Dec. 15, 1931. H. W. CHESHAM 1,836,643

APPARATUS TO FACILITATE INSTRUCTION IN MATHEMATICS

Filed Jan. 2, 1931

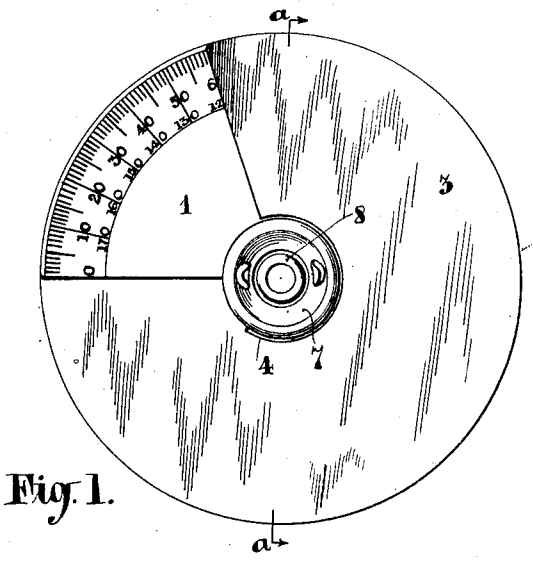



Fig. 1.

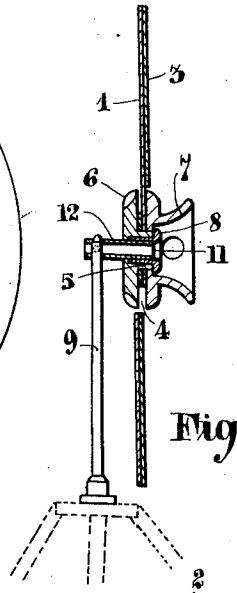



Fig. 2.

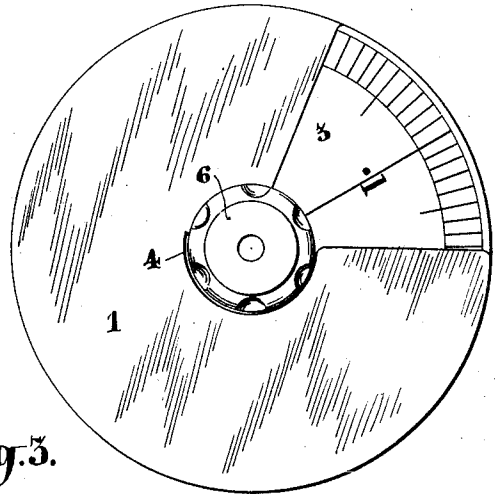



Fig. 3.

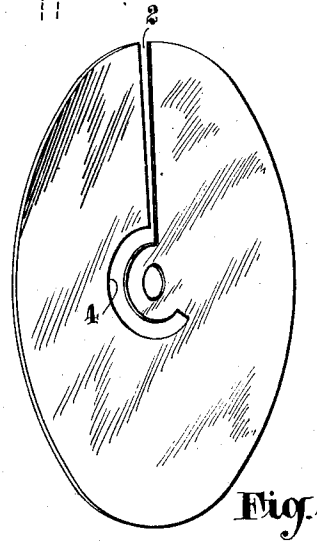



Fig. 4.

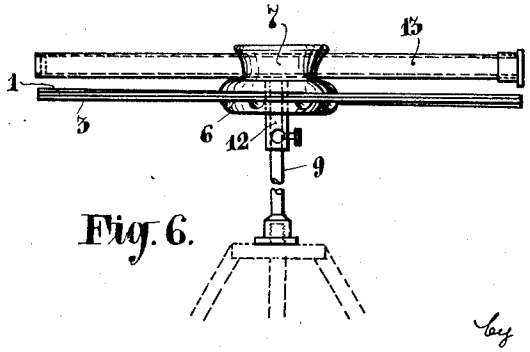



Fig. 6.

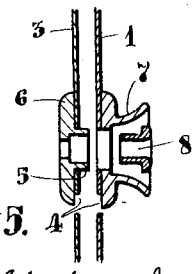



Fig. 5.

H. W. Chesham, Inv.
by C. A. Snow & Co. attys.

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# UNITED STATES PATENT OFFICE

HENRY WILLIAM CHESHAM, OF SHEFFIELD, ENGLAND

## APPARATUS TO FACILITATE INSTRUCTION IN MATHEMATICS

Application filed January 2, 1931, Serial No. 506,260, and in Great Britain January 4, 1930.

This invention relates to apparatus to facilitate instruction in mathematics, of the type comprising a disc having a radial slit and a second disc having a radial slit therein so that the slit edge of one disc can pass through the slit in the other disc.

According to the present improvements, the apparatus comprises an index disc provided with a scale on one or both faces and a cover disc, so that any part of, or the whole, of the index disc can be covered, whereby the proportions of the covered and uncovered portions can be pictorially represented, in addition to the mathematical representation. Each disc has a circularly directed slot at the end of the radial slit. One disc is conveniently mounted on a sleeve fixed in relation to the other disc, and one or both discs is or are provided with a hand grip or support at the centre of the disc.

Referring to the drawings:—

Figure 1 is a front view of a device constructed according to this invention.

Figure 2 is a section on the line *a*—*a* of Figure 1.

Figure 3 is a back view.

Figure 4 is a perspective view of a disc detached.

Figure 5 is a sectional elevation of the centre portions of the disc and mounting sleeve detached, and

Figure 6 shows the apparatus arranged with the disc in a horizontal position.

