PATENTS FOR INVENTIONS.

ABRIDGMENTS OF SPECIFICATIONS.

CLASS 97,

PHILOSOPHICAL INSTRUMENTS,

[*including* OPTICAL, NAUTICAL, SURVEYING, MATHEMATICAL,

and METEOROLOGICAL INSTRUMENTS].

PERIOD—A.D. 1884–88.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY DARLING & SON, LTD., 1, 2, 3 & 5, GREAT ST. THOMAS APOSTLE, E.C.
PUBLISHED AT THE PATENT OFFICE, 25, SOUTHAMPTON BUILDINGS,
CHANCERY LANE, LONDON, W.C.

1896.

PRICE ONE SHILLING.

PATENTS FOR INVENTIONS.

ABRIDGMENTS OF SPECIFICATIONS.

CLASS 97,

PHILOSOPHICAL INSTRUMENTS,

[*including* OPTICAL, NAUTICAL, SURVEYING, MATHEMATICAL, *and* METEOROLOGICAL INSTRUMENTS].

PERIOD—A.D. 1884–88.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE.
BY DARLING & SON, LTD., 1, 2, 3 & 5, GREAT ST. THOMAS APOSTLE, E.C.
PUBLISHED AT THE PATENT OFFICE, 25, SOUTHAMPTON BUILDINGS,
CHANCERY LANE, LONDON, W.C.

1896.

EXPLANATORY NOTE.

The contents of this Abridgment Class may be seen from its Subject-matter Index. For further information as to the classification of the subject-matter of inventions, reference should be made to the *Abridgment-Class and Index Key*, published at the Patent Office, 25, Southampton Buildings, Chancery Lane, W.C., price One Shilling, postage (parcel post) Sixpence.

It should be borne in mind that the abridgments are merely intended to serve as guides to the Specifications, which must themselves be consulted for the details of any particular invention. Printed Specifications, price Eightpence, may be purchased at the Patent Office, or ordered by post on the Patents Form C[1] (to be obtained from any Post Office), no additional charge being made for postage.

SUBJECT-MATTER INDEX.

Abridgments are printed in the chronological order of the Specifications to which they refer, and this index quotes only the year and number of each Specification.

Acidimeters. *See* Specific gravity estimating apparatus.

Actinometers. *See* Photometers &c.

Adjustments. *See* special headings, *such as* Mathematical drawing-instruments; Microscopes; Telescopes &c.

Alcoholmeters. *See* Specific gravity estimating apparatus.

Altitudes, Angular, Measuring. *See* Clinometers &c.; Sextants &c.; Theodolites.

Altitudes, Linear, Measuring. *See* Surveying-instruments.

Anemometers. '84. 3881. 13,182. '85. 13,269. '86. 1345. 8920. 11,041. '87. 1581. 7182. 8600. 10,595. '88. 2309. 3017.
wind vanes. *See* Wind vanes.

Aneroid barometers. *See* Barometers.

Angle-measuring instruments. *See* Bearings and courses, Determining, indicating, correcting, and plotting; Bevels and mitres, [*Abridgment Class* Hand tools &c.]; Clinometers &c.; Gauges, [*Abridgment Class* Registering &c.]; Goniometers &c.; Latitude instruments; Mathematical drawing-instruments; Protractors &c.; Sextants, quadrants, and the like; Surveying-instruments; Telemeters; Theodolites.

Angles, Plotting, Instruments for. *See* Mathematical drawing-instruments.

Astigmatism, Testing. *See* Sight-testing apparatus.

Astronomical charts. *See Abridgment Class* Writing-instruments &c.

Astronomical instruments. *See* Bearings and courses, Determining &c.; Globes and orreries, [*Abridgment Class* Writing-instruments &c.]; Gyroscopic apparatus; Latitude instruments; Lenses; Reflectors; Sextants &c.; Telescopes &c.

Astronomical instruments, (unspecified), Speed regulators for. *See Abridgment Class* Governors &c.

Azimuth instruments. *See* Bearings &c., Determining &c.; Compasses, Magnetic; Sextants &c.; Surveying-instruments; Theodolites.

Barometers. '*84*. 1101. 3881. 4132. 9116. 16,054. '*85*. 3221. 9028. 9857. 11,898. 12,582. '*86*. 3023. 3425. 3625. 11,041. 14,730. '*87*. 1324. 5357. 6907. 14,424. 15,844. '*88*. 2526. 2673. 3021. 4668. 9452. 16,538.
advertising on or in connection with. *See Abridgment Class* Advertising &c.

Bearings and courses, Determining, indicating, correcting, and plotting. '*84*. 1397. 5921. 6842. 8394. 10,112. 13,964. 14,862. 15,951. '*85*. 3536. 7270. 7360. '*86*. 700. 5996. 7077. 8230. 9936. '*87*. 1884. 6489. 12,601. '*88*. 362. 5297. 7110. 9520. 16,663.
Excepting Compasses, Magnetic; Latitude instruments; Sextants, quadrants, and the like; Surveying-instruments; Telemeters; Theodolites;
for which see those headings.
calculating-apparatus. *See Abridgment Class* Registering &c.

Binnacles. *See* Compasses, Magnetic.

Calculating-apparatus. *See Abridgment Class* Registering &c.

Calorimeters. '*84*. 16,940.

Camera obscuras. '*86*. 5139.

Carpenters' squares and the like. *See* Squares, Drawing and like.

Centre of gravity, Adjusting. *See* Gravity, Adjusting centre of.

Centrolineads. *See* Mathematical drawing-instruments.

Charts and plans, Laying-off and measuring courses and bearings on. *See* Bearings and courses, Determining &c.

Chromatropes. '*84*. 12,382.

Clinical thermometers. *See* Thermometers &c.

Clinometers and other instruments for measuring vertical angles and angular altitudes. '*84*. 217. 1397. 6181. 11,469. '*85*. 1964. 2372. 6260. '*86*. 4433. 7664. 9936. 11,220. '*87*. 1082. 4198. 5913. 6280. 6383. 11,578. '*88*. 7124. 9520. 10,263. 11,133. 11,429. 14,818. 15,472. 18,912.
Excepting Latitude instruments; Sextants, quadrants, and the like; Theodolites;
for which see those headings.
trim indicators for ships. *See Abridgment Class* Ships &c., Div. I.

Colours, Matching. *See* Colours &c., Comparing &c.

Colours, surfaces, textures, and the like, Comparing and testing. '*85*. 1246. 8335. '*86*. 12,867. '*87*. 3859. 8754. '*88*. 5688.
Excepting Fabrics, Testing, [*Abridgment Class* Fabrics, Dressing &c.];
for which see that heading.

Compasses, Drawing. *See* Mathematical drawing-instruments.

Compasses, Magnetic. '*84*. 217, [*page* 1 and *Appendix, page* 170]. 926. 1397. 3196. 3852. 3881. 6181. 6288. 8393. 9461. 10,075. 11,603. 11,962. 13,547. 13,964. 14,060. 14,862. 15,951. '*85*. 18. 321. 665. 2350. 7270. 7659. 8653. 9849. 10,366. 11,213. 13,334. 15,537. '*86*. 1038. 6275. 6353. 7077. 8230. 8334. 12,176. 14,960. '*87*. 1884. 1926. 4198. 5470. 6489. 8714. 9520. 12,880. 14,783. 15,223. 15,591. '*88*. 483. 6076. 9293. 9926. 10,053. 10,101. 12,153. 16,468. 16,663. 17,711. 18,019.
controlling steering-gear by. *See Abridgment Class* Ships &c., Div. II.
jewellery for holding. *See Abridgment Class* Fastenings, Dress.
lamps for lighting. *See Abridgment Class* Lamps &c.

Compasses, Non-magnetic. *See* Bearings and courses, Determining &c.

Condensers or lenses. *See* Lenses.

Course indicators and correctors. *See* Bearings and courses, Determining &c.; Compasses, Magnetic.

Current meters. *See* Anemometers; Logs and leeway indicators.

Curve-drawing instruments and moulds. *See* Mathematical drawing-instruments.

Curves, Railway and like, Setting-out. *See* Surveying-instruments.

Dampness indicators and detectors for beds, linen, and the like. *See* Hygrometers &c.

Density indicators. *See* Specific gravity estimating apparatus.

Departure rules. *See* Bearings and courses, Determining &c.; Telemeters.

Dials and the like for instruments. *See* Barometers; Bearings and courses, Determining &c.; Clinometers &c.; Compasses, Magnetic; Latitude instruments.

Dissolving-view apparatus. *See* Magic-lanterns &c.

Distance indicators. *See* Logs &c.; Telemeters.

Dividers and dividing-instruments for circles, arcs, and straight lines. *See* Mathematical drawing-instruments.

Dotting-pens. *See* Ruling, dotting, &c. devices.

Drawing-instruments, Mathematical. *See* Mathematical drawing-instruments.

Ellipsographs and like curve-drawing instruments. *See* Mathematical drawing-instruments.

Eyeglasses. *See* Spectacles &c.

Eye protectors and shades. *See* Protectors and shades, Eye &c.

Eyesight, Testing. *See* Sight-testing apparatus.

Field glasses. *See* Telescopes &c.

French curves and the like. *See* Mathematical drawing-instruments.

Gases, Indicating speed of flow. *See* Anemometers.

Globes and orreries. *See Abridgment Class* Writing-instruments &c.

Goggles. *See* Spectacles &c.

Goniometers and other instruments for measuring solid angles. '86. 10,068. '87. 13,313. '88. 13,258. 16,695. 18,438.

Graphoscopes. *See* Reading-glasses &c.

Gravity, Adjusting centre of. '88. 15,728.

Gravity, Measuring force of. '88. 11,809.

Gyroscopic apparatus. '84. 6842. 8394. '86. 14,208, [*Appendix, page* 171].

Heights, Measuring. *See* Barometers; Surveying-instruments.

Horizons, Artificial. '86. 9844.

Humidity, Testing. *See* Hygrometers &c.

Hydrometers. *See* Specific gravity estimating apparatus.

Hygrometers and hygroscopes, [*including* means for detecting dampness in linen and the like]. '84. 5164. 13,044. '86. 11,041. '87. 5235. 6730. 6907.

Kaleidoscopes. '85. 14,669. '87. 11,317. 11,621. '88. 2924. 3657. 8068. 17,007.

Lantern microscopes. *See* Magic-lanterns &c.

Lanterns, Optical. *See* Magic-lanterns &c.

Latitude instruments. '84. 960. 1397. 6842. '85. 9699.
Excepting Sextants, quadrants, and the like; Theodolites;
for which see those headings.

Leads for sea-sounding. *See* Sounding-apparatus &c.

Leeway indicators. *See* Logs &c.

Lenses. '85. 10,920. 11,985. '86. 9798. 12,148. 14,650. 14,931. '87. 3689. 13,186. '88. 5194. 7695.
Excepting lenses adapted to special purposes such as Lamp lenses, [*Abridgment Class* Lamps &c.]; Magic-lanterns &c.; Microscopes; Pavement lights, [*Abridgment Class* Roads &c.]; Photography, [*Abridgment Class* Photography]; Reading-glasses and graphoscopes; Ships, (*cabin and deck lights*), [*Abridgment Class* Ships &c., Div. I.]; Spectacles and eyeglasses; Telescopes and opera and field glasses;
for which see those headings.

Levelling-staves. *See* Surveying-instruments.

Levels and plumbing-instruments. '84. 6994. 9793. 11,469. 12,175. '85. 1964. 2372. 5073. 6260. 6399. 12,278. 15,133. '86. 2130. 2967. 4433. 6337. 7664. 9244. 11,220. 13,436. '87. 1346. 1364. 5913. 6280. 6383. 6539. 11,578. 14,216. 17,503. '88. 11,429. 14,818.
trim indicators for ships. *See Abridgment Class* Ships &c., Div. I.

Logs and leeway indicators, [*including* Current meters]. '84. 2510. 3666. 5571. 6369. 11,284. 13,366. '85. 3162. 7175. 7996. 11,336. 12,181. 14,757. '86. 807. 1991. 16,202. '87. 3018. 3419. 4545. 7132. 7469. 7914. 11,964. 14,741. 15,251. '88. 1789. 3017. 9293. 10,299. 10,951. 12,242. 13,176. 18,324. 18,924.

Longitude, Gyroscopic apparatus for determining. *See* Gyroscopic apparatus.

Lorgnettes. *See* Telescopes &c.

Magic-lanterns and like projecting-apparatus. '84. 377. 934. 10,226. 13,371. 13,372. 14,951. 15,440. '85. 3598. '86. 1353. 1980. 2459. 3805. 6154. 6431. 6642. 7344. 8076. 9383. 9469. 10,411. 12,125. 15,187. 15,192. 15,873. '87. 4804. 14,171. 14,809. 18,001. '88. 423. 1635. 4545. 7348. 14,171. 15,736. 16,046. 16,556. 16,785. 17,326. 18,150.
advertising on or in connection with. *See Abridgment Class* Advertising &c.
displaying. *See Abridgment Class* Advertising &c.
enlarging and copying lanterns. *See Abridgment Class* Photography.
lamps and burners for. *See Abridgment Class* Lamps &c.
limelight apparatus for. *See Abridgment Class* Lamps &c.
producing slides by photography. *See Abridgment Class* Photography.
signals. *See Abridgment Class* Signalling &c.
valves and cocks for. *See Abridgment Class* Valves &c.

Magnetic compasses. *See* Compasses, Magnetic.

Magnifying-glasses. *See* Microscopes; Reading-glasses &c.

Maps and charts, Plotting bearings and courses on. *See* Bearings and courses, Determining &c.

Marine glasses. *See* Telescopes &c.

Mariners' compasses. *See* Compasses, Magnetic.

Matching colours, textures, and the like. *See* Colours &c., Comparing &c.

Mathematical drawing-instruments :
Excepting Drawing-boards, [*Abridgment Class* Artists' instruments &c.]; Rulers, Drawing and like; Ruling-machines &c., [*Abridgment Class* Printing other than letterpress &c.]; Ruling, dotting, &c. pens &c.; Shading-machines for drawings; Squares, Drawing and like; Tools for setting-out work, [*Abridgment Class* Hand tools &c.];
for which see those headings.
adjusting-screws. '*87.* 10,712.
angles, plotting. *See* ellipsographs &c. *below.*
arc-describing instruments, (*not* compasses). '*84.* 1539. '*87.* 5900.
bow pens and pencils. *See* compasses *below.*
cements for. *See Abridgment Class* Starch &c.
centrolineads. '*85.* 6260. 12,668. '*88.* 9442.
circle-describing instruments. *See* arc-describing instruments *above*; compasses *below.*
compasses. '*84.* 3985. 6375. 9876. 11,469. 13,220. 14,286. 17,031. '*85.* 914. 3777. 4086. 6064. 6260. 8807. 11,151. 11,990. 12,437. 14,289. 15,199. 15,938. '*86.* 4449. 11,802. 17,061. '*87.* 3161. 10,712. '*88.* 2152. 2218. 4163. 5440. 7105. 11,539. 11,869. 14,253.
curves and figures, plotting and reproducing. *See* ellipsographs &c. *below.*
dividers. '*84.* 11,469. 13,220. 17,031. '*85.* 3777. 6688. 11,151. 14,289. 15,938. '*86.* 4449. '*87.* 3161. 17,962. '*88.* 2152. 2218. 16,695.
dividing-instruments. '*84.* 5369. 5443. 12,046. '*85.* 3990. 11,990. '*88.* 13,893.
ellipsographs and other instruments for drawing, plotting, or reproducing curves and figures. '*84.* 5803. 9876. 12,046. 17,031. '*85.* 3777. 4582. 11,990. 12,668. '*86.* 13,581. 17,061. '*88.* 1423. 5440. 9442. 10,950. 16,070.
French curves and like instruments. *See* ellipsographs &c. *above.*
joints. '*84.* 13,220. '*85.* 914. 14,289. 15,938. '*86.* 11,802.
maps, charts, and plans, instruments for setting out courses and bearings on. *See* Bearings and courses, Determining &c.
pantographs. '*84.* 11,128. '*85.* 11,990. '*86.* 14,899. '*87.* 2836. 11,032.
perspective drawing-instruments. *See Abridgment Class* Artists' instruments &c.
proportional compasses. '*85.* 6260. '*88.* 4163. 7105.
protractors and like angle measuring and plotting instruments. *See* Protractors &c.
scales. '*84.* 11,698. 14,507. '*85.* 12,704. '*86.* 700. 5407. 8984. '*87.* 627. 4198. 5900. 10,744. 11,362. '*88.* 2152. 5111. 11,869. 13,893.
section-lining apparatus. '*86.* 13,581. '*88.* 10,447. 16,432.
trammels. *See* compasses *above.*

Measuring angles. *See* Bearings and courses, Determining &c.; Bevels and mitres, [*Abridgment Class* Hand tools &c.]; Clinometers &c.; Goniometers &c.; Latitude instruments; Mathematical drawing-instruments; Protractors &c.; Sextants &c.; Ships, (*trim indicators*), [*Abridgment Class* Ships &c., Div. I.]; Surveying-instruments; Telemeters; Theodolites.

Measuring force of gravity. *See* Gravity, Measuring force of.

Measuring heights and distances. *See* Barometers; Surveying-instruments; Telemeters.

Measuring intensity of light. *See* Photometers &c.

Meteorological instruments. *See* Anemometers; Barometers; Hygrometers &c.; Radiometers; Sunshine - recorders; Thermometers &c.; Weather indicators; Wind vanes.

Microphotoscopes. *See* Microscopes.

Microscopes. '*84.* 202. 912. 7639. 12,952. 12,991. '*85.* 1027. 1594. '*86.* 2622. 14,931. '*88.* 13,258. 16,992. 18,542.
coin-freed apparatus for hiring. *See Abridgment Class* Coin-freed apparatus &c.
lantern microscopes. *See* Magic-lanterns &c.
reading-glasses and graphoscopes. *See* Reading-glasses and graphoscopes.

Microtomes. '*87.* 9900.

Moisture, Testing. *See* Hygrometers &c.

Monoscopes. *See* Reading-glasses &c.

Navigation, Instruments for use in. *See* Bearings and courses, Determining &c.; Calculating-apparatus, [*Abridgment Class* Registering &c.]; Clocks and watches, (*chronometers*), [*Abridgment Class* Watches &c.]; Compasses, Magnetic; Latitude instruments; Logs and leeway indicators; Mathematical drawing - instruments; Sextants, quadrants, and the like; Telescopes &c.

Objectives. *See* Lenses; Magic - lanterns &c.; Microscopes; Telescopes &c.

Opera glasses. *See* Telescopes &c.

Opsiometers. *See* Sight-testing apparatus.

Optical instruments :
Excepting Bearings and courses, Determining &c.; Camera obscuras; Clinometers &c.; Compasses, Magnetic; Goniometers &c.; Horizons, Artificial; Kaleidoscopes; Laryngoscopes, [*Abridgment Class* Medicine &c.]; Lenses; Levels and plumbing-instruments; Magic-lanterns &c.; Microscopes; Mirrors for use in surgery &c., [*Abridgment Class* Medicine &c.]; Ophthalmoscopes, [*Abridgment Class* Medicine &c.]; Optical instruments, Surgical, [*Abridgment Class* Medicine &c.]; Polarizers and polariscopes; Reading-glasses and graphoscopes; Reflectors; Sextants, quadrants, and the like; Sight-testing

Optical instruments—*cont.*
Excepting—*cont.*
apparatus; Spectacles and eyeglasses; Specula, Surgical, [*Abridgment Class* Medicine &c.]; Stereoscopes; Surveying-instruments; Telemeters; Telescopes and opera and field glasses; Theodolites;
for which see those headings.
circumscribing vision in viewing pictures and other objects. '86. 6848.
polarized light, excluding. '86. 4375.

Optometers. *See* Sight-testing apparatus.

Pantographs. *See* Mathematical drawing-instruments.

Parallel rulers. *See* Rulers, Drawing and like.

Photometers and actinometers. '84. 3771. 3881. 6312. 9931. 14,457. '85. 3755. '86. 4624. 14,548. '87. 11,985. 13,332. 15,907. '88. 6923. 11,578.

Pince-nez. *See* Spectacles &c.

Plumbing-devices. *See* Levels &c.

Polarizers and polariscopes. '84. 14,699. '86. 4375. '88. 13,258.

Position finders. *See* Bearings and courses, Determining &c.; Telemeters.

Prismatic compasses. *See* Compasses, Magnetic.

Projecting-lanterns. *See* Magic-lanterns &c.

Proportional compasses and instruments. *See* Mathematical drawing-instruments.

Protectors and shades, Eye, face, and like. '84. 5086. '87. 4614.
Excepting Masks, [*Abridgment Class* Toys &c.]: *for which see that heading.*

Protractors and like angle measuring and plotting instruments. '84. 880. 1539. 10,105. 11,469. 11,698. 14,507. '85. 2372. 3536. 4530. 6260. 12,704. '86. 9936. 10,068. 17,061. '87. 627. 4198. 4768. 6741. 12,601. 13,313. '88. 4163. 5111. 7596. 11,429. 12,296. 16,695.

Pyrometers. *See* Thermometers &c.

Quadrants. *See* Sextants &c.

Radiometers. '84. 3881.

Railway and like curves, Setting-out. *See* Surveying-instruments.

Range-finders. *See* Telemeters.

Reading-glasses and graphoscopes. '84. 912. 10,140. '85. 1027. '88. 8726. 9315.
advertising on or in connection with. *See Abridgment Class* Advertising &c.

Reflectors:
Excepting Daylight reflectors, [*Abridgment Class* Buildings &c.]; Lamp reflectors &c., [*Abridgment Class* Lamps &c.]; Pavement lights, [*Abridgment Class* Roads &c.]; Ships, (*cabin and deck lights*), [*Abridgment Class* Ships &c., Div. I.]; Specula, Surgical, [*Abridgment Class* Medicine &c.]; Steam generators, (*for* reflectors *for water-level indicators*), [*Abridgment Class* Steam generators]; Telemeters; Theodolites;
for which see those headings.
alloys for. *See Abridgment Class* Metals and alloys.
combined with—
spectacles and eyeglasses. '85. 3701. '86. 2764.
manufacture and construction. '84. 9464. 12,382. '85. 8222. 10,690. 11,985. '86. 2764. '87. 14,868. '88. 435.
showing objects not directly visible. '84. 9464. '85. 3701. '88. 7987. 15,428.

Roads and the like, Determining curves and inclines of. *See* Clinometers &c.; Surveying-instruments.

Rulers, Drawing and like. '84. 74. 880. 6723. 7373. 8248. 13,313. 14,405. '85. 3777. 4785. 4858. 6260. 7480. 10,733. 12,668. 12,970. '86. 849. 8984. 12,965. 13,581. 14,811. 14,891. '87. 627. 4100. 6377. 9487. 10,502. 10,744. 11,362. 12,964. 16,598. 17,227. '88. 5111. 6383. 9442. 12,186. 16,432. 17,854.
section-lining apparatus. *See* Mathematical drawing-instruments.
slates modified for use with. *See Abridgment Class* Writing-instruments &c.

Ruling, dotting, tracing, and like pens and devices. '84. 641, [*Appendix, page* 170]. 3985. 11,279. '85. 8551. '86. 5794. 11,802. '87. 5465. 8985. 10,712. '88. 4405. 13,310. 13,664. 15,505. 15,664.
Excepting Electric and like pens for stencilling, [*Abridgment Class* Writing-instruments &c.]; *for which see that heading.*
filling-brushes for. *See Abridgment Class* Brushing &c.

Saccharometers. *See* Specific gravity estimating apparatus.

Scales, Drawing. *See* Mathematical drawing-instruments.

Scales for instruments. *See special headings, such as* Barometers; Thermometers &c.

Scales, Mathematical. *See* Mathematical drawing-instruments.

Sea-sounding apparatus. *See* Sounding-apparatus &c.

Section-lining apparatus. *See* Mathematical drawing-instruments.

Sectors or protractors. *See* Protractors &c.

Set-squares. *See* Squares, Drawing &c.

Sextants, quadrants, and the like. '*84.* 12,088. '*85.* 7412. '*86.* 9844. '*88.* 1794.

Shading-machines for drawings. '*85.* 9772.

Ships' logs. *See* Logs &c.

Sight-testing apparatus. '*85.* 4354. 8870. '*86.* 7820. 11,631. 14,523. 15,786. '*87.* 2249. '*88.* 16,090.

Slides, Magic-lantern. *See* Magic-lanterns &c.

Slides, Microscope. *See* Microscopes.

Sounding-apparatus, Sea and like. '*84.* 1346. 1603. 13,366. 13,454. '*85.* 2148. 7575. 7890. 8461. 8624. 9969. 12,240. '*86.* 3967. 4888. 12,848. '*87.* 146. 5357. 7122. 7986. 10,527. 15,012. '*88.* 2703. 4272. 6134. 10,287. 12,798. 16,720. 18,924.

Sounds, Locating. '*84.* 8794. '*86.* 13,003. '*88.* 1700. 14,943.

Specific gravity estimating apparatus. '*84.* 11,066. 12,585. 15,970. '*85.* 5589. 12,582. 13,050. '*86.* 1938. 3594. '*87.* 12,963. 14,169. '*88.* 4139. 7411.

Spectacles and eyeglasses. '*81.* 2891, [*Appendix, page* 169]. '*84.* 912. 3879. 4584. 6377. 7461, [*Appendix, page* 170]. 11,710. '*85.* 1027. 3701. 8342. 8953. 9202. 10,415. 10,526. 10,920. 11,207. 12,921. '*86.* 2764. 11,179. 12,148. 14,650. 14,931. 16,464. '*87.* 798. 2020. 2137. 3689. 9202. 9454. 12,337. 15,234. '*88.* 1213. 5652. 6059. 8621. 9315. 10,956. 11,380. 18,404.
- alloys for making frames. *See Abridgment Class* Metals and alloys.
- eye protectors and shades. *See* Protectors and shades, Eye &c.

Specula. *See* Reflectors.

Speed and direction of motion of distant objects, Determining. *See* Telemeters.

Speed indicators. *See* Anemometers; Logs and leeway indicators.

Spirit levels. *See* Levels &c.

Squares, Drawing and like. '*84.* 880. 10,105. 11,469. 14,507. '*85.* 2372. 6260. 8873. 12,668. 12,704. '*86.* 2946. 3290. 12,265. 13,581. 17,061. '*87.* 5913. 6741. '*88.* 1819. 5111. 8599. 9442. 10,447. 11,429.

Stands for instruments. *See* Tripod &c. stands.

Stereopticons. *See* Magic-lanterns &c.

Stereoscopes. '*84.* 12,329. '*86.* 15,000. '*87.* 9814. 11,317. '*88.* 2375. 7067.
- advertising on or in connection with. *See Abridgment Class* Advertising &c.

Stereoscopes—*cont.*
- coin-freed apparatus for displaying stereoscopic views. *See Abridgment Class* Coin-freed apparatus &c.
- tripod and like stands for. *See* Tripod &c. stands.

Straight-edges. *See* Rulers, Drawing and like.

Sun-dials. *See Abridgment Class* Watches &c.

Sunshine-recorders. '*84.* 16,976. '*85.* 9699. '*86.* 949.

Surfaces of materials, Comparing. *See* Colours &c., Comparing and testing.

