

March 7, 1933.

F. LORIA

1,900,117

SUNDIAL

Filed March 13, 1928

4 Sheets-Sheet 1

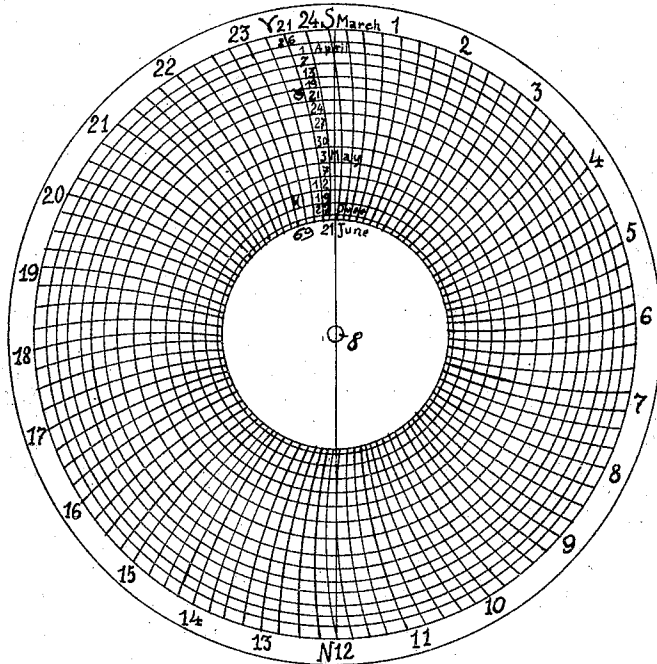


Fig. 1

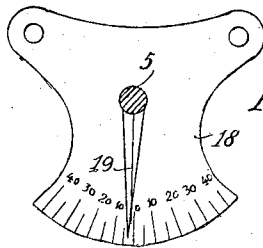
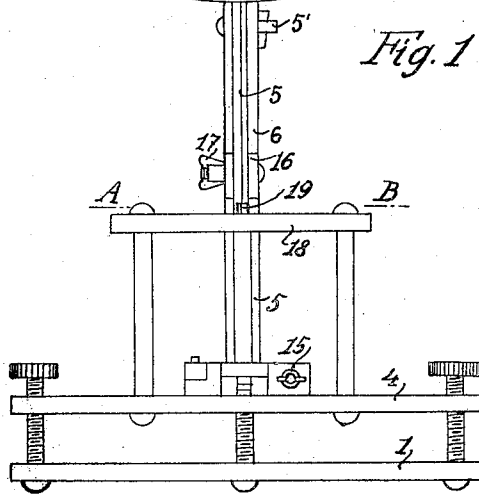


