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A.D. 1812 . . . . . N<sup>o</sup> 3545.

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**S P E C I F I C A T I O N**

OF

**CHARLES AUGUSTUS SCHMALCALDER.**

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**PHILOSOPHICAL INSTRUMENTS.**

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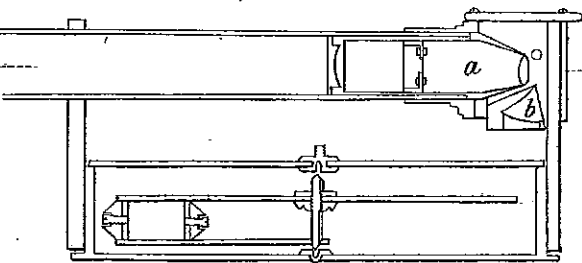
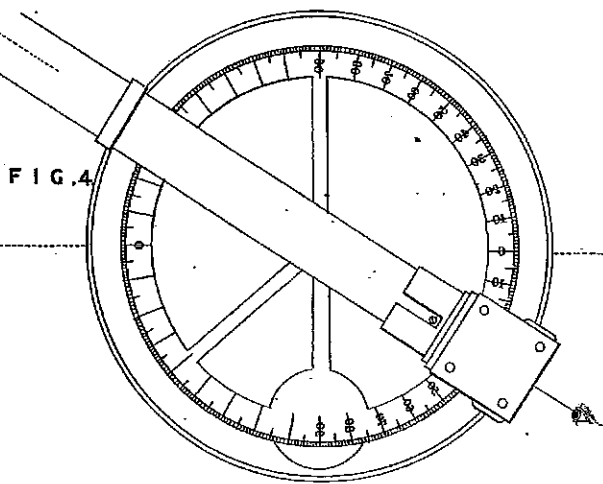


FIG. 1.

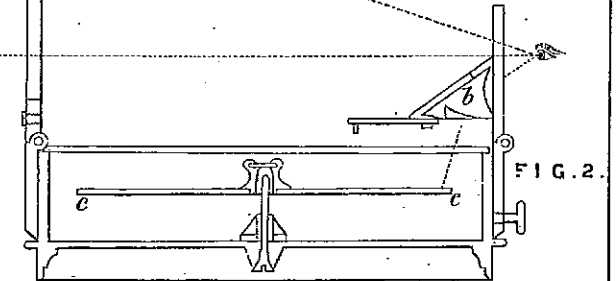
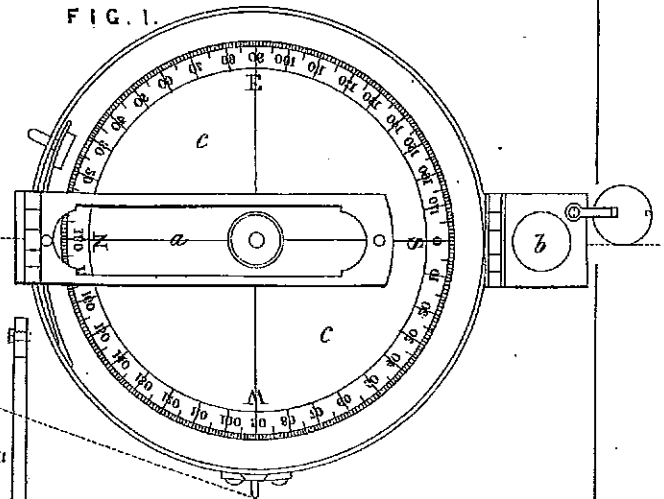
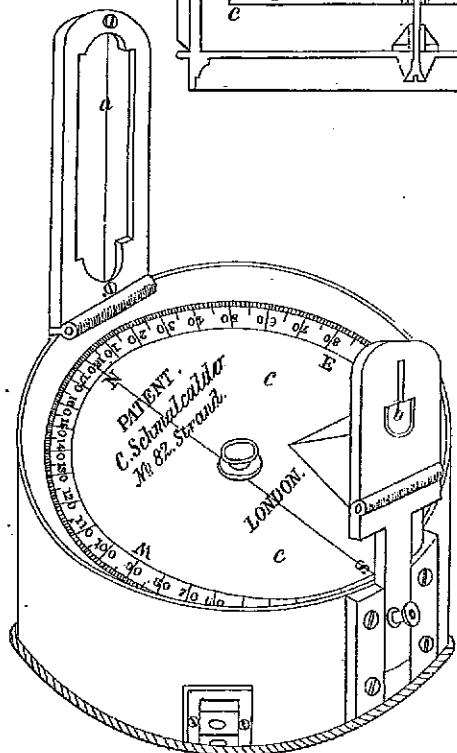


FIG. 3.



*The encolled drawing is colored.*

Drawn on Stens by Malby & Sons.



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**Philosophical Instruments.**

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**SCHMALCALDER'S SPECIFICATION.**

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, CHARLES AUGUSTUS SCHMALCALDER, of the Strand, in the City of Westminster, and County of Middlesex, Mathematical Instrument Maker, send greeting.

