box *f* which is supported by tubes *g* and contains a screw *k* carrying a soft iron bar *m*. The motion of the fan-wheel *a* is imparted to recording or indicating mechanism contained in the box *n* through the action of a magnet *i* which is fixed on the axis *b* of the fan wheel and attracts the iron bar *m*. The tube *d* and box *n* are fixed to a double circular plate *o* which may be attached to a wooden block *f*, Fig. 4, so that the tube *d* fits the circular opening therein. The block *f* may be carried within a box *b* provided with pins d^1 for engaging holes in the bottom of the block *f* and supporting the apparatus in a vertical position when in use.

1587. Johnson, J. H., [*Redier & Co.*]. May 5.

Barometers; specific-gravity estimating-apparatus; thermometers; hygrometers.—The invention consists in applying clockwork mechanism to instruments for determining pressure, weight, temperature, &c. in such a manner that the index hand can be worked over a large dial, and a recording-apparatus be better employed. Fig. 1 shows the application to an aneroid barometer. The index C of the aneroid D carries a cross-piece *a* at the end, so that when the index is moved to one side or the other, one or other of the flyers B, B^1 is liberated. The flyers are worked in opposite directions from springs A, A^1 through gearing 1, 2, 3, 4. The spring barrels B, B^1 have wheels E, E^1, Fig. 4, gearing with differential gearing F, F^1, G. From the pinion G a spindle H is worked which carries the large index. In order that the cross-piece *a* may hold both flyers when the barometer is neither rising or falling, the whole barometer is turned

round in one direction or the other from the spindle H through gearing I &c. and a segmental rack O formed on the plate carrying the barometer. The pencil carrier of the recording

FIG.1.

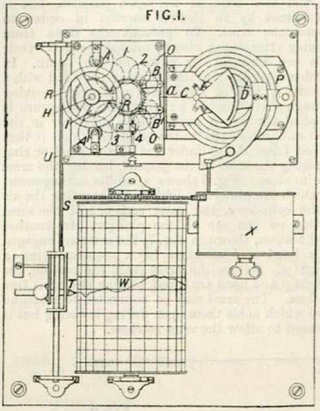


FIG.4.

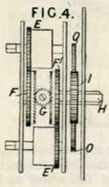
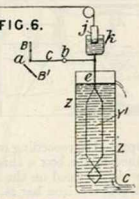


FIG.6.



apparatus slides on a rod U and is worked by a chain S passing over a pulley R on the spindle H. The barrel W is rotated by clockwork X. In a modification, one of the flyers is dispensed with and an escapement, constantly working, is substituted. In the case of a mercurial barometer the cross-piece is connected to a float. The barometer itself is made to rise and fall instead of oscillating as before. The same principle is applied to indicate and record the change of density of alcohol produced in a distillery. In Fig. 6 is shown a vessel Z through which a flow of liquid is kept. The stem e of the hydrometer Y^1 floating in this liquid is connected to the cross-piece a through a rod C pivoted at b. The apparatus is moved for holding the flyers B, B^1 by means of a plunger j dipping into a vessel of liquid k on the stem of the hydrometer ; this plunger is moved from the spindle H by a cord and pulley R^1. In the case of thermometers, an open mercurial instrument is used which discharges its excess due to expansion into the scale of a balance, the oscillation of the beam of which actuates the above mechanism. The mechanism may also be applied to hygrometers.

1718. Johnson, J. H., [*Waring, J. B.*]. May 14.

FIG.14.

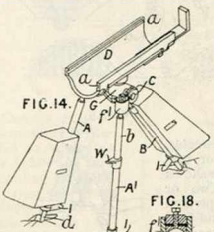


FIG.18.

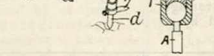
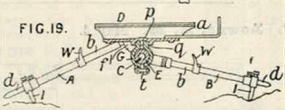


FIG.19.



Tripod stands.—A tripod for supporting a rock-drill cylinder stand D, Figs. 14 and 19, is supported on three legs, each formed of an external tube b, within which a rod d may be adjusted and secured by a set-screw. The upper end of the leg B is forked and secured by a bolt C to a cylindrical frame E forming the top of the tripod and having two arms f^1 with which the legs A and A^1 make ball and socket joints, Fig. 18. A circular recess p in the stand D fits over a circular projection q formed partly on each of two clamps G embracing the frame E. The stand D may thus be rotated laterally to any position and secured by tightening the bolt t. Adjustable spurs I are fitted to the rods d for supporting the legs when outstretched to lower the stand, and weights are hung on the hooks w when the drill is working. These weights are grooved to rest against the tripod legs.

1857. Casartelli, J. L. May 27.

Miners' dials.—The graduated arc, hitherto separate, is fitted above the compass and made to turn down, when not in use, between the compass box and the ring which carries the sights. The angle of rise or fall is shown on this arc by two pointers on the ring carrying the sights. Fig. 1 shows a dial with the graduated arc in position for

use, and Fig. 2 a portion of the arc and one of its pivots.

FIG.1.

