

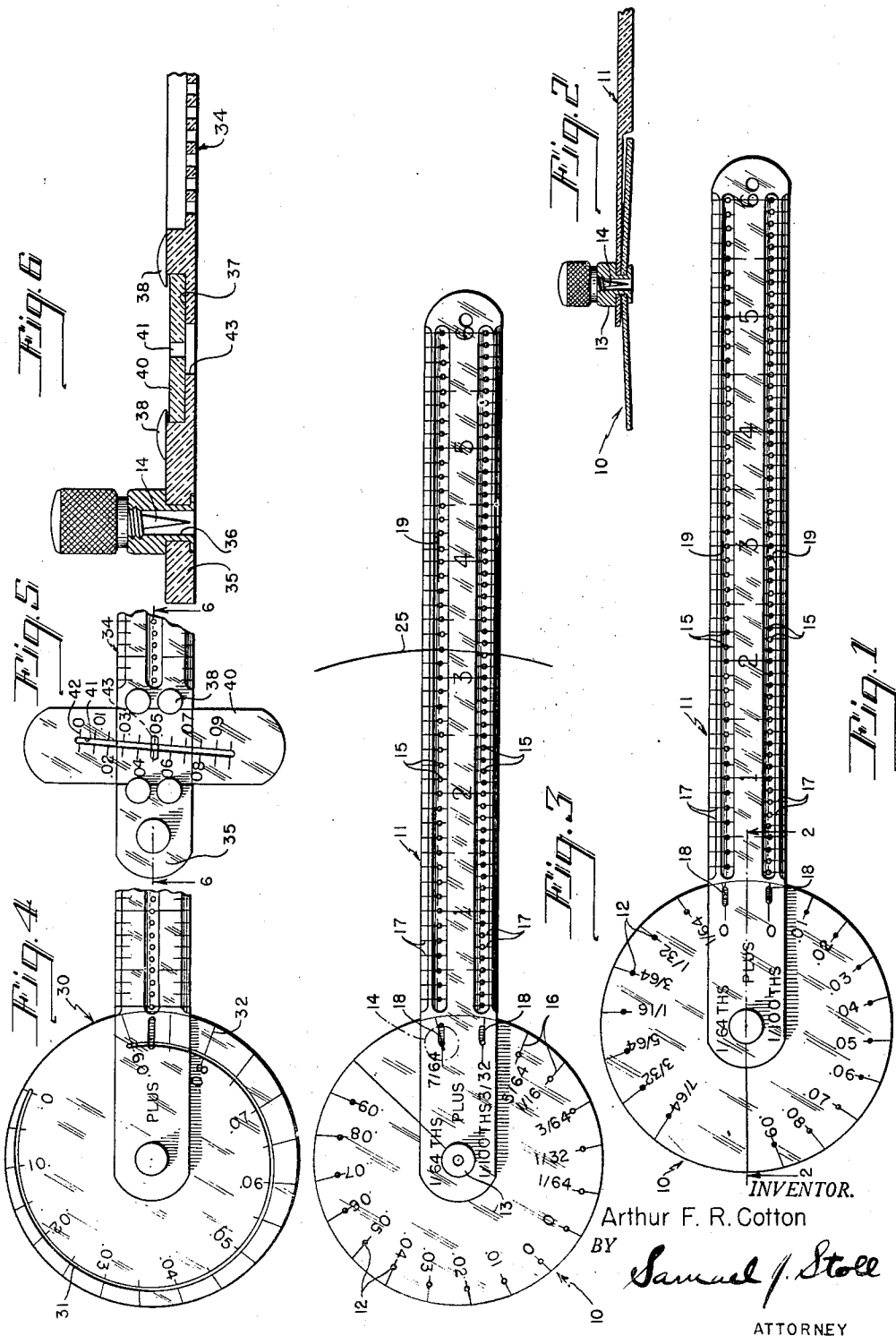
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COMPASS

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COMPASS

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1 Claim. (Cl. 33—27)

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This invention relates to compasses.

The principal object of this invention is the provision of an instrument which may be used as a compass, a pair of dividers, or as a measuring rule. It may also be used as a straightedge and a T square. With modifications it may be used as a protractor or as a beam compass. This instrument may be used by engineers, architects and draftsmen, and it may also be used by tool makers in the making of tools and dies. The instrument herein provided must accordingly be precise and accurate in every respect, and it is accordingly fitted with a vernier so that metric measurements and adjustments may be provided for.