Fig. 4

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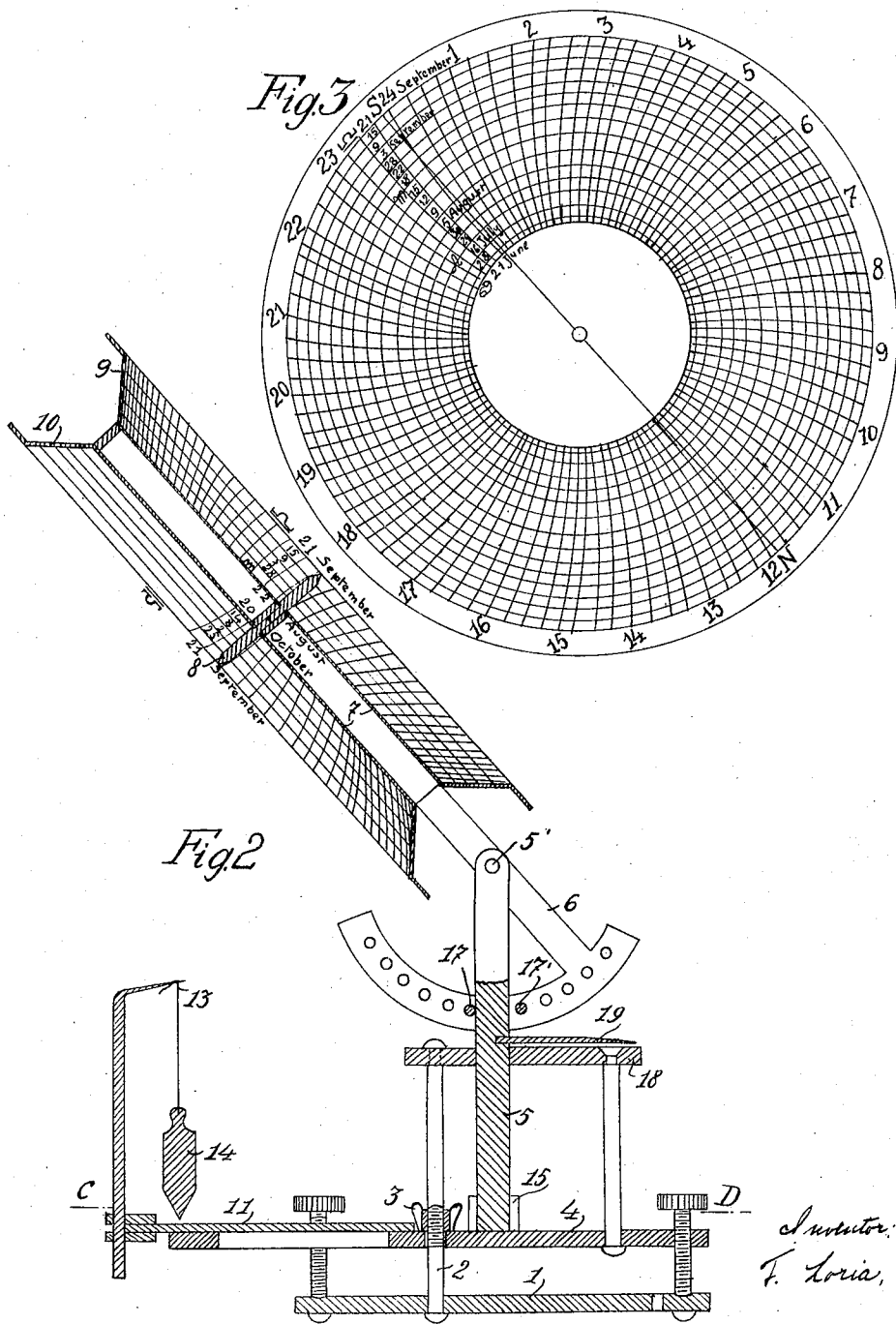
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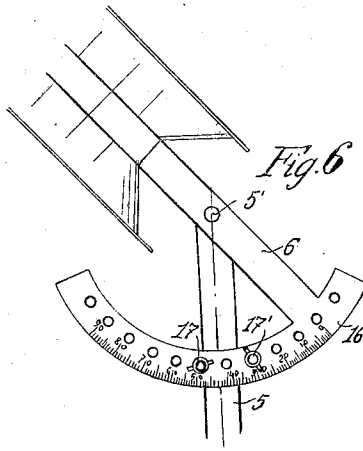
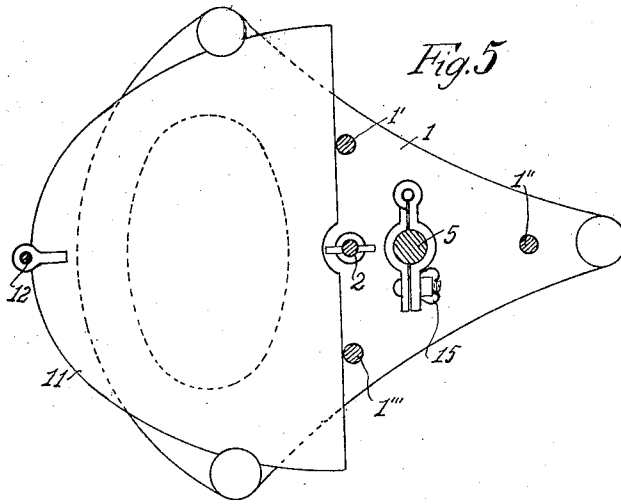
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4 Sheets-Sheet 3