The index member is conveniently a disc 1 which has a radial slit 2 extending from the circumference to the centre. A second disc 3 having a similar radial slit therein is located at the side thereof and the index member 1 is rotatably mounted in relation thereto. The index disc may be stationary and the cover disc movable. The slits are such that one slit edge of the index disc can be passed through the slit in the cover disc and rotated so that a part, or the whole of the cover disc, can overlap the index disc, or vice-versa. The index disc and cover disc are preferably formed of bakelite or a metal of light weight, and in order that the disc will readily pass through the slit in the other disc a circularly directed slot 4 passes from the inner end of the radial slot in each disc, one slot 4 in one disc passing in one direction, whilst the slot 4 in the other disc passes in the other direction. The discs are rotatably mounted conveniently by means of a sleeve 5, fixed or formed centrally to one disc 3 on which the other disc 1 is rotatably mounted. A flange 6 on the other face of the disc, at the centre and inside the slot 4, is provided for the holding and manipulation purposes. The other disc 2 has a finger grip 7 similarly fixed to the outer face, and such disc is prevented from axial movement on the sleeve 5, by means of a plug sleeve 8 or the like. The two discs 1 and 3 are slightly sprung in use to lie close together and interfitted with a part of one located behind the other and the rest in front of the other as shown by Figure 2.

The front side of the index plate 1 may be graduated in degrees, so that angles may be readily visualized. The back of the member 3 is, in one instance, divided into ten sections and each section is divided into two divisions and the divisions divided into five subdivisions, so that either side of the apparatus may be utilized. With the disc thus graduated decimals can be readily taught, as for instance, it can be readily seen that .25 represents a quarter of the whole disc and consequently each individual quantity can be actually visualized, thereby enabling the student to much more readily grasp the meaning of the mathematical quantities. The instrument thus constructed may also be utilized by the instructor as a protractor for blackboard and like drawing; the aforementioned sleeve pivotally connecting the two discs enables a point on the blackboard to be viewed therethrough and consequently enabling the device to be placed concentrically in relation to such point.

The aforementioned device can also be utilized for giving instruction in surveying. For this purpose a stand 9 is provided which conveniently has a bearing at its upper end, and a fitting 10 is provided, one end 11 of which is formed as a plug for fitting into the aforementioned sleeve 8, whilst the other end 12 is adapted to engage on the top of the

stand 9. A sight tube 13 may be detachably fixed in holes in the finger piece 7. The top of the stand may be conical and the fitting 10 bears on this conical portion to be rotatably held thereby. In this position the index plate is held in a vertical position and can therefore be utilized for obtaining angles, a plumb line or spirit level placed on the sighting tube enabling the horizon to be obtained. The end of the fitting 11 can also engage the stand 9 as shown in Figure 6, so that the disc graduated in degrees is held in a horizontal position to enable horizontal angles to be obtained. The stand 9 may be fixed on a tripod.

The three separate parts shown by Figure 5 may be formed as single bakelite mouldings or may be built up from individual mouldings. The device may, however, be made from any suitable material. The device comprising the index disc and the cover disc may also be made in a small size for use by the individual student, in which case the two discs may be pivoted together by means of a ferrule.

Claims:

1. Apparatus to facilitate instruction in mathematics, comprising a disc having a radial slit therein and a circularly directed slot at the bottom of the slit passing in one direction, a cover disc having a radial slit and a circularly directed slot at the bottom of the slit passing in the other direction so that the material of the discs on the outer sides of the slots can flex laterally and so that the slit edge of one disc can pass through the slit in the other disc, and means for rotatably mounting the discs in relation to one another.

2. Apparatus to facilitate instruction in mathematics, comprising a disc having a radial slit therein and a circularly directed slot at the bottom of the slit passing in one direction, a cover disc having a radial slit therein and a circularly directed slot at the bottom of the slit passing in the other direction so that the material of the discs on the outer sides of the slots can flex laterally and so that the slit edge of one disc can pass through the slit in the other disc, and bearing members carried by the said discs inside the said circularly directed slots.

3. Apparatus to facilitate instruction in mathematics, comprising an index disc having a radial slit therein and a circularly directed slot at the bottom of the slit passing in one direction and provided with a scale on one or both faces, a cover disc having a radial slit therein and a circularly directed slot at the bottom of the slit passing in the other direction so that the material of the discs on the outer sides of the slots can flex laterally and so that the slit edge of one disc can pass through the slit in the other disc, means for rotatably mounting the discs in relation to one another so that the slit edge of one disc can pass through the slit edge of the other disc and means for detachably fitting a telescope, located in the centre of the apparatus and fixed in relation to one disc.

4. Apparatus to facilitate instruction in mathematics, comprising an index disc having a radial slit therein and a circularly directed slot at the bottom of the slit passing in one direction, a cover disc having a slit therein and a circularly directed slot at the bottom of the slit passing in the other direction so that the material of the discs on the outer sides of the slots can flex laterally and so that the slit edge of one disc can pass through the slit in the other disc, a sleeve fixed centrally on one disc, and means for fixing the other disc on the sleeve to be rotatably mounted thereon, and hand grips carried centrally on the outer face of each disc.

5. Apparatus to facilitate instruction in mathematics, comprising an index disc having a radial slit therein and a circularly directed slot at the bottom of the slit passing in one direction, a cover disc having a slit therein and a circularly directed slot at the bottom of the slit passing in the other direction so that the material of the discs on the outer sides of the slots can flex laterally and so that the slit edge of one disc can pass through the slit in the other disc, a sleeve fixed centrally on one disc, and means for fixing the other disc on the sleeve to be rotatably mounted thereon, and a stand for fixing the said sleeve thereon.

In witness whereof I have signed this specification at Sheffield, England.

HENRY WILLIAM CHESHAM.