Surveying-instruments:
- *Excepting* Bearings and courses, Determining &c.; Barometers; Clinometers and other instruments for measuring vertical angles and angular altitudes; Compasses, Magnetic; Gyroscopic apparatus; Levels and plumbing-instruments; Mathematical drawing-instruments; Measures of length, (*measuring-chains*), [*Abridgment Class* Registering &c.]; Odometers, [*Abridgment Class* Registering &c.]; Sextants, quadrants, and the like; Telemeters; Telescopes and opera and field glasses; Theodolites;
  for which see those headings.
- altitudes, linear, measuring. '*86.* 8748. '*88.* 11,809.
- azimuth instruments. *See* measuring horizontal angles *below.*
- contouring and profiling. '*88.* 9520.
- graphical. '*87.* 1082. '*88.* 18,912.
- hydrographical. '*87.* 1884. '*88.* 9520.
- measuring horizontal angles. '*84.* 217, [*page* 1 and *Appendix, page* 170]. '*85.* 3536. 7412. '*86.* 8748. 9936. '*87.* 12,601. '*88.* 9520. 10,263.
- railway and like curves, setting out. '*85.* 325. '*86.* 2527.
- roads and the like, determining inclines and curves of. '*86.* 9936. '*87.* 1082. '*88.* 18,912.
- staves. '*84.* 3510. '*86.* 3172. 8748. '*87.* 12,668.
- testing collimation. '*87.* 6539.
- stands for. *See* Tripod and like stands.

Sympiesometers. *See* Barometers.

Telemeters, [*including* Range-finders]. '*84.* 4303. 13,288. 16,029. '*85.* 1411. 7412. 8043. 9672. 11,415. '*86.* 3172. 4591. 4739. 8748. 8973. 12,404. '*87.* 4710. 11,578. 11,602. 15,951. 17,580. '*88.* 1204. 1794. 5297. 7110. 8381. 9520. 10,203. 10,263. 10,500. 11,133. 11,725. 11,856. 12,222. 13,021. 13,398. 14,818. 14,820. 18,553. 18,815.
- distance indicators attached to projectiles. *See Abridgment Class* Ammunition &c.

Telescopes and opera and field glasses. '*85.* 8222. '*86.* 4375. 9244. 12,148. 14,931. '*87.* 1905. 2493. 3285. 9814. 17,107. '*88.* 4835. 5176. 7399.
- coin-freed cases for hiring. *See Abridgment Class* Coin-freed apparatus &c.

Telescopes &c.—*cont.*
range-finders. *See* Telemeters.
tripod and like stands for. *See* Tripod &c. stands.

Temperature, Indicating and registering. *See* Thermometers &c.

Testing colours. *See* Colours &c., Comparing &c.

Testing sight. *See* Sight-testing apparatus.

Textures of materials, Comparing. *See* Colours &c., Comparing &c.

Theodolites. '*85.* 325. '*88.* 9520. 14,818.
tripod and like stands for. *See* Tripod &c. stands.

Thermographs. *See* Thermometers &c.

Thermometers and pyrometers. '*81.* 5233, [*Appendix, page* 170]. '*84.* 1138. 2200. 3750. 4132. 6093. 8670. 9116. 9393. 10,140. 10,231. 11,179. 15,947. 16,621. 16,940. '*85.* 303. 1045. 2027. 2568. 4769. 4815. 5671. 7147. 7153. 9028. 9115. 10,805. 11,211. 11,898. 11,968. 12,427. 12,582. 12,716. 13,006. 14,406. 15,843. '*86.* 737. 949. 2520. 3023. 3136. 3155. 7289. 7752. 8189. 9385. 10,816. 11,041. 12,489. 14,204. 14,555. 15,842. 16,414. '*87.* 1770. 2345. 2790. 3089. 3827. 4135. 8013. 9801. 11,320. 11,808. 14,509. 15,513. 15,844. 17,743. '*88.* 640. 2309. 2673. 2951. 4212. 5312. 5690. 7357. 7884. 8027. 10,414. 13,005. 14,683. 14,901. 16,457. 18,752.
glass, making. *See Abridgment Class* Glass.

Thermoscopes. *See* Thermometers &c.

Topophones. *See* Sounds, Locating.

Tripod and like stands, [*including* Telescopic and other adjustable pedestals and standards]. '*84.* 1814. 3232. 3510. 5509. 5647. 12,855. 15,198. '*85.* 976. 2181. 5677. 8748. 11,959. 12,425. 14,205. '*86.* 899. 2039. 2423. 2495. 5636. 6936. 8866. 9970. 11,175. 13,620. 15,697. '*87.* 4270. 4710. 6459. 6780. 8998. 10,841. '*88.* 907. 3196. 3782. 5770. 7476. 9501. 9518. 10,368. 10,860. 11,257. 11,360. 13,868. 14,801. 17,656.
Excepting Lamps and burners for lighting &c., (*pedestals*), [*Abridgment Class* Lamps &c.]; Reading-desks and music stands, [*Abridgment Class* Furniture &c.]; Stands, Card, photograph, and like, [*Abridgment Class* Furniture &c.];
for which see those headings.
camera stands, attachments for. *See Abridgment Class* Photography.
velocipedes adapted for carrying. *See Abridgment Class* Velocipedes.

T-squares. *See* Squares, Drawing &c.

Urinometers. *See* Specific gravity estimating apparatus.

Vanes, Wind. *See* Wind vanes.

Weather glasses. *See* Barometers.

Weather indicators. '*84.* 3881. 13,044. '*87.* 6907. 18,026. '*88.* 11,809.

Wind gauges or anemometers. *See* Anemometers.

Wind vanes. '*85.* 3656. 14,855. '*87.* 5991. '*88.* 3412.
anemometers or wind gauges. *See* Anemometers.

NAME INDEX.

The names in *italics* are those of persons by whom inventions have been communicated to the applicants for Letters Patent.

Abbott, L. ..... '84. 5803
Abel, C. D... '85. 8335. '87. 4545
'88. 3017
Ablett, T. R. ..... '85. 1246
Abraham, A. ..... '87. 798
Ackerley, J. ..... '85. 7575
Adams, F. E. ..... '85. 3990
„ W. P. ..... '88. 16,785
Aflalo, M. ..... '87. 10,502
Aguettant, B. L. ..... '87. 11,362
Albert & Otto. ..... '87. 1905
Aldous, H. G. ..... '86. 14,204
Allison, H. J. ... '85. 6399. 6688
Amour, J. H. ..... '87. 14,741
Anders, G. L. ..... '85. 13,269
Andrews, H. ..... '87. 17,580
Appleton, L. ..... '84. 74
Armstrong, A. W. ... '88. 17,326
Arnold, J. ..... '88. 5690
Ashford, J. ..... '84. 15,198
'85. 14,205

Bach, C. ..... '88. 2375
Bagshaw, W. ..... '87. 17,962
Bahlsen, E. ..... '87. 18,026
Bailey, M. ..... '87. 7986
Baker, F. R. ..... '88. 10,860
„ T. J. ..... '84. 16,940
Balch, W. ..... '84. 1603
Barber, F. ..... '86. 10,411
„ W. ..... '87. 5991
Barczinsky, B. A. ..... '84. 880
Bard, Mabie, Todd &... '86. 8189
Bardtholdt, J. ..... '87. 6730
Barnard, E. ..... '86. 15,786
„ G. A. ..... '85. 6260
Barr, A. ..... '88. 9520
„ F. ..... '88. 907
Barrett, H. ..... '87. 15,223
Barrodale, T. H. ..... '88. 5111
Barry, J. H. ..... '84. 3881
Barton, W. ..... '88. 7110
Bassnett, T. ..... '88. 9926
Batty, W. ..... '84. 13,547
Bayley, T. ..... '84. 14,699
Baynes, W. M. ..... '87. 18,001
Beanland, J. R. ..... '88. 14,253
Beard, R. R. ..... '86. 7344
Beauchamp, F. ..... '88. 16,046
Bechtold, A. M. ..... '88. 8621
Beck, F. W. ..... '87. 5235
„ W. H. ..... '85. 325
'87. 3689
Becker, M. I. ..... '87. 9520
Beilby, G. T. ... '84. 3750. 6093
Bennett, J. F. ..... '84. 9876
'88. 5440
Benoist et L. Berthiot, Soc. F. '87. 3689
Benson & Co., W. A. S. '88. 9501
Benson, C. A. ..... '88. 18,553
„ W. A. S. ..... '88. 9501
Berg, C. F. E. ..... '85. 13,334
Berger, J. H. ..... '88. 4163
Berlingieri, E. ..... '85. 15,537
Berly, J. A. ..... '85. 14,289
Berry, J. L. ..... '87. 10,841
Berthiot, Soc. F. Benoist et L. '87. 3689
Besson, H. '84. 7461, [*Appendix, page* 170]. '86. 12,148
Biggs, F. J. ..... '87. 2493
Binter, G. ..... '85. 9028
Birkbeck, H. ..... '88. 3412
Bisson, E. ..... '86. 1038
Blaënsdorf, R. ..... '88. 10,956
Blakesley, T. H. ..... '88. 3021
Blakey, J. ..... '86. 2946. 7664
Bliss & Co., J. ..... '85. 14,757
Bliss, G. H. ..... '85. 14,757
„ *J.* ..... '85. 14,757
Bloor, T. ..... '87. 12,337
Boehle, H. ..... '84. 12,382
Bogle, J. ..... '85. 9699
Bolton, T. ..... '84. 13,288
'88. 10,500
Boorman, J. A. ..... '87. 13,313
Bos, M. G. van den ... '84. 8394
Bosshardt, F. ..... '87. 6383
Boswell, H. St. G. ... '85. 14,406
Boult, A. J. ..... '84. 11,710
'85. 2181. 8807. '87. 9801
12,964.
Bourne, H. B. ..... '84. 9116
„ H. R. F. ..... '84. 9116
Boyer, J. ..... '87. 1581
Boyhan, P. ..... '84. 960
Bradley, R. ..... '87. 15,234
Brayton, J. T. ..... '84. 1138
Bréguet, Soc. Anon. Maison. '84. 15,951
Briggs, D. W. ..... '86. 13,581
Briggs, J. A. ..... '84. 1346
Brodie, G. G. ..... '88. 16,457
Bromley, J. ..... '86. 12,125
Brookes, A. G. ..... '85. 4769
Brough, R. ..... '85. 12,716
Broughton, V. L. D. ... '88. 362
Brown & Co., W. H. ... '88. 9518
Brown, E. H. ..... '85. 9772
„ J. ..... '86. 6936
Brownlow, W. H. ... '88. 18,404
Bruce, E. S. ..... '86. 15,192
„ T. W. ..... '84. 3852
Brust, C. ..... '85. 12,921
Bruster, J. ..... '86. 1980
Budenberg, Schaeffer &. ..... '88. 18,324
Burns, W. ..... '86. 14,931
Burr, E. B. ..... '87. 3419
Butler, A. E. ..... '86. 2130
„ H. M. ..... '86. 2130

Calderara, A. J. ..... '86. 3594
„ S. A. ..... '86. 3594

Callendar, H. L.....'87. 14,509
Calley, S. .....'84. 8393
Calliburcès, P.....'84. 13,044
Capazza, L......'85. 325
Capito, C. A. A.....'87. 7469
Cardwell, W. A.....'87. 17,107
'88. 5176
Carr, L.....'88. 11,809
Carroll, D......'84. 5571
Carter, W.....'84. 11,128
'85. 8551
Cartwright, W. .....'86. 16,464
Caulfeild, F. St. G. ....'87. 6539
Caws, F. .....'88. 11,133
Chadburn, W. .....'86. 807
Chadwick, W. .....'85. 12,582
Chamberlin, F. .....'87. 10,527
Chamberlin, H. .....'87. 10,527
Chase, H. A. .....'88. 9293
Christensen, H. O.....'84. 1101
Christian, T. G. R......'85. 3777
Christie, W. H. M...'86. 12,404
Clark, A. M.....'84. 4303. 5509 5571. 9461. 10,105. '85. 1411. 2350. '86. 13,581. '87. 1082.
„ W. R. .....'85. 7153
Clarke, C. L......'85. 11,898
Claud-Mantle, J. G....'86. 8984
Coad, T. .....'88. 7695
Coles, W. J. .....'87. 4804
Colton, E. G. .....'85. 10,920
Comitti, L. .....'88. 16,538
Cook, G. .....'87. 17,503
„ H. W. .....'87. 14,424
Cooke, C. F. .....'84. 12,175
„ T.....'84. 12,175
Cooper, A. J.....'84. 13,454 '85. 8461. '87. 7122. '88. 4272. 16,720.
„ T. .....'86. 5139
„ W. C.....'88. 7105
Corsham, R. .....'87. 5900
Cory, G. E. .....'84. 880
Couland, N......'85. 14,289
Coulson, J.....'88. 13,176
Courlander, L. .....'86. 11,631
Cox, J.....'85. 10,415
„ J. B. .....'84. 10,231
Crampton, P. J. R...'87. 14,216
„ T. P. C. ...'88. 7357
Crane, F.....'88. 1635
Crawford, D.....'87. 5913
Crocker, S. H. .....'84. 3985
Cross, A. K. .....'87. 8998
Crossley, E.....'86. 8866
Culbertson, H. .....'86. 14,523
Cumming, W. S. .....'87. 5913
Curry, Pickard &.....'88. 6059
Curry, W...'85. 8953. '88. 6059

Dale, H. F...'87. 9900. '88. 2951
Dalrymple-Hay, H. H. '86. 2527
Dalton, W. H. .....'84. 3985
Daniel, J. .....'85. 10,366
Dany & Lepage.....'84. 4303
Darwin, L. .....'88. 14,820
Davis & Co., J. .....'87. 1324
Davis, A. .....'84. 13,182
„ H. .....'84. 13,182
Dawes, B. M.....'85. 7360
Dawson, A. G. .....'85. 3990
Day, J.....'86. 16,464
Deans, J. W. .....'87. 6780
'88. 11,257
Decoudun, J. .....'87. 13,332
'88. 11,578
Defries, H. .....'86. 9798
„ W. .....'88. 435
Derckmann, C. .....'85. 7147
Derham, T.....'86. 1938
Dessendier, J. E. ....'86. 14,548
Dickman, G. .....'86. 8189
Dillon, J. .....'85. 9969
Dines, W. H.....'86. 1345
Dixon, S.....'88. 5652
Dobbie, J. C.....'87. 14,783
Dobbie, J. G. .....'87. 6280
Dobie, T.....'87. 6280
Doehring, W.....'86. 3136
Dollond, A. W. .....'85. 11,959
'86. 13,620
Dougherty, B. A. ...'88. 14,901
Douglas-Hamilton, A. H. ...'87. 9814
Downing, G. .....'84. 14,060
„ J. S. .....'85. 4785
Draper, D. .....'87. 11,808
'88. 5312
Dredge, W. .....'85. 7412
Drivet, H......'86. 12,176
Dudding, W. .....'84. 10,112
Duncan, W. H. .....'84. 934
'85. 14,669
Dürr, W.....'88. 12,963

Edwards, B. J. .....'84. 10,226
„ E. .....'88. 2375
„ G.....'84. 11,469
Elliot, J. M. .....'87. 13,186
Engelhard, L. .....'87. 2249
Erdmann, A. .....'88. 16,070
Eskell, C. A. .....'86. 2495
Espenschied, C. .....'85. 6399
Evelyn, G. P.....'85. 1964
'86. 9844
Eyre, G. E. B.....'87. 10,744

Falkner, V. .....'84. 6842
Falter, G.....'86. 11,220
„ J.....'86. 11,220
Farquharson, W. .....'86. 8748
'88. 11,856

Farr, G. C. .....'88. 7987
Farrell, W. T. .....'87. 1364
Faucette, J. B. .....'88. 11,725
Favi, Paride, & Co. ...'85. 2350
Fawcett, S. .....'88. 11,429
Fay, C. P. .....'85. 6688
Faymonville, B.....'85. 12,181
Feltre, C. M. M. de Goyon, Duc de .....'88. 1700. 14,943
Ferguson, F. O. .....'86. 700
'87. 3161. '88. 2152
Ferranti, S. Z. de .....'84. 4584
Ferry, J. B. .....'86. 6848
Fessart, E. Vaquez-....'85. 8335
Fischer, J. M......'87. 9801
Fiske, B. A......'88. 18,815
Fletcher, H. L. .....'88. 11,725
„ J. .....'88. 7596
Foord, P. .....'87. 5991
Foster, A. M. .....'88. 11,257
„ W. H. W. ...'87. 14,868
Fournet, A. M. A.....'85. 8870
Fox, I......'84. 6377
Franck-Valery, E....'85. 11,207
„ P. ...'85. 11,207
Frank, L. .....'84. 11,710
Frankenberg, E. .....'87. 2836
Frawley, J. J. .....'87. 798
Free, R. .....'88. 14,683
Freeman, D. .....'84. 8248
Frew, J.....'85. 2568
Fric, J.....'85. 11,985
Fuhrmann, A.....'88. 7067
Füidge, L. V. .....'84. 14,457
Fuller, H. F. .....'88. 5688
Fyfer, J. T. .....'88. 9315

Galland-Mason, R. .....'84. 912
'85. 1027. 3701
Game, J. A.....'87. 10,502
Gare, T. .....'86. 14,899
Gauntlett, W. H. .....'85. 5671
Gautier, A. .....'85. 15,938
Genez, D......'84. 5086
Gibbons, G. B. A. ...'87. 15,907
Gibbs, J. M. .....'86. 1980
Gillie, J. W. .....'86. 7077
Gilmore, J.....'85. 7153
Gire & Co. .....'87. 17,743
Golding, W.....'85. 11,990
Goldsmith, E. M. ...'86. 17,061
Goodrich, A. S.....'87. 9487
Gordon, A. McC.....'84. 641, [*Appendix, page* 170]
„ J. '86. 8920. '87. 8600
Goyon, C. M. M. de, Duc de Feltre.....'88. 1700. 14,943
Grace, G. P. .....'85. 4582
Grant, J. G.....'85. 11,415
Granville, W. P.....'88. 12,242
Gray, C. .....'84. 15,440
Green, B.....'88. 16,090
„ C.....'84. 14,457

Green, T. ..... '88. 16,695
„ W. ..... '84. 6181
Griffin, F. ..... '86. 14,811
Grindley, W. H. ..... '88. 13,005
Gross, A. ..... '88. 6076
Groth, L. A. ..... '85. 12,668
Guarracino, H. ..... '87. 17,227
Guinness, L. H. ..... '86. 3155

Haddan, H. J. ..... '84. 5369 '87. 17,227
Haddow, A. ..... '85. 9115
Hahn, A. F. ..... '87. 6383
Haight, H. J. ..... '87. 4135
Hall, B. G. ..... '88. 7124
„ F. J. ..... '87. 16,598
Halske, Siemens & ..... '87. 4545
Hamilton, A. H. Douglas- ... '87. 9814
Händel, R. ..... '88. 13,664
Hannay, J. B. ..... '85. 2148
Harcourt, A. G. V. ... '87. 11,985
Hardy Bros. ..... '88. 15,728
Hardy, J. J. ..... '88. 15,728
„ W. ..... '88. 15,728
Harger, J. V. ..... '85. 15,199
„ T. ..... '85. 15,199
Hargrave, F. ..... '88. 2703
Harild, H. ..... '84. 13,964
Harling, W. H. ... '86. 11,802
Harrington, J. W. ... '86. 13,436
Harris, F. ..... '85. 6064
„ H. F. ..... '86. 8230
„ R. E. ..... '86. 8230
Harrison, J. ..... '88. 15,505
„ N. ..... '87. 1884
Hart, F. W. ..... '84. 1814
Hartmann, G. ..... '87. 11,320
Harvey, G. C. ..... '84. 10,075
Haskett-Smith, E. L. W. ... '88. 13,021
Havill, G. ..... '88. 6383
Hay, H. H. Dalrymple- ..... '86. 2527
Hayes, H. E. ..... '84. 5509
Haynes, J. W. ..... '84. 377
Hazard, H. T. ..... '84. 17,031
Heale, M. ..... '85. 10,690
Heath, C. ..... '87. 2020
„ G. W. ..... '86. 16,202 '87. 11,964
Heffer, H. C. ..... '87. 11,602 '88. 1204
Heidler, J. ..... '88. 10,263
Hempel, W. ..... '85. 1045
Henninger, F. A. ..... '88. 9315
Hensley, W. S. ..... '88. 13,005
Herrmann, I. ..... '84. 12,046
Hetterich, O. ..... '87. 1905
Heys, W. E. ..... '88. 18,324
Hicks, J. J. ... '84. 2200. '85. 2027 '86. 2967. 14,555. '87. 10,595 14,169. '88. 4139. 4212 10,414.
Higgins, C. M. ..... '88. 4405
Hill, C. F. ..... '85. 12,970
Himly, M. ..... '87. 6730
Hinks, J. ..... '88. 17,656
Hinton, E. ..... '88. 9501
Hoffmann, C. G. ..... '86. 12,489
Holden, H. ..... '88. 10,287
Holman, H. F. ..... '87. 11,578
Hook, H. ..... '88. 17,007
Hooker, J. ..... '85. 8624
Horn, A. ..... '88. 7411
Horne, W. C. ..... '85. 321
Horstmann, H. ..... '88. 9452
Howe, A. C. E. ..... '87. 5991
Hughes, G. ..... '87. 17,743
„ W. C. ..... '84. 13,371 13,372. '86. 8076. 9383 9469. '88. 4545. 7348.
Hulse, W. W. ..... '86. 6337
Hult, O. ..... '84. 11,284
Humphreys, W. J. B. .. '88. 2951
Husband, J. ..... '84. 10,140
Hyams, S. ..... '88. 4668

Immisch, M. ..... '86. 7289
Imray, J. ..... '86. 2764
Inkpen, G. C. ..... '88. 14,801

Jackson, L. C. ..... '87. 627
James, S. H. ..... '88. 6134
Jensen, P. ..... '84. 11,284
Job, H. ..... '85. 7659
Johnson, G. L. ..... '85. 9202
„ J. Y. ..... '85. 12,427
„ W. D. ..... '87. 6459
Joly, J. ..... '86. 12,848
Jones, J. G. ..... '86. 3967
Jordan, J. B. ..... '84. 16,976
Joseph, I. ..... '87. 1324
Justice, P. M. ..... '84. 960

Keith, W. C. ..... '84. 5921
Kellett, J. ..... '85. 8873
Kemp, H. ..... '84. 15,440
Kendall, P. F. ..... '87. 5470
Kent, E. N. ..... '84. 7461, [*Appendix, page* 170]
Key, J. T. ..... '86. 6431
Kilgour, G. ..... '88. 14,818
King, H. J. H. ..... '85. 13,006
Kingdon, Z. H. ..... '86. 15,873
Kinley, W. ..... '85. 2372
Kirk, H. C. ..... '84. 1138
Klif, J. ..... '87. 6741
Korolanyi, A. ..... '88. 1635
Korshunoff, N. ..... '84. 3879
Kotliarewski, P. ..... '88. 3017

La Cour, P. ..... '88. 7399
Laidler, T. ..... '86. 10,068
„ W. H. ..... '86. 10,068
Lake, H. H. '84. 6377. '85. 9857 15,537. '86. 4591. 12,176 '87. 1926. 11,362. '88. 17,854. 18,815.
„ W. R. '81. 5233, [*Appendix, page* 170]. '84. 5086 5803.
Lamers, J. ..... '84. 6375
Lancaster, E. B. ..... '88. 18,438
„ W. J. ..... '85. 5677
Lanchester, F. W. ... '88. 16,432
Landon, E. I. ..... '87. 3827
Landon, H. R. ..... '87. 3827
Lansdell, W. J. ..... '88. 9442
Laws, R. W. ..... '88. 10,368
Lazarus, N. ..... '85. 4354
Lea, J. ..... '84. 10,075
Lebret, A. E. ..... '87. 6907
Lee, D. T. ..... '86. 15,697
Leggott, W. ..... '86. 737
Leigh, H. H. ..... '88. 7399
Leighton, J. L. ..... '88. 1213
„ J. T. ..... '86. 11,179
Leiser, F. ..... '87. 6730
Lepage, Dany & ..... '84. 4303
Le Patourel, J. ..... '88. 4668
Leportier, T. ..... '87. 12,601
Le Prince, L. A. ..... '88. 423
Levetus, H. ..... '86. 14,960
Lilley, G. C. ..... '86. 8334 '88. 12,296. 18,019
Lindley, C. ..... '85. 15,843
Liska, F. ..... '87. 12,964
Livrelli, P. ..... '85. 325
Livsey, J. E. ..... '88. 15,505
Loeb, B. ..... '87. 4614
Lorrain, J. G. ..... '85. 4815 '88. 2924. 18,752
Lovibond, J. W. ..... '86. 12,867 '87. 3859. '88. 3657
Lovegrove, J. ..... '88. 9501
Lowdon, E. J. B. ..... '86. 8920
Lowthime, D. A. ..... '88. 8726
Lubin, S. ..... '87. 798
Lucas, E. ..... '88. 1819
„ F. R. ..... '87. 15,012
„ H. ..... '86. 2039
Lux, F. ... '84. 15,970. '85. 13,050
Lyall, E. ..... '87. 12,668
Lynam, P. J. ... '88. 8381. 10,203
Lyons, J. ..... '84. 12,329
Lysaght, G. J. ..... '88. 7476

Mabie, Todd, & Bard. .. '86. 8189
McArthy, D. ..... '87. 2345
Macdonald, J. ..... '84. 6994
McEwen, C. J. ..... '87. 15,907

McFarlane, J......'84. 10,105
McGregor, D.....'84. 1397
Mackay, R. F.....'84. 13,313
McKellen, S. D. .....'86. 899
Mackenzie, C.....'88. 11,380
„ H. L. .....'86. 9936
Mackle, J. O'N. .....'84. 12,585
MacLellan, J. A. .....'88. 5297
Mainwaring, W. F. B. Massey-'86. 5794
Mallett, J. R. M. ...'85. 10,733
Mallock, H. R. A.....'85. 8043
Manger, J. .....'85. 7480
Mann, W. G. .....'88. 5440
Mantle, J. G. Claud-...'86. 8984
Marks, P. S. .....'84. 5443
Marle, H. .....'85. 12,704
Marsden, S. .....'86. 9970
Martin, E. .....'86. 6275
Mason, R. Galland-. ....'84. 912 '85. 1027. 3701
Mason, Short &.....'88. 2526
„ W. F. .....'87. 2790
„ W. J. .....'88. 2526
Massey, J. E. .....'84. 13,366
Massey-Mainwaring, W. F. B. '86. 5794
Matern, B. von. .....'87. 15,951
Mattison, L. H. .....'88. 3412
Maurice, A. H. .....'88. 11,809
Mavitta, W. .....'88. 9518
Mayer, J. .....'84. 8670
Mayer, J......'85. 1411
Meager, R. .....'84. 11,962
Megson, H. .....'84. 10,112
Methven, J. .....'88. 6923
Meyer, O. .....'84. 7373
Michel, J. .....'87. 7132
Michell, F. B.....'84. 14,286
Middelboe, C. G......'84. 16,029
Mileson, H. G. .....'87. 10,712
Millar, G. A. .....'87. 2137
Milligan, J. W. .....'86. 4449
Mills, B. J. B. .....'84. 6994
Mitchell, A. .....'85. 11,213
„ C. T. .. ..'88. 8027
Moennich, P. .....'86. 11,041
Moëssard, P. .....'84. 9461
Molnar, P. .....'88. 10,951
Moore, F. M ....'84. 3196. 6288
„ J. J. .....'87. 9487
Mora, F. A. .....'84. 5369
Mudford, F. J. .....'85. 15,843
Müller, W. .....'85. 7147
Munro, F. W. .....'86. 12,265
Murphy, P. J. .....'88. 18,924
Murrie, J.....'84. 9393. 15,947 16,621. '85. 303. 10,805 '86. 3023. '87. 1770.
Musgrave, S. .....'85. 5589
Myers, L. .....'84. 13,220

Nevill, P. .....'85. 3536
Newton, H. C. .....'84. 14,951 '88. 16,556
Newton, H. E. .....'85. 14,757
Nicholson, A. .....'85. 12,425
Nievsky, L. .....'88. 2951
Noakes, D. W. .....'86. 6154
Nordenfelt, T. .....'84. 16,029 '85. 9672. '87. 15,951
Normanville, S. A. de. .....'86. 3625
North, C. G. .....'88. 18,542
Norton, J. A. .....'87. 17,580
„ T. .....'88. 10,860
Nowack, J. F.... ...'87. 18,026

