

Compass surveying

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Measuring horizontal angles

- Angles are measured between two intersecting lines in either a horizontal plane or a vertical plane.
- They are usually expressed in terms of degrees, minutes, and seconds of arc, although other types of units may also be used.
- The horizontal angle between a given line and a specified reference line is called the direction of the line. **The reference line is called meridian.**

- A **traverse survey** consists of the measurement of a series of horizontal lengths, called courses, and the horizontal angles between these courses.
- Angles may be measured indirectly using measured lengths or distances and trigonometry, or they may be measured directly using appropriate surveying field instruments.
- Generally, the surveyor will use either a total station or an instrument called a theodolite for direct angular measurement.
- The magnetic compass needle and transit were used extensively in the past to determine magnetic north and to measure directions and angles.

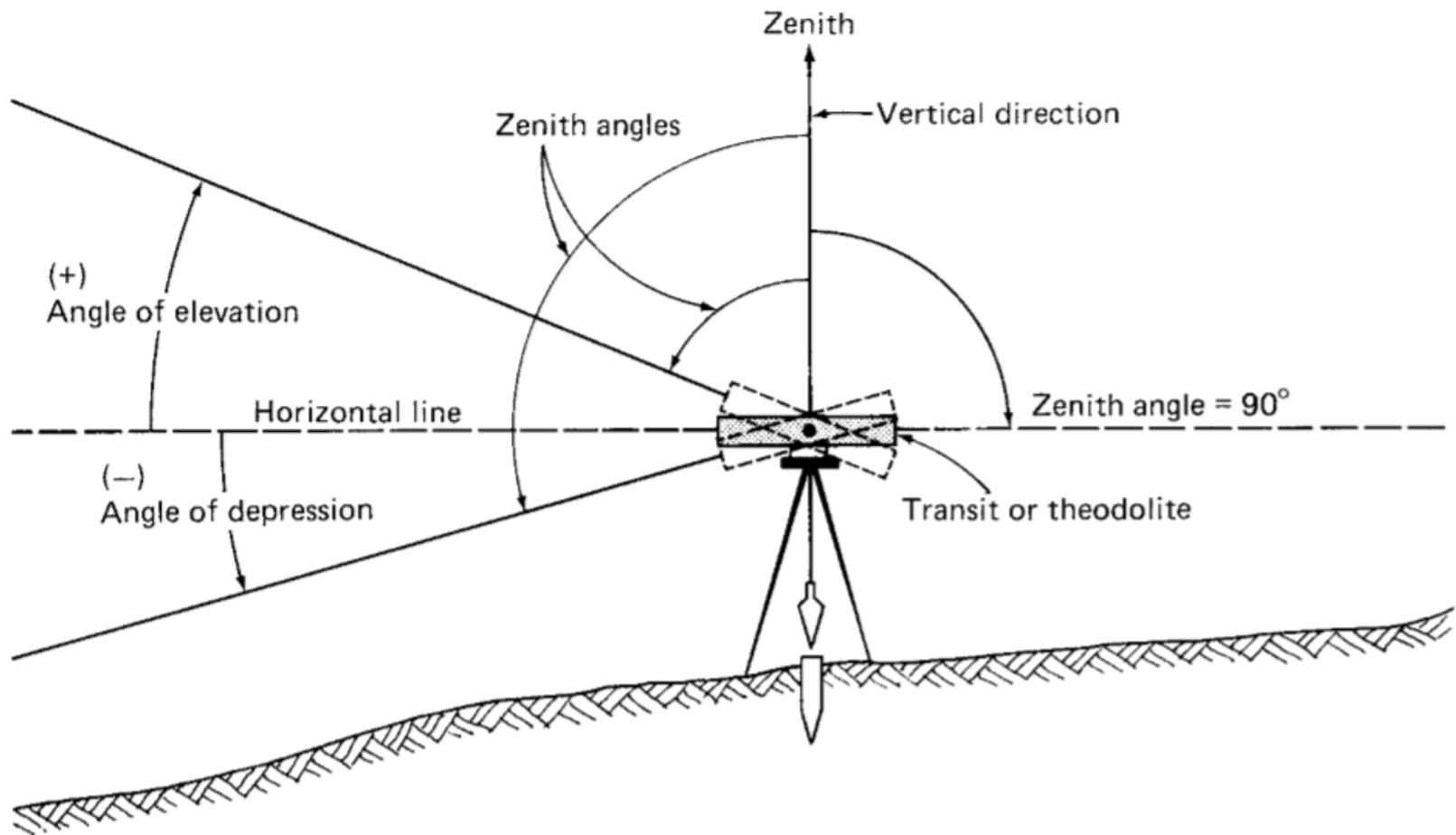


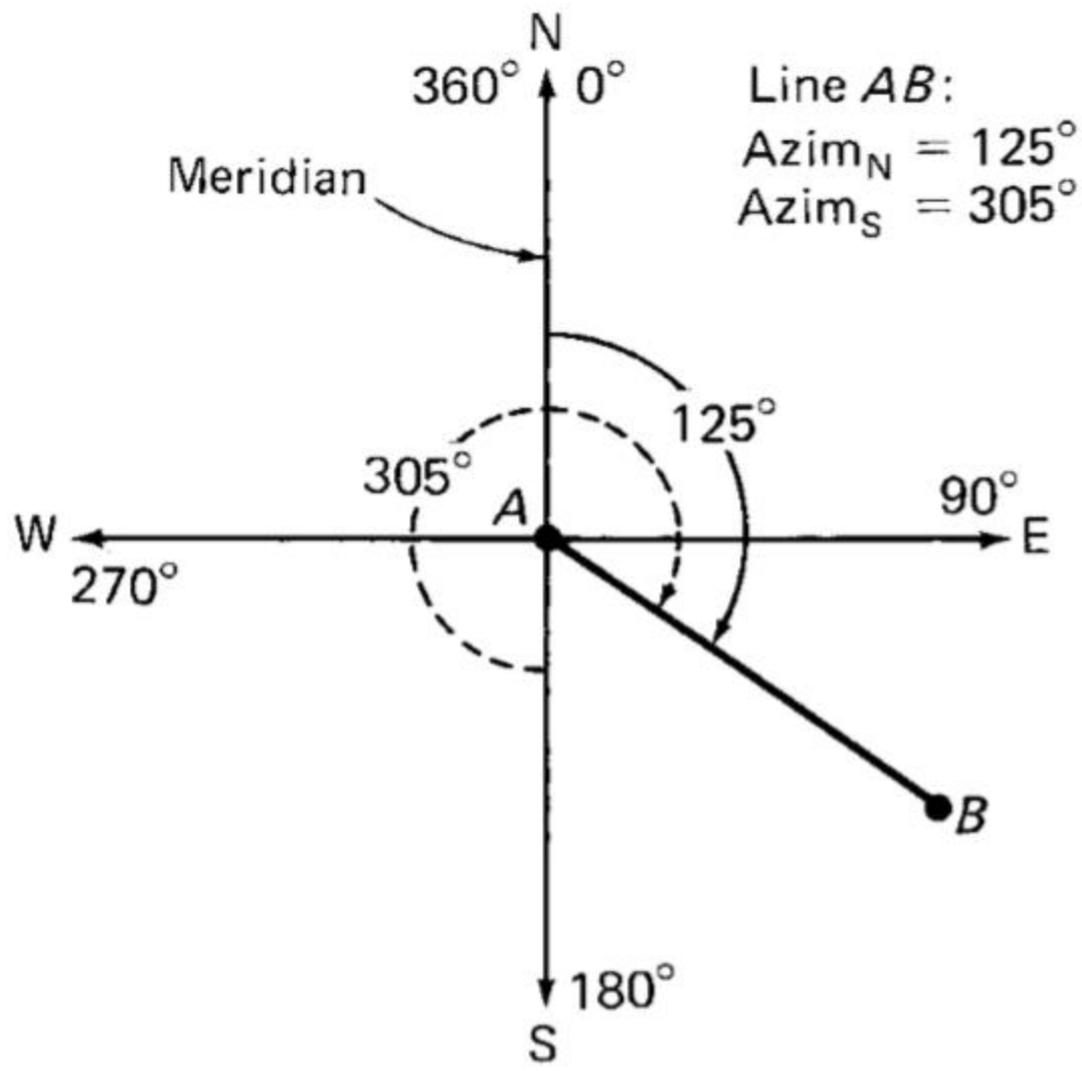
FIGURE 6-2. Designation of vertical angles or zenith angles.

