J. Locke,

Surveyor's Compass.

No. 7,510. Patented Jul. 16, 1850.

Fig. 7.

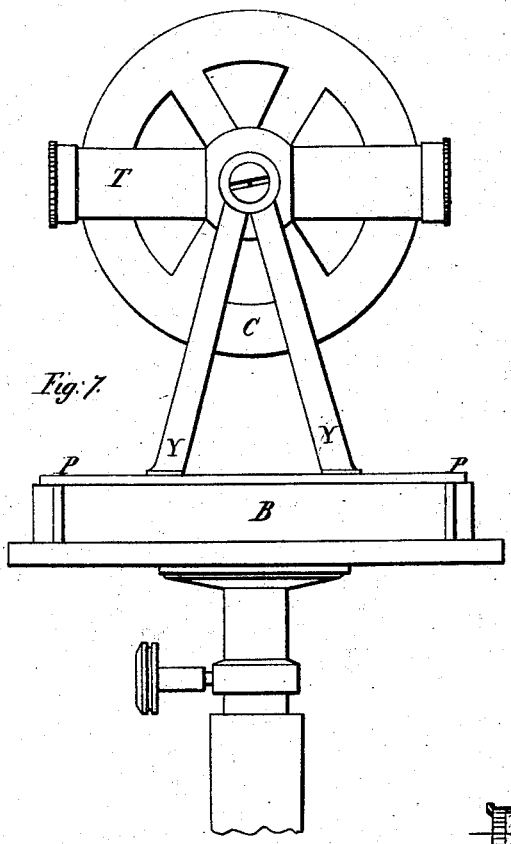


Fig. 1.

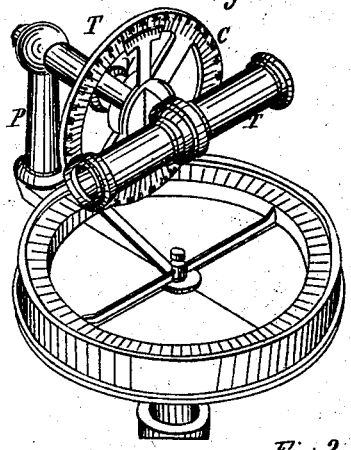


Fig. 2

Fig. 6.

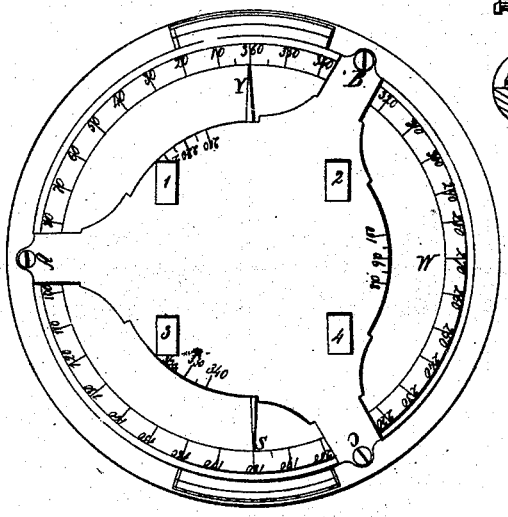
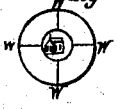


Fig. 3.

Fig. 4

Fig. 5.



UNITED STATES PATENT OFFICE.

JOHN LOCKE, OF CINCINNATI, OHIO.

SURVEYOR'S COMPASS.

Specification of Letters Patent No. 7,510, dated July 16, 1850.

To all whom it may concern:

Be it known that I, JOHN LOCKE, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and Improved Compass-Sight, and also a new and Improved Model of a Compass; and I do hereby declare that the following is a full and exact description thereof, in which—