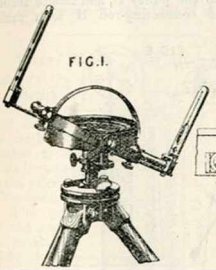
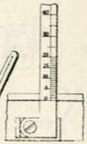


FIG.2



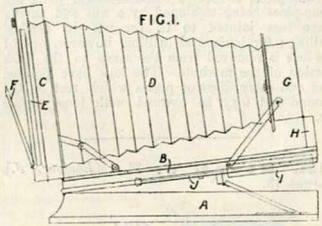
1885. Clark, A. M., [*Malligand, P. M. E.,* and *Brossard-Vidal, M. E. E.*]. May 29.

Alcoholmeters; boiling points of liquids, instruments for determining; thermometers.—In apparatus for obtaining the percentage of alcohol in liquids by determining their boiling points, and applicable to the determination of boiling points generally, the liquid is contained in a vertical cylindrical boiler and is heated in a spiral tube connected to the boiler so that circulation is set up in the liquid. The spiral tube passes through a chimney and is heated directly by a lamp. An inverted condenser, consisting of a tube surrounded by a water jacket, is fitted on the screwed cover of the boiler, the condensed liquid running back into the boiler. A thermometer, passing through a hole in the cover and having its stem bent so that the graduated part is horizontal, is attached to a horizontal bar which is fixed on the cover and carries a movable scale graduated empirically to indicate the percentage of alcohol. A lens or telescope is provided for reading the thermometer, the calibration of which is verified by a scale carried on a jointed bar of wood. A conical deflector, notched or indented at its larger base, is fitted in the boiler to prevent the boiling up of the liquid and to deflect the hottest liquid towards the centre. When using the apparatus, water is first boiled and the zero is brought opposite the reading of the thermometer immersed in the steam. The liquid is then boiled, the reading on the movable scale corresponding to the end of the mercury giving the percentage of alcohol.

1886. Rowsell, C. J. May 29.

Graphoscopes; stereoscopes.—Relates to apparatus for viewing transparent and opaque pictures or objects. Fig. 1 shows the apparatus arranged for viewing transparent pictures. The picture holder C and the lens holder G are supported on a piece B hinged to the base A. The two holders are connected by the collapsable camera bellows D. The picture is viewed in a slit E and is lighted by a reflector F. When viewing single pictures, the stereoscope

FIG.1.

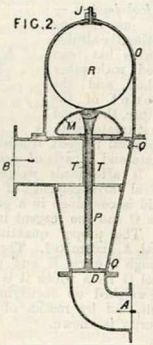


lenses are turned down about the piece H, and the single lens I, which slides on rods J, is turned up. For opaque pictures, the camera is closed and the picture is supported on a stand inserted in the holder C.

1909. Muirhead, L. P. June 1. [*Provisional protection only.*]

Logs.—Consists of a conical casing Q, Fig. 2, having an inlet A and outlet B and fitted with a piston or valve D, the rod P of which is guided in a tube T and carries a mushroom head M bearing against a rubber ball R secured in a cover O. The forward orifice of a "Pitots" "tube" is connected to the inlet A, and the aft orifice to the outlet B. The piston D is raised by the pressure of the water flowing through the apparatus, and the air in the ball R is compressed. An aneroid barometer is connected with the ball R by a tube J and thirty feet of piping, which is allowed for in graduating the dial and is unwound from a pillar as required. A Bourdon gauge may be used and be combined with a drum revolved by an eight-day clock to give a continuous registration. Several dials may be in communication with the ball R.

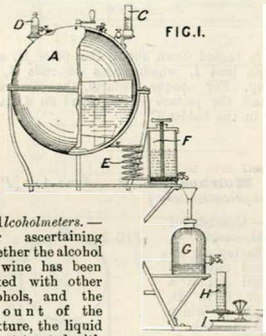
FIG.2.



2085. Sturgeon, T., and **White, W. G.** June 16. *Drawings to Specification.*

Tripod stands for rock drills. A spherical part on the steam &c. cylinder of the drill fits into a strap-piece, to form a ball-and-socket joint, the strap-piece being tightened by a nut and having three legs jointed to it, for use in vertical drilling; for horizontal drilling, however, one of the legs is removed from the strap to the back portion of the machine. The legs have pointed feet and carry discs or plates which rest on the ground and may be covered with loose stones &c.

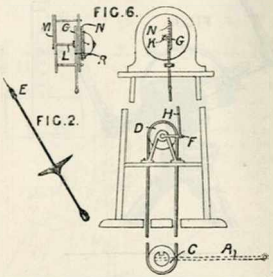
2124. Gedge, W. E., [*Bonjour, J.*]. June 18.



Alcoholmeters.—For ascertaining whether the alcohol of wine has been mixed with other alcohols, and the amount of the mixture, the liquid is first treated with a chemical reagent, consisting of 97 parts of lead acetate and 3 parts of alcohol from grain at 96°, and is afterwards weighed. Fig. 1 shows the general arrangement of the apparatus. The liquid is contained in a graduated gauge or test glass C and the reagent in the graduated vessel D. The proper quantities are run into the vessel A and mixed. The mixture is then passed through a worm E and pressure filter F to a vessel G from which it is drawn into a tester H and weighed on rectifying scales I; from this result, and by means of tables, the amount of impurity is known.

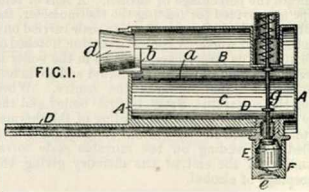
2351. Poole, G. A. July 6.

