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L. A. WEINER
SUN TIME INDICATOR
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Fig. 1.

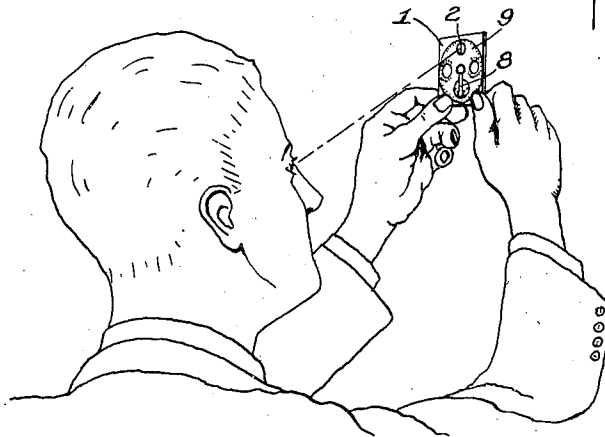


Fig. 2.

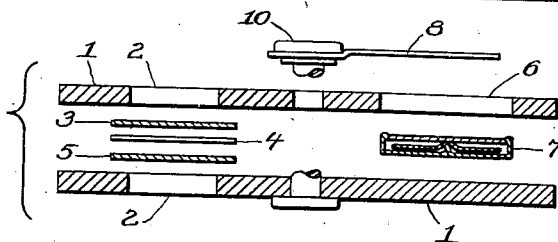
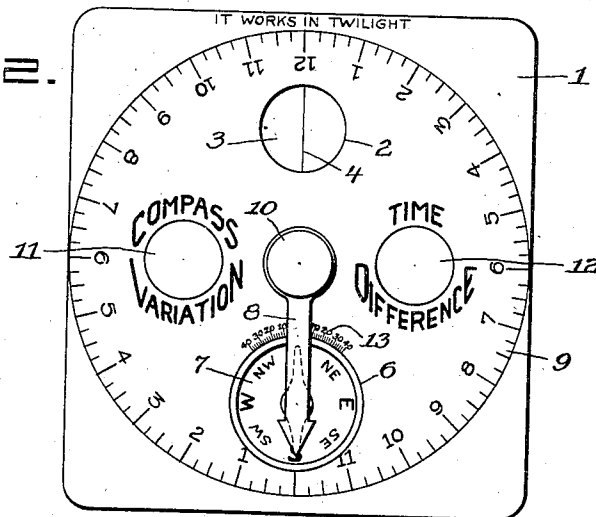


Fig. 3.

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SUN TIME INDICATOR

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11 Claims. (Cl. 33—62)

This invention relates a method and apparatus for utilizing polarized sunlight to determine the time of day, at any point of location. As herein embodied, the invention is designed for use of mariners, hunters, fishermen, scouts and others engaged in outdoor pursuits.

The invention is based upon the scientifically established fact that light acquires the property of polarization by reflection from non-metallic surfaces and upon the further observed fact that as sunlight is polarized by reflection from the sky, the position of the sun may be determined by developing the angle from a sky point due north to which a polarizing element must be rotatably adjusted to effect maximum obstruction of sunlight reflected from that point. As a definite guide in making the adjustment, a visual indication is given as the critical angle is approached, by a change in shade or color of the polarizing element, a maximum dark shade indicating the angle sought.

I have found that as the angle to which the polarizing element is adjusted varies definitely with the time of day, it may be utilized to give a correct time reading, according to the position of the sun, as above determined.

A device suitable for carrying the invention into effect is illustrated in the accompanying drawing, but I do not wish to be understood as intending to limit myself to either the exact form or details shown, as various changes may be made therein without departing from the spirit or scope of the invention as outlined in the appended claims.

In the drawing—

Fig. 1 shows the device in the hands of an observer, positioned for use.

Fig. 2 is a face view of the device, and

Fig. 3 is an exploded sectional view.