Ogden, T. D. .....'87. 4768
Oliver, W. S. .....'87. 11,621
Olson, A. G......'84. 10,105
O'Reilly, W. P. .....'86. 15,187
Otto, Albert &. .....'87. 1905
Owen, D. .....'88. 11,809

Paget, F. A. .....'85. 9849
Palmer, W. .....'88. 8599
Paride, & Co., Favi....'85. 2350
Parker, J. .....'86. 15,697
„ T. .....'84. 11,066
Parkes, W. .....'88. 10,447
Parkinson, C. F.... .'88. 11,429
„ J. .....'88. 11,429
Parr, B. .....'85. 7575
Parsy, L. .....'88. 18,150
Pass, E. de.....'87. 8013
Paxton, G. .....'88. 6059
Pearce, E. H. .....'86. 12,148
Pearsall, W. B. ....'88. 11,360
Peichl, J. von.....'88. 10,101
Pereles, F......'87. 12,964
Perken, E. .....'88. 18,542
„ F. L. .....'88. 18,542
Perken, Son, & Rayment ...'88. 18,542
Phalp, O. .....'88. 16,468
Phelps, R. .....'79. 2891, [*Appendix, page* 169]
Phillips, A. .....'86. 1353
Phillipsbourne, C. ...'87. 15,844
Pickard & Curry. .....'88. 6059
Pickard, J. F. .....'85. 8953
Pierce, H. J. .....'88. 14,683
Piffard, B. .....'84. 202
Pillischer, J. .....'85. 10,526
Pincoffs, M......'88. 1635
Pirard, A. .....'84. 3232
Pitt, S. .....'84. 8394
Plant, H. G. .....'85. 8342
Plumb, R. H. T. .....'85. 7270
Pocock, S. J. .....'85. 11,968
Pope, D. .....'84. 6723
Popplewell, W. W...'86. 16,414 '88. 8621

Potter, E. T. .....'88. 14,171
„ R. .....'88. 1789
Potts, J. .....'86. 15,842
Pound, H. .....'87. 5465
Powell, F. W. .....'88. 12,153
Pozzy, S. .....'85. 15,938
Pratt, W. T. C. .....'85. 665
Preece, W. H. .....'84. 6312
Price, C. W. .....'87. 5900
Priestley, G. F. .....'88. 11,539
Prior, J. D. .....'88. 16,457
Prowse, G. R......'86. 10,411
Prytz, P. K. .....'87. 7469
Puigsech, J. T. y. ...'85. 12,668
Pumphrey, A. .....'85. 976
„ C. .....'86. 5636

Rae, C. S. .....'88. 16,992
Ramsden, J. W. .....'88. 3196 13,868
Rawlings, J. P. .....'85. 3162
Raworth, J. S. .....'85. 7996
Rayment, A. .....'86. 2423 '88. 18,542
Rayment, Perken, Son, &....'88. 18,542
Read, W. .....'86. 14,650
Ready, A. J. .....'87. 8754
Reddie, A. W. L.....'84. 15,951 '85. 8748
Redfern, G. F. .....'86. 5996
Reed, A. H. .....'85. 3777
Reeves, E. A. .....'88. 13,893
Reid, J. .....'87. 11,032
Reizenstein, E. .....'86. 17,061
Revueltas, J. N. .....'88. 12,798
Reynolds & Son.....'87. 6489 '88. 483
Reynolds, A. W. .....'87. 6489 '88. 483
„ F. S. .....'87. 6489 '88. 483
„ W. J. .....'87. 8714 12,880. '88. 10,053. 16,663 17,711.
Rhodes, C. .....'85. 11,151
Richard Bros. .....'85. 12,427
Richard, F. .....'88. 2309
„ J. .....'88. 2309
Richardson, H. .....'87. 3827
„ J. .....'85. 7175
Richardson, J......'87. 3827
Rickard, P. .....'85. 5073
Riley, W. J. .....'86. 11,175
Ripamonti, L. .....'86. 12,176
Robson, M. H. .....'85. 1594
Rogers, F. M. .....'85. 3656
Rohrbach, C. E. M. ...'86. 4375
Rood, R. .....'87. 7914
Rothwell, W. G. .....'84. 2510
Rougeot, P......'87. 8013
Rouse, J. H. .....'87. 4270
Rung, G. A......'87. 7469

Säfärik, V. ..... '85. 8222
Salsbury, H. ..... '86. 849
Salt, T. P. ..... '88. 4212
Sarjeant, W. L. ..... '86. 4624
Sax, J. ..... '85. 14,855
Schaeffer & Budenberg ..... '88. 18,324
Schoening, H. ..... '85. 7890
Schlotfeldt, H. W. ... '85. 11,336
Schmidt, W. ..... '85. 7752
Schneider, K. ..... '86. 4591
Schröder, H. L. H. ... '88. 4835 5194
Scott, A. T. H. ..... '84. 3666
Scott, J. H. ..... '84. 6377
Scott, L. K. ..... '85. 15,133
„ P. ..... '84. 3666
Scott, P. ..... '88. 10,299
Sergeant, H. C. ..... '85. 8748
Sharp, H. B. ..... '84. 3510
Shepheard, G. ..... '87. 11,578
Shettle, J. ..... '87. 6377
Short & Mason ..... '88. 2526
Short, T. W. ..... '88. 2526
Shrader, J. C. ..... '84. 11,698
Siegert, A. ..... '88. 12,963
Siemens & Halske ..... '87. 4545
Silveira, F. A. da. ..... '87. 3089
Silversides, J. ..... '84. 10,112
Simpson, W. S. ... '86. 15,000. '87. 11,317. 11,621. '88. 8068
Sinclair, J. ..... '88. 640
Sirieix, L. ..... '87. 15,591
Sleator, R. L. ..... '84. 14,060
Smith, B. B. ..... '84. 9876
„ C. '84. 12,991. '85. 4086 '88. 10,956
„ C. G. ..... '86. 4433
„ E. L. W. Haskett- ... '88. 13,021
„ G. ... '86. 807. '87. 5357
„ T. ..... '88. 1423. 15,664
„ W. T. ..... '85. 4086
Soc. Anon. Maison Brégueт ... '84. 15,951
Soc. F. Benoist et L. Berthiot '87. 3689
Somerville, J. ..... '88. 12,186
Son, C. R. van ..... '88. 12,222
Spencer, L. ..... '88. 5440
Spencer, R. L. ..... '87. 1926
Sperry, C. ..... '87. 15,251
Spink, W. ..... '84. 14,862
Sporton, H. H. ..... '86. 1991
Spottiswoode, W. H. ... '87. 10,744
Squire, W. ..... '88. 14,253
Stang, H. G. J. ..... '86. 5996
Stanley, W. F. ..... '85. 4530 '86. 4624. 5407. '87. 8985 9454.
Stebbing, J. ..... '87. 4100
Stevens, H. ..... '87. 1346
„ J. ..... '88. 2218
Steward, J. H. ..... '85. 7412 '87. 14,171
Stromeyer, E. C. ..... '84. 11,179
Stroud, W. ..... '88. 9520
Stuart, C. W. ..... '85. 8807
Stuart, G. ..... '87. 3285
„ J. ..... '88. 4835. 5194
Sudmann, J. ..... '87. 15,513
Sutton, S. H. ..... '86. 14,891
Swan, C. F. ..... '85. 8653
Swift, J. ... '84. 12,952. '86. 2622 '88. 13,258
Taylor, C. W. ..... '87. 9202
Taylor, F. ..... '88. 3782
„ H. D. ..... '85. 3755
Thackeray, W. T. W. ... '87. 3827
Thomas, A. ..... '84. 3771
„ H. E. ..... '84. 11,698
Thompson, T. H. ..... '88. 5770
„ W. P. ... '84. 17,031 '85. 11,898. '86. 14,523. '87. 6907. 9202. 11,808. '88. 5312.
Thomson, J. '84. 5647. '86. 2520
„ Sir W. ..... '85. 12,240
Thorne, J. ..... '87. 3419
Thorp, T. ..... '84. 9931
Thropp, J. ..... '85. 12,278
Tight, C. ..... '86. 2967
Todd, & Bard, Mabie '86. 8189
Tinne, T. F. S. ..... '84. 14,507
Tomkins, S. L. ..... '85. 4858
Tomlinson, E. ..... '84. 9464
Torre, F. D. ..... '84. 8794 '86. 13,003
Tourtin, E. ..... '88. 18,150
Tower, B. ..... '86. 14,208, [*Appendix, page* 171]
Townshend, E. ..... '88. 5770
Trapp, E. A. ..... '88. 15,428
Trotter, A. P. ..... '84. 6312 '88. 7884
Trueb, J. ..... '86. 16,414
Turner, J. ..... '86. 12,965
Turnor, M. ..... '85. 914
Twigg, G. H. ..... '88. 11,869
Unge, W. T. ..... '87. 4710
Upton, E. W. ..... '85. 4769
Utting, M. W. ..... '86. 6642 '88. 15,736
Uysdal, R. Ritter von Walcher- '85. 9857
Valery, E. Franck- ... '85. 11,207
„ P. Franck ... '85. 11,207
Vaquez-Fessart, E. ..... '85. 8335
Vaughan, J. ..... '84. 12,088
Vermeleren, N. ..... '88. 17,854
Verner, W. W. C. ..... '87. 4198
Vetch, G. A. ..... '86. 3172
Vigil, P. ..... '88. 12,798
Villepigue, A. E. D. F. de ... '87. 1082
Villepigue, A. E. D. F. de ... '88. 18,912
Wagner, A. ..... '85. 10,920
Waite, F. W. ..... '85. 12,437
„ J. ..... '85. 12,437
„ T. C. ..... '85. 12,437
Wakeman, C. ..... '88. 10,447
Walcher-Uysdal, R. Ritter von '85. 9857
Walford, N. L. ..... '86. 8973
Walker, H. C. ..... '87. 11,602 '88. 1204
„ T. F. ..... '84. 6369
Wallace, N. W. ..... '88. 10,299
Wallich, G. C. ..... '84. 7639
Walters, W. M. '87. 3018. 7182
Walters, W. M. ..... '87. 11,964
Walz, A. ..... '85. 11,211
Ward, P. ..... '86. 9385
Warner, J. S. ..... '88. 18,404
„ W. R. ..... '84. 14,405
Warren, C. H. ... . '86. 4433
„ E. ..... '86. 4433
Washington, S. ..... '86. 3805
Watkin, H. S. S. '84. 217, [*page* 1 and *Appendix, page* 170]. '86. 3425. 14,730. '88. 1794 15,472.
Watson, T. P. '84. 1138. '88. 907
„ W. ..... '85. 18
Watts, A. J. ..... '88. 11,360
„ W. ..... '84. 12,855
Webber, B. K. ..... '86. 3290
Weekes, C. ..... '87. 146
Weeksler, B. ..... '87. 9520
Weissenborn, E. E. ..... '86. 4449
Weldon, F. '86. 4739. '88. 13,398
Westbrook, C. S. ..... '85. 2181
Whieldon, W. ..... '84. 377
Whitaker, R. ..... '84. 926
White, A. W. ..... '88. 15,472
„ J. E. ..... '86. 10,816
Whitefield, H. M. ..... '86. 3805
Whiting, M. ..... '85. 3598
Whitten, J. S. ..... '85. 8342
Wiborgh, J. G. ..... '88. 2673
Wigzell, E. E. ..... '84. 13,454 '85. 8461. '87. 7122. '88. 4272. 16,720.
Wilding, S. P. ..... '85. 7890
Wilke, C. F. F. ..... '86. 6353
Wilkinson, A. ..... '84. 11,603
Williams, J. A. ..... '84. 12,088
Williams, J. S. ... '81. 5233, [*Appendix, page* 170]
Willis, G. R. ..... '84. 11,279
Willmore, C. H. ..... '88. 10,950
Wilson, W. E. ..... '86. 949
Winstanley, D. ..... '84. 16,054

Wolski, F. R. de ..... '86. 4888
Wood, C. H. ..... '84. 4132
" F. H. ..... '84. 1539
" J. ..... '88. 13,310
" J. J. ..... '86. 7820
" W. C. ..... '85. 8870
Woodbury, W. B. ..... '84. 5164
Woolfert, A. ..... '87. 1905
Wrench, A. ..... '86. 2459
'87. 14,809
Wrench & Son, J. ..... '86. 2459
Wright, C. F. ..... '85. 3221
Wright, L. ..... '84. 14,951
" T. ..... '84. 9793
Yeates, S. M. ..... '86. 9244
Young, J. ..... '85. 7175

ERRATUM.

In abridgment No. **217,** A.D. **1884,** *page* 1, for *Altazimuths* read *Clinometers; surveying-instruments; compasses, magnetic.*

PHILOSOPHICAL INSTRUMENTS,

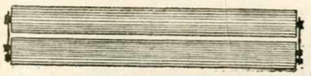
including OPTICAL, NAUTICAL, SURVEYING, MATHEMATICAL,

and METEOROLOGICAL INSTRUMENTS].

Patents have been granted in all cases, unless otherwise stated. Drawings accompany the Specification where the abridgment is illustrated and also where the words *Drawings to Specification* follow the date.

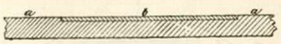
A.D. 1884.

74. Appleton, L. Jan. 1.



Rulers.—The object is to rule lines without blotting or making ink stains. Two rulers are coupled together at their ends in such a manner that the upper one, which guides the pen, is fixed, while the lower one is allowed to revolve easily.

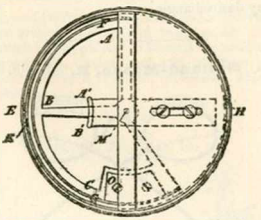
202. Piffard, B. Jan. 1.



Microscope slides.—The slides are made with a recess in the strip *a*, and the cover *b* fits into it exactly, so as to come flush with the surface of the slide. Box slides are made in the same way by dishing the bottom of the recess.

217. Watkin, H. S. S. Jan. 1.

Altazimuths.—Consists in using curved mirrors for taking the readings. In one form, a plumb-bob, consisting of a piece A, B, C with a weight O attached, is pivoted on a centre M. The object is viewed by direct vision through an eye-hole E.



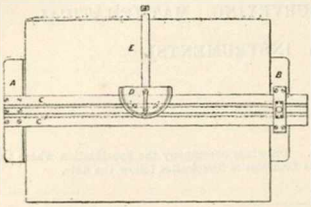
The curved mirror A^1 B^1 gives a magnified reflection of the scale F, E, G. The image of a sight line on the small piece K is brought opposite the object viewed through the opening H, and the inclination is shown in the mirror A^1 B^1.

377. Haynes, J. W., and **Whieldon, W.** Jan. 2.

Magic-lantern apparatus.—Relates to a lamp, and apparatus connected with it, for lighting astronomical charts when working with the telescope in the dark, and for other purposes. The lamp is provided with a magnifying-glass and reflectors, or may be made similar to a magic-lantern. The charts are of uniform size and shape and are fixed

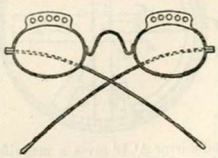
in grooves, or made to pass in front of the lantern by rollers; or the image may be thrown on a screen attached. The charts are painted on transparent ground in opaque colours or *vice versâ*, and the invention is applicable to other maps, prints, &c.

880. Cory, G. E., and **Barczinsky, B. A.** Jan. 7.



T-squares; rulers; protractors.—The T-square is provided with a fixed stock A at one end and an adjustable one B at the other through which the blade can pass to accommodate itself to different sized boards. In the stocks are fixed small friction rollers that bear in grooves in the edges of the board, to allow the T-square to move readily up and down. In the blade of the square, grooves C, C are formed in which slides a small protractor D having a ruler E that can be used as a set-square to any desired angle.

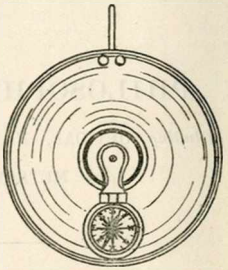
912. Galland-Mason, R. Jan. 8.



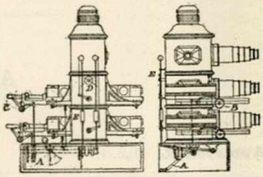
Spectacles and eyeglasses.—Along the upper rims of the spectacles &c. are arranged, behind suitable minute magnifying-glasses, several microphotographs which may consist of printed matter, lecture notes, maps, views, &c. to suit the requirements of the wearer. The rims may be made detachable, and the spectacles &c. may be used with plane glasses or no glasses at all.

926. Whitaker, R. Jan. 8.

Compasses, magnetic.—Relates to combined measuring-tapes and compasses. The compass is let in the centre of those tapes that are worked by a coiled spring. In tapes operated by a handle the compass is placed eccentrically as shown.

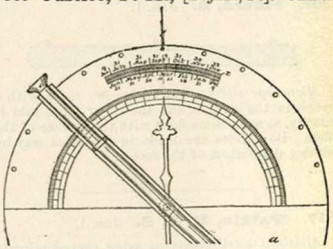


934. Duncan, W. H. Jan. 8.



Dissolving-view apparatus.—The slides are carried in racks on each side of the lantern, and are moved forward by the action of a pedal A and ratchet-wheel B. On arriving at the end of the rack, the slide is pushed sideways in front of the lens by the levers &c. C, and after exhibition are moved back again in the rack on the other side of the lantern. The action of the pedals at the same time turns the gas-cock D by means of the rods &c. E, and also shifts the lime cylinder to present a fresh surface to the gas flame each time.

960. Justice, P. M., [*Boyhan, P.*]. Jan. 8.

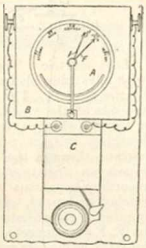


Latitude instruments.—The instrument consists of a graduated circle, with a centrally-pivoted

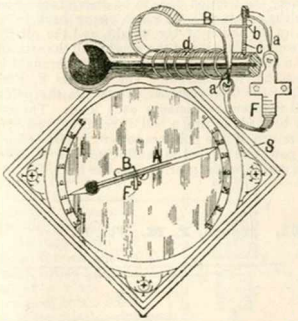
sight tube for sun or pole star. One series of graduation is degrees, and a second shows the declination of sun for each day of the year. The circle is held vertically and in the meridian. A radius bar is set to the declination of sun, and the tube sighted to the sun. At night time the radius bar is set to zero.

1101. Christensen, H. O. Jan. 9.

Barometers. — The object is to make barometers give a signal when they fall to a certain point. An aneroid A has its index F connected by a wire to an electric bell C and battery B. The other end of the wire is attached to an adjustable hand I, which may be set at any desired point. When the barometer falls to this point the index F comes into contact with the bent end I^1 of the set hand, and causes the signal bell to ring.



1138. Watson, T. P., [*Kirk, H. C.*, and *Brayton, J. T.*]. Jan. 10.



Thermometers. — Relates to the suspending-mechanism of balanced thermometers. A forked hanger or suspender B, fastened to the thermometer tube by binding-wire at *d*, has two needle points *a* at the ends of the fork. These bear in mercury cups in a forked bracket F. Or the fork may terminate in two knife-edges bearing in V's in the bracket. There is an adjustment screw *c* which passes through an offset *b* in the hanger, and bears on the lower part *d* of the hanger. Both ends of the tube A may be pointed so as to range over two scales, F. and C.

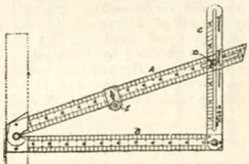
1346. Briggs, J. A. Jan. 12.

Sounding-apparatus.—This apparatus is designed to indicate the varying depth of water when vessels are passing through shallows, but may be used generally. A case containing a vacuum chamber &c. is trailed along the bottom, the case being so shaped that its resistance to the water tends to keep it downward. The vacuum chamber, which consists of two cylinders placed lengthwise, is acted on by the pressure of the water, and, by multiplying-mechanism, moves an index or lever over a surface alternately conducting and non-conducting for electricity. The index lies between two small pins, and is in contact with one or other of them according as the pressure is increasing or decreasing. The passage of the index over the surface sets up an intermittent current through one of the wires forming the towing-line, and thus works an indicator on board with a step-by-step movement actuated by an electromagnet. When the pressure is decreasing, the index lever below comes into contact with the other pin; its retrograde motion over the surface sets up an intermittent current through a second circuit; and, by means of a second electromagnet &c., turns the hand of the indicator on board in the opposite direction to before. The depth of water is thus at all times indicated on board, and by placing an electric bell in one of the circuits, the approach to shallower water is audibly denoted to those concerned.

1397. McGregor, D. Jan. 14.

Dials and the like for instruments for ascertaining compass errors, courses, and bearings, the heel or inclination of ships, &c. Consists in making the dials, quadrants, circles, and arcs of these instruments of vitrified enamel, porcelain, china, or earthenware.

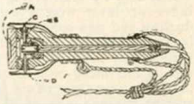
1539. Wood, F. H. Jan. 16.



Protractors; arc-describing instruments.—Relates to instruments of the kind described by the same Applicant in Specification No. 2114, A.D. 1883. The movable arm A is attached to a fixed arm B,

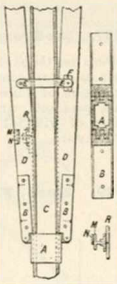
to the other end of which a third arm C is clamped at right-angles. The arm C is graduated so that any polygon can be described, or any angle set off, and is grooved throughout its length to allow the set-screw D to pass through it to the arm A. On this arm also slides a pencil holder E to strike circles of any desired radius.

1603. Balch, W. Jan. 17.



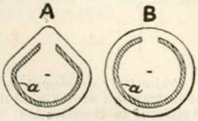
Sounding-apparatus. — The line attached to the weight contains two electric wires leading at one end to an alarum on board. The line passes down the centre of the weight to a cavity at the bottom; one of the ends is attached to a metal cap A, and the other to a spring-washer B surrounding it. Four pins C, pass through holes in the sides of the weight; and, when the apparatus strikes against the bottom, the covering-cap D pushes the pin inwards and puts the washer in contact with the cap A, whereupon the alarum is sounded on board.

1814. Hart, F. W. Jan. 21.



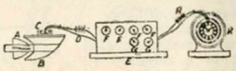
Tripod stands.—Each leg consists of three rods, two forming the upper portion, attached to the stand head by socketed pins, while the third slides freely between the other two and forms the lower portion. The upper rods D, D are fitted with straps B, B hinged to a sleeve A in which the central rod C slides. The upper rods are slightly bevelled off where they embrace the central one, and are pressed to it by the act of fitting them to the stand head. Further grip is obtained by the strap E, F, while if very heavy weights are to be sustained a ratchet-face clamp M, N, R is used.

2200. Hicks, J. J. Jan. 26.



Thermometers, clinical. The tube is formed with a strip of enamel inside extending round the back and sides of the tube. The line of sight is thus left clear, guiding the eye at once to the correct position. The graduations are marked at the side of the opening over the enamel, increasing their visibility. In the drawing A is a "lens "front," and B an ordinary thermometer, the enamel strip being shown at *a*.

2510. Rothwell, W. G. Feb. 1.

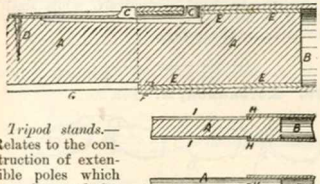


Logs, electric. The screw A of the log is formed with advancing blades, and is protected from eddies by the wing B. The log is attached by clips C to the side of the vessel. The screw spindle carries a worm, which actuates a wheel making and breaking contact periodically, so as to send a current through the wires D. Each such current causes an armature to be drawn down in the recording-apparatus E, which, by means of a ratchet and pawl, causes an advance of the first pointer of the registering-apparatus. The pointers on F, F are connected in the usual way, but those on G, G have their spindles attached to discs acted upon by friction discs geared with the train F, F and held tight by an armature. These pointers are weighted, and one carries an armature. Every hour the minute-hand of the clock K makes contact for the battery H and causes the armature holding the friction discs to be drawn back, setting free the pointers G, G, which swing back to zero, one by the action of the weight, and the other by the combined action of the weight and the attraction of an electromagnet, on its armature, brought into action by the current. The pointers F, F thus register the total distance run, while the pointers G, G register the distance each hour. The clock may be made to ring a bell, if required, just before the return of the pointers to zero. The action of the pawl and ratchet in causing motion is assisted by a spring wheel gearing into the train.

3196. Moore, F. M. Feb. 13.

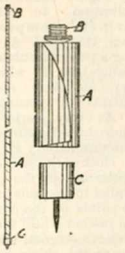
Compasses, magnetic.—The card A is an ordinary paper annulus lapped round the circular tube B, and strengthened by a thin paper strip at C. Radial bars D fix the frame to the ebonite cap H, which carries the centre stone on which the compass is supported. Light supports G carry the framework F, which holds the magnetic needles E, arranged in two systems, one on each side of, and equidistant from, the centre. The tubular rim and suspension gear are of aluminium for lightness and strength.

3232. Pirard, A. Feb. 13.



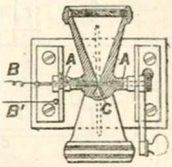
Tripod stands.—Relates to the construction of extensible poles which may be used for various purposes. The Figure shows the application to the handle of a spade, but the invention can be applied to tripod stands, tent poles, umbrellas, &c. The lower part A of the handle is of wood, and slides in the hollow iron part B. The wood carries one or more catches C fixed by the screw D, which can be pushed back into a recess, so as not to interfere with the sliding. There is a ferrule or ring E, on the end of the wood, and a slot G along it, for the projection F on the iron part to work in and guide the one part on the other. In a simpler form of handle, a slot or slots I run along the wood and projections H on the iron work in them. One or more short slots K, at right-angles, are provided so that a slight rotation of the handle can make all firm in any convenient position. The slots may also be made very short and turned towards the end of the handle away from the spade, so that the iron part can easily be detached. In a further modification, the projections are fixed to the wood, and the slots formed in the iron.

3510. Sharp, H. B. Feb. 18.



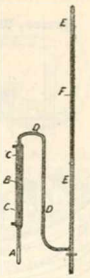
Surveying-instruments; tripod and like stands.—Relates to surveyors' staves, and to legs or standards for supporting stands for cameras, stereoscopes, telescopes, theodolites, music, easels, &c. A long strip of metal is formed into a spring A, coiled like the spring of a clock. To the inside of this is fixed a core B for attaching to the frame of the music stand, or whatever the legs or standards are to support. The spring is then drawn out, and twisted until it becomes a tapering rigid rod, when the socket C is fitted over the other end to hold it from unwinding. The socket may be supplied with a spike for sticking into the ground.

3666. Scott, P., and **Scott, A. T. H.** Feb. 20.



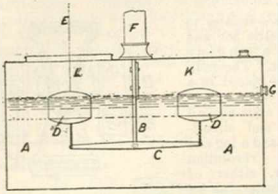
Logs.—Relates to an electric log and ship's engine counter. The indicator is placed in a circuit with a mercurial combined timer and circuit-closer, and a log and engine revolution counter, either of which latter can be thrown into the circuit by a switch according as the speed of the vessel or of the engines is desired to be known. The timer, which is shown in the Figure, is made of steel and is similar to an hour glass. It is suspended on pivots A, A, with which the wires B, B¹ are connected, so that the mercury in its passage through the neck C closes the circuit. On the engine shaft a series of wipers come into contact with a spring, which is thus deflected into contact with a second spring, making and breaking contact each time. The log is towed by an insulated wire leading to a spring contact inside the casing. The rotator causes a wiper to oscillate a lever each revolution, and make and break contact with the small spring. The circuit is completed through the water and ship's side. The indicator is provided with electromagnets and an oscillating lever by which an index finger is moved over a doubly-graduated dial showing knots and revolutions.