Sounding-apparatus.—Apparatus similar to that described in Specification No. 3823, A.D. 1873, is employed, a chain, wire rope, or single wire, weighted at the end, being used instead of a rod. The upper end of the chain or wire is connected to a lever A mounted on the shaft of a chain-pulley C arranged just below the bridge of the vessel. The movement of the lever A, as the weight or lead drags on the ground or strikes against rocks &c., is communicated from the pulley C to the pulley D, and thence through a crank F and connecting-rod H to a rack G



gearing with a pinion K carried by a shaft L of an indicating-apparatus on the bridge. This shaft is provided with an index M moving over a dial graduated to read fathoms, and also carries a wheel N having projecting-pins for operating the hammer of a bell R; the number of pins correspond to the number of fathoms marked on the dial. The weight or lead is shaped as shown in Fig. 2 and is attached by a swivel on the rod E. This rod projects below the lead and terminates in a knob to prevent the lead from being fixed in any soft bottom of sand or mud. When an electric bell is used, as described in the former Specification, means are provided for breaking the circuit when desired.

2366. Clark, A. M., [*Bliss, S. B.*]. July 6.

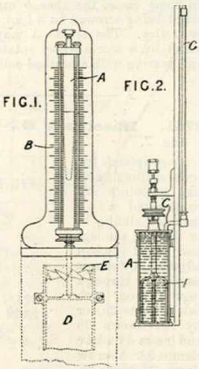


Bubbles, apparatus for blowing.—A casing A, preferably divided into two compartments connected by a slot *a*, receives the soap and water through an opening *b* fitted with a cork or stopper *d*. The exit tube F is fitted with a valve E which only allows a few drops of water to pass at one time. The valve rod *g* passes through the casing A, as shown, and is operated through a spiral spring and rubber discs, or it may be applied directly to a

rubber valve fitted on the exit tube F. By blowing in an air tube D connected with the casing, soap bubbles are rapidly produced at the central hole *e* of the convexo-concave face of the tube F.

2432. Wier, M. A. July 11.

Anemometers; current meters. — Relates to a speed indicator for machinery and the like, stated to be applicable for ascertaining the velocity of the wind and of rivers. The position of the vertex of the paraboloid formed by the surface of a revolving liquid serves to indicate the speed. The liquid is contained in a glass vessel A, Fig. 1, mounted near a graduated scale B and driven by a band or otherwise from the moving object. The containing vessel may be of metal, in which case a float is employed to move an index. In another arrangement, shown in Fig. 2, the containing vessel remains stationary while the liquid is rotated by a blade B. The cylinder A is filled with liquid to a height somewhat above the lower end of a tube C opening into it. When the blade B rotates, the liquid rises at the circumference of the cylinder and a corresponding elevation of the liquid in the tube C takes place; the amount of such elevation then becomes a measure of the speed. A convenient arrangement for driving the vessel A or the blade B, especially when the instrument is situated at a distance from the moving object, consists of wind vanes E, Fig. 1, arranged in the spindle F, and operated by a current of air in the tube D; this current of air is caused by a fan driven from the moving object.

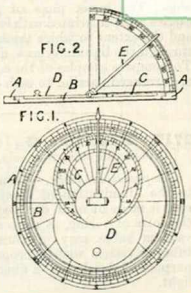


2473. Molony, J. F. July 15. [*Provisional protection only.*]

Sounding-apparatus.—Relates to an apparatus for warning ships of their approach to shallow and dangerous waters. A sounding-rod is fitted to each mast, or to one only, so as to work vertically through an open tube in the hull and pass down below the keel to the required depth. Guys leading to the fore foot and passing through a tube to the upper deck are employed for maintaining the rods in a vertical position. A ball on the lower end of each rod, by coming in contact with a submerged obstruction, will actuate an electric alarum bell, and thus give the necessary warning.

2583. Gedge, W. E., [*Pierson, C.*] July 24.

Bearings, instruments for determining; compasses, magnetic, correcting. Relates to an instrument which can be used to test the accuracy of magnetic compasses, or as a compass or a sundial. The outer and inner rings A and B, marked with the points of the compass, and independently rotatable, are mounted on a weighted box hung on gimbals. In the inner ring B are fitted a sundial plate C and a metal filling-in plate D, the positions of the two being interchanged when observations are made in southern latitudes; or two sundial plates may be fitted. At the centre of the dial is hinged a gnomon E, adjustable for latitude against a vertical arc; or the arc itself may be hinged and be used as a gnomon. The gnomon being set for the latitude, the meridian can be found when the time is known, and *vice versâ*, the time can be found when the meridian is known. The outer disc A is set with the disc B to allow for atmospheric refraction, variations of the compass, and difference between mean and solar time. Each compass is provided with a series of hour dials for different latitudes; the hour dial may be dispensed with and a circle of degrees concentric with disc B used in conjunction with tables. A modification, used only for correcting the magnetic compass, consists of a gnomon, having a slit to allow a beam of light to pass through, and a compass card, the line of light being made to coincide with the N and S line when the sun, moon, or star crosses the meridian.