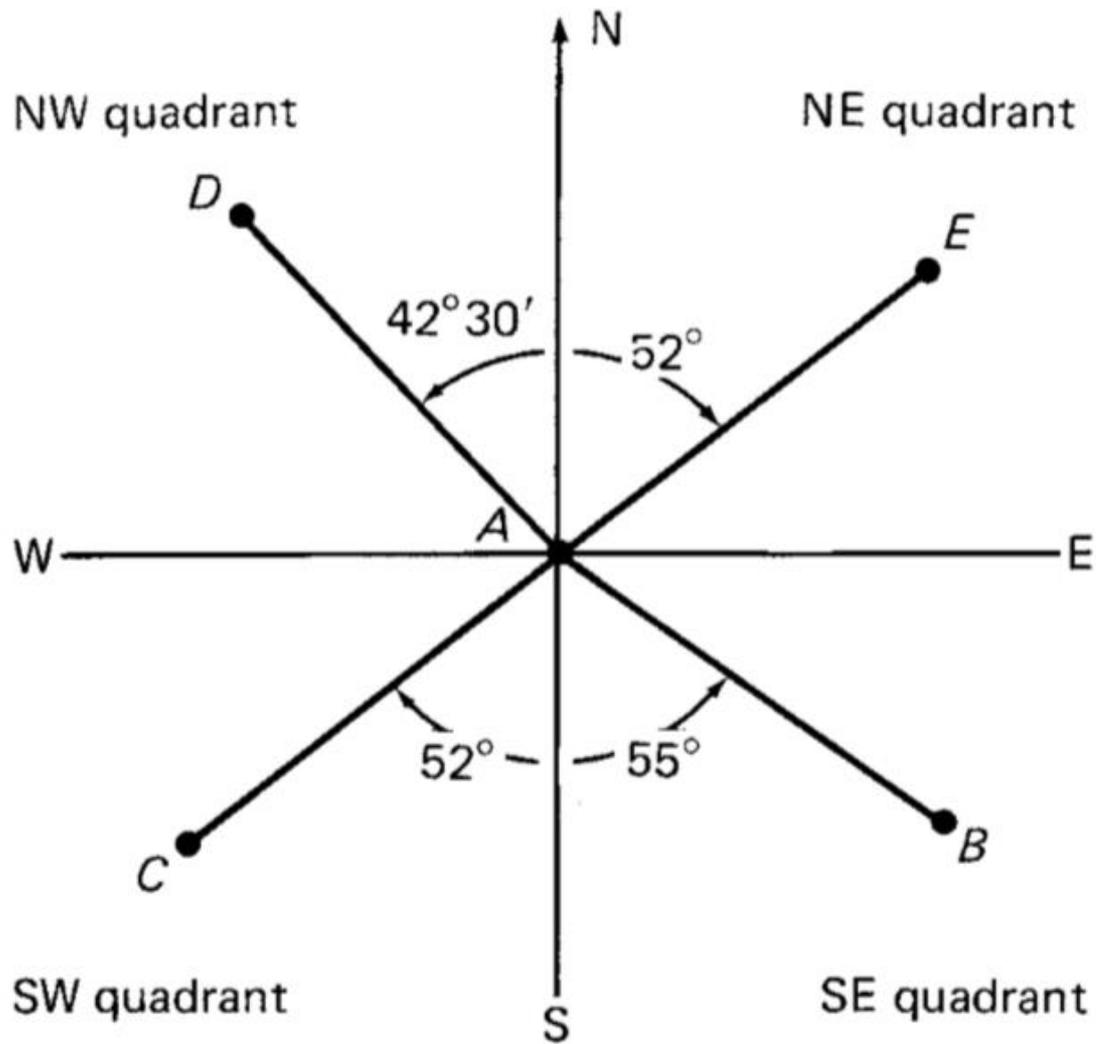
- In modern surveying instruments, the upward vertical direction is usually used as a reference for measuring vertical angles, instead of the horizon. That direction is called the **zenith direction**, and an angle measured with respect to it is called a **zenith angle**.

Azimuth and Bearing of a Line

- The direction of any line may be described either by its azimuth angle or by its bearing.
- The azimuth of a line is the clockwise horizontal angle between the line and a given reference direction (meridian).
- Usually, north is the reference direction; south is sometimes used as a reference for geodetic surveys that cover large areas.
- An azimuth angle should be identified as being measured from the north (AzimN) or from the south (AzimS); north is generally assumed if no specific identification is given.
- Any azimuth angle will have a positive value between 0 and 360° .
- In surveying azimuth is also called as whole circle bearing.