3750. Beilby, G. T. Feb. 22.



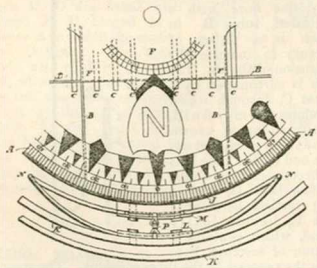
Thermometers.—The bulb A contains air, and is connected by a tube of very fine bore with a graduated tube B, in which is a piston of mercury to indicate the expansion of the air. The tube is surrounded by a jacket C, through which circulates some fluid, usually steam, at known constant temperature. The end of the tube B is again connected, by a tube of fine bore D, with a long vertical barometric tube E, hermetically sealed, which contains a column of mercury F to keep the pressure in the tubes constant. The space between the top of the mercury and that of the tube is of considerable length and is a vacuum, so as to allow of the mercury moving up and down as the air in A expands. The tube D may be dispensed with, by constructing B of greater length, and using it as the barometric tube. In this case the piston of mercury and the column are merged into one, and the indications of temperature are taken from one end of the column.

3771. Thomas, A. Feb. 22.



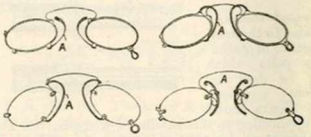
Photometers.—A suitable tank A is divided down the middle by a partition B, which does not reach the bottom. On the bottom of this partition is pivoted a lever C, to the ends of the arms of which the floats D, D are attached by chains. One float is free, and the other has a cord E fastened to it, by which it is connected with a pointer on a dial supported by the standard F. Through the standard a pipe passes, opening at one end into the chamber K and terminating at the other in a gas jet. The upper portion of the standard F is threaded, and a nut carrying a wire gauge can be screwed along it, so as to measure a standard height of flame. Water is first introduced into the tank through the tap G, until the floats are nearly submerged; gas is then allowed to enter, and the jet lighted. The pressure causes the float in K to fall and in L to rise, and the pointer is carried over the dial by a counterpoise. The pressure is raised until the flame burns the standard height, and the pointer then indicates on the dial the richness of the gas.

3852. Bruce, T. W. Feb. 25.



Compasses, magnetic.—The object is to construct a compass which will withstand the shocks incidental to sea use. The card of the compass is made especially light. The framework consists of four brass wires B fixed to a light ring A, over which is stretched a cover of glazed silk or other light strong material F. The magnets C are formed of watch-spring steel, and are sewn by waxed thread to the cover F. The bowl J is suspended from the gimbals K by bent wire springs N. These are held by plates L and M on the gimbals and bowl respectively, while small chains P are attached to the plates to prevent any undue strain on the springs.

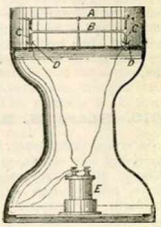
3879. Korshunoff, N. Feb. 25.



Eyeglasses.—Attached to the glasses are holders or clips A, which extend back into the corners of the eyes, and round almost to the middle of the eyebrows. This distributes the pressure more uniformly, instead of pinching a small part of the nose only, and secures the glasses more exactly in position before the eyes. The holders may move on a swivel as in the lower Figure on the right, so that the glasses may fold up flat in the ordinary manner.

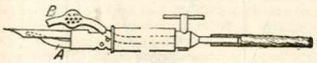
3881. Barry, J. H. Feb. 25.

Compasses, magnetic; photometers; &c.—Relates to electric registering apparatus for use with compasses, photometers, radiometers, anemometers, aneroid barometers, and weather indicators. The Figure shows the application to the mariners' compass. From the card A is hung a pair of insulated parallel bars B, which carry at their ends pendants of platinum C. At every quarter-point of the compass is fixed a spur-shaped contact-piece D, connected with the poles of a battery E. A cylindrical drum, rotated by clockwork, carries the paper on which the register is kept, the paper being ruled in divisions parallel to the ends of the drum, and marked with the points of the compass. A screw, terminating in a ratchet-wheel the pawl of which is actuated by an electromagnet, carries the marking-pencil. As long as the ship's head remains in one direction the pencil is stationary and the line traced keeps to its division. When the ship's head is turned, the pendants sweep over the contact-pieces, making and breaking contact, turn the screw, and cause the pencil to travel parallel to the axis of the drum. The arrangement of the parallel bars and contact-pieces is such that a reverse motion of the ship's head brings the pencil back again. In the application to a photometer, a radiometer is



used, every revolution or half-revolution being registered by counting-mechanism operated by the electromagnet, and the apparatus may thus serve the same purpose as a gas meter.

3985. Dalton, W. H., [*Crocker, S. H.*]. Feb. 26.



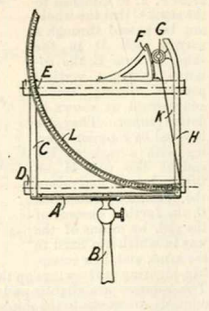
Compasses, drawing; ruling-pens. — Relates, mainly, to a reservoir pen with a gas burner for heating the nib, the invention being stated to be applicable also to ruling-pens and bow pens or compasses for use in lithographic, transfer, and like processes. Lithographic or other ink is contained in the tube A, while a flame impinges upon the pen from the jet B and keeps the ink sufficiently fluid during the operation of writing upon glass or other surface. Gas is supplied by a small tube passing through the holder.

4132. Wood, C. H. Feb. 29. *Drawings to Specification.*

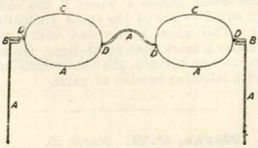
Thermometers and barometers are combined, separately or together, with sideboards, cheffoniers, dressers, sewing-machine covers, and similar pieces of furniture, or a clock may also form part of the combination.

4303. Clark, A. M., [*Dany & Lepage*]. March 3.

Telemeters.— Upon a framework A attached by a ball-and-socket joint to its stand B are mounted two telescopes, one D being fixed and the other pivoted at E to the arm C of the frame. The movable telescope carries an arc F working a friction roller G on the arm H of the frame; to this roller is attached the index finger K, which moves over the scale L and indicates the distance of the object sighted by both telescopes, not the angles at which they are inclined. The movable telescope is adjusted by a screw, which slides it between guides. In instruments for greater accuracy, the adjustment is made delicate by a train of wheels, so that the pointer travels through a large angle for a slight motion of the telescope. For the scale there is a series of graduated concentric circles, and the index finger is made to travel along the pointer so as to point to each in turn, and show the number of complete revolutions. The instrument may be mounted on a geodesical circle or any convenient stand.

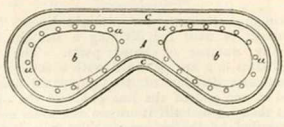


4584. Ferranti, S. Z. de. March 8.



Spectacles.—In one form of frames, the arms, the lower part of the rims, and the bridge are formed of one piece of steel wire A. The bridge consists of a piece of soft iron threaded on the wire before bending. The upper parts of the rims C, C to surround the glasses are fixed on by coiling the ends round the wire A at D, D. At B, where the arms and rims are usually hinged, the wire is flattened, or coiled helically, or both, to render it very flexible, so that the arms can be bent down upon the glasses to go into a case. The rims and arms may also be constructed entirely of one piece of wire.

5086. Lake, W. R., [*Genex, D.*]. March 18.



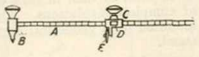
Eye-protectors.—The object is to provide eye guards or protectors for the use of firemen, and for workmen in metal and chemical factories. They consist of a flat metal frame A in which two mica plates *b* for the eyes are secured by rivets *a*. To the back of the frame is fastened a marginal tube *c* of india-rubber, so that the eyes are protected in an airtight manner from smoke or fumes.

5164. Woodbury, W. B. March 19.

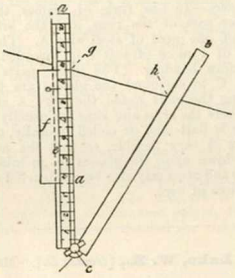
Dampness detectors for linen &c. Gelatine, alone or in combination with glycerine, sugar, or other like hygroscopic material, is prepared in sheets which are cut into stars or other shapes. When placed upon damp linen or other materials they absorb moisture and curl up at the points.

5269. **Haddan, H. J.,** [*Mora, F. A.*]. March 24.

Dividing-instruments for circles. A flat graduated bar A is fitted at one end with a perpendicular support B having a sharp point. Upon the ruler is an adjustable slide C, with a slot D in its side through which the graduations on the bar can be seen, and which carries a wheel E the radius of which is equal to one of the equal graduations on the bar. This wheel is provided with a pricker, which makes a mark each revolution. On moving the slide to any division, the circle described will be divided into that number of parts.



5443. Marks, P. S. March 25.



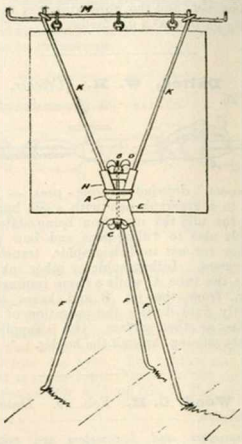
Dividing-instruments for straight lines. The instrument is used for dividing a straight line into any number of equal parts. The two hinged arms *a*, *b* are provided with a set-screw *c*. A particular division of the graduated arm is placed at one end of the line *g*, *h*, and the other arm is then opened till it crosses the other end *h*, and secured by the set-screw. The rule is then slid along in the holder *e*, *f*, one space at a time, and the other arm cuts off the parts from the straight line.

5509. Clark, A. M., [*Hayes, H. E.*]. March 26.

Tripod stands for maps and charts. A base-block A is cast upon a central rod B, which is screwed at each end to receive the nuts C and D. The legs F fit into a socket E on the base, and are clamped into place by a wedge block which is tightened up by the nut C. The upper block H revolves on the central rod and is fitted with two rods K, upon which the cross rod M is placed. The chart or map is then hung from rings fitting over hooks on the rod M.

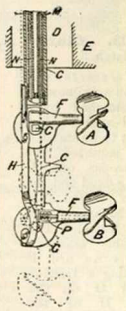
(*For Drawing see next column.*)

5509.



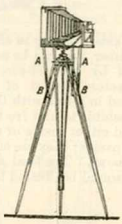
5571. Clark, A. M., [*Carroll, D.*]. March 27.

Logs and leeway indicators. — The apparatus consists of two vaned rotators A, B, working in arms F, F, so attached to the stock C that the whole can be passed through a narrow well D in the ship's bottom E, the rotators taking a vertical position during ascent and descent, as shown in dotted lines. They are lowered by a pinion gearing with a rack on the end of the rod H, so that, when a cap stops the descent of the stock C, the further descent of the rod, by means of the way in which it is fixed to the arms, and their eccentric pivoting at G, swings up the arms into position. The rotators are slightly and equally inclined in opposite directions to the ship's axis; consequently, when the vessel is going ahead, they rotate equally, and if there is any leeway, one moves faster than the other. Upon the ends of the vane spindles worms P are fitted, which gear with worm wheels on two wires N, N passing up through the narrow tubes M in the stock to the indicating-apparatus. These wires carry a right and left handed worm respectively near their upper end, and a little



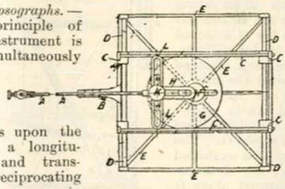
above these a right-handed worm each. The first or lower pair is connected with differential gearing, so that, if the wires rotate at the same speed, no effect is produced, but a difference causes the rotation of the hand on the leeway indicator dial. The second pair, by means of similar gearing, causes the rotation of the wires to be added up, and moves the hands of the headway indicator dial. The wires terminate in flexible portions which are bent round into a line, and on their ends are fixed two bevel-wheels forming part of a system of differential gearing which shows whether the vanes are properly adjusted, by indicating an equal revolution of the wires when there is no leeway. The tubes M act as lubricators, a sufficient head of oil being maintained to force out the water, and supply the working parts.

5647. Thomson, J. March 29.



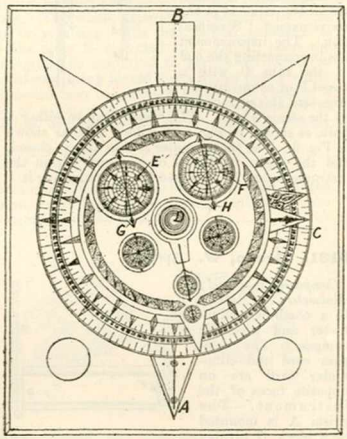
Tripod stands for photographic cameras. Additional supports are furnished to the camera by slotted stays A, which connect the corners of the base of the camera to the camera legs. The stays are slotted at one end and clamped in the proper position by screws B. For use at sea the camera is kept horizontal by a pendulum swung on gimbals. The gimbals are placed within the cap of the stand.

5803. Lake, W. R., [*Abbott, L.*]. April 1.



Ellipsographs.—The principle of this instrument is to simultaneously impress upon the pencil a longitudinal and transverse reciprocating motion so as to describe an ellipse. The pencil is carried at the end of the arm A, which slides in the slotted bracket B. This bracket forms part of a frame C, which is capable of sliding transversely on the guide rods D, D attached to the light framework E, which rests on the table or drawing. To the centre of the framework is fixed by the pin F the disc G, which is adjustable eccentrically by means of a slot through which the pin passes; a nut screwed down tight holds it in the position required. The disc G is also fitted with a slotted arm H, fixed at its side and bent back over its centre. The headed pin K is adjustable along this slot, and passes also through the slotted arm L, attached to the arm A at right-angles to the same. When the disc G is rotated, its eccentric mounting will cause the frame C to reciprocate transversely, and the pencil with it. At the same time as the pin K rotates, the pencil rod reciprocates also longitudinally. Graduations for adjustment are marked along the sides of the slots in the disc and the slotted arm H.

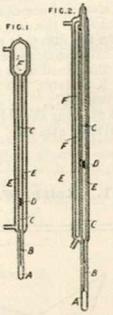
5921. Keith, W. C. April 4.



Course indicators.—A series of superposed discs of brass are supported by wood between them, the lowest one being fixed to a stand which may be placed in any convenient place to be referred to by the officers of the ship. The line A B is kept parallel to the keel. The discs are graduated with points and fractions of points of the compass, and each movable disc can be rotated round a central spindle D, by means of the projections, such as C, and adjusted in any required position. The course steered being, say, east, the pointer C is set north and the dials E, F are connected by gearing so as also to point north. If, then, any deviation is to be made, such deviation is allowed for by altering the position of the upper disc, and is then shown by the directions of the arrows G, H. The other dials are duplicates, only here the arrows move, while the dials are fixed.

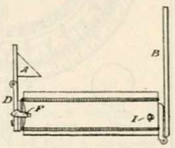
6093. Beilby, G. T. April 8.

Thermometers.—Relates to the air thermometer described in Specification No. 3750, A.D. 1884, and consists in another method of regulating the pressure in the instrument. The air-bulb A, connected by a very fine tube B with the tube C in which a piston of mercury D moves, and the steam jacket E surrounding the tube C to keep its temperature constant, are all the same as in the above-named Specification. The improvement lies in connecting the end of the tube C with a vessel F of comparatively large size, also surrounded by the steam jacket. This vessel may be either a bulb, as shown in Fig. 1, or a long tube as shown in Fig. 2. The thermometer is thus always closed, and the slight variations of pressure within the instrument may be arranged for in graduating it.



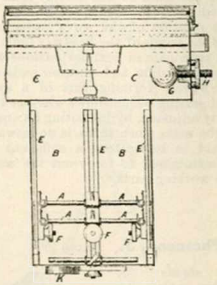
6181. Green, W. April 9.

Compasses, magnetic; clinometers. — Relates to a combined clinometer and prismatic compass. The compass card and clinometer card are on opposite faces of the instrument. The prism A is mounted on a block D pivoted to the frame, and can thus be turned round to read the angles on either face of the instrument. A catch F retains the block in either position. The sight frame B is jointed to a projecting hinge, so that it can be used for either face or lie down flat on one face when not in use. The compass card is lifted from its pivot, when not in use, by a small lever with a projecting nut, and is brought to rest by a spring pressed down by a small stud shown at I.



6288. Moore, F. M. April 12. *Amended.*

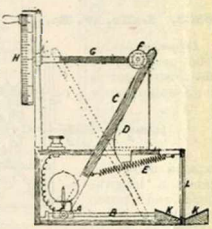
Compasses, magnetic.—The correctors for controlling the errors of the compass are attached to the bowl itself instead of to any fixed part of the case, thus securing an invariable position and action of the correctors to the compass needle. The magnets A, A for the cardinal errors are placed in a chamber B fixed below, and forming part of the bowl C. They consist of brass rods with a core of magnetized iron of various thickness, and are made of uniform size to allow of their being readily interchanged. They are clamped in



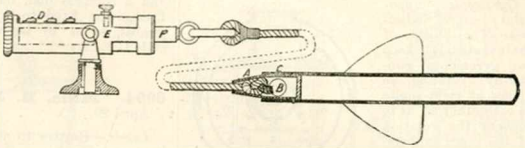
brackets working in slides E on the sides of the chamber, and can be adjusted to any position and fixed by the set-screws F. The "quadrantal" correctors consist of two balls G of soft iron placed in a line with the magnets of the card, and adjustable to and fro by screws H. They may be fitted either inside or outside the bowl with fluid compasses; they are enclosed in brass cylinders if in the bowl. The final adjustment to make the card horizontal is effected by the eccentric weight K.

6312. Preece, W. H., and **Trotter, A. P.** April 12.

Photometers.—The rest A for the lamp slides along the rod B, and has the bar C attached to it by a hinge. The bar C is pulled against the cam D by the spring E, and can be moved by the piece F on the screw G. The cam D is so shaped that the distances measured along G correspond to the inverse squares of distances measured along B. Equal graduations on the wheel H thus enable the power of a light to be read off at once. Instead of a fixed cam-plate the bar A C might be appropriately shaped. Mirrors are placed at K, K for facilitating the inspection of the screen L on both sides.

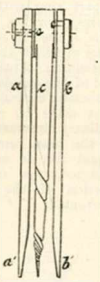


6369. Walker, T. F. April 15.



Logs.—The rotator is provided with a hollow conical piece A at one end. The apex is cut off so as to leave a central hole through which the rope passes. The rope is drawn out at a side opening B, knotted, and drawn in again, when it locks against the inside of the cone. A cylindrical piece C is then slid over the hole B. The rotator is made of some light material, or hollow at the hinder end and weighted at the front end. The indicating-mechanism is contained in a casing D on board which can be disconnected from E by sliding, being held in contact by a screw. Slots in the case of D permit it to be partially turned or slid away from E without moving the screw, for convenience of examining. The whole apparatus is constructed so as to secure ease in getting at the working parts for oiling or repairing. The first motion spindle F is terminated by a disc turning on friction rollers. Thus the piece E, mounted on a gimbal, takes the strain. In place of a gimbal a cranked or looped metal sling may be employed to permit of inspection of the dial from either side of the instrument, the inner dial-case being turned (by a milled head) within the outer perforated case; or the whole registering-mechanism may be reversed. The disc engages a small wheel which drives the indicating-wheels by means of a pin. To admit of the easy removal of the gimbal from its socket or fixture it is secured to the latter by a bayonet joint or somewhat similar device.

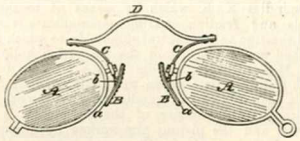
6375. Lamers, J. April 15.



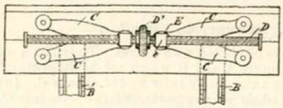
Compasses, drawing, combined with hand tools &c. Two or more tools are pivoted on a common axis so that each can be turned into any required position independently of the others, and thus, while one tool is being used, the others may form a handle or lever to the same. This combination tool contains screwdrivers, scales, a file or saw, a gimlet *c*, and a wire cutter; it may also be used as a pair of compasses. The screwdrivers a^1 and b^1 are formed at the end of the file *a* and the saw *b*, on the flat sides of which scales of inches and centimetres are also marked. A radial notch *e*, having sharp edges, is formed in the boss of each tool, and when wire has been inserted the notches will act as a wire-cutter by turning one of the blades quickly on its pivot.

6377. Lake, H. H., [*Fox, J.*, and *Scott, J. H.*]. April 15.

Eyeglasses.—The spring connecting the lenses A is made in two parts C, C, each of which is curved back over the glasses. The ends are joined by a stiff piece of metal D, which prevents any undue strain on the springs by the frames abutting against the metal yoke. The nose clips B each consist of an inclined bar *a*, attached to an arm *b*, which can be fixed to any convenient part of the frame, and, being of soft metal, allows of the adjustment of the glasses.



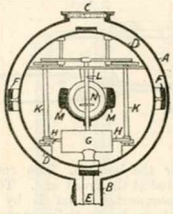
6723. Pope, D. April 23.



Parallel rulers.—To the upper ruler are fixed parallel graduated guide-bars B, B^1, upon which the lower ruler slides. The two rulers are connected by double links C, C pivoted together at *e*, and carrying nuts E through which passes the rod D. This rod is threaded half right and half left handedly, and is rotated by the milled head D^1, causing the nuts E to separate or close together, and the lower ruler to slide along the bars B, B^1.

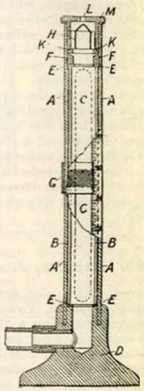
6842. Falkner, V. April 26.

Gyroscopic apparatus; course indicators.—The object of the invention is to keep two gyroscopes constantly rotating in planes at right-angles to each other, so as to prevent the rotation of the vessel supporting them. The apparatus may be used in place of the compass and to determine latitudes, while the apparent rotation of the vessel indicates longitude &c. The apparatus consists of an external shell A, provided with a sight hole C, and supported on a hollow pillar B screwed to the base-plate. Within this shell is an inner shell D, which carries the gyroscopes and working parts. A vertical gimbal ring is held by the spindle E passing down the hollow pillar and resting on a bearing at its lower end, its upper end being supported by antifriction wheels. A horizontal gimbal ring F is carried by antifriction bearings on the vertical ring, and this in turn is connected with the inner case by antifriction bearings. G is a double piston cylinder, which may be either fixed or oscillating; H, H, its two connecting-rods, actuate the spindles K, K which by means of toothed wheels and friction gearing communicate very rapid rotation to the central spindle L, to which is attached one gyroscope in the form of a hollow bowl M. Upon the spindle L is a friction disc which transmits its rotation to a pair of discs N, one on each side of the spindle, forming the other gyroscope. The interior of the inner shell is a vacuum, and the pistons are worked by fluctuations of air-pressure in the space between the shells with which a pipe from the cylinder communicates, these variations being created by working a hand or other pump. On the exterior surface of the inner shell are painted latitudinal and meridional lines, divided scales, mappings, &c., and a compass dial, movable pointer, and other fittings are fixed to the outer shell, or vertical gimbal, so as to be visible through the glass plate C.



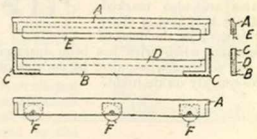
6994. Mills, B. J. B., [*Macdonald, J.*]. April 29.

Levels.—Relates to an improvement in the standard of the level described in Specification No. 3034, A.D. 1883. The standard consists of a brass tube A fixed to a base D, and having a slot C at each side, through which the liquid in the glass tube B can be seen. The ends of the glass tube rest on packing-rings E, E of india-rubber, the upper one being kept tight by the nut F. The edge of one, or both, slots is marked with a scale, and a sliding indicator G, consisting of a part ring with guide pieces working in the slots, is used to mark the place at which the liquid is standing. At the upper end of the standard is an automatic, conical headed, float valve H, which rests on a stop K under ordinary circumstances, leaving free the air-hole L in the brass screw-cap M. Should, however, the liquid rise so as to escape, or the standard be inverted, the valve passes into the undercut portion of the hole L, and such escape is prevented.



7373. Meyer, O. May 7.

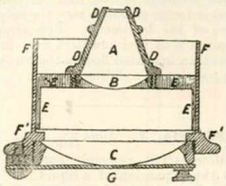
Rulers combined with knives. The ruler is made in two parts A and B, which can be fitted together to form an ordinary ruler by the clamps C. In the inside edges of the parts are two saw cuts D, in the upper of which is fixed a knife E, which can be used for cutting paper in straight lines. When the parts are fixed together the edge of the knife lies in the second saw cut. Instead of one long knife, two or three shorter ones may be used, or circular knives F, F may be employed.



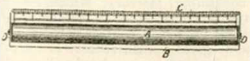
7639. Wallich, G. C. May 13.

Microscopes, condensers for. The condenser consists essentially of a truncated cone of glass through which the rays of light are transmitted and suffer internal reflection at the sides. The cone A, with the lens B cemented to the base, is fitted into the jacket D which screws into a plate E. This plate slides in the tube F, F¹, to vary the distance between the lenses B and C, and

the whole is fitted with a diaphragm or shutter G to regulate the admission of light.

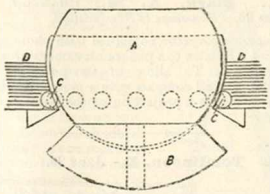


8248. Freeman, D. May 27.



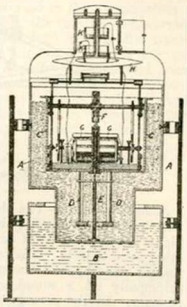
Rulers.—An ordinary round ruler A is provided with a parallel guard B running its whole length and fixed to two end pieces D, D. The pen is pressed against this guard so that the ruler does not get inked. To D, D is also fixed the counterpoise C, on which the fingers press while ruling; it is graduated for measuring, and its edge can also be used as a ruler with a bow pen. The ruler itself is graduated circumferentially at its end, and a pointer is fixed to D, so that the ruler can be moved any required distance down the paper.

8393. Calley, S. May 29.



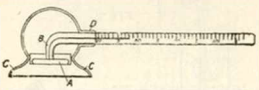
Compasses, magnetic.—Relates to apparatus for controlling the rolling and pitching of ships, ships' saloons, and furniture, and also applicable to a mounting for compass cards. The Figure shows the apparatus partly in section as applied to ships. It consists of a sphere A carrying a heavy weight B and resting on balls C, C in a framing D secured to the vessel. This weight is so shaped that the vessel may roll several degrees, but should it exceed this the weight, by coming against the framing, prevents or diminishes further rolling.

8394. Pitt, S., [*Bos, M. G. V.*]. May 29.



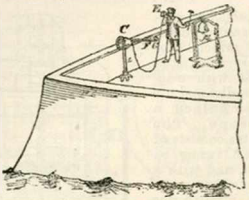
Gyroscopic apparatus; course indicators.—The principle of the invention is to dispense with magnetic needles and use in their place a gyroscope. The apparatus consists of a case A swung on gimbals, and with a contracted lower part resting in glycerine in a case B also swung on gimbals. A is partly filled with a mixture of alcohol and water, in which rests the case C containing the working mechanism, which, if necessary, is steadied by the contracted lower part D. The case C nearly floats in the liquid and so bears only lightly upon the supporting-pillar E and turns upon it very readily. Within C is mounted a heavy wheel F the axis of which is connected with the rotating axes of two electro-motors G, G. A compass card H is mounted on the case E, with the north and south line parallel to the axis of the wheel F. Electricity is conducted to the motors by means of wires dipping into the mercury cups K, K fixed to the lantern on the case A. The requisite play is thus given to the case C. Other means however may be employed for driving the wheel F, as, for instance, clockwork. It is claimed that the wheel F, acting as a gyroscope, combined with the mounting of the instrument, so as to preserve the axis of F horizontal, causes this axis to settle in the meridian.