2611. Crawford, T., and **Russell, E. N.** July 25. [*Provisional protection only.*]

Optical instruments, telescopic or sliding joints for. To prevent the inner sliding tube or rod from being scratched, it is fitted at its inner end with two rings, which fit inside the outer tube. The inner end of the tube and one of the rings is split to form a kind of expanding or spring joint. A screw ring at the end of the outer tube is packed inside with leather to exclude dust.

2633. Tinker, W., [*Munnich, J. T.*]. July 28.

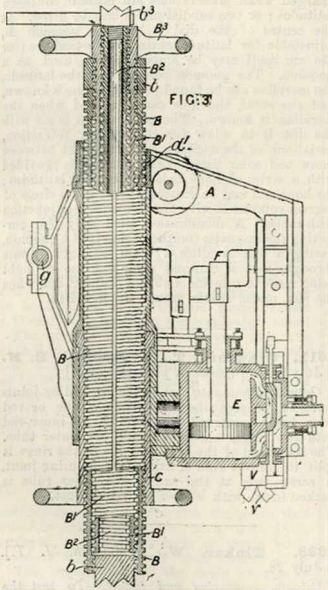
Colours, comparing and testing.—To test the quality of colouring-matters, pigments, extracts, powders, &c., they are first diluted with water and

placed in a box in which two pieces of glass are arranged so that the angle between them is adjustable. The lower piece of glass is engraved, or carries a paper printed with letters, lines, or figures, and the extent to which the letters &c. can be seen through the liquid forms a measure of its quality. To compare samples of the colours &c., the glasses are arranged parallel to each other.

2717. Haseltine, G., [*Cook, H. O.*]. Aug. 5. [*Provisional protection only.*]

Compasses, magnetic.—Vacuum tubes are applied to the illumination of compass cards &c. The card is made of mica &c., and the vacuum tube, in the form of a ring, is suspended below it. The vacuum tubes may be furnished with internal tubes or vessels with appropriate contents for the purpose of developing a fluorescent and persistent light.

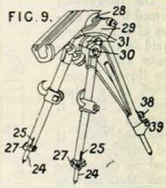
2728. Tregay, W. Aug. 6.



Stands for rock drills. The machine frame A is fitted, and free to turn, on a female screw C, which may travel on the outer screw section B of a telescopic stand, so as to raise or lower the machine. The part B carries a shoe *b* to fix in the rock and a nut b^1 to receive the section B^1, in the upper part of which works the section B^2 carrying another shoe b^2. By turning the hand-wheel B^3, the sections B^1, B^2 are extended simultaneously. In some cases, the shoe *b* may be removed, the stand being screwed on a foot bolted to a pedestal or trolley. The frame A may be turned on the stand by a worm-wheel rotated by a hand-wheel and gearing with a toothed collar d^1.

2741. Haseltine, G., [*Thurston, R. H.*]. Aug. 7.

Tripod stands for rock-drilling and like machines are constructed with bars 24 sliding in or through the legs and held, when adjusted, by screws passing through lugs 27 on each side of slits 25, or by set-screws 38 and removable clamps 39. A screw clamp 29 binds on a stud 28 projecting from the machine bed, and a similar clamp 30 made in one with it embraces a cylinder made fast to the tripod, a universal joint being thus formed. The cylinder is formed of piping, its ends being capped by the sockets 31 of the tripod, within which the cylinder may revolve; the sockets and pipe are kept in position by bolts.



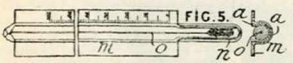
2918. Casella, L. P., and **Denton, S. G.** Aug. 26. [*Provisional protection only.*]

Thermometers, maximum and minimum. Relates to mercurial minimum thermometers having an additional chamber communicating with the mercury in the thermometer, the end of the outlet of which chamber forms a flat surface or stop, termed a diaphragm, so that the flow of mercury out of the chamber into the indicating tube ceases on reaching the fixed point owing to the adhesion of the mercury to the diaphragm. The mercury falls with the temperature, but does not rise in the tube when the temperature rises. The improvements consist in making the additional chamber of uniform bore, and preferably horizontal, and communicating with the bulb or tube of the thermometer. The diaphragm may be formed by fitting the chamber into a portion of larger bore, the flat end of the chamber constituting the diaphragm. Or a fixed or movable plug of glass may be used in the additional chamber. For a maximum thermometer, the additional chamber is filled with mercury to cause mercury to flow towards the bulb when the temperature decreases.

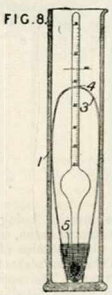
2929. Humy, P. R. de F. d'. Aug. 27.
[*Provisional protection only.*]

Thermometers.—A bell or gong consisting of a coil of metal wire may be adapted as a thermometer by fixing a pointer to one end of the wire over a fixed scale; the contraction or elongation of the wire moves the finger over the scale to indicate the temperature.

3073. Clark, W., [*Granier, E.*]. Sept. 7.
[*Provisional protection only.*]

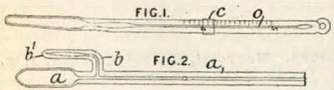


Thermometers.—A thermometer *o*, *n*, Fig. 5, for use in an apparatus for testing the ignition point of mineral oils, is provided with two scales and enclosed in a metallic casing *m* lined with cork *a*, openings being left round the bulb *n*.