Preferred embodiments of this invention are shown in the accompanying drawing in which—

Fig. 1 is a plan view of the first embodiment;

Fig. 2 is a longitudinal section on the line 2—2 of Fig. 1;

Fig. 3 is another plan view of the device shown in Fig. 1, showing how it is used to describe an arc of a measured radius;

Fig. 4 is a fragmentary plan view of a second embodiment of this invention;

Fig. 5 is a fragmentary plan view of a third embodiment of this invention; and

Fig. 6 is a longitudinal section on the line 6—6 of Fig. 5.

Referring now to the first three figures of the drawing, it will be seen that the embodiment of this invention therein shown comprises essentially four main parts: a calibrated, perforated disc 10; a calibrated and perforated straightedge 11; a fastening member 13 by which the disc and the straightedge may be pivotally connected to each other and a pin 14. A recess is formed in the bottom of the straightedge to accommodate disc 10, the depth of said recess corresponding substantially to the thickness of said disc so that the bottom surfaces of the disc and of the main body of the straightedge will occupy a substantially common plane. See Fig. 2. One additional element is needed for use of this device as a compass or as a pair of dividers, and that is a marking member such as a pencil, pen or scriber which, of course, are not shown in the drawing.

The disc 10 is provided with a centrally located hole through which the fastening member 13 extends. Arranged spirally of said hole is a plurality of perforations or holes 12 which are spaced from each other in accordance with calibrations or graduations 16.

The straightedge 11 is provided with at least

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one longitudinally extending series of holes 15 which are spaced from each other in accordance with calibrations or graduations 17. In the drawing two series of holes are shown and two complete sets of calibrations accompany said series of holes, one set for each series. For reasons which will hereinafter appear, each series of holes is formed in a longitudinally extending groove 19 which is formed in the body of the straightedge 11. In line with said grooves and said series of holes 15 are slots 18 formed in straightedge 11 at a point which enables said slots 18 to register with the disc holes 12 when the disc and the straightedge are pivotally connected to each other as shown in the drawing.

For convenience in carrying the pin 14 around and to make certain that it will not become separated from the other members of the device and consequently lost, the pin is provided with a threaded portion which meshes with a correspondingly tapped portion of the fastening member 13. When the device is not in use, therefore, the pin may be screwed into the fastening member as shown in Figs. 1 and 2.

When the device is used as a compass, and an arc of a predetermined radius is sought to be described, the pin 14 is removed from the fastening member 13 and inserted through one of the slots 18 and through a selected registering disc hole 12. The pencil, pen or scriber is then inserted into one of the holes 15 in the straightedge and with the pin used as a fulcrum or pivotal point, the pencil, pen or scriber, as the case may be, is moved along an arcular line to describe the arc 25 shown in Fig. 3. This arc may, of course, be continued to complete a circle.

The function which grooves 19 perform may now become apparent. The straightedge 11 is of fair thickness to lend it all necessary strength. The holes 15 are relatively minute. Hence, were it not for grooves 19 which reduce the thickness of the straightedge at holes 15, it would be necessary to provide a pencil or pen point of exceedingly fine dimensions to extend through the holes and make the necessary impressions or markings upon the paper underneath. The grooves are also used to facilitate selection of a given hole 15. The writing or marking instrument is simply run up or down the groove until the selected hole is reached, and it is then inserted into said hole.

The mechanical operation of the device has above been given. It is important to state the theoretical or mathematical basis of the mechanical operation. Reference to Fig. 1 will dis-

close that on one side of the straightedge each calibrated inch is divided off into eight equal parts, and it will be seen that on the other side of the straightedge each calibrated inch is divided off into ten equal parts. On the first mentioned side fractional measurements in terms of eighths of an inch may be had; on the other side of the straightedge decimal measurements or measurements in terms of tenths of an inch may be had. The first side may accordingly be used for fractional work and the second side for work on the decimal scale.