8670. Mayer, J. June 6.



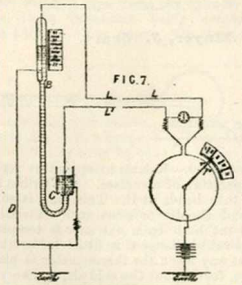
Thermometers.—Relates to apparatus for taking the temperature of a surface. The bulb A is spiral and the tube bends at B. This part is contained in a cup of ebonite or some such material, which protects the bulb from extraneous temperatures. An india-rubber flange C is fitted below the bulb, and gives way when the thermometer is placed on a surface, forcing out the cold air, and keeping the instrument in place. The tube, where it passes out of the cup, is surrounded with india-rubber tubing D, and, if necessary, a stiffening-ring is put round the mouth of the cup.

8794. Torre, F. D. June 10.



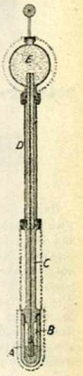
Sounds, locating.—The object is to provide ships with means for detecting in foggy weather or at night the proximity of land, icebergs, vessels, or other solid objects. The principle made use of is that of the echo, and the means employed consist principally of a sound-producer and a sound-receiver. In the arrangement shown A is a bell, the sound emitted by which is reflected from any solid body in the proximity of the ship, and returns to the receiver C which is pivoted to a stem *c*. A telephone is attached directly to C, or a microphone may be inserted therein and connected by a wire with the telephone E. The arm of the receiver is provided with a compass F and a timepiece G, by means of which the direction and distance of the reflecting body can be readily found, the time between the transmission and receiving of the sound being noted. If desired the telephone and timepiece may be removed to the cabin and the bell worked therefrom, by which arrangement the interference of extraneous noises will be obviated.

9116. Bourne, H. B., and **Bourne, H. R. F.** June 17.



Barometers and thermometers, reading at a distance by electric means. Line-wires L, L' are carried into the mercury of the barometer and preferably attached to the tube at B and C. A conductor D connects the two wires to cut out the mercury and complete to earth. When the mercury falls at B it rises proportionately at C, the resistances of the line-wires L, L' being varied. A contact *r* in a Wheatstone bridge is moved over an index until the current detector comes to zero, the index giving the reading of the barometer. This arrangement is also applicable to thermometers &c. In another arrangement, an insulated float in the barometer &c. alters the position of a sliding contact.

9393. Murrie, J. June 25.

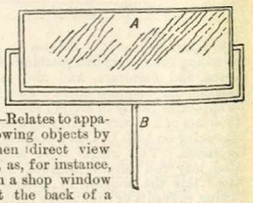


Pyrometers.—The principle employed is the expansion of a liquid against the force exerted in a closed tube by a more compressible liquid. The first liquid can thus be heated to temperatures considerably above its normal boiling point without vapourizing. A is a steel or iron vessel containing mercury, which may have water or ether or some compressible fluid B in contact with it, where great sensitiveness is required. An iron or steel tube C dips into the mercury and is screwed into the vessel A. A glass tube D is connected by nuts and packing with the tube C and the globe E, which contains alcohol and which may be surrounded by water to keep the temperature uniform. The alcohol occupies a part of the tube D. A scale on or attached to D indicates the temperature. The tube C may be dispensed with, and the glass tube directly connected with the vessel A. The vessel A and the tube C are preferably coated with fireclay to prevent oxidation.

9461. Clark, A. M., [*Moëssard, P.*]. June 26. *Drawings to Specification.*

Compasses, magnetic, combined with photographic cameras. Relates to a panoramic camera of special construction. To allow of its position being adjusted, a small compass with a moving graduated limb is fitted on a projection at the bottom of the camera.

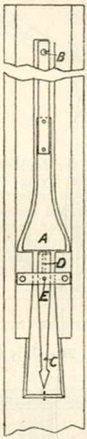
9464. Tomlinson, E. June 26.



Reflectors.—Relates to apparatus for showing objects by reflection when direct view is impossible, as, for instance, the articles in a shop window to persons at the back of a

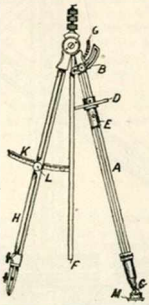
crowd, the objects in front of a boat to the rower, &c. Consists in mounting a mirror A on a stand B so that it can be turned in the required direction. In the Figure it is mounted so as to revolve round a horizontal axis.

9793. Wright, T. July 5.



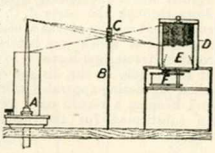
Plumb-rules.—A plumb-bob A is fixed to a rod pivoted at B, and a pin D at its end controls the pivoted index finger C showing when the rule is exactly vertical. The working parts are covered by a casing to protect them from wind and weather. A spirit level and thermometer may be attached.

9876. Bennett, J. F., and **Smith, B. B.** July 8.



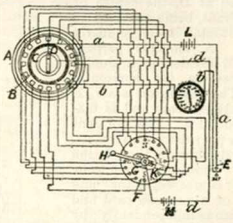
Mathematical drawing-instruments.—Relates to compasses and the like for tracing various curves, such as circles, spirals, ellipses, &c., and other regular or irregular figures. Various arrangements are described, of which one is here shown. A spindle on the shoulder B, passing down a socket in A, allows the instrument to revolve, while A is connected to the piece M, fitted with two or more points, by a ball-and-socket joint C, but prevented from revolving by two pins fitting a groove in the ball. A templet D of any desired shape is adjusted as required upon the leg A by means of a sliding piece E, and against this templet the leg F is pressed continually by a spiral spring G. The leg H, which carries the pen, is clamped at any required angle to F by means of the quadrant K and set-screw L. It follows that, as the instrument is revolved, the shape of the templet will determine the curve traced. Another form is illustrated in the Specification, in which a cord attached to the rotating leg is wound on a cone on the fixed leg; this is for tracing spirals. For tracing ellipses, the fixed leg may have a cross-bar with a pulley at each end, round which, and round the moving leg, a cord is passed. The non-rotating leg may be made in three lengths connected by knuckle joints in planes at right-angles. The legs may be parallel, the loose leg being held by a cross-bar. This last form is mentioned in the Provisional Specification only.

9931. Thorp, T. July 9.



Photometers, registering. A governor valve, preferably a diaphragm governor with a loose valve resting on the central portion, ensures a constant flow of gas to the jet-burner A. In the opaque screen B is an aperture, in which is fixed a lens C. This lens throws an image of the gas jet through a narrow slit in the outer drum D, upon sensitized paper carried by an inner drum E. Clockwork F slowly rotates the drum E, and thus a continuous record of the height of the jet is kept, by which the illuminating power of the gas can be estimated. Instead of a drum and sensitized paper, dry plates, drawn forward by clockwork, may be used.

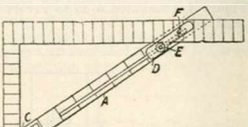
10,075. Lea, J., and **Harvey, G. C.** July 11.



Compasses, magnetic.—The object of the invention is to enable the indications of a magnetic compass to be read at a distance from the same, so that the compass may be floated in a boat out of the range of the disturbing influence of the iron on the ship. The Figure shows only the principle of the invention. Contact-pieces are fitted round the card of a compass A at each point, or half-point; there is also an insulated coil B round the

needle, and a metal ring C below it. The needle carries a light contact-maker D, which, when the needle dips, connects the ring C with the adjacent contact-piece. The dipping of the needle is caused by depressing the key E and sending a current from the battery L through the wires *a*, *b*, which may also include a second coil round another compass for purposes of comparison. From each "point" contact-piece on A a wire passes to a corresponding piece on the recording-instrument F, all these wires being combined into one cable. A wire *d* passes from the ring C to a second battery M and thence to the electromagnet G on a frame rotated by a handle H. On pressing the key E the needle dips; the handle H is then turned until a metal point on the frame touches the contact-piece corresponding to that on the distant compass against which the needle is dipping. A current flows through the parts *d*, C, D, G, M, and the consequent motion of the armature of G sets free a pointer K which was before carried with the rotating frame, and leaves it to show the direction of the needle of the distant compass. An automatic registering-apparatus worked by clockwork, and keeping a record on a revolving drum, may be substituted for the hand instrument here described.

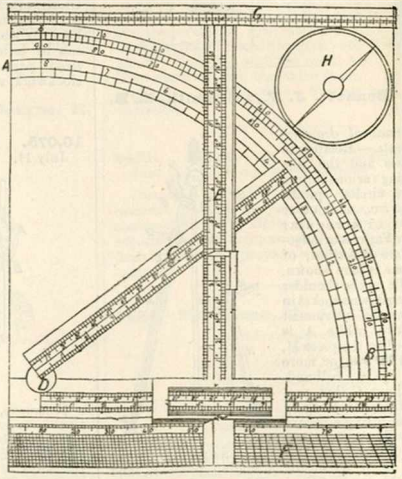
10,105. Clark, A. M., [*Olson, A. G.*, and *McFarlane, J.*]. July 12.



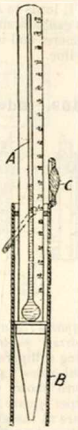
Squares for builders' use. The instrument is adapted for laying out rafters, stairs, &c., and consists of an ordinary square with a slotted bar A of L-shaped section adjustable thereon. One end of the bar terminates in a jaw B and is clamped as desired by the set-screw C; a second jaw D works in the slot and is adjusted by the sliding stud E; it is then clamped to the square by the set-screw F.

10,112. Silversides, J., Dudding, W., and **Megson, H.** July 14.

Course indicators and correctors.—Relates to a calculating-apparatus for use in navigation, with which is combined a course indicator and corrector. The instrument consists of a rectangular plate on which is a quadrant A B divided into degrees and also into points and quarter-points of the compass. A radial arm C, divided into degrees and sixths of a degree, is pivoted at D, the centre of the quadrant, being attached to the horizontal scale similarly divided. A movable perpendicular E divided in a similar way slides on the horizontal arm. The mercator scale F slides between bars and is diagonally divided. The different scales are provided with verniers. G is a scale showing the relation between time and longitude. H is a "course corrector" and consists of a compass card and index turning independently; by means of it the true course can be corrected for variation with reference to steering, and the compass course for leeway and variation in order to correct reckoning.



10,140. Husband, J. July 14.



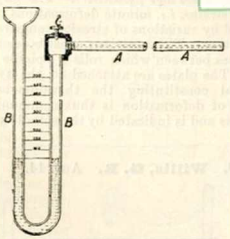
Thermometers; magnifying-glasses.—A thermometer and magnifying-glass are combined with a holder for a pencil case, watch key, &c., or with a locket or other trinket. One method of effecting this is shown in the Figure, in which A is the thermometer, sliding in the case B provided with a lid in which a magnifying-glass C is fitted so that it can be utilized for reading the degrees on the thermometer scale. When combined with a locket the thermometer tube is arranged in the form of a volute with the bulb in the centre.

10,226. Edwards, B. J. July 16. *Drawings to Specification.*

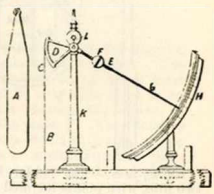
Magic-lanterns.—The object is to rapidly change the pictures in the lantern during an interval of darkness caused by the covering of the lens. Two diaphragms with concave ends are arranged to slide vertically in opposite directions in front of the lens, so that when in their extreme positions their concave ends form a circular aperture through which the light can pass. One end of a cord is fixed to one of these, and then passed round a pulley above worked by a lever, and the other end fixed to the other screen. The spindle of the pulley carries a one-toothed cam, gearing with a catch on a spindle above, as in the Geneva stop. A lever fixed to this spindle is slotted at its lower end, and in the slot works a pin attached to a horizontally-sliding carrier, suited to hold two pictures. By turning the lever the lens is thus covered by the sliding diaphragms, the slotted lever slides the carrier so as to change the picture, and the lens is again uncovered.

10,231. Cox, J. B. July 16.

Pyrometers.—A long fine tube A of heat-resisting material is connected with a U-tube, one end of which is open to the atmosphere, the other being closed by the stopper C. This stopper is unscrewed and mercury poured in to the zero point; C is then screwed in again and the pipe A inserted in the place where heat is to be tested. The expansion of the air then moves the mercury column. If B be made of opaque material, a float is used protruding from the end of B. In some cases the U-tube may be dispensed with and a single tube passed down nearly to the bottom of a wider tube into which the mercury is poured.

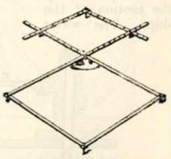


11,066. Parker, T. Aug. 8.



Specific-gravity estimating apparatus.—The apparatus, which is on the principle of the hydrostatic balance, is specially intended for indicating the condition of secondary batteries; it may also be used to determine specific gravities in the ordinary manner. A glass bulb A, loaded with shot or mercury, is suspended in the cell by a platinum wire B attached to a silk thread C passing round a quadrant D. This forms one arm of the balance; the other arm E is screwed and carries an adjustable counterweight F and pointer G, moving over a graduated scale H, which may show "ampère-" "hours" &c. The whole is suspended from a standard K by silk threads L. As the battery is charged the specific gravity of the liquid increases and the pointer falls; as it is discharged the pointer rises. Contacts may be arranged on the pointer to cut out the dynamo when the cells are sufficiently charged, or to signal when the battery is exhausted.

11,128. Carter, W. Aug. 11.

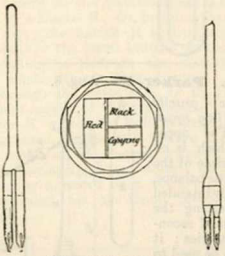


Pantographs.—The instrument consists of six pieces of wood pivoted together as shown. The fixed point is at the middle of the instrument, the tracer and marker, which are interchangeable, being on opposite sides. The rods are connected by screw eyes which serve also as supports, and the rods on one side of the fixed point being pierced with holes at set distances apart, a drawing can be enlarged or diminished to any desired scale.

11,179. Stromeyer, E. C. Aug. 12.

Thermometers and pyrometers.—The object is to indicate strains, *i.e.* minute deformations of solids, produced by variations of stresses, temperatures, or other causes. The apparatus consists essentially of two plates between which rolls a spindle with an index. The plates are attached to the two pieces of metal constituting the thermometer. The amount of deformation is thus communicated to the plates and is indicated by the spindle and index hand.

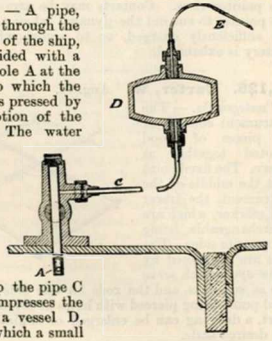
11,279. Willis, G. R. Aug. 14.



Ruling-pens.—The holder is arranged to carry two nibs, with points inclined to each other in plan at an angle of about 120° so that while one nib is in use the other is out of the way. The Figure shows two forms of holders for this purpose, but others slightly modified may be used. Or a nib with two points may be manufactured to fit an ordinary holder. The inkstand shown is divided by thin partitions in order that one nib may be dipped in one sort of ink while the other is dipped in a different kind.

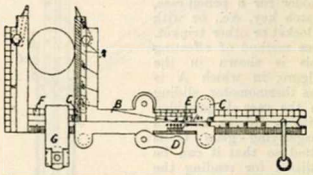
11,284. Jensen, P., [*Hult, O.*]. Aug. 14.

Logs. — A pipe, passing through the bottom of the ship, is provided with a small hole A at the side, up which the water is pressed by the motion of the ship. The water



rises up the pipe C and compresses the air in a vessel D, from which a small pipe E leads to a gauge in the cabin or elsewhere. This gauge is similar in construction to an aneroid barometer and is regulated for different depths of load-line.

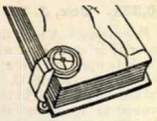
11,469. Edwards, G. Aug. 20.



Squares; plumb-rules; clinometers; compasses or dividers; protractors.—Relates to callipers and sliding calliper squares, which may also be used as plumb-rules, protractors, compasses, &c. The Figure shows one of the many forms which the calliper square may take. The slide B touches the square at the ends C only, and may be fixed in any position by a tightening-lever D. The slides and jaws are graduated in any convenient way, for instance, the jaw A may be graduated as shown, so that, by attaching a plumb-bob at E, the instrument may be used as a clinometer or plumb. A stop G is adjustable on the arm F, so as to prevent the jaws from closing more than a certain distance; by this means a workman may test his work while it is revolving without stopping the lathe. The ends of the jaws may be fitted with a folding point and pencil for use as compasses. The metal of which the instruments are made may be fluted or ridged to give stiffness and strength. Single and double jointed callipers of the ordinary type are also described. These are, in some cases, formed also with compass points which are protected by the calliper heels when the instrument is folded up. They may also be fitted with arc-shaped connecting bars, with sliding stops, which may be graduated, and they may be adapted to serve also as squares and bevel gauges.

11,603. Wilkinson, A. Aug. 25.

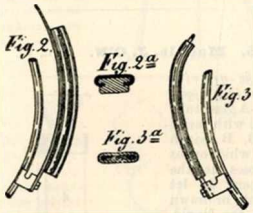
Compasses, magnetic.—Attached to a compass for use in sketching, surveying, &c. is a clamp by which it may be fitted to a field or sketch-book. The compass can revolve stiffly in its clamp so as to adjust its meridian as desired.



11,698. Thomas, H. E., and **Shrader, J. C.** Aug. 27.

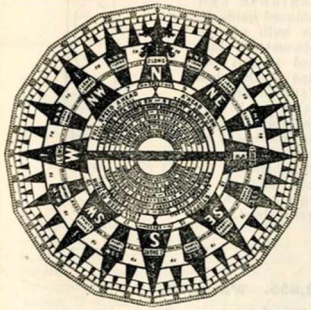
Scales; protractors.—The scale is made of glass, graduated at the edge. Lines are also marked on the underside, across the scale, and a protractor is provided at one edge at the centre.

11,710. Boult, A. J., [*Frank, L.*]. Aug. 27.



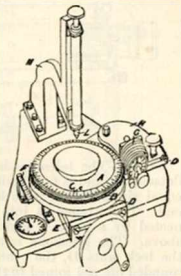
Spectacles and eyeglasses.—The bridge of spectacles, or the plaquet of folding eyeglasses, is provided with an elastic covering to relieve the pressure on the nose. India-rubber may be inserted in a groove in the bridge or plaquet as in Figs. 2 and 2a, or may entirely surround it as in Figs. 3 and 3a.

11,962. Meager, R. Sept. 2.



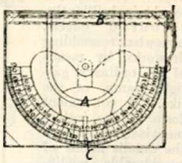
Compasses, magnetic.—The card is made polygonal in shape to facilitate the reading, and is divided by a transverse band to separate the northern from the southern points. On the card is printed a code of fog signals.

12,046. Herrmann, I. Sept. 5.



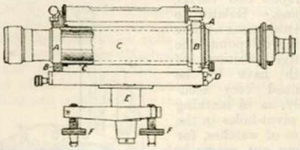
Angles and curves, plotting.—Relates to an instrument for setting off points the relative positions of which have to be obtained very accurately, as in marking the pivot-holes in the plates of watches, for setting out points in curved figures, or for copying, transferring, enlarging, or reducing such figure, or for dividing any straight line or circle, &c. The work is clamped to a platform A on a wheel B with 360 teeth, carrying a collar C divided into 360 degrees, and clamped to the wheel as required. The toothed wheel is free to turn on an arbor fixed to a platform D attached to a V slide E, so as to be capable of rectilinear motion, the extent of which is indicated on the scale F. Very delicate adjustment of the work is obtained, firstly, by the tangent-screw G, which is mounted on the platform H pivoted to D so as to be capable of slight movement to throw the tangent-screw out of gear; and, secondly, by gearing the platform with the pointer K in such a manner that every division it travels on the scale F will cause a complete revolution of the pointer. Some point is chosen as origin, and the work is then clamped so that the centering-spindle L, carried by the bracket M, comes exactly over this point, zero being shown on the various scales. By advancing the V slide and turning the toothed wheel according to the given co-ordinates of the points to be obtained, the work is moved into positions for the points to be marked by the centering-spindle.

12,088. Vaughan, J., and **Williams, J. A.** Sept. 6.



Quadrants.—Relates to a pocket quadrant consisting of a graduated semicircle, covered by a glass face, over which swings a plumb-bob A with index finger C. The plumb-bob can be set free by pressing a spring, and when an observation has been taken the spring is released and the bob held in position. Two shades are provided, one on each side of the dial, for taking the altitude of the sun, and a set of tubes B, fitting into each other, for observing the moon and stars at night, or elevated objects by day.

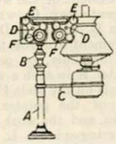
12,175. Cooke, C. F., and **Cooke, T.** Sept. 9.



Levels.—The telescope is complete in itself and detachable, and is fitted with two flanges A, A of equal size to allow it to be inserted from either end. The flanges fit into two sockets B, B connected by a tube C and carrying a spirit level above. The telescope is adjusted at one end by the lock nuts D, the other socket being slightly rounded off and joined to the base by a screw. The vertical axis E is adjusted in the ordinary manner by the screws F.

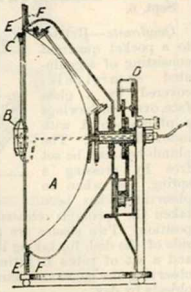
12,329. Lyons, J. Sept. 12.

Stereoscopes.—The stereoscope is mounted upon a stand A with ball-and-socket joint B for changing its inclination. A lamp is carried by an arm C protruding from a sleeve on the stand. To the case of the stereoscope are pivoted two frames D, D, which carry pieces of coloured glass in circular apertures E. The eye pieces F, F of the instrument have slots in their sides, so that by turning the frames any desired piece of glass may be brought between the picture and the eye.



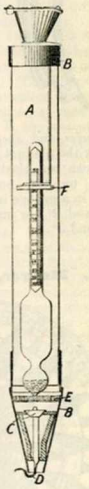
12,382. Boehle, H. Sept. 13.

Reflectors; chromatropes.—The object is to obtain brilliantly-coloured effects, somewhat resembling fireworks, by means of an ordinary gas-light, lamp, or the like. A convenient form of the instrument is shown, though the details admit of considerable modification. The reflector A is made of a great number of small reflecting-surfaces turned in various directions; at its focus is the light B, which is surrounded by a transparent casing, formed of differently-coloured panes of glass. The case is suspended by a wire from a bevel-wheel C which is connected with a motor D, and so caused to revolve. The same motor rotates a ring F, placed behind a stationary ring E, and, the edges of both rings being cut into a pattern, the reflector itself appears to be rotating, while the revolution of the case causes constantly-changing coloured light to be thrown in all directions from the surfaces of the reflector. In a modification, transparent multi-coloured funnel-shaped pieces or discs may be rotated in the same or alternately-opposite directions between the flame and the reflector, producing a similar effect to the chromatrope.



12,585. Mackle, J. O'N. Sept. 19.

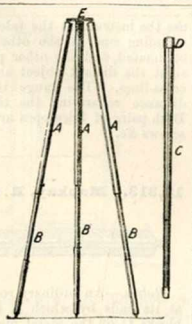
Specific-gravity estimating apparatus.—A glass tube A fitted with metal ends B, B has a valve C which opens and closes as the instrument is let down into or drawn out of the liquid, or which may be opened by the wire attachment D when required. A sample of liquid may thus be taken at any depth. Within the tube is inserted a hydrometer, which is supported by a cushion E and cushioned guide F. The bulb of the hydrometer is elongated to suit the shape of the glass vessel, and a thermometer is fixed inside it. The instrument may be modified for use in the laboratory, or made telescopic if required to be carried about.



12,855. Watts, W. Sept. 27.

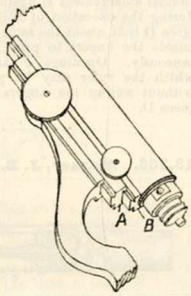
Tripod stands for cameras. The upper part A of the leg of the tripod is a tube in which a wooden bar B slides. The tripod when folded assumes the shape of a walking-stick C. The cross-section of each tube is triangular, to enable them to fold well together. The upper ends

of the sections are held together by a suitable cap D. The tripod top E is made of two pieces riveted together; the outer ends of the arms are jaws in which staples at the ends of the tripod legs are inserted. The end of the solid tube is split and a spring inserted to press it out, to produce the necessary frictional resistance.

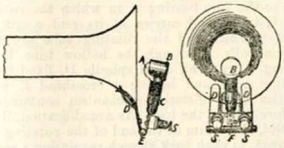


12,952. Swift, J. Sept. 29.

Microscopes.—The coarse adjustment slide A supports the fine adjustment slide B so that in adjusting delicately the optical tube is moved as a whole.



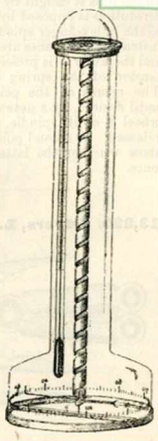
12,991. Smith, C. Sept. 30.



Microscopes, electric-light attachments for. The Figure shows the application of the invention to a speculum, but it is stated to be applicable for microscopes. A small incandescent lamp A is partially enclosed in a metal casing B, and carried by a holder C attached by a ball-and-socket or other joint to a plate F which is hinged at E to a piece D which clips the edge of the speculum, or the piece D may be replaced by a set-screw, or a ring which fits round the edge; coils of wire connect the binding-screws S with the lamp. The double joint permits a delicate adjustment of the lamp.

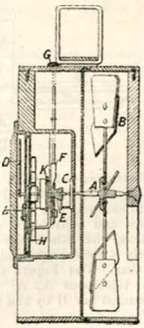
13,044. Calliburcès, P. Oct. 1.

Hygrometers; weather indicators.—The essential feature of this invention is the construction of a "spring" composed of a combination of any elastic and non-hygroscopic substance, with some hygroscopic substance. The effect of varying degrees of moisture on this compound spring is to cause it to coil or uncoil, and thus by an index to show the hygroscopic condition, either of the surrounding medium or of the substance forming part of the spring. Various forms of instruments are described, of which one is shown by the Figure. A helix of india-rubber is coated with any hygroscopic material whatever and is suspended from its upper end, a small index ranging over a scale at the lower end. The base has a hole which may communicate with one of two openings below, one containing water and the other a drying-agent such as chloride of lime. By observing the deflection of the index between complete dryness and complete saturation, for different materials with which the helix may be coated, the hygroscopic character of the materials can be determined. By keeping the helix open to the air, the instrument may be used as an ordinary hygrometer. Various other forms of springs are described in the Specification, which also enters at some length into the experiments, pathological as well as meteorological, for which the invention may be used.



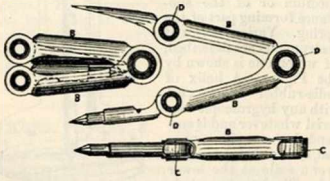
13,182. Davis, H., and **Davis, A.** Oct. 4.

Anemometers.—Relates to speed-indicating apparatus. Upon the end of the axis A, which carries the rotating vanes B, a disc C is fixed having a projecting pin. The spindle of the index-finger D is made square at its end, and a boss E slides upon it which is normally pressed to the left by a flat spring, but forced in the other direction, on pushing the knob G,



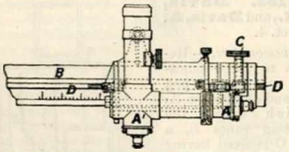
by the wedge-piece F. In the latter position a pin on the boss is caught by the pin on the disc, but its revolution is opposed by a spiral spring H attached to the index-finger spindle and casing. To use the instrument the vanes are allowed to attain full speed and the knob G is pressed; D then rotates until the tension of the spring balances the air pressure. The return of the pointer to zero is prevented, until desired, by a detent engaging with a ratchet-wheel K on its spindle, which is lifted when G is released. A second pointer L is geared with D to show whether the latter has revolved more than once.

13,220. Myers, L. Oct. 6.