- A bearing of a line is the angle from the north (N) or the south (S) end of the meridian, whichever is nearest, to the line; it has the added designation of east (E) or west (W), whichever applies.
- A line may fall in one of four quadrants: northeast (NE), southeast (SE), southwest (SW), or northwest (NW).

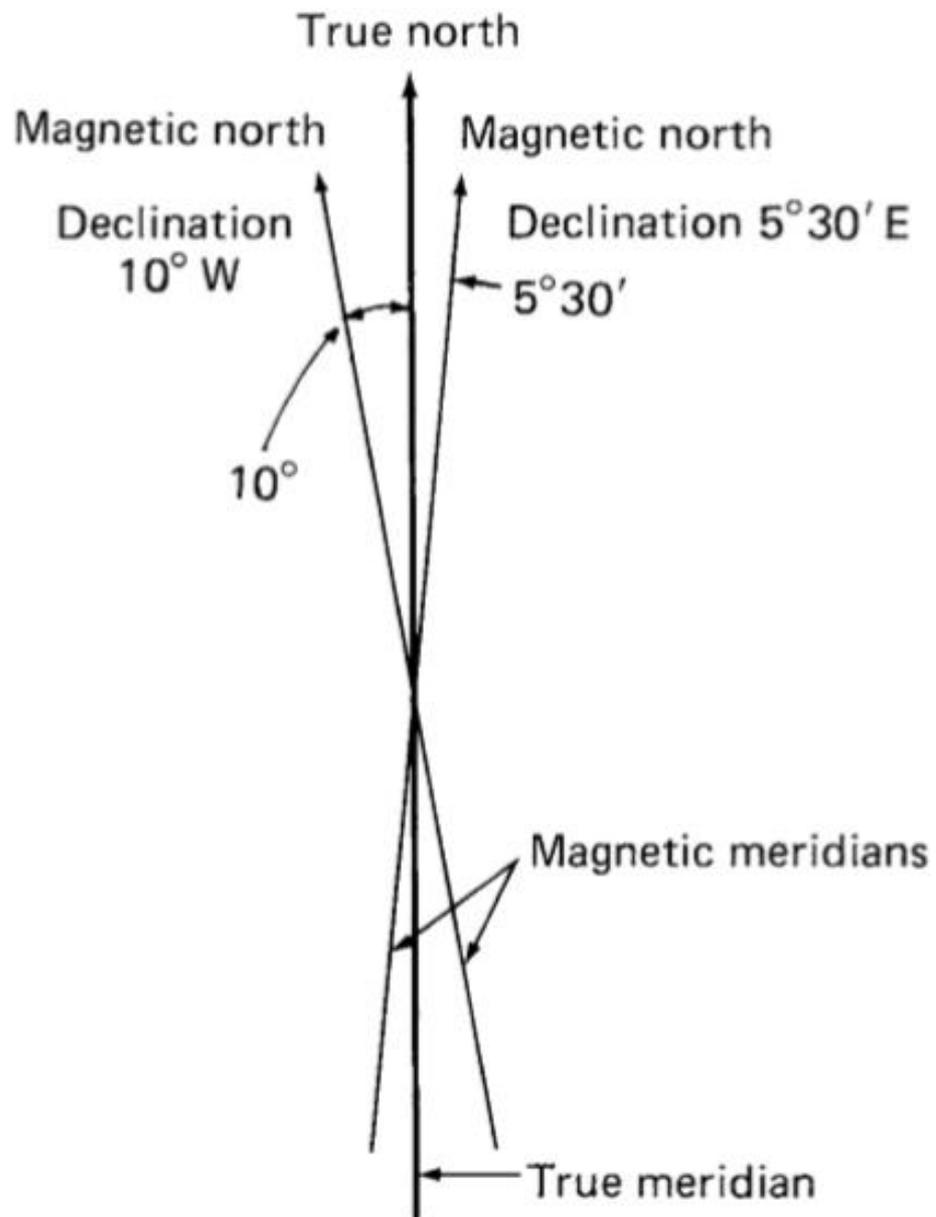




<u>Line</u>	<u>Bearing</u>
AB	S 55° E
AC	S 52° W
AD	N $42^{\circ} 30'$ W
AE	N 52° E