Referring now to the drawing, the device is preferably reduced to a size suitable for being conveniently carried in a coat or vest pocket and as here shown, is substantially square in outline with rounded corners but may be given any shape desired. The body of the device is formed of two superposed layers of heavy cardboard or like material 1, 1, secured together by a suitable adhesive and is provided with a circular window 2, in which the polarizing element 3 is exposed to view.

The polarizing element is preferably in the form of a thin sheet of transparent processed material which is interposed and adhesively secured around its marginal edge between the two layers of cardboard that form the body of the

device. Various materials, available in the open market, may be employed for the polarizing element.

The right hand semi-circular portion of the outer surface of the polarizing element, as viewed in Fig. 2, is covered by a thin layer 4 of Cellophane, to form, in effect, a split field and over this and completely covering the window opening facing the sky, there is a protective layer of glass or other transparent material 5 that will not affect polarized light. The Cellophane is positioned with the line of its grain angularly disposed about 15 degrees to the normal plane of polarization of the element 3, which changes the plane of polarization of the latter to the line of the grain. The term "grain" as used here, is to be understood to mean the formation of the Cellophane in the direction of its length.

The split field is provided to assist the observer in making the final adjustment of the device, as hereinafter described, to equalize the intensity of the color change of the polarizing element in the two halves of the field.

The layer of covering material 5 merely serves to protect the processed surface of the polarizing element from being scratched or otherwise damaged.

Below and in vertical alignment with the window 2, a circular cavity 6 is formed to receive an encased compass 7, which is secured therein flush with the outer surface, to provide clearance for the back and forth movement over the same of an index or pointer 8.

The index or pointer serves as one member of a time indicator, the other member of which is shown, for convenience of illustration, as a twenty-four hour dial 9, printed or otherwise integrally formed on the surface of the device that faces the observer when the device is in use. Dials of other forms may be employed to meet other uses.

The pointer or index 8 is pivotally mounted centrally of the dial, as indicated at 10, to have free movement about its pivot and with the device vertically disposed, as in use (see Fig. 1), is maintained by gravity with its free end at the lowermost point of the dial, as best shown in Fig. 2. If preferred, the time indicating end of the pointer may be reversed by extending the pointer above and below the pivot and weighting the lower end.

The dial is divided into two sections of twelve hours each, consecutively numbered and each hour division is subdivided into halves and quarters, enabling a fairly accurate time reading to be had at a glance.

On the dial, at the left of the pivotal mounting of the index or pointer, an enclosed circular space 11 is provided for entry of the compass variation for the particular location in which the device is used and on the opposite side of the pivotal mounting, at the right, there is a similar enclosed space 12 for entry of the difference between mean and standard time, both of which are obtainable from printed charts furnished with the device.

For the convenience of a user in adjusting the device for compass variation, a forty degree arcuate scale, east and west of due north, is provided as indicated at 13.

In the use of the device, constructed as above described, it is first held horizontally disposed, in the hands of the observer and slowly turned right or left, as required, to obtain a compass bearing due north. This point having been found, after allowing for compass variation at the particular location, the observer raises the device to the position shown in Fig. 1 and, holding it slightly inclined or perpendicular to the axis of the earth and about a foot in front of him, at a suitable height above his eye level, depending upon the latitude of his location, he slowly rotates the device about the window 2, as an axis, keeping the sight opening under careful observation, to note any change of shade or color in the polarizing element.

When the device is first brought into position by an observer at any time during daylight hours excepting noon, a very light shade or color appears at the sight opening and continues to show there until the polarizing element, in its rotary adjustment closely approaches the angle of maximum obstruction of light. The color then begins to change to a darker shade, which, under continued adjustment, increases toward dark blue and when of equal intensity in the two halves of the split field, it is a sign to the observer that the device is properly positioned to give a time reading, according to the position of the sun, which he finds indicated by the index at the lowermost point of the dial.