Compasses and dividers.—The various limbs are cut out of sheet metal and the blank is stamped into form, and fitted together by eyelets D, D, or screws or rivets. The links B, being U-shaped, admit of the other limbs being folded into them. The washer C keeps apart the forks of the joint. The end limbs are so arranged, in some of the modifications, as to make one pair of compasses act both as dividers and ink and pencil compasses. The points are made of hollow triangular cross-section for the purpose of strengthening them.

13,288. Bolton, T. Oct. 7.

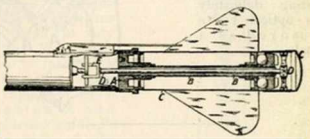


Telemeters.—At each end of a graduated bar supported by two tripod stands are mounted a pair of telescopes, one pair being correctly at right-angles and capable of only a slight adjustment motion, the other pair being at an angle very nearly a right-angle and capable of motion along the bar. The Figure shows the latter pair, the two telescopes A, A^1 being moved along the graduated bar B by the pinion C and rack D. To use the instrument the telescope A and the corresponding one at the other end of the bar are collimated, and the other pair are then caused to sight the distant object and bisect it with their cross-lines. The range is then shown by the distance separating the telescopes on the bar. Both pairs of telescopes are fitted with adjusting-screws &c.

13,313. Mackay, R. F. Oct. 8.

Rulers.—An ordinary round ruler has pivots B at its ends by which it is attached to the side blocks C of the metal piece D, and rotates independently of it. The piece D carries a longitudinal enlargement E, against which the pen bears during the operation of ruling. The top of the piece D is at about the same level as the ruler, to enable the fingers to press upon the two simultaneously. Openings F are provided through which the ruler may be grasped and removed without soiling the fingers by contact with the piece D.

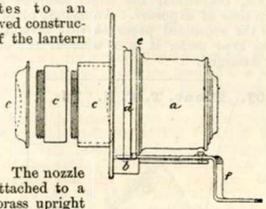
13,366. Massey, J. E. Oct. 9.



Logs; sounding-apparatus.—A hollow tube B is fixed to the fore-bearing A in which the rotating tube C turns, and carries at its end a nut cap, between which and the rotating tube are anti-friction balls. Through the hollow tube B and bearing A runs an axial spindle D, fixed to the rotating tube and having a crosshead E which actuates the registering-mechanism contained in the fore-part of the log. As a modification, B may be solid, and a cam at the end of the rotating tube arranged to push back at each revolution a spring-controlled rod, working in an eccentric cylindrical hole in A. To this rod is attached a pawl which actuates the registering-mechanism. For sounding purposes, the case of the log is clamped to a bow-shaped metal frame with eyes at each end to which are fixed the sinking weight and line, or the frame may carry a cylindrical holder containing the log, its ends being sufficiently open for the free passage of the water.

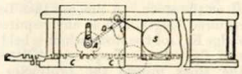
13,371. Hughes, W. C. Oct. 9.

Magic-lanterns.—Relates to an improved construction of the lantern



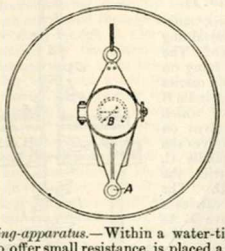
front. The nozzle *a* is attached to a solid brass upright plate *e*, firmly held by the brass ground plate *b*, so that insertions can be made from the top if required. A brass frame *d*, with two compartments brought alternately before the lantern by the lever *f*, carries large pictures. There are small adjustable frames, to fit the compartments, for small pictures. The condenser *c*, *c*, *c* is made in several joints so as to be capable of extension to 10 or 12 inches.

13,372. Hughes, W. C. Oct. 9.



Magic-lanterns.—Relates to a slide-carrier moved by the segmental wheel A working in the rack C, C, C. While the picture is changing the shutter S is raised in front of the lantern nozzle, by means of the connecting-rod D fixed to the eccentric G, and so the light is shut off. Where the frame has only two compartments, the shutter is attached directly to the spindle of the segmental wheel, which is moved alternately to the right and left.

13,454. Cooper, A. J., and **Wigzell, E. E.** Oct. 11.



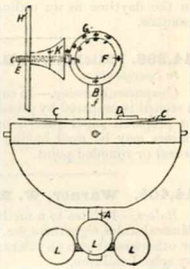
Sounding-apparatus.—Within a water-tight case, shaped to offer small resistance, is placed a pressure gauge of the Bourdon type, the water being allowed to enter through a hole at A to act on the pressure chamber. The depth is registered by the pointer B, which is carried forwards as the pressure increases but does not return. To the bottom of the sounder is attached an instrument with a cup, closed automatically by a lid as the sounder is raised, for bringing up samples from the bottom.

13,547. Batty, W. Oct. 14.

Compasses, magnetic.—The card is fixed to a thin wire framework A connected with the central support B by thin wire bridges C resilient vertically and horizontally. From these wires the magnets D, D are suspended by clips. The communication of vibrations from B to the card is thus lessened, and it is still further reduced by attaching a light tubular flange, preferably of paper, to the inner edge of the card.

13,964. Harild, H. Oct. 22.

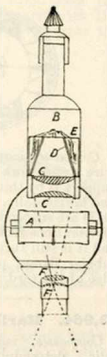
Compasses, magnetic, determining deviation of. A balance rod A swung on gimbal rings carries a standard B and crosshead C, to which the compass card may be clamped, and upon which is a spirit level D. An arm is pivoted to the head of the standard B with a socket for a screw rod E. To this arm is fixed the vernier-marked circle F, while the graduated annulus G is attached to the standard. Upon the rod E screws a "shadow circle" H and a conoidal piece K graduated for 24°, upon which the shadow of the circle H is to fall. The action is as follows:—The compass card is clamped to the crosshead, so as to make the angle of "variation" with a line marked "ship's head" on the inner gimbal ring. The arm E is then raised until the latitude is shown on the dials, and clamped in position, and the card is levelled by means of the screw-weights L. The apparatus is then turned round until the circle H throws its shadow on the graduation corresponding to the declination for the day. The true magnetic course is now shown by the "ship's head" point, and the difference between this and the ship's head by compass is the deviation. Sometimes a screw-ball is used instead of the conoidal piece, and in this case the



apparatus is somewhat different in other respects. When the sun is not bright enough to cast a shadow, a tube with cross-wires is used to "sight" it, instead of the screw-arm and shadow-circle.

14,060. Downing, G., [*Sleator, R. L.*]. Oct. 23.

Compasses, magnetic. — The compass card A is mounted in the usual manner, but the bottom of the box is of transparent material, and the top is capable of holding an adjustable lamp B, provided with the lenses C, C, and a reflector D (in the shape of a frustum of a cone) forming a receptacle for oil for the wicks E. At the bottom of the box are the lenses F, so that an image of the card, which is transparent in the centre with the figures painted round, or opaque with the figures cut out, is thrown where desired, in the manner of a magic-lantern picture. The card may have an annulus of opaque material around it, with the signs as usual, so that the lamp may be removed and the compass used in the daytime as an ordinary compass.



14,286. Michell, F. B. Oct. 29. *Drawings to Specification.*

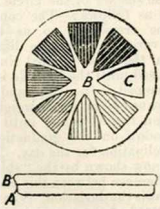
Compasses, drawing.—In copying-apparatus where a stencil is prepared by pressing with an instrument on prepared paper placed on a file surface, compasses may be used having one leg ending in a wheel or rounded point.

14,405. Warner, W. R. Oct. 31.

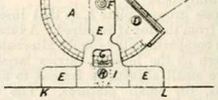
Rulers.—Relates to a method of teaching music. Musical scales, signatures, &c. are printed, embossed, or otherwise shown on rulers and other articles used by school children.

14,457. Green, C., and **Füidge, L. V.** Nov. 1.

Actinometers.—A metal box A, preferably circular and of a size to suit the pocket, is provided with a perforated lid B, through which a graduated scale of tints can be seen, these tints being generally painted on porcelain. One perforation C extends also through the porcelain plate, below which is a piece of sensitized paper. The actinic power of the light is estimated by observing, in reference to the scale of tints, the colour the paper assumes after a certain time of exposure. An opaque plate is put below the sensitized paper, so that several sheets may be kept under it in A, without fear of their being damaged.



14,507. Tinne, T. F. S. Nov. 3.



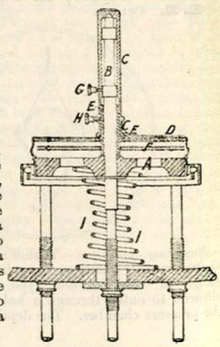
Scales and protractors.—To the stock E is pivoted at F a protractor A, on the straight edge of which a part scale B is secured by thumb-screws C, D. A hole in the stock permits the protractor to be adjusted by means of its divided edge and the vernier G on the stock. A line can then be drawn of the required length, and at any required angle with the edge K, L of the stock, which is held against the edge of the ruler or T square. A flat spring I under the stock presses the protractor firmly against the stock, and holds it in position; on pressing the button H, the protractor is freed from the spring, and can be adjusted.

14,699. Bayley, T. Nov. 7.

Polarizers.—Instead of the usual half-wave plate of quartz, a thin sheet of mica is mounted between two sheets of glass, and placed between the polarizing and analysing prisms, so as to cover a portion of the field of vision.

14,862. Spink, W. Nov. 11.

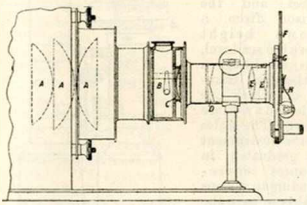
Compasses, magnetic, ascertaining deviations of. The box A is hung on gimbals and carries a vertical spindle B the top of which forms a pivot on which revolves the hollow spindle C, which carries the pointer D. The spindle C carries a loose sleeve E to which is attached a dumb compass card F. The spindle C also carries either a



vane or a lamp the chimney of which is bent at right-angles, the direction of the wind being indicated by the smoke issuing from it. Set-screws G, H respectively fix the hollow spindle C to the spindle B, and the sleeve E to the spindle C. To use the instrument the ship's head is turned to the east, for example, and the dumb card having been disengaged from the spindle C is set to the same point. The pointer is then turned to the direction of the wind with the aid of the lamp or vane. A similar series of operations is repeated with the ship's head pointing to the west, and the mean of the two readings gives the magnetic direction of the wind. The card is then fixed in such a position that the pointer indicates this mean. By placing the ship's head at any point of the compass by the dumb card when fixed to the spindle C the correct magnetic course to steer by the aid of the compass is indicated, while the smoke travels in the line of the pointer. The box A is kept horizontal by a heavy weight attached to the lower end of the spindle B, and steadied by the spring I.

Bearings, instruments for determining. — The above-described apparatus may also be used as an azimuth instrument for taking bearings.

14,951. Wright, L., and **Newton, H. C.** Nov. 13.



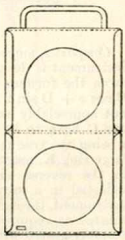
Lantern-microscopes.—In order to obtain a more clearly-defined image, and prevent the damage of delicate balsam-mounted slides by heat, the rays from the lamp are passed through the condensers A and into the alum trough B, after which they are rendered parallel by the plano-concave lens C, which is balsamed to the alum trough to stop the balsam-heating rays and avoid loss of light at different surfaces. For showing opaque objects a coned or prismatic lens D is inserted to split the central beam, part of which would otherwise be lost. The ray then passes through the condensers E and so through the stop-diaphragm F to objectives, the curves and the distances apart of which are worked out on the screen to produce a flat picture and pass the greatest amount of light. The stop-diaphragm can be rotated about the point G so adjusted as required, and the slides are fixed to it by spring fingers H, instead of having a separate stage.

15,198. Ashford, J. Nov. 19.

Tripod stands for photographic cameras and similar purposes. The head is of the usual triangular form. Each projection is slotted horizontally from the outside, the slot ending in a larger circular recess. On the upper end of each leg of the stand, an oval pin is fixed with the longer diameter in the direction of the length of the leg, its smaller diameter being rather less than the width of the slot. The leg being in a horizontal position the pin may be inserted through the slot into the recess, where it may be turned into the standing position. The slot may be made without a larger recess at its inner end; in this case a spring is attached to the underside of the head, its outer end being turned up so as normally to close the slot. It is formed with an inclined-plane end so that a round pin on the leg may be pushed into the slot, the spring rising behind it to prevent its release.

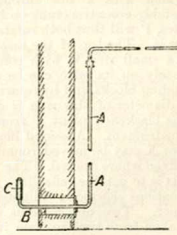
15,440. Gray, C., and **Kemp, H.** Nov. 24.

Magic-lanterns.—Relates to slide holders. Two or more slides are placed one above the other as shown, or side by side, in a frame which occupies the position of the ordinary slide holder in a magic-lantern, but is made to slide either horizontally or vertically or in any other convenient direction. While one of the slides is being exhibited the other can be exchanged for a fresh one. The sliding holder can be fixed in the position necessary for the exhibition of the slides by a spring catch on the lantern.



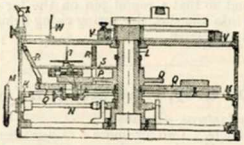
15,947. Murrie, J. Dec. 4.

Thermometers for use with high temperatures, and for recording at considerable distances if required. With these objects in view the vertical tube A is of considerable length and is connected by a short tube B with an iron or steel chamber C. The instrument may thus be readily put through the wall of an oven or the like. The tubes terminate in a short glass tube D to which a scale is attached, which may if desired be connected with a pressure



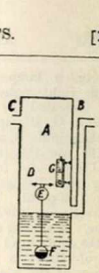
gauge, and between A and D any length of tubing or a series of U tubes may be inserted. The liquid used is principally mercury, though water may fill part of the U tubes and should be placed between the mercury and the pressure gauge. Boiling is prevented by the great pressure caused by the length of the mercury column, and the resistance to expansion, the end of the apparatus being hermetically sealed, but containing air or gas. The temperature is indicated either by the height of the mercury or by the pressure shown on the gauge.

15,951. Reddie, A. W. L., [*Soc. Anon. Maison Brèguet*]. Dec. 4.



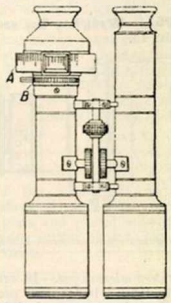
Compasses, magnetic, correcting reading of. The instrument is designed to calculate the true north from the formula—deviation $= A + B \sin z + C \cos z + D \sin 2z + E \cos 2z$, where A, D, E do not appreciably vary during the voyage, while B and C have to be determined from time to time, z being the true magnetic course of the vessel. A large ring K, marked with the compass points, but in the reverse direction so as to be correctly reflected in a mirror, is fixed in the case of the instrument, through which runs a central spindle L rotated as required by the key M on a spindle N suitably geared with L. On this central spindle is mounted a graduated toothed wheel O gearing with another P of half the diameter, the bearings of which are formed in a pointer Q pivoted on L and supporting the mirrors R, R. A second pointer S carrying a blackened point T is pivoted on L and provided with a slot through which passes an adjustably-eccentric crank on P. As the pointer Q rotates, P will thus both rotate with it, and vibrate about it. The top of the case is glazed, and above this a small ring V, with compass points marked reversely on its edge, can be adjusted as required by sliding blocks, and by rotating it in its mounting. The diameter of this ring is equal to the distance of the blackened point T from the central axis of the instrument. A second blackened point W and mirror X may be moved round the rim of the case and fixed where desired. The use of the blackened points is to get the reflections of the different ring graduations correctly aligned in any required manner. Two observations on different courses are taken from time to time in order to adjust the eccentricity of the crank on the wheel P to suit the varying values of the parameters B, C. This being done the instrument will give the deviation at once according to the formula.

15,970. Lux, F. Dec. 4.



Specific-gravity estimating apparatus for gases and vapours. Within a tightly-stoppered glass bottle A, having inlet and outlet pipes B, C, is a liquid in which floats a hollow globe F weighted with mercury and connected by a very thin tube or bar (a hair or thread passing over a pulley may be substituted) with another hollow globe E. A graduated scale G is provided over which moves the pointer D attached to the globe E, or the scale may be marked on the connecting-bar in the manner of an ordinary hydrometer. By this arrangement the specific gravity of gases may be estimated as they flow through the bottle at known pressure, by observing where the pointer stands on the scale.

16,029. Nordenfelt, T., [*Middelboe, C. G.*]. Dec. 5.



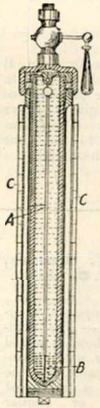
Telemeters.—Distances are found by observing the angle between the object and the horizon from a known height above the sea level, thus obtaining a right-angled triangle of which one angle and a side are known. The scales of the instrument are graduated in distances corresponding to various heights to save the trouble of calculating. When applied to a binocular, the angle is measured by parallel wires focussed in the eyepiece and under the control of a cam by which they can be brought nearer to or separated from each other. The motion of the cam is produced by rotating the graduated ring A, from which the distances may be read off, until one wire corresponds with the water line of the object and the other with the horizon. The worm B is used for altering the zero point of the scale when land interferes with the view of the horizon. A modified form of the sextant is also used to obtain distances on the same principle. In this case one of the mirrors of the sextant is moved through a small angle by a radius arm or the like moving through a larger angle on a scale graduated to indicate the distance of the object.

16,054. Winstanley, D. Dec. 6.

Barometers.—The instrument is on the principle of the toy known as the "Cartesian diver" and consists, in the most usual form, of a globe A partly filled with air and having an aperture through which water can enter. This globe floats in liquid filling the tube B, and has a chain C attached which, as the globe rises and falls, increases or decreases the weight to be supported. The air pressure is communicated through the U tube D containing mercury, and by properly proportioning this part changes of temperature are compensated for.

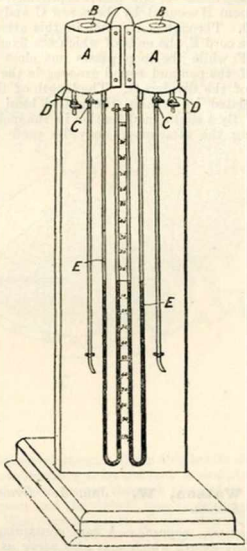
16,621. Murrie, J. Dec. 18.

Thermometers.—Relates to pressure gauges specially adapted for use with the thermometer described in Specification No. 9393, A.D. 1884, and arranged to show "the "pressure within the appa- "ratus corresponding to "the temperature to which "the said apparatus is sub- "jected." The apparatus consists of a long tube A, with a bulb at the end, within a liquid subjected to the pressure which has to be measured. The end of the tube A dips under mercury B, and the tube and bulb are filled with an elastic liquid, or with air or gas, so that the pressure forces the mercury up the tube. The effect of the bulb at the end is to cause the graduations on the scale C to be nearly equal.



16,940. Baker, T. J. Dec. 27.

Calorimeters; thermometers.—The apparatus is used for determining latent heats, comparing specific heats, &c. It consists of two air vessels A, A, exactly similar, and with similar attachments. In each is a well B into which the substances whose properties are to be examined are inserted;



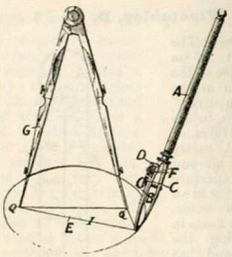
the well has a stop-cock C and tube for drawing off liquid contents. The air vessels are provided with one or more stop-cocks D and communicate with the U tubes E containing coloured water, the levels of which on the scale common to them show the expansion of the air in A, A.

16,976. Jordan, J. B. Dec. 29.

Sunshine-recorders.—Within a cylinder of opaque material, closed at the ends, is placed a lining of sensitized paper. The cylinder is placed on a stand so as to be held at right-angles to the plane of the sun's apparent motion, and there are three holes in its sides masked by screens in such a manner that sunlight passes through the first from sunrise to 8 a.m., through the second until 4 p.m., and through the third until sunset, leaving a mark on the paper. The paper is ruled with parallel lines marked with the hours.

17,031. Thompson, W. P., [*Hazard, H. T.*]. Dec. 30.

Ellipsographs.—A bow-pen A is provided with an attachment B secured by the screw C and projections D. Through a channel in this attachment runs the cord E, the ends of which are fixed to the drum F, while the loop passes out close to the point of the pen and round grooves in the needle points of the dividers G. The length of the cord is regulated by turning the milled head of the drum. By a slight modification in the method of fastening the attachment may be used with a pencil.



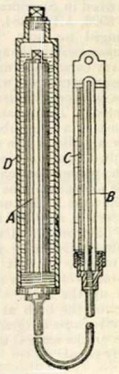
A.D. 1885.

18. Watson, W. Jan. 1. *Drawings to Specification.*

Compasses, magnetic.—A case containing a reel for a hat guard, which may also serve as a tape-measure, may be constructed to form a magnetic compass. The guard consists of a cord, band, ribbon, &c. wound on a reel, bobbin, &c. fixed permanently or detachably in various ways to a hat or coat. One end of the band is fixed to the reel, while the other is provided with a hook, bar, ring, clasp, button, or whistle which takes on or into an ordinary buttonhole, or on or into a special eyelet, ring, hook, or button placed on any convenient part of the dress, or on the other side of the hat to that on which the reel is situated.

303. Murrie, J. Jan. 9.

Thermometers. — The object is principally to prevent distortion in the receptacle for mercury or other liquid of the thermometer or pressure gauge described in Specifications Nos. 9393 and 15,947, A.D. 1884. The mercury in the receptacle A expands under heat or pressure against an elastic fluid in B, and so shows the temperature or pressure on the scale C. Around the receptacle A is put a jacket D filled with the same liquid, so that the pressure inside and out is equalized when heat is applied, and distortion prevented. If desired the elastic fluid in B may be forced in under pressure, so as to give a greater range of temperature to the same length of scale.

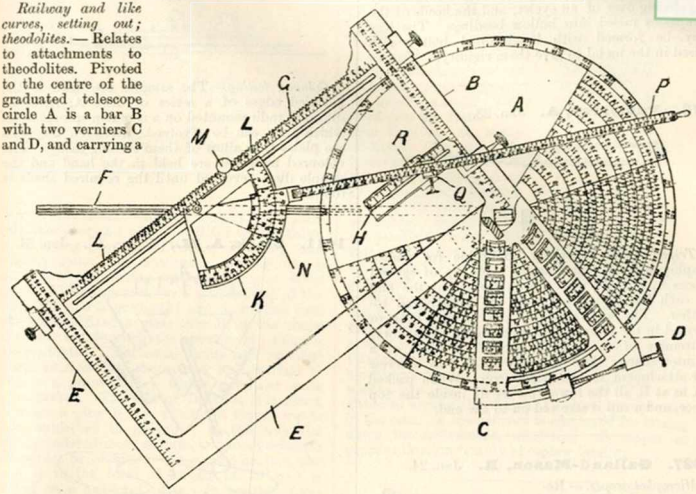


321. Horne, W. C. Jan. 9.

Compasses, magnetic. — The compass bowl is coated inside with luminous paint, and the card is made of talc, or similar transparent substance, the signs being printed upon it in black.

325. Beck, W. H., [*Capazza, L.*, and *Livrelli, P.*]. Jan. 9.

Railway and like curves, setting out; theodolites.—Relates to attachments to theodolites. Pivoted to the centre of the graduated telescope circle A is a bar B with two verniers C and D, and carrying a



rigid frame E partly supported by the slotted arm F on the telescope stand. Upon this bar B slide two slotted bars G and H, the former of which carries an arc K movable along it by the rack L and pinion M. At the centre of the arc is pivoted a vernier N, the spindle of which passes through the slot in G into that in F; the straight-edge P is rigidly connected to the vernier, and the slide Q may be adjusted upon it, and fixed when required to a slide R on the bar H. The various parts of the instrument are graduated with some convenient scale. Having determined the angle between two lines of railway by the theodolite, and settled the radius of the curve to join them, this radius is set off on G by the centre of the arc K. G is then moved on B until the angle between G and F is half the supplement of the known angle. Lastly, the slides Q and R are connected, and, by moving the edge P round, the ordinates and abscissæ of any number of points on the curve may be read off at once.

---

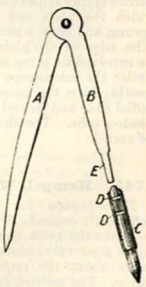
665. Pratt, W. T. C. Jan. 17.

Binnacles.—Relates to improvements on the invention described in Specification No. 1416, A.D. 1882, where mirrors are used to reflect the image of the compass card from the bridge into the wheel-house. In order to prevent the deposition of moisture upon the mirrors, their surfaces are heated. For this purpose steam jackets, or receptacles for air heated by oil lamps, are placed adjacent to the mirrors, and a sheet of glass similarly heated is situated between the binnacle and the wheel-house.

---

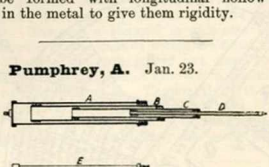
914. Turnor, M. Jan. 22.

Compasses, drawing.—The long and short legs A, B of the compasses, and the holder C, are stamped from metal blanks. The legs are riveted together, and incisions D, D are made in the holder blank, after which it is bent into a cylindrical form, and the metal between the incision raised so as to form a hold for the tapered part E of the leg B. In another form the end of the short leg may be formed into a socket, and a reversible pen and



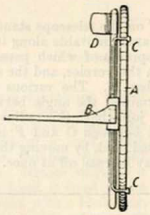
pencil holder used, or the pencil fitted in direct. Instead of the rivet, the joint may be formed by the closing over of an eyelet, and the heads of the compasses raised into hollow beadings. The legs may be formed with longitudinal hollow ribs raised in the metal to give them rigidity.

976. Pumphrey, A. Jan. 23.



Tripod stands specially applicable for photographic cameras. Each leg is made up of several pieces A, B, C, D, with screws formed at the end of each length so that they can be screwed together. The screws may be put in as a bush or formed in the body of the tube itself. The lower extremity of the bottom tube D is made of a pointed shape; the top is provided with a screw for attachment to the tripod top. When packed up, as at E, all the lower pieces fit inside the top piece, and a cap is screwed on to the end.

1027. Galland-Mason, R. Jan. 24.

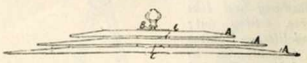


Microphotoscopes.—Relates to the invention described in Specification No. 912, A.D. 1884. A series of microphotographs are taken in a circle and mounted between two thin circular sheets of glass with transparent cement. This circular plate A can then be fitted to a pair of spectacles B or to a hand glass, the frame of which carries spring clips C, into which the plate can be sprung, and from which it may be readily removed. The edge of the plate A is milled so that it can be revolved to bring any of the microphotographs under the microscope D fixed to the frame. In another form the microscope may be attached to a radial slide and moved round as required over the photographs. The details of mounting may also be varied.

1045. Hempel, W. Jan. 24.

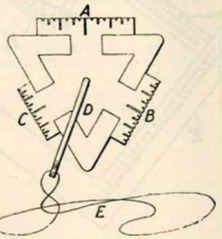
Thermometers for indicating when meat is sufficiently cooked. The larding pin or spit, used to pierce the meat being cooked, is made hollow, and a glass tube, containing some substance which melts about the required temperature, is fitted inside. The melting of this substance shows when the meat is sufficiently done.

1246. Ablett, T. R. Jan. 29.



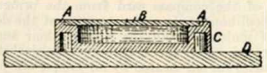
Colours, testing.—The samples are fixed to the bevelled edges of a series of discs A, A, A of different radii mounted on a common spindle upon which they can be revolved. Between the discs are plates C to allow of them turning easily. The coloured materials are held in the hand and the sample discs revolved until the required shade is found.

1411. Clark, A. M., [*Mayer, J.*]. Jan. 31.



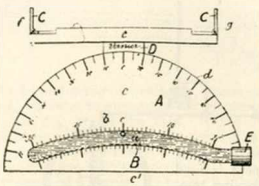
Range-finders.—This instrument consists of a triangular metal plate to which three transparent scales A, B, C are attached. The instrument being held at a distance of 56·25 centimetres from the eye, which is determined by the pivoted bow D and cord E, the scales are so made that a division subtends 4 paces, 4 men's breadth, 4 metres respectively at a distance of 100 metres. It follows then that, if a cross dimension of an object be known, its distance can be calculated by proportion by simply observing the apparent length of the cross dimension on one of the transparent scales.