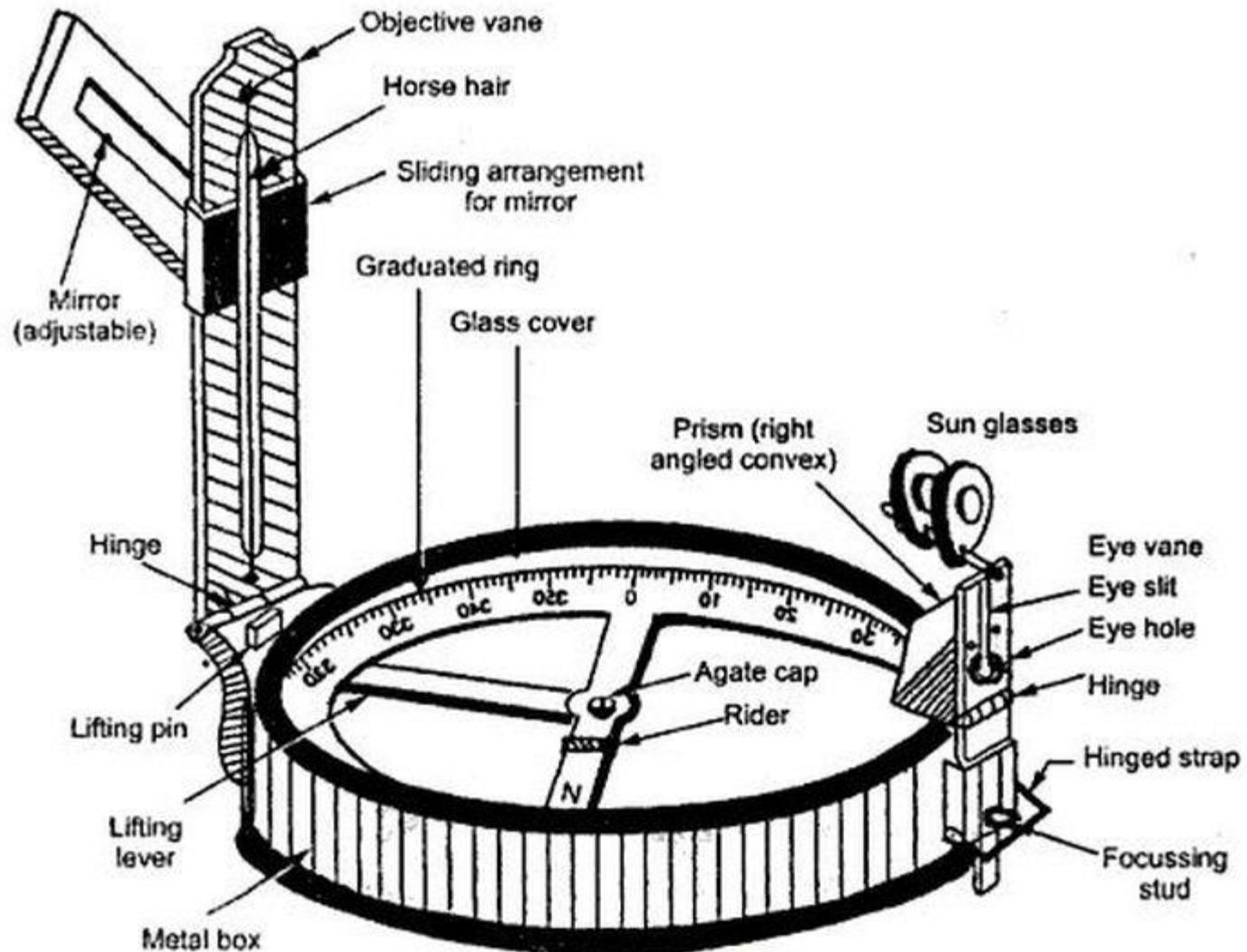
The bearing of a line is measured from the north or from the south (whichever is closer), in a clockwise or counterclockwise direction (whichever applies). It is also called as quadrant bearing or reduced bearing.

At any given time, at any point on the earth's surface, the true geographic bearing of a freely suspended magnetic needle is called the magnetic declination.



Prismatic compass





Prismatic compass parts

Prismatic compass consists of a non-magnetic metal case with a glass top and contain the following: Elements of prismatic compass.

Cylindrical metal box: Cylindrical metal box is having diameter of 8 to 12 cm. It protects the compass and forms entire casing or body of the compass. It protect compass from dust, rain etc.