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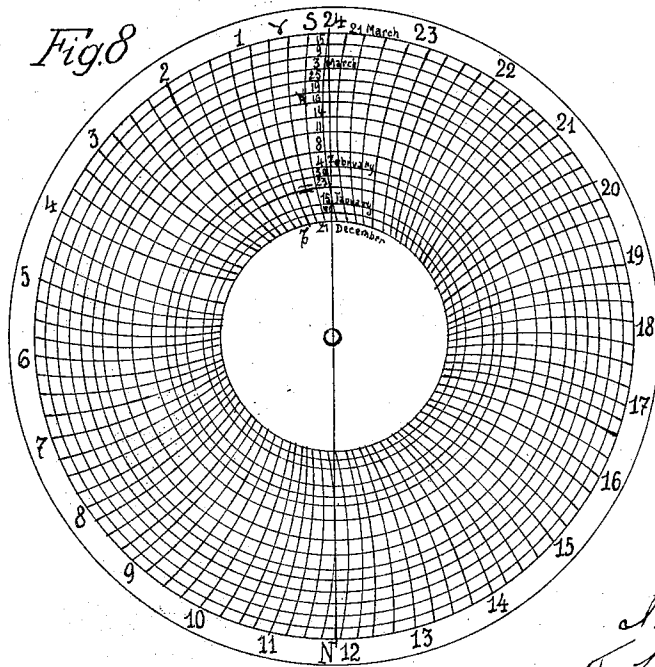
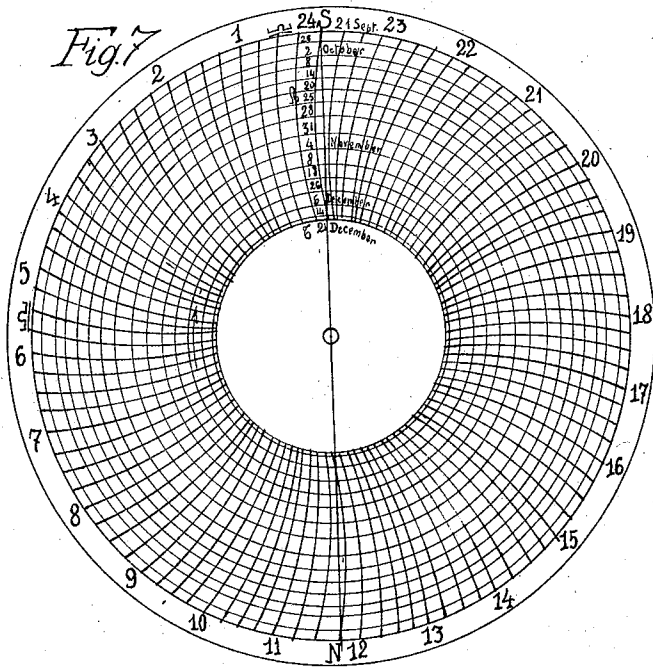
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UNITED STATES PATENT OFFICE

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SUNDIAL

Application filed March 13, 1923, Serial No. 261,335, and in Italy January 14, 1928.

The sundial in accordance with the present invention is provided with a bearing which permits it to be easily set up or taken to pieces, and which permits setting it promptly to the necessary latitude and properly orientating it with respect to the meridian of the place. This bearing is also provided with a device which permits correcting the position of the sundial in order to permit it to coincide with the meridian of another place.

All these operations required till now a long time and above all a knowledge of the cosmography, whilst with the sundial in accordance with the present invention the operations may be carried out in a short time, owing to the simplicity of the device.