The disc holes 12 are divided into two series; one of which relates to the first mentioned side of the straightedge; and the second series, of course, relates to the second side of the straightedge. Considering the spiral on which the first series of holes 12 is disposed, it will be understood that the difference between the radial distance of one end of said spiral from the center of the disc, and the distance of the other end of the spiral from the center of the disc, corresponds to the spacing between adjacent holes 15 on the first mentioned side of the straightedge. By the same token, the distance between adjacent holes 15 on the second side of the straightedge corresponds to the difference between the radial distances of the two ends of the second spiral on disc 10 from the center of said disc. Although mention has been made of two so-called spirals on disc 10, it will be appreciated that what is meant is a spiral line on which the first and second sets of holes 12 are disposed, the first set relating to the first side of the straightedge and the second set relating to the second side of said straightedge.

From the foregoing it will be apparent that the calibrated perforations on disc 10 serve as a vernier with respect to the straightedge 11 so that arcs and circles may be drawn to radii accurate to within small fractions of an eighth or a tenth of an inch. Each eighth or tenth of an inch may be broken up into as many equal parts as there are holes 12 in the two spiral sections on disc 10.

A still finer adjustment may be had by connecting the holes 12 to form a continuous slot 31 such as is shown in disc 30 of the second embodiment of this invention in Fig. 4. Calibrations or graduations 32 determine the fineness of the adjustment. If the first section of the spiral 31 corresponding to the first series of holes 12 is broken up by means of graduations 32 into eight parts; then it is clear that an adjustment true to $\frac{1}{8}$ th of an inch may be had. If the second section of spiral 31, corresponding to the second series of holes 12, is divided up into ten equal parts by means of calibrations 32, then the second side of the straightedge may be used for describing circles accurate to within $\frac{1}{100}$ th of an inch.

In all other respects the device as shown in Fig. 4 corresponds to the device shown in the first three figures of the drawing.

The spiral 31 has been described as covering two adjoining sections corresponding to the two series of holes 12 on disc 10. Actually these two sections may be made to coincide with each other so that the entire spiral slot may be used for adjustments in sixty-fourths as well as hundredths of an inch. In such case only one side of the straightedge need be used in place of the two sides above referred to. Using this arrangement it would be found desirable to space the holes on the straightedge one inch or 0.5 inch apart.

The third embodiment of this invention shown in Figs. 5 and 6 makes use of a sliding, slotted

and calibrated cross-bar 40 in place of the pivotally mounted discs 10 and 30 above referred to. In this third form of the invention the straightedge 34 is provided with a recess 37 which extends transversely thereof at right angles thereto. This recess is adapted to accommodate the crossbar 40 for slidable movement of said crossbar relative to said straightedge on a line transversely of, and perpendicular to, said straightedge. Pins 38 having relatively large heads are affixed to the straightedge to engage, guide, and prevent accidental displacement of the crossbar relative to the straightedge. The straightedge shown in Figs. 5 and 6 is provided with a small extension 35 which is not needed on the straightedge 11 shown in the first four figures of the drawing. This extension 35 is provided with a bushing 36 corresponding to the fastening member 13 above described. This bushing is also adapted to accommodate the threaded portion of pin 14 so that when the pin is not in use, it may be screwed into the bushing 36. This bushing may be used to take the place of one of the pins 38 and given a head to perform the same function as do pins 38 relative to the crossbar 40.

Corresponding to spiral slot 31 in disc 30 is a diagonally extending slot 41 in crossbar 40. There are calibrations or graduations 42 on the crossbar dividing up the slot into a predetermined number of equal sections; and it will be understood that these calibrations and their function correspond to the calibrations 32 of disc 30. A series of holes 15 is formed in the straightedge 34, longitudinally thereof and in a groove corresponding to grooves 19 of the first embodiment. A single slot 43 is formed in the straightedge 34 corresponding to the slots 18 in straightedge 11, and it will be seen that registration is provided between said slot 43 and slot 44 of the crossbar. It will also be seen that the distance between adjacent holes 15 in straightedge 34 corresponds to the distance separating a pair of imaginary lines, parallel to the long sides of the crossbar and intersecting the opposite ends of slot 41 in said crossbar. Thus should the diagonal slot 41 be divided by calibrations 42 into one hundred equal parts, the net effect would be to provide an adjustment accurate to a hundredth of the distance separating adjacent holes 15 in straightedge 34. If, therefore, the holes on the straightedge are spaced $\frac{1}{60}$ th of an inch apart, the compass might be used for adjustments to within $\frac{1}{6000}$ th of an inch. This device may be used in substantially the same manner as the first two devices herein described; that is, the pin is inserted through the registering slots 43 and 41 and the marking implement is then inserted through a selected hole 15.