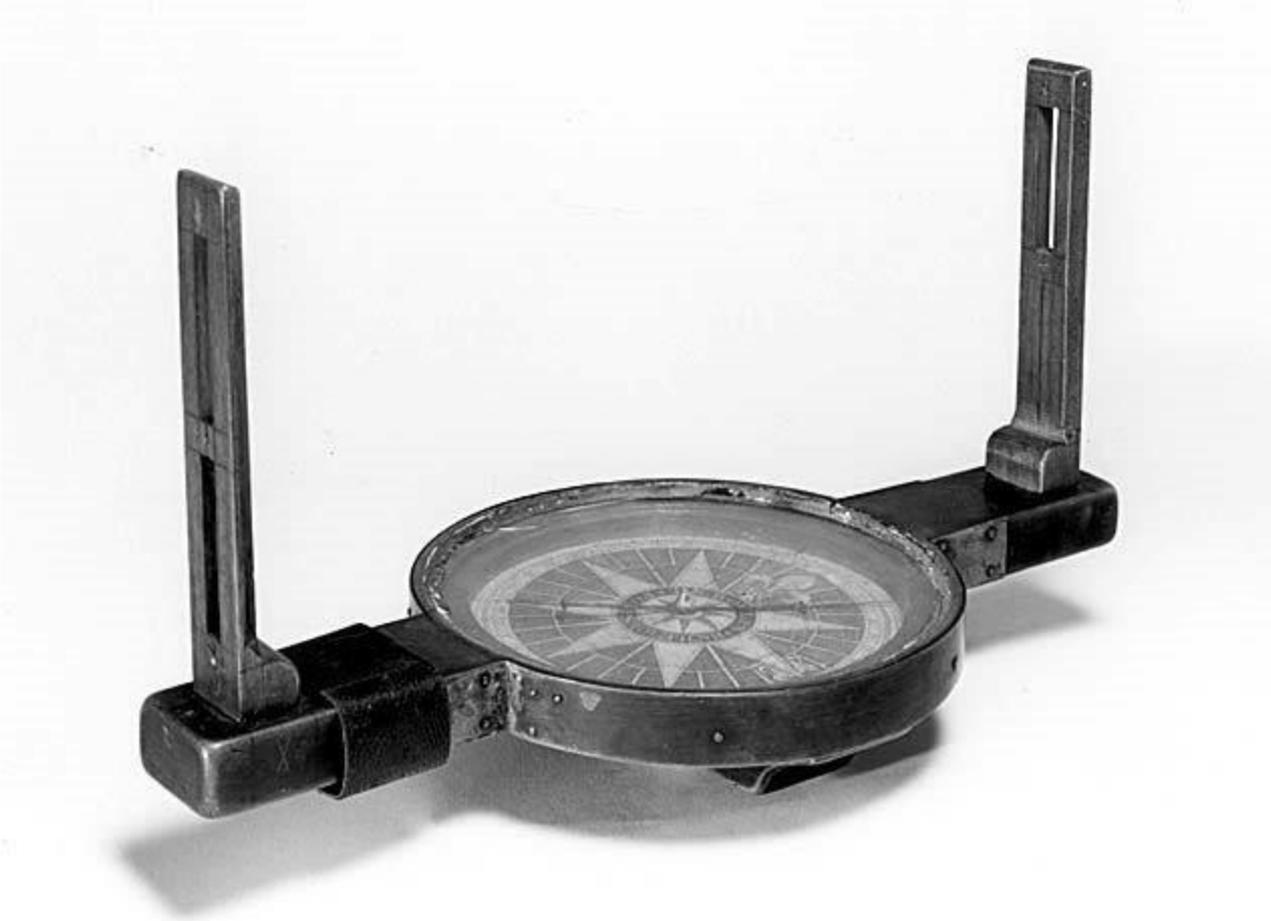
Magnetic needle: Magnetic needle is the heart of the instrument. This needle measures angle of a line from magnetic meridian as the needle always remains pointed towards north south pole at two ends of the needle when freely suspended on any support.

Graduated circle or ring: This is an aluminum graduated ring marked with 0° to 360° to measures all possible bearings of lines, and attached with the magnetic needle. The ring is graduated to half a degree.

Object vane: object vane is diametrically opposite to the prism and eye vane. The object vane is carrying a horse hair or black thin wire to sight object in line with eye sight.

Eye vane: Eye vane is a fine slit provided with the eye hole at bottom to bisect the object from slit.

Reflecting mirror: It is used to get image of an object located above or below the instrument level while bisection. It is placed on the object vane.



Surveyor's compass with no prism and quadrantal bearing.