As the hour lines at the average time are curved like the form of the figure 3, whose widest part reaches a space of more than 30 minutes, the consequence is that the signs of the quarters of an hour, and also of the halves of an hour, would intersect one another and thus produce confusion. In order to avoid this inconvenience the present invention provides the use of two series of hour indicia, one of which indicates the time from December 21st to June 21st and the other the time from June 21st to December 21st. Each of these series is formed by two circular plates having the form of a cup, whose hour lines may be applied on each face of the disc, which constitutes the sundial, so that for each one of the two faces there are two plates. One plate will bear for instance the hour lines from March 21st to June 21st and the other, the hour lines from June 21st to September 21st. In the same way another plate will bear the indications from September 21st to December 21st, and the last plate will bear the hour lines from December 21st to March 21st.

The invention will be understood from the following specification, which refers to the annexed drawings in which:

Fig. 1 is a front view of the universal sundial in accordance with the invention, which is supposed to be placed vertically, viz. at the Equator with the plate marked for the period from March 21st to June 21st.

Fig. 2 is an axial section of the sundial supposed to be inclined at the latitude of 42°.

Fig. 3 is a front view of the sundial with the plate marked for the period from June 21st to September 21st.

Fig. 4 is a section along the line A—B of Fig. 1, which shows the goniometer and the pointer for setting the sundial under the meridian used.

Fig. 5 is a plan in accordance with the section C—D of Fig. 2.

Fig. 6 is a partial view on the side of the sundial, which shows the goniometer for setting it to the latitude of the place.

Figs. 7 and 8 are respectively a view of the sundial having the plate marked for the period from September 21st to December 21st, and a view of the sundial with the plate marked for the period from December 21st to March 21st.

In the Northern Hemisphere the two plates March 21st—September 21st must be placed on the upper face of the disc, and the other two, September 21st to March 21st, on the lower face. The contrary must be done if the sundial is set up in the Southern Hemisphere.

The apparatus is made up of a triangular base 1 to be fixed on supports or pillars made with bricks, stone, iron or wood and which carries at its centre a pin 2 whose end is threaded and to which a nut 3 is screwed in order to secure in place a frame to be fixed on a plate or supporting member 4 after this plate has been placed exactly horizontally. In the centre of said frame is arranged a shaft or upright bearer 5, which may turn on its axis and which carries in equilibrium at its top, in 5', an arm 6 which is fixed to the disc 7 of the sundial. The centre of the disc 7 is crossed by a style 8 which extends normally to the two faces of the disc, and on these faces, as well as on the inclined borders 9, 10 of the disc, are arranged plates on which are marked the hours, the halves of an hour and the three quarters of an hour, at the average time, which are indicated exactly by the shadow of the style.

In order to set up the apparatus it is before all necessary to place the triangular base 1 on its basement, taking care that one of the

angles be directed by approximation towards north.

It is here assumed that the sundial is to be set up in the Northern Hemisphere; if instead it is to be set up in the Southern Hemisphere, one of the angles of the basement must be directed towards the south, as well as the angle of the upper plate. Afterwards the triangular base 1 must be levelled and fixed on its basement by means of the holes 1', 1'', 1'''.

The frame is then put in place by introducing the plate 4 upon the pivot 2 of the base and by directing the point towards the north or the south according to circumstances. The nut 3 is put on the pivot 2 without screwing it completely up; the plate 4 is perfectly levelled in all directions and afterwards the nut 3 is screwed up until it adheres to the plate 4. When this has been done the shaft 5 is placed into the frame and on this shaft is arranged the disc 7 already provided with its season plates.

In order to place the sundial at the latitude of the place one proceeds as follows.

If the geographical latitude of the place is known, it is sufficient to turn the disc 7 on its pivot 5', until the corresponding degree marked on the goniometer 16 arranged on the arm 6, coincides with the axis of the shaft 5. Figs. 2 and 6 represent for instance the sundial at the latitude of 42° . The disc is then fixed by screwing up the two screws 17, 17' near the shaft 5, until the two segments of circle 16 are fixed firmly to the said shaft.