It will be understood that although a single series of holes 15 in a single groove 19 is shown in the third embodiment of the invention, and two series of holes and grooves in the first embodiment, these two embodiments may be modified, as desired, by forming a single series of holes and a single groove in the first embodiment and two series of holes and grooves in the third embodiment. This is simply a matter of choice, and it is determined by the use to which the device in question is to be put. Although the first series of holes has been described as being graduated to eighths of an inch and the second series to tenths of an inch, it will be appreciated that this has been done simply by way of illustration and not by way of limitation. The devices hereinabove described may ad-

vantageously be made of transparent plastic material. It may be found desirable, however, for use in engineering workshops to make this device of a stronger material such as stainless steel or tempered steel. When plastic is used, a strengthening or reinforcing member of metal may be employed. In such case it would be possible to reduce the thickness of the material of the straightedge immediately surrounding the holes 15. It would then be possible to use a writing or marking construction having a finely reduced point of somewhat shorter dimensions than would be possible in the use of a straightedge which is thicker around the holes 15. These holes 15 may also be enlarged above the bottom surface of the straightedge to accommodate the body of the writing or marking implement as distinguished from its writing or marking point, as the case may be. The enlarged portion of holes 15 would then serve as a socket to accommodate the body of the writing or marking implement. Conventional provision might also be made to prevent the ink from running when a pen is used as a scribing member. Where the device is used for laying out work in a machine shop, a center-punch or scriber would be employed in place of a pin, pen or pencil. It is desirable, whether the device is made of plastic material or metal or any other suitable material, to make certain that the material is sufficiently yielding and resilient to enable the straightedge to conform to the contours of curved surfaces.

The device may be modified in other respects than above indicated without departing from the basic principles of the invention. For example, the pins 38 which are used to lock the crossbar 40 in place, may be eliminated and other means which would occur to men skilled in the art might be used to provide a track for the crossbar 40. The bar is shown in the drawing to be completely removable from the recess 37 in the straightedge 34. It will be found a simpler matter to carry the device from place to place by removing the crossbar from the straightedge and placing them side by side or superimposed in a simple carrying case. Although a recess has been shown in the straightedge, this, too, might be dispensed with in other constructions which would enable the crossbar to move transversely of the straightedge and at right angles thereto. Use may be made of a tension member, for example, to lock the crossbar in place on the straightedge. As a substitute for a tension member, a clamp screw or a cam member may be used to equal advantage. These members, however, are not shown in the drawing, because they are conventionally used for the purpose indicated. Furthermore, it should be remembered that when a pin or scriber

is inserted through the two registering slots in the embodiment last above described, or in the registering slots of the second embodiment, or through the registering slot and hole in the first embodiment, relative movement between the crossbar and the straightedge or the disc and the straightedge is prevented. Still another respect in which the device may be modified is by substituting holes in the crossbar for the slot 41, these holes corresponding to holes 12 of the first embodiment. Other modifications and variations will occur to those skilled in the art and need not here be listed.

I claim:

15 A compass comprising a substantially disc-shaped member having a plurality of calibrated holes formed therein in spiral relation to its center point, a straightedge having a plurality of calibrated holes formed therein, longitudinally thereof and in alignment with each other, a slot 20 formed at one end of the straightedge in alignment with the calibrated holes in said straightedge, said straightedge having a recess formed in the bottom thereof to accommodate the disc-shaped member, the depth of said recess corresponding substantially to the thickness of said disc-shaped member so that the bottom surfaces of said disc-shaped member and of the main body of the straightedge will occupy a common plane, and a rivet pivotally securing said recessed end of the straightedge to the top center of said disc-shaped member, thereby providing for relative 25 pivotal movement between said disc-shaped member and said straightedge on a substantially common plane and thereby enabling said spirally arranged holes to enter into registration with said slot at different points along said slot, depending upon which hole is in registration there-with.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
452,054	Sperry	May 12, 1891
824,299	Huey	June 26, 1906
1,154,673	Van Ness	Sept. 28, 1915
1,341,457	Costovici	May 25, 1920
2,342,476	McEvoy et al.	Feb. 22, 1944
2,370,741	McDonnell	Mar. 6, 1945

FOREIGN PATENTS

Number	Country	Date
324,597	Germany	Sept. 1, 1920