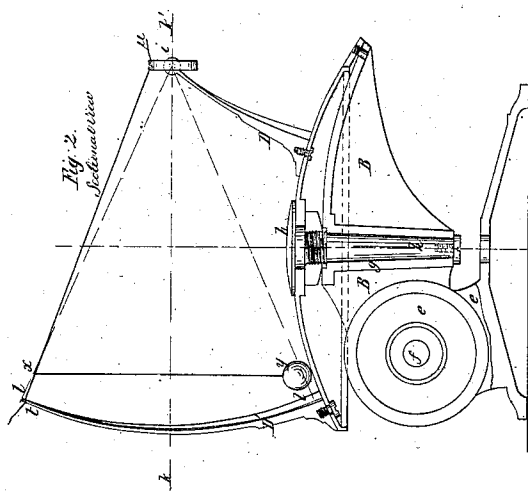
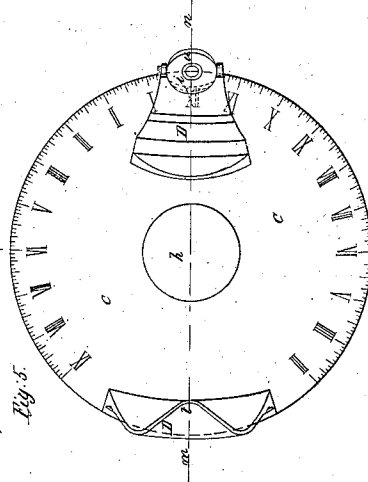
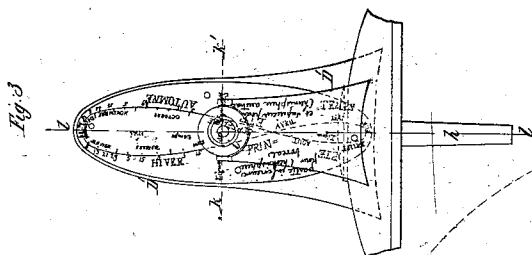
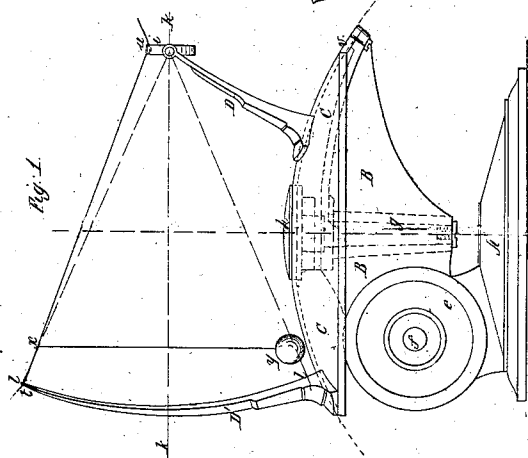
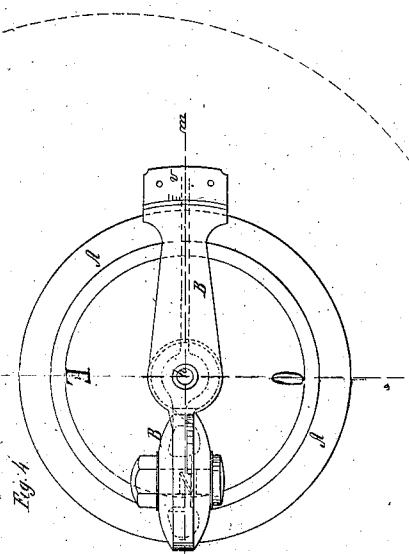


P. Flechet.

Sun Dial.

N^o 35,225.

Patented May 13, 1862.



Witnesses;
Wm. H. Harrison
Nancy L. Rode

Inventor;
Paul Flechet by
A. Polak his atty

UNITED STATES PATENT OFFICE.

PAUL FLÉCHET, OF PARIS, FRANCE

IMPROVEMENT IN SUN-DIALS.

Specification forming part of Letters Patent No. 35,225, dated May 13, 1862.

To all whom it may concern:

Be it known that I, PAUL FLÉCHET, of Paris, in the Empire of France, have invented certain new and useful Improvements in Solar Time-Keepers or Chronometers; and I do hereby declare the nature of the said invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement thereof, reference being had to the drawings hereunto annexed—that is to say:

This solar chronometer may be used generally and in all quarters of the globe. It gives the hour in true and mean time without the aid of any table of corrections. It also indicates the meridian as well as the latitude of the spot where it is used, and it is self-verifying. It is illustrated by the accompanying drawings, in which—

Figure 1 represents a longitudinal elevation of my improved apparatus or solar chronometer; Fig. 2, a vertical and longitudinal section; Fig. 3, a front view of the upper dial; Fig. 4 shows the vernier or sliding scale with its bracket, and Fig. 5 a plan view of the whole apparatus. It is composed of four principal parts, A, B, C, and D.