Figure 1 is a perspective drawing of the sight, T, attached to a compass; Fig. 2 a longitudinal section of the sight tube, W being the cross wires; L, a half lens; T T, a sliding tube in which that lens is fastened; S a socket or outside tube in which the main tube A, B, is held; A and B caps closing the tube by means of strong plane plates of glass; Fig. 3 a view through the sight, W being the crosswire seen through the semi-lens, and the house and tree seen through plane glasses and of course not magnified; Fig. 4, a view through the same sight, the tube having been rotated on its axis to a check 90°, W being the cross wire seen as before; Fig. 5, a view through the tube when made with perforated lens, there being two cross wires terminating W, W, W, W; L, represents a semicircular portion of a convex lens, placed in the middle of the tube, or equidistant from the crosswires W, W, which must be in the principal focus of the lens L, therefore the distance from one crosswire to the other must be twice the focal distance of the lens. Fig. 6, is a plan of a new and improved model of compass, in which A, B, C represents a plate partly covering a common double plate compass and fastened to it by screws near these letters, the object of the plate being to furnish a base or attachment for the usual supports of a telescope axis when mounted like a transit telescope. 1, 2, 3 and 4 are intended to represent the places where the feet of the V pieces are to be screwed on to support the telescope. These V pieces will rise say about 3 inches, and will receive the pivots of the axis through which the main tube above described will pass transversely.

It will be seen that one end of the needle N, S, will sometimes be concealed by being under the parts A, B, and C. As I prefer reading by the north end of the needle, the circle being numbered continuously from 0° to 360°, I have invented a peculiar device in this case. When the north end is thus concealed the south end is always visible, and I propose marking the readings of the north end of the needles on the opposite edge of the superimposed plate A, B, C, as shown opposite to the letter, W, at 80, 90, 100, and also at two other places 120° from this. These figures will answer the purpose of double readings by double and reverse figures. The surveyor will read the extreme south end of the needle but he will be guided by the interior scale on the superimposed plate in entering his field notes in regard to the leading numbers as 80, 90, 100, &c., for example; the south of the needle points to 276° the north being concealed under A—by the scale opposite to W the surveyor will see the north reading to be between 90 and 100 instead of between 270 and 280 and will therefore enter it 96 instead of 276. It is indeed a tabular way of subtracting 180 from the south reading.

The tube of the sight and parts included may be constructed as follows: Select a piece of drawn brass tube three fourths of an inch in diameter and four and a half inches long. Fit a short tube T, T, Fig. 2, to slide finger tight inside of it and in the middle or end of this interior tube set a partial lens L say a half lens in the usual manner of setting lenses of small telescopes, taking care to insert an arc of brass, like a piece of wire suitably bent, into that part of the groove or cell left deficient by cutting away part of the lens. This lens must be adjusted in the middle of the tube and of such power that the crosswires W, W, will be each in its principal focus, or the focus of parallel rays; cap each end of the principal tube with a brass cap having a thick plain glass plate set into it, the brass part being merely a ring leaving the view through the tube quite open, the object of these glass caps being merely that of protection and not for any optical purpose; finally, insert two crosswires one at each end, as shown in Fig. 2 W, W. The crosswires should be made adjustable laterally, if possible without the use of capstan screws which are objectionable on account of letting in water, and catching on external objects in rough field service. A diaphragm should be inserted with the largest aperture possible, a mere ring in itself and the cross wires fastened to it in the proper place directly or by the intervention of a second ring screwed to the first and adjustable laterally by slits under the screw heads. An outer tube, S, is represented in the sectional figure, by which it

may be supposed to be clamped or fastened to the compass.

Fig. 1, represents one of the modes of mounting the sight upon a compass by which it has motion in altitude as well as in azimuth, viz: it can be turned upward and downward as well as turned around, and can be used for taking altitudes by means of the graduated circle C and the vernier V. In the model, Figs. 6, and 7, the instrument has a similar altitude circle and similar motions but the axis is supported at both ends as in the common theodolite.

