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INDICATING MEANS FOR COMPASS CARDS

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Fig. 1.

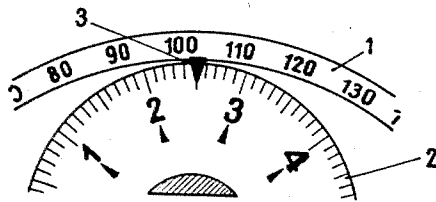


Fig. 2.

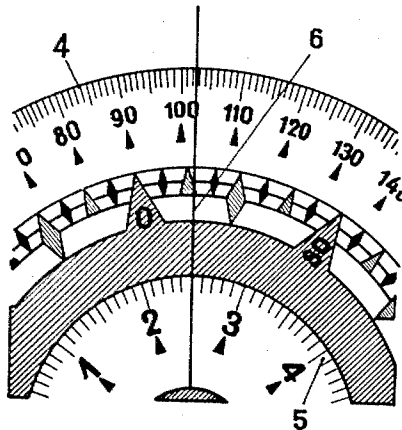
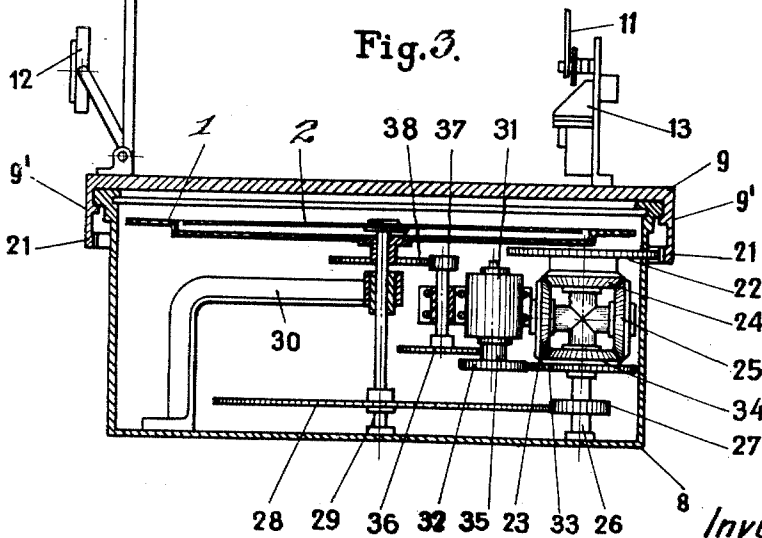


Fig. 3.



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INDICATING MEANS FOR COMPASS CARDS.

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My invention relates to improvements in the indicating card system of nautical measuring apparatus such as compasses, receiver compasses, compasses for taking bearings and the like, and more particularly in apparatus of the type provided with two cards one corresponding to the ordinary compass card and the other showing the changes of the course of the ship on an enlarged scale by rotating at increased velocity. The cooperation of the cards has been compared to the hands of a clock, the card rotating at increased velocity being termed minute card, and I shall make use of this term in the following description.

In constructions such as are now in use the minute card has been added to the main card as a new and independent element, and the cards were not organically combined into one system in the manner usual in clocks in which the same dial is used for showing the hours and minutes, whereby the indications can be readily read at a glance. As distinguished from such instruments the receiver compasses now in use are equipped with independently mounted cards, so that the disposition of the minute card resembles that of the seconds hand of a watch rather than the minute hand. Therefore two separate readings must be taken though both cards are provided on the same instrument. The object of the improvements is to provide an instrument of the type referred to by means of which the positions of the main and minute cards can be read at a glance, and with this object in view I dispose the graduations of the main and subsidiary cards in such a way that they are adjacent to each other, and that the figures of the subsidiary card are read in connection with those of the main card, both readings being taken from a fixed mark provided at the point where the graduations meet. It will be understood that my improved system may also be used in other nautical instruments for determining angles of heading and for taking bearings.

For the purpose of explaining the invention several examples embodying the same have been shown in the accompanying drawings in which the same reference characters have been used in all the views to indicate corresponding parts. In said drawings,

Fig. 1, is a diagrammatical view showing parts of the cards,

Fig. 2, is a similar view showing the construction now in use, and

Fig. 3, is a view in vertical section of the compass.

In Fig. 1 I have shown the cards of a compass, the numeral 1 indicating the margin of the main card, and the numeral 2 the minute card. The main card shows a scale of graduations provided with thirty-six figures from 0, 10, 20, etc. to 350 which are spaced from each other at angles of 10° . The minute card performs one complete rotation for every 10° of change of the course, and its graduations show the figures 0, 1, 2 etc. to 9 and divisional lines of graduation corresponding to half degrees and to tenths of a degree. A small fixed mark 3 indicates the point where the readings are to be taken. In the positions shown in the figure the minute card shows the value 2.5 at the mark 3, which is to be added to the figure 100 of the main card located at the left of the mark 3. As appears from the figure the readings are not composed by calculation but optically and by mere sight, the figure read from the minute card taking the position of the last zero of the figure read from the main card.

In order that the improvement be more clearly understood I have shown the cards such as are now in use in Fig. 2, the cards showing the same reading of 102.5° . Also in this case the minute card shows 2.5° , thus repeating or more accurately showing the reading of the main card. For ascertaining the course the eye must be successively directed to the graduations 4 of the main card and the graduations 5 of the minute card, which is undesirable because, by reason of the narrow graduations, the attention of the attendant is diverted and errors are possible, particularly when taking the readings when the ship is turning.