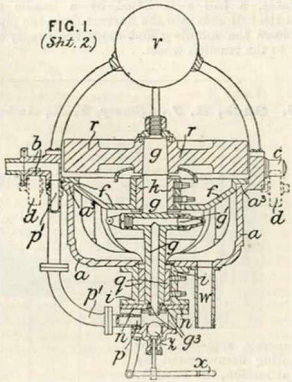
Specific-gravity estimating-apparatus.—To prevent breakage of the bulb in a hydrometer for testing the specific gravity of mineral oils &c., the stem passes through an aperture 4, Fig. 8, in the spring 3 which is inserted in the glass 1 and provided with a wirework casing 5 at its lower ends.

3114. Negretti, H., and **Zambra, J. W.** Sept. 10.



Thermometers.—Relates to minimum and clinical thermometers. In mercurial minimum thermometers, the ordinary tube *a*, Fig. 1, is provided with a supplementary tube *b* terminated by a capillary tube b^1, placed either behind the bulb or between the bulb and the index. In clinical thermometers, the indicating-column consists of alcohol, coloured fusel oil, or creosote; the tube, shown in Fig. 2, is made with a wide bore just above the bulb and a narrow bore above the wide bore, the zero of the scale being at the temperature of a healthy person. A sliding index is attached to the tube.

3274. Bessemer, H. Sept. 24.



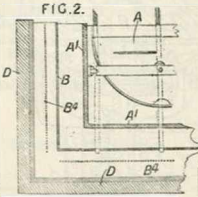
Gyroscopic apparatus.—Relates to the invention described in Specification No. 1742, A.D. 1870, [*Abridgment Class* Hydraulic machinery &c.], in which the axial motion of suspended ships' saloons &c. is controlled by hydraulic apparatus fitted with equilibrium valves, and with a handle which is operated by an attendant for regulating the supply and escape of water to the cylinder. The present invention consists in fixing the valve box on the floor of the saloon so that the movement of the saloon itself regulates the opening and closing of the valves, the attendant merely maintaining the lever in horizontal position; the axis of the handle is supported on a pair of frames in a line with the axis of the saloon. For rendering the valve automatic, its spindle is connected by a lever and rod with the frame of a combined gyroscope and reaction wheel, a cross-section of which is shown in Fig. 1, the handle being connected to the opposite sides of the frame. The frame *a* is circular and supported by trunnions *b*, *c* on rollers *d*, the trunnions *b* being hollow for admitting water through a pipe p^1 to the bottom of the apparatus. The frame is also formed with shoulders a^3 to receive a casting *f*, the centre of which carries adjustable brasses *k* embracing the hollow spindle *g* of the gyroscope *r*, the spindle being furnished with arms g^1 having orifices for allowing water to escape in the direction of a tangent to the line of rotation. The lower end of the spindle enters a box *i* fixed to the frame and fitted with adjustable brasses *q*, the extreme end being formed with a shoulder g^3 which is prevented from bearing on the plate *n* by a film of water admitted between the spindle and the plate. To neutralize the tendency of the apparatus to oscillate with the motion of the ship, a ball *v* is supported at the top

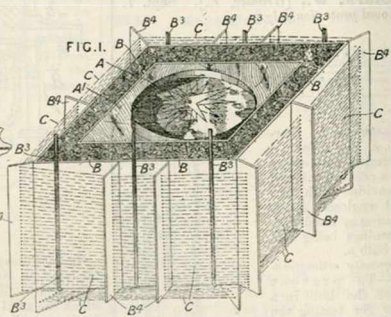
of the frame. On admitting water under pressure through the pipe p^1 to the spindle g, it passes up the latter and escapes through the arms g^1, its reaction causing the wheel r to revolve. The water escapes through the pipe w. To stop the apparatus, a ball z is lifted by a handle x. When the ball gets into the current from the pipe p, it closes the spindle g and stops the supply of water to the reaction wheel.

3275. Ladd, W., and **Hilger, A.** Sept. 24. [*Provisional protection only.*]

Spectroscopes.—Lenses in the collimating and observing tubes are dispensed with, and the surfaces of the prisms are cylindrically curved; the ends of the two tubes fit against and move about these curved surfaces, or the prisms may be mounted in the tubes.

3539. Such, H. J., [*Benary, F. H., Anthony, T. T.,* and *Seimunds, C. H. E.*]. Oct. 14.





Compasses, magnetic.—For preventing derangement by local attraction, the bowl A, Fig. 2, is mounted in a wooden box A^1, which is enclosed by a zinc casing B, the space between the two being filled with powdered vegetable charcoal sprinkled with an aqueous solution containing alum and gum arabic. Three glass tubes B^3, Fig. 1, pass down one side of the casing B, extend across the bottom and up the opposite side, as shown. These glass tubes contain a cooling-solution composed of salt, sal ammoniac, and water. Zinc plates B^4 are fitted diagonally at the corners of the casing B and also along the sides; four similar plates are also arranged diagonally across the bottom. Perforations are made in the plates B^4 for receiving a copper wire C forming an endless chain and passed through the holes in succession. The whole apparatus is then placed in a box D of oak, teak, &c., the interior being lined with a woollen cloth, preferably green, which is protected by a thickness of glass. Strips of tinfoil or the like are pasted on the glass plates to within a short distance from the top. The spaces between the casing B and box D are filled with powdered glass saturated with a solution containing sulphuric acid, hydrochloric acid, and water. The top of the glass filling is covered with tinfoil, and above this is placed a layer of compressed cotton, the whole being kept in place by a cover of oak, teak, &c., having a central aperture for viewing the compass.

