

Aug. 7, 1928.

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MAGNETIC COMPASS

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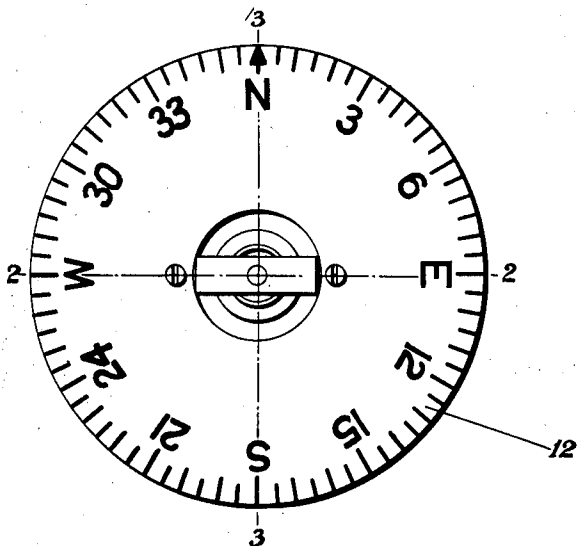


Fig. 1.

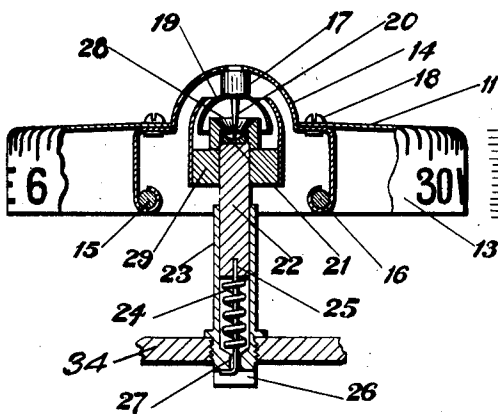


Fig. 2.

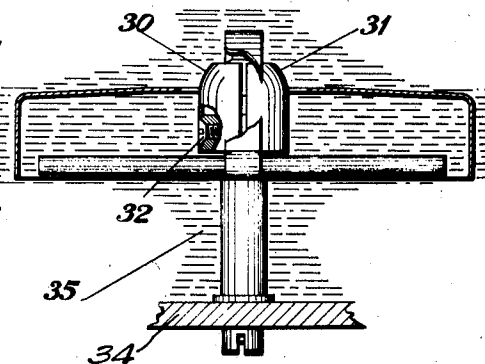


Fig. 3.

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# UNITED STATES PATENT OFFICE.

CHARLES H. COLVIN, OF BROOKLYN, NEW YORK, ASSIGNOR TO PIONEER INSTRUMENT COMPANY, A COPARTNERSHIP CONSISTING OF CHARLES H. COLVIN, BRICE H. GOLDSBOROUGH, AND MORRIS M. TITTERINGTON, OF BROOKLYN, NEW YORK.

## MAGNETIC COMPASS.

Application filed October 11, 1922. Serial No. 593,696.

My invention relates to magnetic compasses, and more particularly to the magnetic elements of compasses of the moving card type. The magnetic element shown in my drawings and described in the following paragraphs is of the general form disclosed in my Patent #1,334,273 issued March 16, 1920. The improvements made are not limited, however, to this type of compass.

An object of my invention is the improvement of the magnetic element of a compass, and of its mounting. Further objects are to make such a magnetic element easy to construct, light in weight and of low specific gravity, strong enough to be easily handled in manufacturing, well damped in its oscillations when submerged in liquid, and secure in its mounting. Other objects and advantages will appear as the invention is herein after disclosed.

Referring to the drawings, which illustrate what I now consider a preferred form of this invention:

Figure 1 represents a top view of the magnetic element and support,

Figure 2 represents a side view, partly in section, as at 2—2 in Figure 1, and

Figure 3 represents a side view, partly in section, as at 3—3 in Figure 1.

Referring to the drawings, part 11 is an inverted cup upon which are marked the compass cards 12 and 13. The cup is preferably of a cellulose material, such as is commonly known as "celluloid" or "pyralin". The cards are preferably printed thereon while part 11 is in flat sheet form, and this part (11) is then formed into a cup as shown. The markings of the card may be painted with radio-active material to render them visible at night.

Part 14 is a carrier to which is attached the cup 11, the magnets 15 and 16, and the pivot bushing 17. The cup 11 is removably attached by means of the screws 18. The magnets are clamped or soldered in place, and the bushing 17 is riveted or soldered or both. At the lower end of the bushing 17 is attached the hemispherical cup 19. In the center of the bushing 17 is fastened the pivot 20, whose point approximately coincides with the center of the sphere of which the cup 19 forms a part.

The jewel bearing 21 in which part 20 rests is secured in part 22 which acts as a

plunger in socket 23. The plunger 22 is supported on a spring 24 and has extending from its lower end a wire 25 the extremity of which is bent at right angles, lying in a slot 26 in the end of the socket 23. A hole 27 communicates from the spring chamber in socket 23 to the outside.

At the upper end of part 22 is a jewel cap 28. Below this is a collar 29. Both 28 and 29 are secured solidly to part 22. To collar 29 are removably attached retainers 30 and 31, by means of screws 32.

At 34 is shown a fragment of the compass bowl to which socket 23 is attached. The entire magnetic element is surrounded with the liquid 35, which is contained in the compass bowl. Kerosene, or a similar petroleum or asphalt base product, is a preferred liquid.