WHEREAS His most Excellent Majesty King George the Third did, by His Letters Patent under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the Fifth day of March, in the fifty-second year of His reign, give and grant unto me, the said Charles Augustus Schmalcalder, my exors, admors, and assigns, His especial licence, full power, sole privilege and authority, that I, the said Charles Augustus Schmalcalder, my exors, admors, and assigns, should and lawfully might, during the term of years therein mentioned, make, use, exercise, and vend, within England, Wales, and Town of Berwick-upon-Tweed, my Invention of "CERTAIN IMPROVEMENTS IN MATHEMATICAL INSTRUMENTS;" in which said Letters Patent there is contained a proviso that if I, the said Charles Augustus Schmalcalder, shall not particularly describe and ascertain the nature of my said Invention; and the manner in which the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be enrolled in His Majesty's High Court of Chancery within two calendar months next and immediately after the date of the said Letters Patent, that then the said Letters Patent, and all liberties and advantages whatsoever

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thereby granted, shall utterly cease, determine, and become void, as in and by the same (relation being thereunto had) may more fully and at large appear.

**NOW KNOW YE**, that in compliance with the said proviso, I, the said Charles Augustus Schmalcalder, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, are described 5 and ascertained as follows (that is to say):—

In the first place I do adapt and apply to mariners' compasses, theodolites, and other instruments for measuring angles of azimuth or bearing, a three-sided prism having two plain surfaces, forming an angle of forty-five degrees, or nearly that quantity, with each other, and having the third surface ground 10 spherically convex, in such a manner as that a line drawn perpendicular to the line of intersection of the said plane surfaces, and through the middle point of one of the said surfaces, shall not be far distant from the plane of a great circle of the said spherical convexity lying parallel to the said plane surface; or, in other words, that the optical axis of the said spherical surface, 35 parallel to and within one of the said plane surfaces, shall not far distance from that surface. And I do so adopt and apply the said prism that the convex surface shall face the divisions of the compass card or theodolite limb, or other equivalent part of the said other instrument, and the plane surface nearest and parallel to the said axis of the spherical surface shall be 20 opposite the eye of the observer. And in these circumstances the other plane surface will be so inclined as to shew the said divisions by reflexion, and render it practicable at the same time for the observer to see by direct vision the subject of observation by bringing for that purpose part of the pupil of the eye above the angular edge of the prism; and in this manner the line of collima- 25 tion will become the index to the said divisions, and the azimuth or bearing may be taken and read off at one observation.

Secondly, I do make the like adaptation and application, *mutatis mutandis*, to instruments for measuring vertical or oblique angles, and also to the spirit level of the levelling instrument. 30

Thirdly, I do make a four-sided pyramid having a square base, and two of the sides of the said pyramid are at right angles to the base and to each other, and the other two sides are so inclined to the base that each of them makes an angle therewith of forty-five degrees or thereabouts; and in case 35 the eye be placed against the base of the said pyramid the observer will see an object or objects reflected by each of the inclined sides at the same time; and I do place one of the first-mentioned sides above or against the horizontal divisions of the compass card or theodolite limb, or other instrument, so that those divisions can be read off in a similar manner to that already described

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by the prismatic lens first mentioned; and I do place the other of those two first-mentioned sides opposite to a plumb line, spirit level, or the divisions of a theodolite or other instrument, so that at the same time that the subject of observation is seen by direct vision or otherwise, the station or position of such plumb line, or the bubble of such spirit level, or divisions of other instruments, is seen by means of one reflecting or inclined surface, while the divisions are seen and read off by means of the other reflecting or inclined surface; and in cases where a magnifying power is required I do make the two first-mentioned sides, which are at right angles with the base of the said pyramid, spherically convex, so that the divisions to be read off may be opposite to or nearly in the focus of one spherical side, and the plumb line, or bubble of the spirit level, or divisions of a theodolite or other instrument, may be opposite to or nearly in the focus of the other spherical side.

Fourthly, I do apply the said prismatic reflectors, not only in their simple state, but also to the telescope of instruments for observation, such as quadrants, Hadley's sextants, and the like, and do by that means find the angles of azimuth and altitude without requiring two or three observers to operate together, as is commonly practised.

And I do farther declare, that in such instruments as do not require a magnifying power in the said prismatic or compound reflectors I do not make any of the surfaces convex, but do substitute or make a plane surface or surfaces, and at right angles to that plane which is intended to be opposite the eye of the observer:

And the Drawings in the margin hereof, in the illustration of the premises, do represent, Figs. 1, 2, and 3, a compass improved in the manner hereinbefore described, wherein  $a$  is the line of collimation or sight, against or upon which the divisions of  $c$ , the card; are seen, magnified by  $b$ , the reflecting prism. In Fig. 1 the same is turned back to allow the cover to be put on after shutting down the sight  $a$ .

Fig. 4 and 5 shews the manner of attaching the compass, or any other instrument for giving azimuths or altitudes, along with my said improvements, to the eye-end of the telescope. By attaching a sextant to the object-end of the same telescope I take the altitude and azimuth at the same time.

In witness whereof, I, the said Charles Augustus Schmalcalder, have hereunto set my hand and seal, the Second day of May, in the year of our Lord One thousand eight hundred and twelve.

C. A. SCHMALCALDER. (L.S.)

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*Schmalcalder's Improvements in Philosophical Instruments.*

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SMITH. AND BE IT REMEMBERED, that on the Second day of May, in the year of our Lord 1812, the aforesaid Charles Augustus Schmalcalder came before our said Lord the King in His Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written: And also the Specification aforesaid was stamp'd according to the tenor of the Statute made for that purpose.

Inrolled the Second day of May, in the year of our Lord One thousand eight hundred and twelve.

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