

Astronomical Field Tables. It is added when the point of observation is in the east half of the township, and subtracted in the other half. The rule of clause 69 of the Manual is inverted, the object in this case being to refer the bearing to the meridian of the point of observation.

3. The bearing of compass north has now been referred to the meridian of the point of observation.

4. The index error is furnished with each instrument after comparison with the unifilar magnetometer.

5. The bearing of magnetic north is the angle formed by the astronomical and magnetic meridians.

There are instances of the polarity of the needle being reversed by transporting an instrument on an electric car. It is difficult to conceive that a needle may be brought into such an intense magnetic field as that of an electric car without its magnetism being effected in some way, therefore, it is preferable to avoid this mode of transportation.

The place of observation must be at least three or four hundred yards away from electric wires carrying direct current. The observer must scrutinize his clothing and make sure that he has no iron or nickel on his person, as there must be no iron near the instrument. Iron is found in buttons, as wire in hat brims, in some forms of neckties, in watches, chains and other articles of jewelry. The pivot in folding reading glasses is frequently made of iron. In case of doubt, the object may be tried close to the compass, measuring the distance at which an appreciable deflection is first produced. If the object during the observation for declination is not brought closer than 15 or twenty times the above distance, the effect on the needle is negligible in observations of this kind.

The needle may be deflected by static electricity developed in cleaning the glass cover of the compass trough or the rubber frame of the reading glass; this electricity is dissipated by breathing on the glass or rubber frame.

There is an index correction for each instrument. This is ascertained by comparison with a standard unifilar magnetometer at the Magnetic Observatory. When possible, it is well to determine the index error both at the beginning and at the end of a survey.

Setting a Transit by Means of the Compass.—In connection with surveys of Dominion lands, the most frequent use of the compass is for checking the courses of a traverse or for setting up the transit to read astronomical bearings.

In the first case, it is sufficient to make sure that there is no abnormal change in the reading of compass north: any sudden change indicates a probable mistake in some of the last courses.

The second case arises when it is desired to observe the pole star in day time at a place where there is no line of known bearing. The problem consists in setting up the transit so that it shall read astronomical bearings. If the surveyor has already ascertained the bearing of compass north with his instrument, he merely sets his vernier to read this bearing, releases the lower clamp, turns the whole instrument till the needle is exactly opposite the zero mark, fastens the lower clamp and releases the vernier clamp. With the instrument used for the specimen observation and anywhere near the place where the observation was taken, the vernier would be set to read 25° , or rather $25^{\circ} 07'$.

It may be, however, that the surveyor has not ascertained the bearing of the compass north with his own instrument and has to resort to the bearing of magnetic north taken from a map or determined by another surveyor. Then the surveyor must, from the bearing of magnetic north, deduce the bearing of compass north by applying the index error of his own instrument after changing the sign. Starting with $25^{\circ} 01'.1$, for bearing of magnetic north in the case already cited, and the index error being $-51'.8$, the surveyor would add $51'.8$ to $25^{\circ} 01'.1$, which would give him $25^{\circ} 06'.9$ for the bearing of the compass north. He would then proceed as already explained.

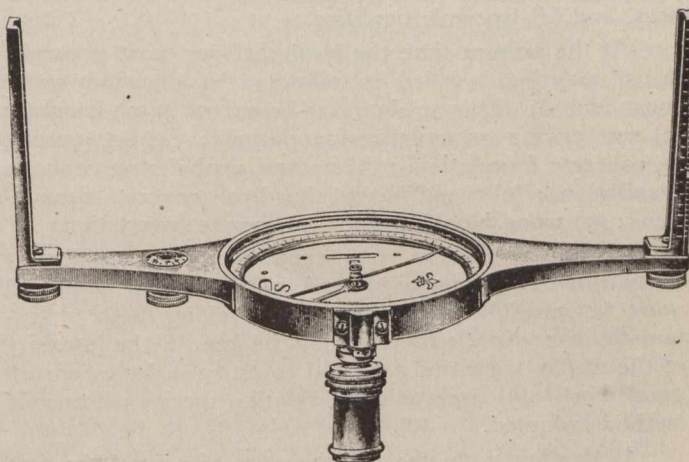


Fig. 3.

All these corrections, it may be observed, are generally small and in practice are frequently disregarded.

Line of no Declination.—The line of no declination, or the line which a needle will indicate a true north and south direction is situated in any imaginary line drawn from Sault Ste. Marie to Charleston, South Carolina. A magnetic needle placed east of this line has a declination to the west, and when placed west of the line a declination to the east; and in both cases it increases as the needle is carried farther from the line of no declination.

Thus, in Vancouver, the declination is twenty-four degrees to the east, at Winnipeg eleven to twelve, to nothing at the Soo; while east of the Soo the declination is west, increasing from nothing, to $23\frac{1}{2}$ degrees, at Charlottetown, Prince Edward Island. The declination is now said to be decreasing.

It is to be noted in determining lines of declination that the needle does not remain constant through an entire day, but reaches its farthest point east about 8 o'clock a.m., and its farthest point west about 2 o'clock p.m. The cause of this daily variation of the needle is not understood, as observations show that it is greater in summer than in winter.

Conditions of temperature, magnetic storms and other causes at times affect the needle and different needles observed at the same time and under the same conditions differ in their directions, but show nearly the same daily change.

Gaspe Bay district has high hopes of oil-producing possibilities. In view of the increasing attention being given to the adoption of oil in the Royal Navy and the decision of the Imperial Government to secure supplies so far as possible within the Empire, there opens up the prospect of another large Canadian industry. The admirable shipping facilities which the district possesses are receiving attention.