In a magnetic compass it is important if not essential that both the absolute weight, and the net weight on the pivot (the difference between the two being due to the buoyant effect of the liquid) be kept at a minimum, with the magnets as the major item of weight. It is also particularly desirable to keep the moment of inertia of the element as low as possible: that is, it is important to reduce the weight of those parts which are at the greatest distance from the center. This is accomplished by the use of the celluloid cup 11, the specific gravity of which is of the nature of 1.4 as compared to water. The specific gravity of the filling liquid (say, kerosene) is approximately 0.7, which therefore reduces the effective weight of the cup by one-half. Since this cup comprises the only structure at a distance from the center, the moment of inertia is at a minimum. Furthermore, as this cup presents a large surface to the liquid, the damping factor is high.

The carrier 14 constitutes an improvement in construction, as it provides in a single element a means of inter-connecting the magnets, cards and pivot.

Parts 19, 30 and 31, in combination with the pivot 20 and jewel 21 provide a means of preventing the magnetic element from becoming disassociated from the mounting post.

The jewel cap 28, in combination with the above elements, acts as a guide for the pivot 20, and assures its contact with the polished

center of the jewel and prevents its riding on the rim of the jewel.

The combination of parts 22, 23, 24 and 25, with slot 26 and hole 27, provides an elastic supporting means for the magnetic element and cushions the reaction between pivot and jewel in the case of sudden movements of the compass, and prevents the rotation of the plunger in respect to the socket 23.

Having thus disclosed and described my invention, and explained its purpose, what I claim as new is:

Claims:

1. In a magnetic compass, in combination, a magnetic element, and supporting means for said magnetic element: comprising a plunger, a cup-bearing mounted therein, a socket in which said plunger is carried, elastic means between said plunger and said socket, an axial extension on said plunger terminating in a positioning element, an extension on said socket member terminating in a slot in which said positioning element is contained, and said socket having a passage connecting from the inside to the outside of said socket.

2. In a magnetic compass, in combination, a magnetic element, and supporting means for said magnetic element: comprising a plunger, a cup-bearing mounted therein, a socket in which said plunger is carried, elastic means between said plunger and socket, an axial extension on said plunger terminating in a positioning element, and an extension on said socket member terminating in a slot in which said positioning element is contained.

3. In a magnetic compass, in combination; a magnetic element, comprising a cup composed of cellulose material, indicating cards marked thereon, magnets, pivoting means, a supporting member connecting said cup, magnets and pivoting means, means for removably attaching said cup to the supporting member, means for attaching said pivoting member to the supporting member; supporting means for the entire magnetic element, comprising a plunger, a cup-bearing mounted therein, a socket in which said plunger is carried, elastic means between said plunger and said socket, an extension on said plunger terminating in a positioning element, an extension on said socket member terminating in a slot in which said positioning element may be contained, said socket having a passage communicating from the socket chamber to the outside of the socket; and retaining means, comprising in combination with the before-mentioned pivoting means and cup-bearing, a cup attached to the pivot and substantially concentric therewith, covers attached to said plunger for retaining said cup; means for guiding said pivot into said cup-bearing; and a liquid

contained in said compass, and surrounding the above mentioned elements.

4. A magnetic compass comprising in combination, a magnetic element, means including a pivot and bearing for supporting said element, retaining means for said element, said retaining means comprising a cup attached to said pivot and substantially concentric therewith, and a plurality of covers attached to said supporting means for retaining said cup.

5. A magnetic compass comprising in combination, a magnetic element, means including a pivot and bearings for supporting said element, retaining means for said element, said retaining means comprising a cup attached to said pivot and substantially concentric therewith, a plurality of covers attached to said supporting means for retaining said cup, and means for guiding said pivot into said bearing.

6. A magnetic compass comprising in combination, a magnetic element including a cellulose cup having two cards, permanent magnet means connected to said cup, means including a pivot and support therefor for supporting said magnetic element, a second cup secured to said pivot and substantially concentric therewith, and retaining covers attached to said support and surrounding said second mentioned cup.

7. A magnetic compass comprising in combination, a magnetic element having two cards, permanent magnet means connected to said cards, a support, means pivotally mounting said element upon said support, a cup attached to said pivotally mounting means and substantially concentric therewith, and covers attached to said support for retaining said cup.

8. A magnetic compass comprising in combination, a support post, a pivot resting thereon, an arched carrier straddling the pivot and post and fixed to the pivot, parallel arms integral with the arched carrier extending downward to either side of the post, a flat rest integral with the arched carrier and each arm, a compass card centrally apertured and disposed on the flat rests with the arched carrier projecting up through the card, and magnets carried by the arms.

9. A magnetic compass comprising in combination, a support post, a pivot resting thereon, an arched carrier straddling the pivot and post and fixed to the pivot, a pair of cooperating retainer cups movable relatively to each other but connected and held together against separation, means attaching one cup to the arched carrier, means connecting the other cup to the post, parallel arms integral with the arched carrier extending downward to either side of the post, a flat rest integral with the arched carrier and each arm, a compass card centrally apertured

tured and disposed on the flat rests with the arched carrier projecting up through the card, and magnets carried by the arms.

10. A magnetic compass comprising in  
5 combination, a compass indicating means, a post supporting the indicating means, a pivot interposed between the indicating means and the post, an inverted hemispherical member fixed on the indicating means  
10 and embracing the pivot, an upstanding cup-shaped device fixed on the post embracing the inverted hemispherical member, and said upstanding cup having its upper rim re-

duced in diameter to prevent withdrawal of said inverted member yet permit universal  
15 freedom of movement between the inverted member and upstanding device.

11. A compass as defined in claim 10 further restricted by making the said upstanding cup-shaped device in a plurality of  
20 sections.

Signed at Brooklyn, in the county of Kings and State of New York this 10th day of October, A. D. 1922.

CHARLES H. COLVIN.