1594. Robson, M. H. Feb. 5.



Microscope cells.—The cell is formed of any convenient material which will resist the action of the fluids used in the preparations, and is preferably constructed in one piece. A collar A is provided, to which the glass cover B is cemented, and an annular groove C runs round the cell to lighten it, and form a receptacle for cement when it is required to be fixed to the slide D.

1964. Evelyn, G. P. Feb. 12.

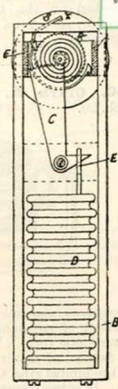


Clinometers; levels.—Relates chiefly to a combined clinometer and spirit level for use on ships, and in laying pipes and drains, elevating and depressing guns and howitzers, making stairs, pitching roofs, adjusting instruments, and other purposes. The Figure shows a simple form of the instrument. To a graduated arc A, in this case semicircular, is fixed a glass tube B, in the shape of a circular arc, forming the spirit level; this arc is also graduated. The usual sights and reading-adjuncts, such as C, C, are carried by a carriage D sliding in a groove, upon which a vernier scale may be marked. The end of the tube B is fitted with a screw-plug E, by which the liquid inside can be subjected to pressure; in this way the bubble is rendered more definite, and more accurate readings can be obtained. In a modification, the tube *a* is in the form of an arc of 90° and is mounted on a quadrant plate. In another form adapted for laying drains &c., the tube *a* is semicircular. To render the indexes of liquid levels, generally, more steady and accurate, the liquid is subjected to pressure in order to compress the air of the bubble and to cause the latter to become smaller and more spherical. This may be effected by means of a plug or cork fitting in one end of the tube containing the liquid, and adjusted by a screw-cap; in some cases a diaphragm of corrugated metal pressed on by a screw may be employed.

2027. Hicks, J. J. Feb. 13.

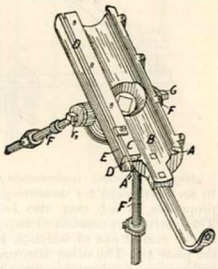
Thermometers.—The thermometers are filled in the usual manner, and a large chamber left at the top of the tube to prevent it from bursting in the subsequent operation. The tube is then sealed and annealed by immersing it for two or three weeks in an oil bath, or the like, kept at a temperature considerably above the highest temperature which the thermometer is required to register. This process causes the gradual contraction to which the tubes are ordinarily subjected to take place at once, and makes it possible to graduate them as soon as it is concluded.

2148. Hannay, J. B. Feb. 17.



Sounding - apparatus.—Consists in improvements on the invention described in Specification No. 5256, A.D. 1883. The dial and its accessory working parts are fitted to a small frame fixed into the frame B so that they can be easily removed. The dial hand receives its motion from the teeth on the end of the arm of the bell-crank lever C connected to the corrugated vessel D by the pin E as shown. The dial is thus situated at the side instead of on the top as formerly. The frame B is surrounded by a suitable casing with an aperture for observing the dial, and around the upper part of this casing is a sleeve with a corresponding aperture, which can be turned either to expose the dial, or to close the aperture in the case. A special cord is employed for letting down the instrument, consisting of copper or copper alloy, preferably phosphor bronze.

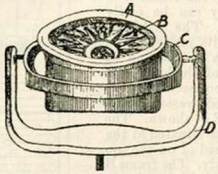
2181. Boult, A. J., [*Westbrook, C. S.*]. Feb. 17.



Tripod stands for rock drills. The rock drill is supported in parallel bevelled grooves A, A^1 in the cradle B, being fed by a screw in the usual manner. The bevelled piece C which forms the groove A^1 is attached to B by bolts and adjusted by a wedge-piece D between it and a rim E on B. The legs F, F, and F^1 are telescopic, the upper portions being solid and the lower tubular, and the upper and lower parts are locked together by set-screws passing through removable nuts in sockets at the tops of the tubular portions. Trunnions G, G, keyed into each side of the saddle or bed carrying the cradle, each pass through one of the collars on a fork at the top of the back leg F^1 and through a boss on one of the side legs F, F. The bosses of the side legs are pressed against the collars on the back leg, and these collars against the saddle to

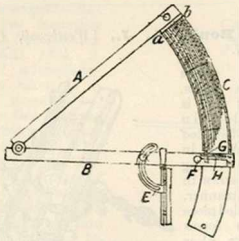
lock the machine when adjusted, by turning inclined washers on the trunnions. The legs and washers are locked on the trunnions by gibs and keys secured by set-screws passing through the ends of the trunnions.

2350. Clark, A. M., [*Favi, Paride, & Co.*]. Feb. 20.



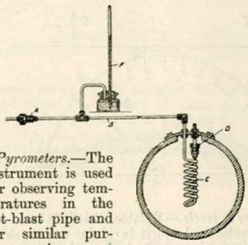
Compasses, magnetic.—The object is to neutralize the effect of surrounding iron and to concentrate the magnetic force. To obtain this result the box A is formed of cast iron, the card B of sheet iron, and the gimbal ring C and support D of wrought iron. In other respects the compass is of ordinary construction.

2372. Kinley, W. Feb. 21.



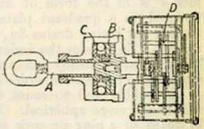
Angle-measuring instruments; squares.—Relates to an instrument for measuring the pitch of screw propellers, which may also be used as a square. The instrument consists of two jointed arms A, B, to the end of one of which A is fixed a graduated arc plate C. The other arm moves over this plate and carries an adjustable spirit level E which may be clamped in any required position by a screw and plate F. G is a pointer sliding in the slot H. The graduations are marked along concentric arcs, each arc corresponding to a particular diameter of the propeller, shown on the line *a*, *b*. The outermost graduation is in degrees. If the pointer G be set to the right scale, and the angle between the arms shows the angle of the propeller, the pointer will show the pitch of the screw. The arms A and B, when fully opened, form a square, and they may be graduated for use as measuring-rules.

2568. Frew, J. Feb. 25.



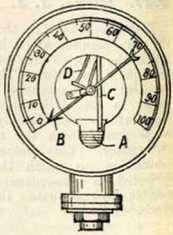
Pyrometers.—The instrument is used for observing temperatures in the hot-blast pipe and for similar purposes. A current of air is introduced, at a constant pressure and temperature, into a regulating-nozzle A, whence it passes along the tube B to a worm tube C in the hot-blast pipe, and out at the exit nozzle D. The expansion of the air in the worm forces a coloured liquid up the gauge tube F. The pressure of the introduced air is kept constant by a pressure-reducing valve, or by dipping a branch from the inlet pipe into water kept at a uniform level.

3162. Rawlings, J. P. March 11.



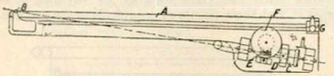
Logs.—The rotator is attached by a rope to the spindle A on which is fitted a steel disc B. The spindle passes into a cylindrical vessel in which is a corresponding steel disc C, between which and B are antifriction balls. The end of the spindle carries a pinion which gives motion to the registering-mechanism D.

3221. Wright, C. F. March 12.



Barometers.—The fluctuations in pressure cause the length of the corrugated seamless tube A to vary, and motion is imparted to the pointer B by the link C and sector D.

3536. Nevill, P. March 19.

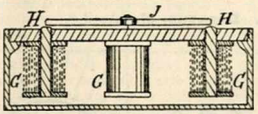


Angle-measuring instruments; surveying-instruments.—Relates to apparatus for measuring angles on plans &c., or on the field. Upon a straight-edge A, centered on the needle point B, is mounted the spindle of the roller C in adjustable centres always in a line with the centre B. The roller is graduated and a vernier D beside it allows of very delicate reading. The spindle of the roller carries a worm E gearing with a toothed wheel rigidly connected to the graduated dial plate F. A needle point for marking the angles measured is carried by the saddle G, which can move along the straight edge into any desired position. To keep the plane of the instrument constant, a third point of support, in the form of a rubber or roller, is provided not in the same line with the other two. By running the roller round between the boundary lines of any angle, a very accurate measurement thereof may be obtained. The apparatus may be adapted for measuring angles on a globe.

3598. Whiting, M. March 20.

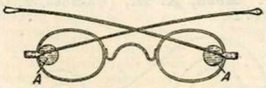
Magic-lanterns.—A receptacle is placed at each end of the slide carrier, and in one of these the slides are placed vertically and pushed to the front by a spring. A plunger, provided with a stud, is moved backwards and forwards, and the stud catches the slides and places them one by one in front of the lens; each is then pushed on by the one behind it until it comes in front of the second receptacle, into which it is forced by a spring.

3656. Rogers, F. M. March 21.



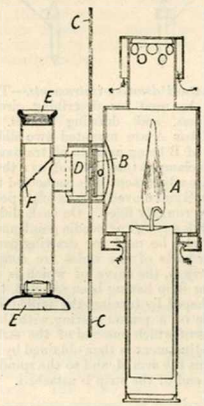
Wind vanes.—On the spindle of the vane is a contact-making arm which sweeps over a series of contact-points fixed in a circle to a non-conducting disc. The points are connected respectively with the series of electromagnets G in the indicator, and thence to one pole of a battery, the spindle of the vane being connected to the other pole or to earth. The bar J is supported so as to turn freely, and setting itself to the core of the magnet vitalized, shows the direction of the vane. The cores of the magnets are hardened at the tips, so as to retain a trace of magnetism after the current ceases, and so keep the bar in position until the next contact is made. When the vane and indicator are separated by a considerable distance a single wire is used and the contact-points connected to this wire via coils of different resistance. A light magnetized needle is pivoted near a coil formed from the single wire, and is deflected more or less according to the point with which the vane is making contact.

3701. Galland-Mason, R. March 23.



Spectacles and eyeglasses.—Small silvered reflectors A, A are cemented to the glasses of spectacles or eyeglasses to enable the wearer to see objects behind him.

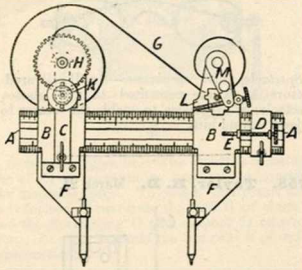
3755. Taylor, H. D. March 24.



Photometers for photographic use. A is a light-tight lamp (holding a standard candle) with an opening in which is placed a disc of opal glass B illuminated by the candle. C is a sliding strip of metal with a graduated series of apertures to come over the opening in the lamp as required. A hollow socket D rotates stiffly within the tube carrying C, and the observing-tube E E is fixed at right-angles to its axis. Within the observing-tube is a diaphragm F perforated by a central hole round which is painted a white ring for receiving light from B. In one end of the tube E E blue glass is placed, so that only chemical rays of light pass through the aperture in F, while the other end is provided with a lens. In using the instrument, the observing-tube is directed towards any required part of the

subject to be photographed, and the eye observes a blue spot of light in the centre of F. The slide is then raised or lowered until the white ring is practically equal in brilliancy to this blue spot, and the number of the aperture which is then over the disc indicates the exposure required.

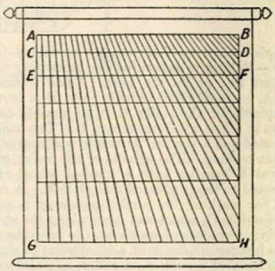
3777. Reed, A. H., [*Christian, T. G. R.*]. March 24.



Mathematical drawing-instruments.—This instrument can be used for describing circles, ruling parallel lines, and drawing curves. Upon a graduated bar A are mounted two slides B, B', a portion C of B being capable of transverse adjustment. B is clamped into position by a thumb-screw. For delicate adjustment B' is connected to a piece D by a screw E and moved into its exact position after D has been roughly fixed. On each slide is a leg F which carries a pencil or needle point, and the edges of which may be used for drawing parallel lines. The upper parts of the slides are connected by a flexible strip G, the curve of which is adjustable. The proper strip having been selected, the curve is roughly shaped by turning the milled head K on the spindle of a pinion gearing with the wheel H, to the axis of which one end of the strip is fixed. Delicate adjustment is then obtained by the screw L which turns the arm M, and so the spindle to which the other end of the strip is attached.

3990. Dawson, A. G., and **Adams, F. E.** March 28.

Dividing-instruments.—Relates to a diagram or appliance for dividing straight lines into any number of equal parts. Upon a piece of paper or other fabric are ruled a number of lines converging towards a point and dividing a line A B into equal parts. It follows that the parallel lines C D, E F, &c., drawn at convenient distances, will be divided into equal parts, the lowest G H being such that the divisions are double those on A B. This diagram may be made on transparent material, or mounted upon rollers and stretched round a straight-edge, or in any way for convenience in applying it to a line which requires to be divided. The line is then moved until the right number of dividing-lines cross it, and their points of intersection are marked.

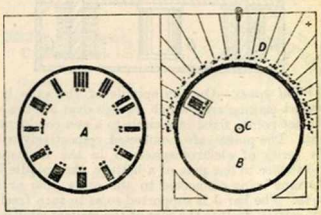


For convenience in size, the method of marking is sometimes somewhat modified, the principle remaining the same.

4086. Smith, W. T., and **Smith, C.** March 31.

Compasses, drawing.—Relates to a combined pen and pencil for compasses. A is a movable part having a pen B at one end, and solid lead C at the other. This may be inserted either way into the hollow tube or socket formed in one compass leg. The other leg is solid and sharpened to a point.

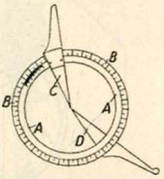
4354. Lazarus, N. April 8.



Sight-testing apparatus.—On a pivot C rotates a disc A, in front of which is a rotating disc B. The disc A, shown separately on the left of the Figure, has on its margin groups of lines intended to be viewed from different distances. These are seen

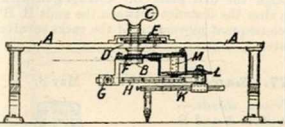
singly through the aperture in the disc B. The front disc can be turned through different angles relatively to a graduated back-plate D, so that cases of astigmatism may be tested.

4530. Stanley, W. F. April 13.



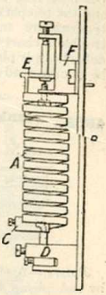
Protractors.—A flat ring A is concentric with, and can revolve upon, another flat ring B, and the rings carry triangular pieces C, D, with their vertical angles at the centre. B is graduated in degrees, and A with a vernier scale, the straight-edge used for ruling starting from the zero of each scale. These edges may be extended beyond the rings, as shown, if desired. One ring only with a second pointer on a sliding piece moving in an undercut groove may be used; or the instrument may be made less than the complete circle with a straight edge.

4582. Grace, G. P. April 14.



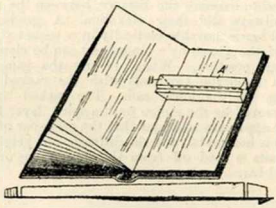
Ellipsographs.—In the centre of the frame A is a spindle B rotated by the handle C. Around this spindle is a sleeve D caused to rotate in the opposite direction three times as fast by the gearing E and carrying a wheel F at its lower end. The central spindle is attached to the piece G, upon which is an adjustable arm H at the end of which is a bearing for the spindle of a clamp, in which is adjusted the pencil arm K carrying at its upper end a wheel L equal to F. L and F are connected by toothed wheels on a linked frame M which allows of the horizontal distance between L and F being varied according to the ellipse to be described. By means of this gearing the arms H and K are caused to rotate in opposite directions at equal speeds and an ellipse is described. In another form L and F are connected directly and the eccentricity of the ellipse is altered by changing these wheels. Sometimes the gearing is so arranged that the velocities of the arms are not equal, and looped curves are the result.

4769. Brookes, A. G., [*Upton, E. W.*]. April 17.



Thermometers.—Relates to instruments of the Bréguet type, in which the axis of the helical coil A runs parallel to the face of the dial B. The coil is held at one end by the clamp C, which can be adjusted so as to regulate the effective length of the coil and thus make all instruments read alike. Other adjusting-screws D are provided, by which the pointer may be set to correspond exactly with the temperature. The upper end of the coil is fixed to a pivoted arm E adjustably centered on the bridge F. A crown-toothed arc on the other end of this arm gears with a pinion on the spindle of the index finger. Maximum and minimum fingers are also provided which are carried into position by a projection on the index finger, and, to prevent mistakes, these fingers are made less than the main index, and move over concentric graduated circles of a smaller radius.

4785. Downing, J. S. April 18.



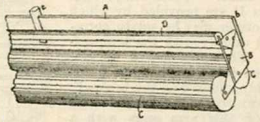
Rulers.—An overhanging edge is provided for inking, which, when reversed, lies upon the paper for pencilling. The ruler may be of various sections. One form, adapted for ruling quite close up to the inner edge of a book, is shown. For this purpose the edge A is under cut and the back stepped, while the end B is chamfered to go against the leaves at the other side. The surfaces to rest upon the paper may be fluted to give a firmer grip.

4815. Lorrain, J. G. April 18.

Thermometers.—Relates to means for determining temperatures at a distance. The essential principle of the invention, which may be to some extent modified according to circumstances, is to carry two strips or wires of different metal, joined at their ends but insulated between, from the transmitting to the receiving station. At the

latter a galvanometer is included in the circuit, and a thermometer is placed close to the junction. On observing the deflection of the galvanometer and the temperature of the junction the required temperature may be calculated, but to save trouble a chart with the temperatures for various deflections is placed close by, so that the result can be at once read off.

4858 Tomkins, S. L. April 20.

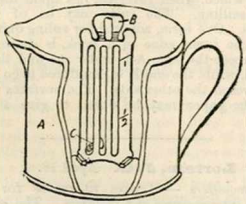


Rulers.—A vertical straight-edge A is connected by end pieces B with two or more rollers C, C; upon the end pieces may be mounted a bar D to act as a finger rest, and also a piece E with rings or clips for holding the pen steady, may be fitted to slide freely along the straight-edge. The finger rest and slider may, however, be dispensed with.

5073. Rickard, P. April 24.

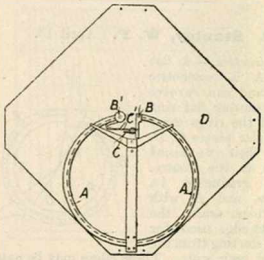
Levels.—Relates to a spirit level and gauge adapted to measure the distance between the rails of railways and their elevation. A graduated racked bar is movable vertically in a socket at one end of the gauge by a pinion and can be clamped in any position. When in use the gauge is placed upon the two rails with the racked bar resting on the lower rail. The racked bar is then moved by the pinion until a spirit level fixed to the apparatus indicates that the cross-bar of the gauge is horizontal, and the difference of height of the rails is read off from the graduations on the racked bar.

5589. Musgrave, S. May 6.



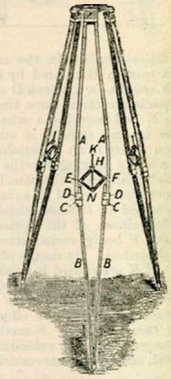
Specific gravity estimating apparatus.—Relates to milk-testing apparatus combined with a measure. A cylindrical measure A is provided with a perforated screen B, graduated for measuring the milk, behind which is a specific-gravity bulb C which sinks in all but good milk. The screen is fixed so as to be readily removable.

5671. Gauntlett, W. H. May 8.



Thermometers.—A bi-metallic band A, in the form of a horse-shoe or a nearly complete circle, is fixed in the middle, the two ends B, B^1 being left free. The end B carries a bracket on which are two parallel racks C, formed by fine screw threads; the end B^1 carries a similar rack C^1 by an elastic bracket. The spindle of the pointer consists of a piece of pinion wire which rests between the two lower racks C and the upper C^1, and thus requires no bearings but passes freely through the dial plate D. Changes of temperature alter the distance between the ends B, B^1, and the consequent movement of the racks revolves the pointer.

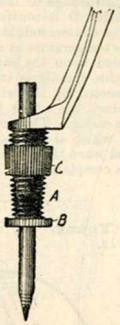
5677. Lancaster, W. J. May 8.



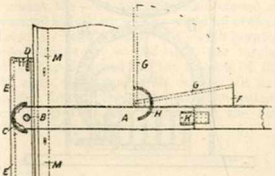
Tripod stands.—The parts A and B slide on each other by the sockets C and D. The tops of B carry, by short links, a couple of flat-bar parallelograms, hinged at E and F on roughened pins between the links, and at N and H to cross-pins. The screwed rod K is fastened to the cross-pin at N, and passes through a plain hole in that at H, above which it bears a milled nut. On screwing down this nut the parallelogram is extended, thereby causing A and B to be tightened together. A rack may be used instead of the screw K.

6064. Harris, F. May 18.

Compasses, drawing. — Relates to holders for pencils, needle points, &c. A split tapered barrel A is screwed externally, and has a collar B at its lower end, over which works the internally-screwed ring C for tightening the grip on the pencil &c. When very elastic material is used one longitudinal slit in the barrel is sufficient, but ordinarily two or more are employed. The holder may also be made plain, and the ring then slides instead of screwing.

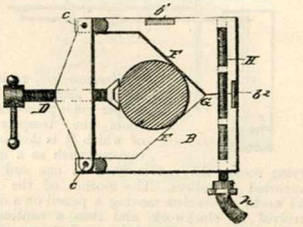


6260. Barnard, G. A. May 22.



Squares; angle-measuring instruments; rulers; compasses, drawing; levels.—Consists principally in forming the parts of a T and set square so as to adapt them to other uses. The blade A of the T-square, which is pivoted at B to the head, and which ends in a pointer moving over a graduated arc C, may also be clamped at any required angle so as to form a protractor, or it may be removed and fixed at the end D. The T-head has a bar E pivoted to it, which may be opened out and set to any required angle on a graduated plate attached by a screw. When the blade is fixed at D and the bar E so opened out, the combination is used as a centrolinead. F is the set-square, the arm G of which can be adjusted in any required position by a thumb-screw in the slot of the quadrant H. In another form of this set-square two slotted rectangular bars are pivoted together; but, when desired, these may be connected by links so as to form a parallel ruler, or fitted with points at their ends and connected by a pin passing through their slots, for use as proportional compasses. The blade of the T-square is made in two parts fixed together by a joint K of special construction, and the T-head may be fitted with an angle-iron that rides in a groove between the drawing-board clamp M and a metal facing thereon. The T-head may be detached and fitted with a spirit level, and the arm E with sights, for taking elevations.

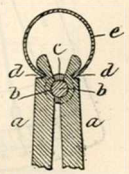
6399. Allison, H. J., [*Espenschied, C.*] May 26.



Levels. — Relates to a shaft level and aligner. The instrument consists of a plate B shaped as shown, with the inside edges F, F at right-angles. A clamping-screw D passes through the cross-piece fastened at *c*, *c*, and is tightened down on to the shaft, the parts being carefully constructed so that the axis of the screw should pass through the centre of the section of the shaft, and bisect the angle between the edges F, F. To the plate are fixed two spirit levels b^1, b^2 and a graduated glass tube H open at both ends, which may be connected at one end with flexible tubing *h*. To level a shaft two or more of these instruments are fixed to it, and the tubes H are brought vertical by the spirit levels b^1. The tubes H are then connected to a flexible water vessel, and water is forced into them, which, if the shaft be level, will rise to the same height in all. To align shafts the instruments are set by the levels b^2 so that the tubes H are horizontal. The marks G, exactly bisecting the instruments, are then brought into line by means of a cord. In a modification, the shaft is grasped by a pair of jaws worked by a right and left handed screw.

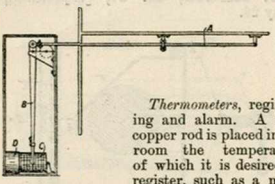
6688. Allison, H. J., [*Fay, C. P.*]. June 2.

Dividers. — Relates to an improved joint for those callipers and dividers in which the legs are forced together or apart by a spring, and kept in position by a nut on a screw fixed to one leg and passing through the other. The legs *a*, *a* are formed with sockets *b*, *b* which grasp a pin *c* having a head at both ends. At the top of the legs are formed, on the



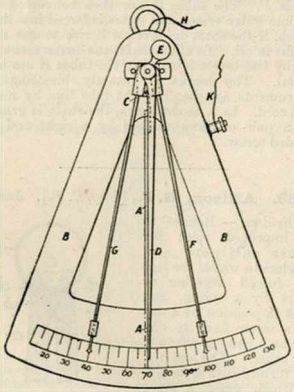
outside, notches *d*, *d* into which fits a hoop spring *e*, notched at its ends so as to be kept securely in position. On removing the spring, the parts separate so that the legs can be easily changed.

7147. Müller, W., [*Derckmann, C.*]. June 11.



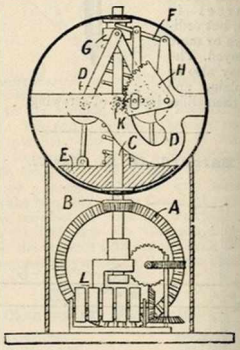
Thermometers, registering and alarm. A long copper rod is placed in the room the temperature of which it is desired to register, such as a malt-drying room; the rod is fixed at one end and supported on rollers. The motion of the free end works mechanism moving a pencil on a drum revolved by clockwork, and thus a continuous record is kept of the changes of temperature. Some part of this mechanism carries a contact-maker which, on touching a certain point, which is set as required, completes the circuit of an electric bell. The Figure shows a simple form of the apparatus, where the copper rod A presses against the short arm of the lever B, the other end of which traces a record on the drum C revolved by the clockwork D.

7153. Gilmore, J., and **Clark, W. R.** June 11.



Thermometers.—Relates to alarm thermometers. A band A of two different metals fixed at the back of the graduated sector B carries a pin C projecting through to the front of the case. The index finger D is constantly pressed against this pin by the counterweight E, and is thus caused to show the temperature at any time. Two arms F, G are pivoted upon the same spindle as the index finger; this spindle is insulated from the casing, but connected by the wire H with one terminal of a battery, the other wire K being connected with the casing. The arms are set at the temperatures at which it is desired an alarm should be rung, and when the pin touches either of them the circuit is completed.

7175. Young, J., and **Richardson, J.** June 12.

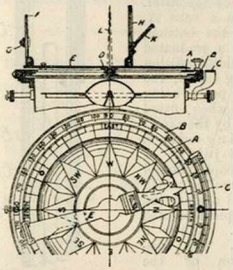


Logs.—The cord of a vaned rotator is connected to a spindle on which is mounted the bevel-wheel A, and also a pinion (not shown). The former gears with the bevel-wheel B and so communicates rotation to the spindle C upon which are mounted a pair of governor balls D linked to a flywheel E rotating in frictional connection with the spindle. A lever F, with a stud on its free end running in a groove in the sleeve G, causes the quadrant H to move with different speeds of the governor balls; H gears with a pinion K on the spindle of which is mounted a pointer showing the speed at any instant. The pinion on the spindle of the bevel-wheel A gives motion to counter discs L, by which the total distance the ship has run is shown. A recording-apparatus, consisting of a pencil tracing on a revolving drum, may be added if desired.

7270. Plumb, R. H. T. June 15.

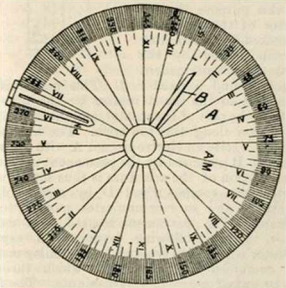
Compasses, magnetic; course indicators and correctors, non-magnetic.—Relates to a combined compass and course corrector. An annular ring A

reversely graduated with the points of the compass, a second ring B marked with degrees, and a variation arc C, are fitted round the compass, or to the binnacle, so that they can be revolved



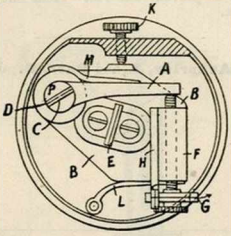
independently and clamped in any required position. A boss C on the glass of the compass supports a cross-bar E on which are hinged a closed sight vane F with sliding coloured sun-shade G and an open sight H with wire and hinged mirror back-shade K. The shadow pin L is used in place of the sights under some circumstances. By this instrument the true and magnetic course may be determined as follows:—The meridian of the ring B is placed to "ship's head," the south point of the reversed card is put to the sun's true bearing, and the cross-bar E turned till the shadow of the wire in the open sight vane falls on the slit in F and the centre line of the cross-bar; the pointer then shows the true course. To obtain the magnetic course the variation arc is used.