A comparison of Figs. 1 and 2 shows that in Fig. 1, in lieu of the elongated scale mark 6 shown in Fig. 2 a small mark or hand 3 is provided which represents a single point. This difference illustrates an important feature of my invention. From this point a single reading is made at one part of the card system, the system being similar in this respect to a clock, in which a single series of scale marks is provided for the hours and the minutes and cooperating with two hands, while in my system there is only one hand and

two series of scale marks. In the systems now in use in receiver compasses the readings are taken at two points and the indications are made by two hands and two graduations. In addition, in the system both graduations show fine divisions, while in my improved system the main card shows a rough division and only the minute card shows fine divisions.

By thus arranging the scale marks on the cards the number of the gear wheels of the transmission gears can be reduced, and also in other respects the cost of manufacture of the instrument is reduced. But the most important feature of the invention resides in the reliability of reading the angles on the instrument, which is particularly important in observations such as compensating the magnetic compasses upon an acoustic signal being given, in which case the readings must be taken from the moving cards at one moment and in a reliable way.

Apparently, the same results can be attained by modifying the instrument in various respects. Thus the position of the cards with respect to each other may be changed in a number of ways, provided at least a portion of the scale marks are always kept adjacent at a common point and both readings are taken at said point. For example, both cards can be disposed concentrically of each other when properly arranging the scale marks.

It will be understood that my improved system may also be used in other nautical instruments, for example in instruments for taking absolute bearings and cooperating with a compass for measuring the direction of a certain pole. In taking absolute bearings, for example, the main compass card 1 must be rotated according to the change of the course of the ship, for which purpose a receiver compass or compass repeater motor 31 is employed in the usual way, and the minute card 2 is connected with two driving mechanisms, one connected to the attachment for taking the bearings, and the other with the compass repeater motor.

The cards 1 and 2 may be mounted and operated in any preferred way. In Figure 3 I have shown an example, more or less diagrammatically, in which the instrument includes a cylindrical case 8 mounted in gimbals or the like, not shown, for universal movement in the manner well-known to the art of navigational instruments. Journalled for rotary motion on the flange of casing 8 is the marker in the form of a ruler 9 extending diametrically across the upper face of the casing 8 and having its ends connected to a depending annular flange 9', rotatively mounted on the upper rim of the casing 8, and provided with an interior rack 21. At one end the ruler 9 carries a hinged member 10 provided with a vertical sighting wire and with a circular mirror 12, while the opposite end of the ruler 9 carries a sighting instrument pro-

vided with a sighting slot mounting 11 and a reading prism 13. Of course, the sighting ruler may be constructed in a different way.

Mounted for rotary movement in bracket 30 and in a step bearing on the bottom of casing 8 is spindle 29 to the upper end of which is secured the minute card 2 and to the lower end of which is secured the large spur gear 28. The main card 1 is mounted concentric with minute card 2 so as to rotate freely upon vertical shaft 29, and the hub thereof carries a pinion 38 driven by pinions 37 and 36 from pinion 35 of compass repeater motor 31 in accordance with the course of the ship. The minute card 2 is indirectly driven by the repeater motor 31 through pinion 32 on the repeater motor shaft, gear 33 fixed to bevel gear 34, and both journalled on shaft 26, the bevel gear 34 driving bevel gears 23 and 25 pivoted to the radial arms of the spider of the differential and both meshing with bevel gear 24 of the differential, this spider being integral with shaft 26 so that this shaft drives gears 27 and 28 and spindle 29 to rotate minute card 2. However, these movements of the minute card 2 are increased or decreased by manual movement of the ruler 9, the rack 21 of which drives meshing gear 22 and bevel gear 24 of the differential, which accordingly increases or decreases the movement of the differential spider, its shaft 26, gears 27 and 28, spindle 29 and attached minute card 2. Therefore, when thus turning the ruler 9 the minute card 2 rotates relatively to the main card 1, and the gear ratio is such that when turning the ruler 9 through an angle of 10° the minute card performs a complete rotation minus 10° turning movement, and in the opposite direction from the ruler. Therefore a mark provided on the ruler 9 beneath the prism 13 and corresponding to mark 3 of Figure 1 shows the first two figures of the graduation of the turning movement of the ruler on the main compass card 1, and it shows the last figures and the tenths of the grades of the said movement on the minute card in the same way as has been described with reference to Figs. 1 and 2. The cooperation of the parts described shows that only by enlarging the turning movements of the ruler by the transmission gearing the scale marks showing the tenths of a degree can be made with sufficient accuracy.

I claim:

1. In a nautical instrument, the combination, with a main card, and a subsidiary card, of means common to both cards for rotating the same at different velocities, sighting means, and means to impart additional movement from said sighting means to said subsidiary card independently of the main card.
2. In a nautical instrument, the combination, with a main card, and a subsidiary card, of differential gearing intermediate said cards, means connected with said differential

gearing for simultaneously rotating said cards at different velocities, and sighting means connected with said differential gearing for rotating said subsidiary card independently of the main card.

5 3. In a nautical instrument, the combination with a movable graduated member, of a movable sighting member, a rotatably mounted disc carrying a subsidiary graduated scale adjacent to the graduations on said graduated member indicting means cooperating with both graduations, and differential gearing connecting said subsidiary disc with said sighting member and said graduated member.

4. In a nautical instrument, the combination with a movable graduated member, of a movable sighting member, a rotatably mounted disc carrying a subsidiary graduated scale in close proximity to the graduations on said graduated member, and differential gearing interposed between said sighting member, said graduated member and said disc, said gearing including a connection between said sighting member and said subsidiary disc.

In witness whereof I have hereunto set my hand.

WOLFGANG OTTO.