3552. Gray, J. M. Oct. 15. *Drawings to Specification.*

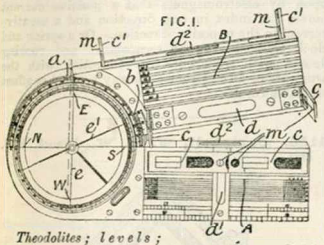
Gyroscopic apparatus.—Relates to apparatus for controlling the valves of pressure cylinders for lessening the oscillations of saloons and platforms on vessels of the kind described in Specification No. 3274, A.D. 1874. It consists of a revolving flywheel carried by a frame mounted on knife-edge trunnions, the axis of which is at right-angles to the axis of the flywheel. The frame is connected by rods and levers with the valve-rod, so that as it tilts with the motion of the vessel, the valve is actuated to admit fluid to the cylinders.

3585. Negretti, H., and **Zambra, J. W.** Oct. 19. [*Provisional protection only.*]

Thermometers, clinical. To indicate at once whether the body is above or below the normal temperature, the zero point is at the normal temperature and the graduations above and below this. Above the bulb the tube has a wide bore which gradually passes into a narrow bore, so that the instrument will be very sensitive. An index slides on the stem. Coloured fusel oil or creosote is preferably used which is easily seen in a fine bore and also allows the instrument to be immersed in hot water to get rid of an air bubble, when necessary.

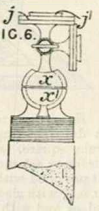
3616. Francis, G. Oct. 21.

FIG.1.



Theodolites; levels; angle-measuring instruments; tripod stands.—Comprises a pocket theodolite and stand which can be used for ordinary levelling, for magnetic surveying or "dialling," and as a clinometer &c. It is formed of two arms A, B pivoted or jointed together at their circular ends like a folding-rule and fitted with spirit levels d, d^1, d^2 and hinged or folding sights c, c^1 on the fronts and sides. A scale a for measuring angles is formed on one or both of the circular ends and a vernier b is carried on the arm B. Scales are also formed on the upper surfaces of the arms, and a protractor scale for plotting angles on the outer side or edge of the arm A and on the square and round ends of the instrument; or the protractor scale may be formed on the inner half of the circular end and used when the arms are open. Semicircular scales are also formed on the back of the instrument for showing the angles "in inches to the fathom" and the length of the base of the angle. A magnetic needle e^1 is balanced in a recess e sunk in the circular end of the arm A and marked with the points of the compass. When in use, the instrument is fixed on a tripod stand by means of a bevelled or dovetail projection j^1, Fig. 6, which is formed on a revolving table j connected to a ball-and-socket joint x, x^1, so that it can be turned down at right-angles, as shown, for enabling the instrument to be used for taking vertical angles. The instrument may be screwed to the top of the ball-and-socket joint, in which case the socket is grooved to allow the neck and table to be turned down, and the joint is split vertically and clamped by a screw. In the joint shown, the socket is formed in two parts which screw together to clamp the joint. For "dialling," the arms of the instrument are opened to form a straight line, the outer sight c on each arm being used for making observations. For ordinary levelling, it is set horizontal and observations are taken through perforations m formed in the upper part of the sights. For taking a dip or gradient, the lower edge of the instrument is placed on the surface and the upper arm thrust into a horizontal position. The tripod, when closed, is round, and may be used as a walking-stick, the upper part being covered with a metal cap.

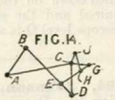
FIG.6.



3901. Kempe, A. B. Nov. 12. [*Provisional protection only.*]

Dividing-instruments.—In apparatus for trisecting angles, two equal rods A B, C D are connected by two equal rods A C, B D, and a rod E G equal in length to the rod C D is hinged at one end to a pivot E on the rod B D and at the other end to the end of a rod C G hinged to the pivot C and equal in length to the rod E D, the lengths of the rods being so proportioned that D E : D C :: A B : B D. A link-frame G H, H J, J C, C G, bearing the same relation to the link-frame E D, D C, C G, G E as the link-frame E D, D C, C G, G E bears to the link-frame A B, B D, D C, C A, is similarly constructed. The angle between the rods A C, C J is trisected by the rods C D, C G. By continuing the number of link-frames, an angle may be divided into any desired number of equal parts.

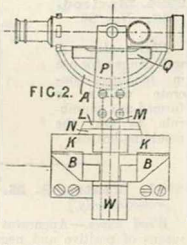
FIG.4.



3964. Scott, L. K. Nov. 18.

Range-finders.—Relates to a combined gun-sight and range-finder. The upper half of the sight is similar to a theodolite, except that a micrometer is added to the telescope, and a piece of glass on which cross-lines are cut is substituted for the cross-wires. The vertical arc A, kept in position by a spring, is for giving the elevation for "direct fire," and the level Q under the telescope is used for giving the elevation for "vertical fire," when the object fired at is out of sight. The telescope supports P are fixed to a square collar resting upon V-shaped studs M attached to the plate L. The upper plate L revolves upon the lower plate N which is graduated on its edge to enable the gunner to allow for lateral deviation, and also to find the range. The "axis of suspension" K is attached to the lower plate N, and consists of a bar with knife-edges which are placed in notches made in two brackets B on the gun in a direction parallel to the axis of the gun. A counterpoise W attached to the bar K keeps the telescope above the axis; or the telescope may be below the axis and act as a counterpoise itself. Back and fore sights are provided on the telescope to assist in

FIG.2.