If we assume the time indicated to be six o'clock in the afternoon, or that the dial has been adjusted by the polarizing element 90 degrees from its normal position,—noon, it will be found that the polarizing element has been adjusted an equal number of degrees or to the same angle to effect maximum obstruction of light, from which it will be seen that the time is thus automatically indicated in each operation of the device.

If an observation is taken exactly at noon, the color change will occur instantly without adjusting the polarizing element from normal and the time indicator will likewise, without adjustment, give a reading for the noon hour.

Observations, effective for giving time readings, may be taken as long as sunlight, is reflected from the sky at a point due north, which occurs throughout the day and also before the sun rises above the horizon and after it passes below, during the twilight hours.

The expression "due north," as used above, is to be understood as meaning "celestial north," for best results and the term "normal" is to be understood as referring to that position in which the device is held facing due north, approximately perpendicular to the axis of the earth and with the time indicator reading "12," the noon hour.

While the present simple and inexpensive em-

bodiment of the invention will give time readings with a degree of accuracy within five minutes, exact readings may be readily obtained, without departing from the principle involved, by elaborating the detail structure.

In addition to the above described use for indicating sun time, the device is adaptable for serving a number of other purposes such, for example, as determining the angle of a plane from which light from any source, is reflected.

For this purpose, the normal position of the device is the same as above described, in which the polarizing element faces the reflected beam of light, with the grain of the Cellophane, indicated by the central line of the split field, vertically disposed or substantially so. The adjustment from normal to develop the angle of maximum extinction of light and equal distribution of the color change in the divided field, is also the same and by using a dial reading in degrees, instead of hours, it will be found that the angle of the reflecting plane will be indicated by the number of degrees of the above adjustment. The advantage of this convenient method of measurement will be apparent, particularly when the observer is located at a distant point or the reflecting plane is otherwise inaccessible. Having thus found the angle of the reflecting plane, the location of the source of light, is a matter of simple calculation.

Having described my invention, I claim:

1. A device for indicating sun time, comprising a polarizing element adjustable to an angle to effect maximum obstruction of sunlight reflected from a point due north in the sky, and cooperating means responsive to the aforesaid adjustment for giving a time reading of the position of the sun as indicated by the angle of adjustment of the polarizing element.

2. A device for indicating sun time, as defined in claim 1, in which the polarizing element is provided with a divided field of exposure.

3. A device for indicating sun time, as defined in claim 1, in which the field of exposure of the polarizing element is divided into halves one of which is of greater thickness than the other.

4. A device for indicating sun time, as defined in claim 1, in which the field of exposure of the polarizing element is divided into halves by a superposed layer of transparent material over one of the half sections.

5. A polarizing element and means for giving the exposed area of the element a split field effect, the said means consisting of an overlay of grained material covering a portion of the field of the element and arranged with the grain thereof at an angle to the normal plane of polarization of the element.

6. A polarizing element and means for giving the exposed area of the element a split field effect, the said means consisting of an overlap of grained material covering a portion of the field of the element, with the grain thereof angularly disposed to the normal plane of polarization of the element to change the plane of polarization of the same to the line of the grain.

7. A device for indicating sun time, as defined in claim 1, in which a member of the time-indicating means is secured to and movable in fixed relation with the polarizing element.

8. A device for indicating sun time, as defined in claim 1, in which a member of the time-indicating means is controlled and actuated by gravity and is movable independently of the polarizing element.

9. A device for indicating sun time, as defined in claim 1, in which the time-indicating means consists of two members, one of which is secured to and movable in fixed relation with the polarizing element and the other is controlled and actuated by gravity and is movable independently of the polarizing element.

10. A device for indicating sun time, as defined in claim 1, in which the time-indicating means consists of two members, one of which is 10

pivotaly mounted to swing freely about its pivot under gravity control and move independently of the polarizing element.

11. A device for indicating sun time, as defined in claim 1, in which the outer surface of the polarizing element exposed to the sky is provided with a transparent protective covering.

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