7360. Dawes, B. M. June 17.



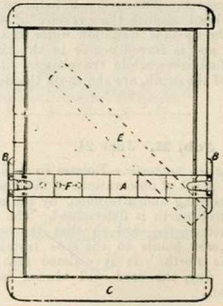
Bearings, instruments for determining by the sun or stars. The disc A is divided into hours and degrees, and carries an adjustable pointer B, for taking bearings, and a slit elevator as shown. The slit is first set to the time of observation and then, the disc being held horizontal, is brought into alignment with the sun. It is stated that the "noon" line will now point north and south.

7412. Steward, J. H., and **Dredge, W.** June 18.



Angle-measuring instruments; range-finders. — Relates to instruments of the sextant class, both mirrors D, E being mounted on movable arms A, B pivoted on the same axis C. The lower limb B carries a boss F through which works a micrometer screw to adjust the arm A, the graduated drum G upon the screw working in connection with the bar index H on the boss. The screw K is used for adjusting the lower limb B. Springs L, M press the limbs against their respective screws. By the use of this instrument the two objects observed need not subtend an exact right-angle at the observer. A reading is obtained, by two observations of the object of which the distance is required, from opposite ends of a base line of known length; the distance can then be read off from tables used with the instrument.

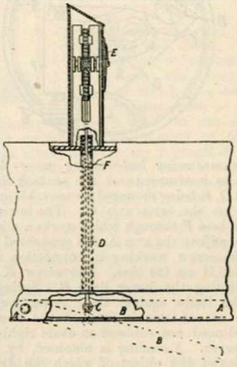
7480. Manger, J. June 19.



Rulers. — School slates are provided with a sliding ruler A guided by the pieces B, a second

ruler being attached on the other side. The rulers have a scale marked on them, as also may one of the side rails. Holes F are made in which a pencil may be inserted and vertical lines obtained by sliding the ruler. For ruling inclined lines a bar E may be pivoted to A. At the top and bottom of the slate projecting pieces C are attached to prevent the ruler from sliding off the frame.

7575. Ackerley, J., and **Parr, B.** June 22.

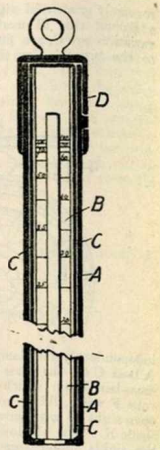


Sounding-apparatus.—Within a recess in, or upon the side of, the keel A of a vessel is pivoted a rod B which can be let down or drawn up by a chain at its other end. To B is pivoted at C a second rod D which passes up through the vessel and is connected by a rack and pinion with an index finger E. The spring F helps to keep the rod B down against the pressure of the water. When the vessel is in shallow water, B strikes the bottom, and is forced nearer to the keel as the depth diminishes, while the changes of position, and so of the depth, are shown on the dial.

7659. Job, H. June 24.

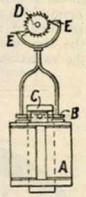
Compasses, magnetic.—Relates to mariners' compasses. A set of observations of the sun are made in the morning and afternoon, by the average of which true north is determined. The needle is then fixed on the card so that the north point on the card points to the true instead of the magnetic north. It is claimed that once set in this way, the card will always be free of deviation.

7890. Wilding, S. P., [*Schoening, H.*]. June 29.



Sounding-apparatus.—Within a tube A, open at the bottom, is placed a graduated rod B, held in position by a long cap C, the different parts being secured when fitted together by the cap D fastening with a bayonet-joint. A strip of paper marked with an aniline pencil is clasped against the rod by a piece pivoted thereto. After a sounding, the discolouration of the aniline shows the distance the water has penerated the tube, and the depth of the sounding is then read off on the graduated rod.

7996. Raworth, J. S. July 1.

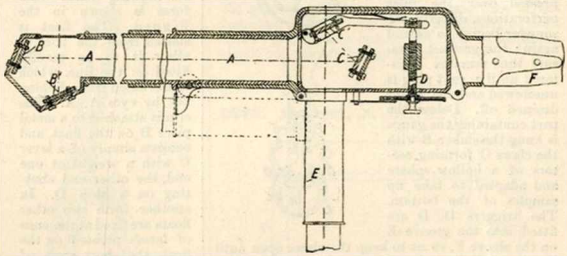


Logs; current meters.—Relates to electrical apparatus for indicating the distances travelled by ships, applicable also for indicating the speed of flowing fluids. The principal object is to avoid the use of batteries and moving contacts, and for this purpose the indicator of the apparatus is worked by alternating currents caused by the revolution of a permanent magnet round a fixed coil. This mechanism is connected to the vaned rotator by the tow-rope, or it may be part of the rotator, and the conducting-wires pass along the tow-rope. The alternating currents excite an electromagnet A with a pivoted armature B polarized by the permanent magnet C; an oscillation of the armature is thus set up which rotates the escape-wheel D by means of the pallets E, and so communicates motion to the indicator. The instrument is used as a current meter in the following manner:—A separate indicator is provided worked in a similar manner, but combined with clockwork which throws it into or out of gear every half minute. The index finger of the indicator is advanced by an arm on the main spindle, which is returned to zero by a spring whenever the indicator is thrown out of gear, and leaves the finger stationary. A light spiral spring tends to return the finger also to

zero, but this is prevented by another spring which presses a little cone on the finger against a conical bearing. Every minute, however, the clockwork withdraws this pressure spring for a short period and allows the finger to swing back against the before mentioned arm. Every minute the position of the index finger is thus corrected, so that while stationary it shows the number of revolutions per half minute, and thus very approximately the speed at any instant.

8043. Mallock, H. R. A. July 2.

Telemeters. — At each end of a rod A of known length are fixed a pair of mirrors B, B¹, C, C¹, the first pair at an angle of 45°, while one of the second pair is adjustable by a screw D which works an index finger of a dial graduated for distances. The direct view and the reflected image of the object of which the distance is to be determined are made to coincide by moving the mirror C¹, and the distance is then read off from the dial. A telescope E may be fitted to the rod and turned back when not required ; F is a stock by which the instrument is held in the hand.

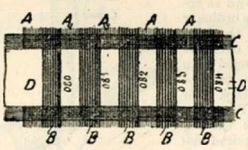


8222. Šafařik, V. July 7.

Specula for telescopes &c. are cast in special hard bronze alloys of various types, and then turned on the lathe. The surface is next polished by emery wheels, and finally coated electrically by a film of silver, platinum, or the like.

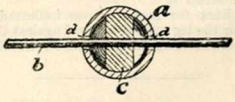
8335. Abel, C. D., [*Vaquez-Fessart, E.*]. July 9.

Colours, testing.—A fabric for use in testing colours of threads for textile fabrics is woven with two sets of warps A, A, A and B, B, B, the first of white or coloured cotton, and the second of silk or wool of different shades : the warps are held together at intervals by wefts C, C. This fabric is then cut into strips and a card D inserted alternately over and under the warps. The construction may be somewhat varied if desired.



8342. Whitten, J. S., and **Plant, H. G.** July 10.

Spectacles, safety attachment for. The invention is designed to prevent the loss, while in use, of spectacles, and like articles. It consists of a disc *c* of india-rubber, wood, cork, cardboard, or any similar substance enclosed in a globular case or shell *a* having a hole *d* on each side through which and the disc *c* the wire, pin, &c. *b* of the article to be secured is passed. In applying the attachment to spectacles the shell *a* is preferably mounted upon a wire so that when it is forced on to the ends of the side pieces the said wire passes behind the wearer's ear and secures the spectacles in position.

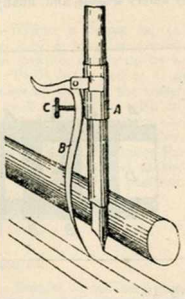


8461. Cooper, A. J., and **Wigzell, E. E.** July 13.

Sounding - apparatus.—Water is admitted to the part of the instrument A, containing a Bourdon gauge, by a valve in the side which is closed, by an india-rubber ring being pressed over the inlet perforations, directly the sounder begins to ascend again; the greatest pressure thus remains registered until a vent plug is unscrewed and the water drained off. Below the part containing the gauge is hung the sinker B with the claws C forming sectors of a hollow sphere and adapted to take up samples of the bottom. The triggers D, D are fitted into the groove E on the sleeve F, so as to keep the claws open until the rope slackens by the sounder striking the bottom. The sleeve then slips down the spindle G and the claws close by an india-rubber ring H or a spring. Where the bottom is very hard, toggles and springs are used for this purpose.

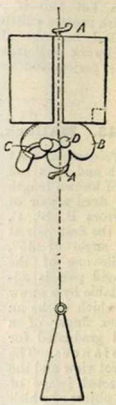
8551. Carter, W. July 15.

Ruling - pens.—Relates to an attachment to drawing-pens for ruling music and other lines, the invention being shown as applied to an ordinary pen. To the tube A, fitting over the pen, is hinged a leg B, which can be turned back for dipping. The screw C adjusts the leg at the required distance from the penholder. The appliance may be used either for ruling a series of parallel lines for music &c., as indicated in the Figure, or the leg may be pressed against the ruler to prevent it from getting smeared with ink.

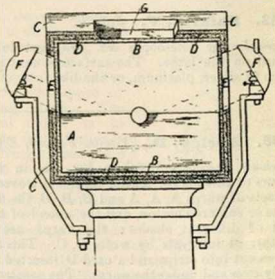


8624. Hooker, J. July 16.

Sounding-apparatus for rivers, wells, &c. The apparatus is designed principally for the use of anglers. It consists of a float with central bore through which a line passes having a plummet at the end. The float is provided with an automatic clip which allows the plummet to descend freely but nips the line on drawing back. One form is shown in the Figure. The float is slotted from the bore to allow it to be readily fitted on the line, which is prevented from slipping out by eyes A, A. The clip is attached to a metal piece B on the float, and consists simply of a lever C with a weight at one end, the other end abutting on a stop D. In another form two other floats are fixed at the ends of levers pivoted on the float, the short arms of which actuate the clip.



8653. Swan, C. F. July 17.



Binnacles.—The compass is mounted in the ordinary box A and surrounded by a glass case B which is further surrounded by a rubber shield C. Between the glass and shield is placed non-conducting material D, such as charcoal, for destroying local attraction. Requisite spaces E, E are left in the shield and charcoal to admit the light of the lamps F, F, and a similar space G to permit of observation.

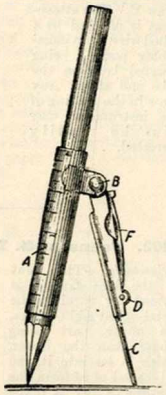
8748. Reddie, A. W. L., [*Sergeant, H. C.*]. July 20. *Drawings to Specification.*

Tripod stands for rock drills. The stands have hip-pieces at opposite sides between which extends

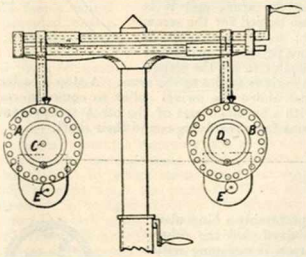
a socket carrying the cylinder &c., and which have trunnion bearings for the said socket. The back leg is pivoted between the hip-pieces at their rear ends, while the front legs are pivoted to the front ends of the hip-pieces.

8807. Boult, A. J., [*Stuart, C. W.*]. July 21.

Compasses, drawing.—The pencil is carried by a graduated sleeve A into which it may be reversed for protection when not in use. On this sleeve is a bracket B to which the leg of the compass is hinged, so that it can be clamped at any angle by a nut. The leg has a socket for the needle C, which can be pushed right back or fixed in any position desired by the screw D. The back of the leg is slit to allow a knife blade F, pivoted on the same axis as the leg itself, to be folded up.

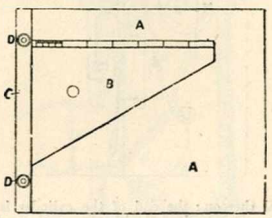


8870. Fournet, A. M. A., and **Wood, W. C.** July 22.



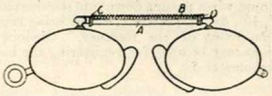
Sight-testing apparatus.—The apparatus consists of two sets of double plates A, B revolving on spindles C, D independently. A series of circular apertures are made around the circumferences of the plates ; in one plate is fitted a graduated series of convex lenses, and in the other on the same spindle convexo-cylindrical lenses. The second pair of plates are fitted with concave and convexo-cylindrical lenses. The plates carrying the convex or concave lenses can be rotated by means of gearing E by a handle, and each lens brought alternately before one of two apertures in a guard plate not shown. The plates with the cylindrical lenses can be turned by hand, but gearing is arranged which simultaneously rotates all the lenses until the direction of astigmatism is found ; this is then read off on an index in connnection with the gearing. In each plate an aperture is left vacant so that one only of the plates may be used. The Figure shows a convenient form of adjusting stand, but any other may be used.

8873. Kellett, J. July 22.



Squares.—Relates to an improved drawing-board, and to set-squares for use therewith. The drawing-board consists of a rectangular sheet of stout cardboard A with a strip of wood C permanently affixed or secured by thumb-screws D. The set-square B is trapezoidal in form, and it is preferably graduated along its upper edge.

8953. Curry, W., and **Pickard, J. F.** July 24.

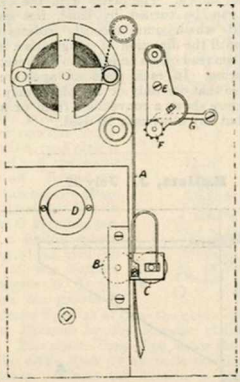


Eyeglasses.—The bridge is constructed in two pieces A and B, each having a metal piece C, D at one end and being attached to the glass frame at the other. The pieces C, D are pierced so as to allow B and A respectively to slide through them, and a spring is coiled round B which tends to draw the glasses together when being worn.

9028. Binter, G. July 27.

Thermometers and barometers, recording-apparatus in connection with. A ribbon of paper A is drawn

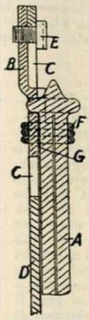
forwards by the roller B and spring roller C, the former being revolved steadily by clockwork D. A rocking bracket E is provided with a cylinder with printing or pricking devices arranged in a



spiral thereon; the end of the cylinder is fitted with a ratchet-wheel F with the same number of teeth as there are marking-pins into which gears the pawl G. Each time the bracket is moved forward to mark the ribbon, the pawl engages with a fresh tooth and advances the cylinder on the return movement. The printing may be performed by hand, or the bracket may be moved by an electric current exciting an electromagnet to the armature of which it is attached. For instance, in registering temperature, a series of thermometers have their bulbs connected to one wire of the magnet, the other wire being attached to an arm moved by clockwork over a corresponding number of contact-pieces; these are in connection with platinum wires passing down into the thermometers to 5°, 10°, &c., respectively, circuit being completed by the rising of the mercury. Obvious modifications may be used for registering the height of the barometer &c.

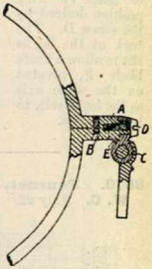
9115. Haddow, A. July 29.

Thermometers.—The thermometer tube A is attached to a piece B capable of sliding in a slot C in the scale D and fixed in any position by a binding-screw E. The attachment is effected by a coiled wire F, an india-rubber pad G being inserted between the tube and scale. Any error in the reading of the instrument may thus be readily corrected.



9202. Johnson, G. L. July 31.

Spectacles.—The joint of the lens frames is formed by turning the metal out at right-angles, the upper part being longer than the lower, which is let into it, and so shaped as to form one continuous bar A; the two parts are then fixed together by a screw B. The end of the bar A is cut down, so as to form a spindle on which is an ordinary swivel joint C for the arms, and it is also tapped for the screw D; a friction joint is thus produced, making it possible to set the glasses at various angles to the arms. A stop E is formed just above the swivel collar to come in contact with a flattened part of the bar A and prevent the arms from revolving round their shaft.



9672. Nordenfelt, T. Aug. 13.

Range-finders.—Within the draw tube of a telescope, preferably a binocular, is mounted a divided lens A, one half of which is fixed and the other attached to a movable slide B worked by a projection upon it engaging with a snail groove on a disc. The disc is rotated by means of a worm on the spindle C with milled head D. The two parts of the lens are kept in contact during the movement, and a double image is obtained of the distant object by which its distance is known in different ways. For example, the water-line of a ship in one image may be made to coincide with the horizon line in the other. The periphery of the disc is flanged, and the flange is graduated according to the use of the instrument, so that the distances may be at once read off. Where a binocular is used similar mechanism is fitted in both draw-tubes and

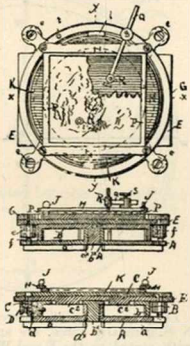
worked simultaneously. Instead of the divided lens an equivalent arrangement of mirrors and prisms may be used.

9699. Bogle, J. Aug. 14. *Drawings to Specification.*

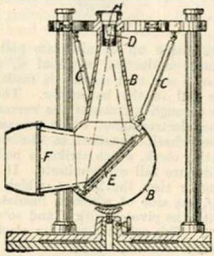
Latitude instruments.—A hemispherical brass bowl is pivoted on an axis, and within the bowl is gimballed a hemisphere of glass with a thin brass lid at the centre of which is a small hole. The interior of the glass bowl is washed with silver nitrate or covered with sensitized paper, so that a line is traced by the action of the sun's rays passing through the hole. In reading, the brass bowl is turned upon its pivot so as to expose the glass, and a graduated semicircle fitted to slide round the glass bowl is employed. By comparison with the declination the latitude may be found at once. The sensitized paper keeps a permanent record of the sun's path.

9772. Brown, E. H. Aug. 18.

Shading-machines for drawings.—Relates to apparatus for tinting and shading drawings, by placing the drawing in contact with a plate having raised and inked lines. The Figure shows a plan of the machine and sections upon the lines $x\,x$ and $y\,y$. The parts are arranged upon a bed-plate A with feet a, which is provided with a central hollow boss $a^{\times}$ to receive a central pivot $b^{\times}$ upon a circular plate B. The plate B is also provided with feet b at its periphery which rest upon the bed-plate, and with radial slots for receiving ribs or downward projections of corresponding width C^2 from a circular plate C, by which means the latter may be made to slide upon the plate B. This sliding movement is brought about in one direction by a screw D which passes through a downward projection upon the plate C, and is screwed into one of the feet b; a spring d serves to move it in the opposite direction when the screw is turned outwardly. Surrounding the plate C is a ring or skeleton plate E with brackets f for receiving the adjustable screw feet e, which rest in cavities in the bed-plate A, which they fit. The picture is stretched in a frame P, and is clamped face downwards upon a ring G so as not to touch the plate K (the inner circle of which corresponds with that of the plate E) by means of bars H and screws J, the screws passing through the ring G to tapped holes in the plate E. The picture is shaded by pressing it upon a lined or grooved and inked plate K which is fixed upon the plate C by clamps l which clip its edges in a dovetail manner. The plate as above mounted may be rotated or moved laterally as desired. The rod Q carries a pencil R, and is adjustably held by a set-screw s, in a pivot resting in holes t in the ring G. This device serves to adjust the relative positions of the picture and tinting-plate.



9849. Paget, F. A. Aug. 19.

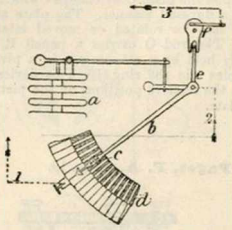


Compasses, magnetic.—A very minute card is used, formed preferably of mica upon which the points are produced by photography, and directed by one or more needles of about $\frac{1}{12}$ of an inch in length. An optical apparatus, such as a low-power microscope, is then employed to render the image of the card distinct. Such a compass is scarcely affected by local disturbing influences, such as the iron of the ship, and can be used as a reference compass, or, in one of its modified forms, for taking azimuths. The Figure shows a form adapted for being viewed at a distance. The minute card A is mounted in the case B, swung in gimbals and steadied by springs C. The image of the card is magnified by a combination of lenses in the tube D and directed by the mirror E of special construction upon the translucent screen F, shaded so as to avoid light falling upon it from its front. The cap which holds the card may be composed of an alloy of magnesium and aluminium, and the magnets inserted in saw cuts; the card itself may be formed of hard vulcanized cork dust, india-rubber, and sulphur.

9857. Lake, H. H., [*Walcher-Uysdal, R. Ritter von*]. Aug. 19.

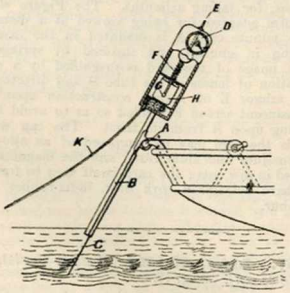
Barometers, signalling-apparatus for use with, chiefly applicable for mines. The apparatus is devised to signal a fall of the barometer, which

is generally followed by an outburst of fire-damp in proportion to the fall. An ordinary or aneroid barometer *a* actuates a pointer *b*, which carries a small metallic wheel *c*, which runs



on a plate made up of alternate plates of insulating and conducting material *d*, each part being of such size that contact is made for each millimetre fall in the barometer. The contact thus made through 1, 2 causes the current to pass through an electromagnet which actuates a pawl and ratchet-wheel connected to the snail-wheel of a repeating clock, which strikes a bell once for every millimetre fall every minute. If, however, the barometer rises the lever *e*, which works in the fork *f*, one side of which is insulated, makes contact with the pivoted fork *f*, and so closes the circuit 2, 3. This actuates another electromagnet automatically breaking the circuit 1, 2 till a fall occurs, and also brings the snail back to its first step. Various other mechanisms can be actuated by the electromagnets, all of which can be used to sound the bell &c. as before, but in any case the clockwork mechanism is so arranged that it brings the striking parts back to the normal position after a definite interval, say eight hours.

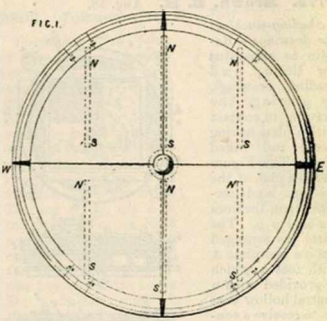
9969. Dillon, J. Aug. 22.



Sounding-apparatus.—A convenient type of the apparatus is shown, although the details may be very much modified. Upon a suitable part of the ship, or upon a submarine or other boat running in advance of it, is pivoted at A a rod B, which may either be continued so as to drag along the bottom at convenient depths, or a wire C may be used for this purpose weighted at its lower end. The inclination of the rod and consequent depth of the water is indicated on the dial D, the motion being given by the sliding rod and weight E working against a spring F. A pencil G traces a record on the moving section paper H, which is advanced by clockwork actuated by the revolutions of the log line K, or other suitable means dependent upon the movement of the ship: other signals may be arranged in various parts of the vessel worked from the same source, and electric alarms are fitted to give warning in case of dangerous shallows being approached. In another form a pressure gauge, the dial of which is connected electrically with a dial on board, is trailed along the bottom.

10,366. Daniel, J. Sept. 1.

FIG. 1.

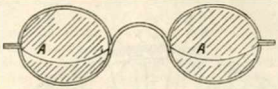


Compasses, magnetic.—Several pairs of needles N S, generally three, are arranged symmetrically with regard to the E and W line of the card, by which means greater steadiness is obtained. The card is mounted in the usual manner, and the needles of each pair are placed in a line with one another.

10,415. Cox, J. Sept. 3.

Spectacles, cleaners for. A packet of equal-sized sheets of paper is folded in the middle, and the bevelled or wedge-shaped edges so produced are attached by gum to a folded cover of leather. The spectacles may be moved to and fro within this pad for cleaning, and soiled sheets can readily be removed. The construction may be somewhat modified.

10,526. Pillischer, J. Sept. 5.



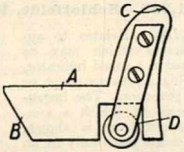
Spectacles.—Relates to spectacles with divided lenses, the two parts being of different powers. The join A is curved so as not to interfere with the line of vision, and the edges are blackened, or a strip of ebonite or opaque substance is inserted between the segments and fixed to the the rims.

10,690. Heale, M. Sept. 9.

Reflectors for ornamental or other purposes. Thin sheets of mica are silvered and set in a frame which holds them in the requisite form, curvature, and position.

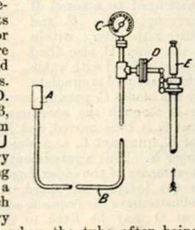
10,733. Mallett, J. R. M. Sept. 10.

Rulers.— The body A of the ruler is flat, with the front edge B bevelled and a ledge C at the back for the fingers and thumb to grasp. A recess D is generally provided below for a small roller, so that parallel lines can be ruled but the ruler will not readily run off a desk or table. A recess may be cut in the upper flat face in which pencils or penholders may rest.

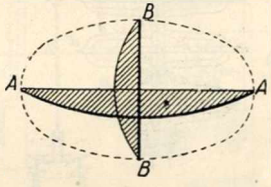


10,805. Murrie, J. Sept. 12.

Thermometers.— Relates to improvements on the apparatus for measuring temperature or pressure described in Specifications Nos. 9393 and 15,947, A.D. 1884, and No. 303, A.D. 1885. A vacuum is produced in the U tubes of the mercury gauges by providing in the shorter leg a cock through which the excess of mercury is allowed to escape when the tube, after being filled in an inclined position, is raised to a vertical position. In one form of gauge a straight tube is used, its upper portion being coiled and provided with a cock for exhaustion. In another straight tube, open at its lower end, dips into an expansion chamber containing the mercury &c. The Figure shows a modification in which a U tube is used. A is an expansion chamber which is subjected to heat and connected by the tube B to a pressure gauge C. Within the instrument a complete or partial vacuum is produced by exhaustion through a pet cock or in other ways. The liquid volatilizes in the vacuum, and as the pressure increases with the heat it is indicated by the gauge C, while the mercury is prevented from boiling. A diaphragm D may be fitted by which an alarm E is rung at a certain temperature ; or a safety-valve of ordinary type may be employed. For high temperatures the expansion chamber is coated with asbestos and a chronometer is used to indicate the time the coating takes to heat ; a temperature scale is attached graduated empirically. The apparatus may also be used to indicate pressures not generated by heat, such as the pressure in a water main ; it is then connected by a branch pipe with the vessel in which the pressure exists.



10,920. Colton, E. G., [*Wagner, A.*]. Sept. 15.



Lenses ; spectacles.—Relates to lenses for spectacles and other optical instruments, and consists in grinding the surface so that the radius of curvature of the section along the longer axis A A is greater than that of the section along the shorter axis B B.

11,151. Rhodes, C. Sept. 19.

Compasses, drawing ; dividers.—A pencil, pen, or pointed rod is held between two coils of spring wire, one end of which is bent out at right-angles and sharpened to form the other leg. The pencil can easily be adjusted as required, and the spring coils then grip it firmly enough for circles to be described.

11,207. Franck - Valery, P., and **Franck-Valery, E.** Sept. 21.

Eyeglasses.—In addition to the ordinary gripping-devices A a pair of arms B are pivoted to the frame. When in use these can be bent inwards by the little levers C, C, so as to grip the nose and ensure