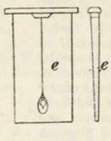
getting the line of sight roughly. In using the sight, the knife-edges are placed in the notches on the brackets, the range is found by the micrometer or by the graduated plate N, and the telescope turned down on the vertical arc to the division required; the gun is then laid on the object, and, after removing the upper half of the sight, may be fired. For "vertical fire", the telescope is turned down on the vertical arc to the elevation required and the gun is then raised until the telescope level Q is again level.

3984. Johnson, J. H., [*Baudry, C. J.*]. Nov. 19. *Drawings to Specification.*

Thermometers, alarm. Two platinum wires connected to the conducting-wires of an ordinary electric call bell are led to a mercury thermometer. One wire is inserted into the lower part of the thermometer tube and is in contact with the mercury, while the other wire is inserted into the upper part of the tube and is reached by the mercury column at a certain temperature. A small reservoir is formed in the tube at the graduation corresponding to this temperature. If a fire or elevation of temperature occurs in the room &c. where the thermometer is fixed, the expansion of the mercury closes the circuit and rings the bell.

3994. Macleod, M. Nov. 20.

FIG. 8.

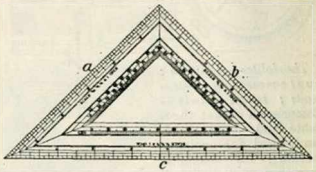


Plumb-rules.—A wall-gauge *e* for use in building concrete walls is formed as a plumb-rule to test the moulding-boards.

4141. Yeates, S. M. Dec. 2. [*Provisional protection only.*]

Wind vanes.—Apparatus for telegraphing by means of positive and negative currents may be used also to indicate the position and movement in either direction of the axis of a "weather" vane. The transmitter of an alphabetical telegraph can be worked either backwards or forwards. A tongue of gold or other metal is brought into contact with one of two points by turning the handle to the right or left. "A toothed wheel acting on "a fly by means of a pinion is so fixed to the "vibrating tongue that it prolongs the contact "and thereby ensures better electrical contact." A wheel on the axis of the handle, having, say, twenty-eight contact pins, makes the requisite number of contacts, and, at the same time, a blade between two of these contact pins acts upon a long lever to make contact with one or other of two pins according to the direction in which the handle is turned. The index of the receiver moves backwards or forwards according to the motion of the handle of the transmitter. The index is so acted upon by electromagnets that a positive current moves the index in one direction and a negative current in the opposite direction. Or a spring and clock train, having an escapement and rocking detent, with wheelwork in connection with the armature of an electromagnet may be used to effect the same result.

4155. Campbell, W. H. W., [*Smith, W.*]. Dec. 3.



Rulers; squares; protractors; scales.—Relates to a drawing-implement which forms a combined rule, square, triangle, scale, and protractor. An ordinary set-square, with cut-out centre, as shown, is provided with various scales on its outer edges *a*, *b*, *c*, with a scale of degrees on two of its inner edges and with a scale of chords on its third inner edge. For schools, the instrument is formed of stiff paper or card.

4201. Thompson, W. H., and **Kimberley, N. G.** Dec. 7. [*Provisional protection only.*]

Course indicators and recorders.—Relates to apparatus in connection with the "steering-apparatus" of ships for giving or recording the course taken or to be taken during a given time. Indicating points or pencils in connection with the steering-apparatus work in conjunction with cylinders or other moving surfaces covered with paper marked with lines denoting port, starboard, time, and courses, or with other suitable lines.

4204. Campbell, W. H. W., [*Smith, W.*]. Dec. 7.

Compasses, drawing.—Relates to a folding combination compass which may also be used as a writing-instrument. The tubular leg A, Fig. 1, is slotted on the inside to receive the leg B when the compass is folded, and receives within it a similarly-slotted slide or leg C, which at one end carries a steel point *c*, Fig. 3, and at the other a slide D. The slide D carries a nib which faces the direction of rotation of the instrument when in use and is moved, according to the Provisional Specification, by means of a pointed instrument inserted through the slot *d*, or by a pin on the slide D projecting through the slot *d*. When the slide D is drawn back into the

slide C, a pencil may be fitted into the cylindrical end of the slide C. According to the Provisional

FIG.1.

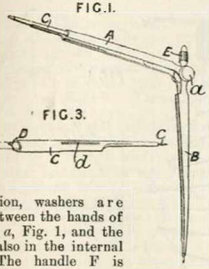
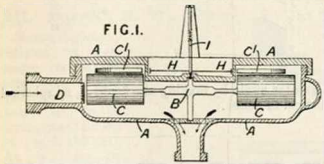


FIG.3.

Specification, washers are placed between the hands of the rivet *a*, Fig. 1, and the legs and also in the internal space. The handle F is screwed into the central washer.

4228. Muller, J. A. Dec. 9.

FIG.1.