When the latitude of the place is not known the disc must be directed towards the sun and at midday it must be put in such a position that the shadow of the style falls on the day circle corresponding to the day of the operation. For instance, if the day is April 13th, the disc must be put in such a position that the shadow of the style falls on the circle of April 13th. When this has been done, the sundial is placed at the latitude of the place and the goniometer 16 will give the corresponding indication.

In order to place the sundial under the meridian, one proceeds as follows.

The slate 11 with its small rod 12 is put on the south part of the plate, and after having levelled it in every direction, from a small hole 13 which is arranged in the upper part of the rod 12 a plumb 14 is dropped in a vertical direction and the resulting point is marked. This point is taken as the centre for describing two or three arcs of a circle as large as the slate allows. One now observes when the ray of light projected by the small hole crosses each one of these arcs by passing into and out of the area of the slate, and in the spots thus obtained points are marked. The two points of every arc are connected by a line and these lines are divided at their centre and from these points a line is

drawn passing through the vertical from the small hole and this line is the meridian line of the place. On the following day, when the ray from the small hole is about to approach to the meridian line, one observes it and when it is exactly on that line, one arranges so that the shadow of the style in its turn falls exactly on the NS line of the disc. Afterwards the binding clamp 15 must be screwed up at the foot of the shaft 5 and the sundial will be fixed under the meridian of the place.

In order to place it under the meridian of another place, it is sufficient to displace it by as many degrees as it is away from the first place. The scale 18 placed on the upper face of the frame serves for this purpose in co-operation with the hand 19 fixed to the shaft 5. It is to be noticed that if the meridian of the new place is eastward the displacement is to be made towards the east, whilst if the meridian of the new place is westward the displacement is to be made towards the west.

In sundials of great size, the day circles on the different circular plates may be marked for every day, instead of for a period of days, as for the sake of simplicity it has been shown on the drawings, and in this case the sundial may also form a calendar.

What I claim is:

1. In an instrument of the class described, a supporting member, an upright bearer upon said member, an arm mounted for tilting adjustment upon the bearer, two cup-shaped discs mounted upon the arm at their axes and in opposition to each other, the relatively remote faces of the discs bearing indicia indicating hours and fractions of hours, the angular adjustment of the arm permitting either disc to be positioned to receive rays from the sun, a style at the axes of the discs projecting at its end portions beyond the faces of the disc whereby to provide for the casting of its shadow, under the sunlight rays, onto the respective face of the respective disc, the bearer being rotatable for adjustment of the discs in accordance with the adopted meridian, and means for holding the bearer in its positions of adjustment.

2. In an instrument of the class described, a supporting member, an upright bearer upon said member, a disc mounted upon the bearer for angular adjustment whereby it may be inclined in accordance with the latitude of the place where the instrument is to be used, the disc bearing upon its face, indicia indicating hours and fractions of hours, a style positioned axially of the disc to cast its shadow, under sunlight rays, on to the face of the disc the bearing being rotatable for adjustment of the disc in accordance with the adopted meridian, means for holding the bearer in its positions of adjustment, a slate mounted upon the supporting member op-

posite the bearer, and a plumb suspended above the said slate.

3. In an instrument of the class described, a supporting member, an upright bearer upon
5 said member, a cup shaped disc mounted upon the bearing member for angular adjustment whereby it may be inclined in accordance with the latitude of the place where the instrument is to be used, the bearing member
10 rotatable, means for holding the member in positions of rotative adjustment, means in juxtaposition to the bearing member and bearing a scale concentric to the axis of rotation of the said member, a pointer carried
15 by the said bearing member, the disc bearing upon its face, indicia indicating hours and fractions of hours, and a style positioned axially of the disc to cast its shadow, under sunlight rays, on to the face of the disc.

20 In testimony whereof I have affixed my signature.

FRANCESCO LORIA.

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