A, Figs. 1 and 2, represents a stand having a hole in it for attaching and adjusting the instrument in a horizontal position on any suitable bed-plate.

e is a projecting piece with vertical front, against which the part B is fitted and secured by an axis, *f*, about which it is free to move, a screw keeping it fixed, when desired.

g is a socket in the part B, into which the axis *h* of the spherical cap C takes. The upper circumference of this cap C is divided into twenty-four equal parts, indicating the two periods of from noon to midnight and from midnight to noon, as shown at Fig. 5. Each division, which represents an hour, is subdivided for the quarters and minutes. The plane passing through the line of axis *h h* and the whole corresponding to noon, is parallel with the vertical face. The pieces D D' are fixed to the spherical cap by screws. That marked D carries a lens, *i*, and that marked D' is a section of a sphere, *ll*, of which the lens *i* is the center.

v is a vernier on the cap C. Through the axis *h h* and the point *i* (the center of the lens)

a plane passes, the trace of which is shown by *m n* in Fig. 4 and by *ll* in the projection, Fig. 1, of the spherical section. The beginning of the vernier is in this plane, as well as two notches, *t* and *u*, Figs. 1 and 3, which receive the stretched thread *t u*, and which will also be in the plane *h h i l l*. Through the point *i* a second plane is drawn perpendicular to *h h*. Its trace *k k'* on the projection of the spherical section *ll*, Fig. 5, will be the equinoctial line. The two lines *ll* and *k k'* being obtained, I draw the curve *l k l' k'* is traced, showing the equation of time for each day of the year according to L'Annuaire du Bureau des Longitudes, and for the focal distance *i l* from the lens. The line *ll* represents true time.

The parts are constructed in such manner, first, that the piece A can be brought into and maintained in a horizontal position; second, that the piece B may turn vertically about the axis *f* and be secured to the piece A by a pressure-screw; third, that the piece C may turn in a plane perpendicular to that of B about the axis *h* and may by a screw be fixed to the piece B; fourth, that the pieces D D', being fixed on the spherical cap C, may participate in the vertical rotary motion of the piece B about the axis *f*. These motions are independent of one another, and they can be combined or not by the screws and tightening-bolts. It is indispensable, first, that the axis *f* of the piece B be in a plane perpendicular to the vertical face of the disk e, projecting piece in the support A; and, second, that the axis *h h* of the piece C be parallel with the vertical face of the projection on the support A and of the piece B. If, then, this upright face is vertical, whatever position is given to the piece B and to the piece C the axis *h h* will always be in a vertical plane.

The operation of the instrument is as follows: Supposing it to be resting on the horizontal support A, turn the piece C to bring the zero of the vernier to noon, stretch the thread *t u*, and suspend from it the plumb-line *x y*. The line *t u* is common to the two planes *h h i l l* and *t u x y*, which is rendered vertical by making the two planes to coincide, and that in different positions, so as to be certain that the plane is vertical. That determined, the piece A is definitely fixed in that

position and the plumb-line is removed. In order to give the piece B the desired inclination at mid-day, place the zero of the vernier at noon and bring the focus of the lens on the point of the curve corresponding to the day on which the operation takes place, tighten the axis, the inclination of which piece must not again be varied for the particular latitude. The apparatus may be oriented or set to mark the bearing or situation with respect to the four cardinal points at any hour; but it is at six o'clock in the morning or evening that the operation affords the greatest exactness. Without displacing the axis f , bring the focus of the lens l upon the point of the curve corresponding to the day on which the operation is being performed. The apparatus will be in position and the vernier will give the hour. However, as there are two positions possible, it is necessary to choose that in which the vernier is to the right of noon, if the operation takes place in the evening, and that where the vernier is to the left of noon, if the operation takes place in the morning. The piece C alone remains movable, and the vernier will give the hour mean time when the focus falls on the curve, and it will give the true time when the focus falls on the straight line. When the instrument is at work, the three pieces are: one horizontal, corresponding with the bearing in respect to the cardinal points; one vertical, corresponding with the latitude; the third equinoctial, corresponding with the hour. One of these quantities being known, the instrument gives the other two by the sun. If a compass is used to ascertain the bearing with respect to the cardinal points, the instrument will give the latitude and the

hour. By comparing the hour of the place with that of the first meridian given by a chronometer, the longitude can be ascertained, and consequently the geographical position of the place where the operation takes place.

For purposes of instruction the piece carrying the vernier can be replaced by a terrestrial globe, and placed in such manner that all its circles would be parallel with analogous circles on the earth, so that when the sun shines all the lighted parts on the earth will have their analogous parts lighted on the globe. It is very interesting to watch on this terrestrial globe the sun rising and setting.

The instrument may be made of inoxidizable metal and enameled, and parts of it—such as the cap C—may be of glass or other material.

And having now described the nature of my said invention and in what manner the same is to be performed, I declare that I do not limit myself to the particular arrangement and materials hereinbefore described, for the same may be varied without departing from the invention; but

What I claim is—

The improvements in solar time-keepers or chronometers, substantially as hereinbefore described, and illustrated in the accompanying drawings.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

P. FLÉCHET.

Witnesses:

GEO. HUTTON,
L. CLAËS.