The optical difficulty of naked sights is that on ranging the "far sight" and the distant object together the eye cannot see both of them clearly at once, for as the rays come nearly parallel from the distant object and divergently from the near one, they cannot both form together a clear image on the retina of the eye. Thus when a thread is held up a few inches from the eye and a distant object is looked at in the same direction, the thread appears as a transparent blur; and when the thread is looked at steadily the distant object is indistinctly seen, the eye like a telescope requiring a different adjustment within itself for distant, and for near objects. To obviate this difficulty and that of the expense, size, and liability to accident and derangement, and the diminution of light in the proper telescope, I have invented the above described instrument, not so accurate perhaps as the well adjusted telescope of the theodolite but more accurate than the common naked sights. One half of the lens being cut away, the field of view will be a semicircle as represented in Fig. 2, W being the cross hair, which coincides nearly with the tree represented in the field. The cross-wire W at the end of the tube opposite the eye being in the focus of the lens will send its rays parallel to each other as they reach the eye, and of course coinciding very nearly with the rays from the distant objects not coming through the lens but over it in the space from which the half lens has been removed. These relations of the rays coming from the distant object and from the near one, the cross wire, are represented in Fig. 2 by the parallel continuous lines from B to A and by the divergent dotted lines from a point in the cross-wire W diverging only to the lens L whence they emerge parallel to the eye at A, so the eye takes no cognizance of rays otherwise than as they are received from the last medium of transmission, both the cross-hair, and the tree (the last supposed to be quite distant), will appear at the same distance because the rays from each are received in the same manner, viz: nearly parallel to each other, as if they both came from a great distance. The most useful part of this arrangement is that the cross wire thus viewed as a "far sight" has no parallax, or in other words, when the eye is moved from side to side across the whole opening of the tube, the cross hair still clings to the same object and to the same point of that object. Optically indeed, this "farsight" is at the object, and is a mark upon that object. Hence there is no need as would seem, that the eye end of the tube should be contracted into a hole no larger than the pupil, but it may be open to the whole size of the tube itself. Those who are acquainted with the properties of collimators will perceive that the partial lens is a true collimator to the cross hair. It will be seen by the above description that there is always a cross wire near to the eye, indeed almost in contact with it. This creates no difficulty for it is too near to form an image in the eye and is not seen hence we obtain the advantage of making either end of the tube the eye end, and of taking "forward and back sights" without touching the instrument. The same sight may be used as a leveling instrument by turning it in the socket S a quarter around on its axis, at which point there is designed a proper check, when the cross wire becomes horizontal, and the field will be presented as in Fig. 4 and will show the exact level if the tube be fixed at zero and the compass leveled; or it will show altitude if the tube be adjusted on any object having elevation above the instrument, or vertical and horizontal wires may be used by having a three quarter lens or a circular lens with a hole in the middle as in Fig. 5, in which case we must be governed by an estimate of the intersection of the lines of the cross wires as if they were complete. Instead of the partial lens, a whole one of a size too small to fill the field of view might be substituted.

It will be seen that without moving the tube a range of altitude about 12° can be obtained by moving the eye up and down over the open end of the tube, and thus the apparent end of the cross wire may be made optically to coincide with the point desirable in the view.

The tube with the arrangements which I have described, may be considered as a telescope without an object glass and of course without magnifying the objects viewed; at the same time that it admits of viewing the crosswire by an eye lens and in contact with the object. An arrangement analogous may be made by an eye lens in each end of the tube and a cross hair at their common focus between them. This would collimate the cross wire and present a view of the field of the natural size but the objects would be inverted.

Fig. 7, is a side view of the improved model of which Fig. 6 is in part a ground plan in which B is the box, of the compass

made in nearly the usual way P P the superimposed plate, Y, Y, the usual supports planted at 1, 2, 3, 4, on Fig. 6, T the sight tube having motion in altitude; and C, the graduated circle of altitude.

What I claim as my invention and wish to secure by Letters Patent is—

1. The application of the partial lens or lens of reduced size, by means of which to view a cross wire or a sight mark in optical contact with the object aimed at, either in the compass, in gunnery or for any other purpose requiring and using a sight in the manner herein described or any other substantially the same, and which will produce the intended effect.

2. Especially do I claim also the arrangement by which my compass sight is made susceptible of having either end used as the eye pieces and by which back and forward sights can be taken without disturbing the instrument.

3. I claim also the convenient model of the compass to be used with the sight here described viz: with a superimposed plate, and with the sight planted and supported upon it and with the opposite readings at such planes as are required in order to obtain indirectly the reading of the occasionally concealed end of the needle as in Figs. 6 and 7.

I disclaim the invention of the magnifying telescope sight in which the eye piece views not the object itself but a focal image of that object in optical contact with the cross wire or sight mark, the object being by that means magnified beyond its natural size, nor, do I claim the collimating arrangements of Kater & Schmallcalder in the reflecting compass by which a floating ring or card is reflected to the eye and magnified so as to be viewed in optical contact with the unmagnified object; my invention being applicable to the compass with the unincumbered naked needle without reflection.

JOHN LOCKE.

Witnesses:
JOHN LOCKE, Jr.,
JAMES LOCKE.