Current meters.—Relates to an impulse liquid meter, which is stated to be applicable as a current meter. A wheel B, carrying two or more floats C, is mounted horizontally in a closed-in chamber. The liquid entering at D is given a tangential direction by means of a curved guard, and a spring flap over the inlet may also be used, which yields more or less according to the pressure. The rotation of the wheel is communicated to the registering-mechanism by two horse-shoe magnets C^1, which take round with them a needle H mounted on a spindle I carrying a worm.

4400. Hugon, A. Dec. 22. [*Provisional protection only.*]

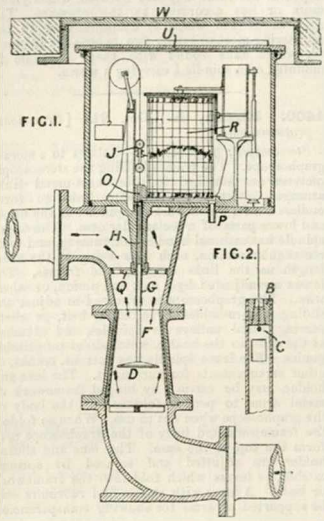
Stereoscopes; graphoscopes.—Relates to a stereographoscope. The frames holding the stereoscopic pictures are attached to thin sheet-metal links arranged alternately with wire links to form endless bands, which work on spindles at the upper and lower parts of a rectangular case. The upper spindle has external handles for turning, and is of rectangular section, each side being of the same length as the links carrying the frames. The lenses are adjusted by a rack and pinion, or otherwise. The graphoscope is arranged to adjust the sliding picture-holder by a band, belt, or chain passing round pulleys on spindles, and attached at the ends to the holder, which slides on suitable guides. The front spindle has buttons, cranks, or other arrangements for turning it. The lens and holder may be carried by hinged framework or metal arms to permit folding into the body of the graphoscope when not in use. When so folded, the framework and body of the graphoscope may form the top of the case. The lens and sliding holder are adjusted and secured by springs, catches, or levers which fold into the framework or body. A lamp with shades and reflectors may be supported on arms for showing transparencies.

A.D. 1875.

50. Deacon, G. F. Jan. 5.

Current meters.—To diminish the wear of certain parts of the apparatus described in Specifications Nos. 937 and 4264, A.D. 1873, the liquid meter or apparatus for measuring the velocity of flow in pipes is constructed as shown in Fig. 1 with a disc, ball, &c. D guided by means of a spindle F in a tube G, thus maintaining the suspending-wire H central and protecting the tube surrounding the wire. The spindle F may be extended below the disc, or may be replaced by a tube sliding on a fixed rod. The wire H is connected to a small carriage J fitted with a pencil and counterbalanced. The registering-cylinder R revolves once per day by clockwork, and is divided into twenty-four

equal vertical portions representing hours. A pipe P is connected to a channel O to carry off leakage, and a perforated diaphragm Q is fitted to equalize the flow of water. The wire H is protected from



corrosion due to galvanic action at its lower end by securing it to a plug C, Fig. 2, of lignum-vitæ coated with shellac &c. and fixed in a metal collar B. The apparatus is provided with a hinged and locked cover U, Fig. 1, and is arranged in a footway beneath an independent cover W.

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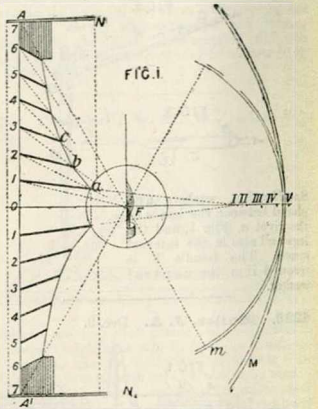
89. Clark, A. M., [*Balestrieri, P.*]. Jan. 9.

Reflectors for concentrating light or heat from a luminous centre consist of internally-polished or silvered conical surfaces *a*, *b*, *c*, &c., having a common axis and held together by radial ribs. In the construction for determining the proper shape of the cones, equal distances 0 1, 1 2, &c., are taken on the line A, A¹ and the distances I F, II F, &c., made equal to I F, 2 F, &c.; the lines II, 2 II, &c. will then give the generating-lines of the cones. A parallel beam of light is obtained by placing a luminous object at the focus F, and a converging or diverging beam by moving the object on one side or the other of the focus. The reflector is enclosed in a glass frame N, and is pivoted on a stand for adjusting it in any position. A spherical reflector *m*, or M, may be arranged behind the light. The reflector may be arranged to subtend



a greater angle by making the front A, A¹ spherical instead of plane.

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127. Main, R. Jan. 13.

Thermometers and pyrometers for measuring the temperature of the hot blast used in furnaces for smelting iron ores &c. A chamber A, consisting of a double casing *c*, *d* packed with asbestos &c., is connected by a pipe C with the hot-blast main and contains a receptacle F in which the thermometer or pyrometer G is placed. The pipe C may be surrounded by an outer casing B packed with asbestos &c. The chamber is provided with an outlet pipe E. The blast has its temperature reduced in passing through the pipe C, and the thermometer &c. is graduated accordingly. The chamber F may be dispensed with, and the blast may act directly upon a thermometer &c. inserted in the chamber A. The Provisional Specification states that if the pipe C is large, the chamber A may be dispensed with and the thermometer &c. inserted in the pipe.