Sheet 1-3 Sheets.

C. F. L. Risch

Heliometer.

No. 78,133. Patented May 19, 1868.

Fig. 2.

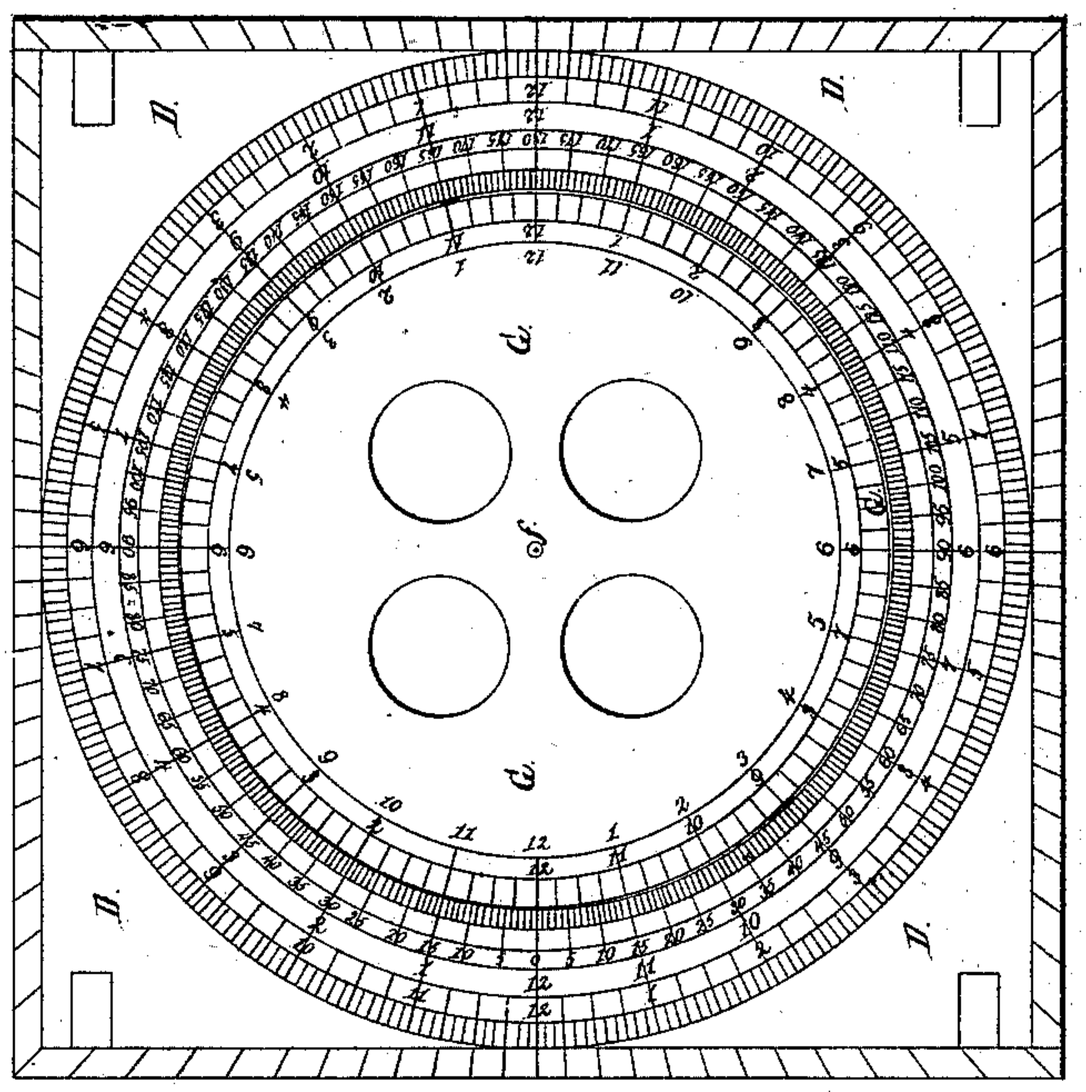
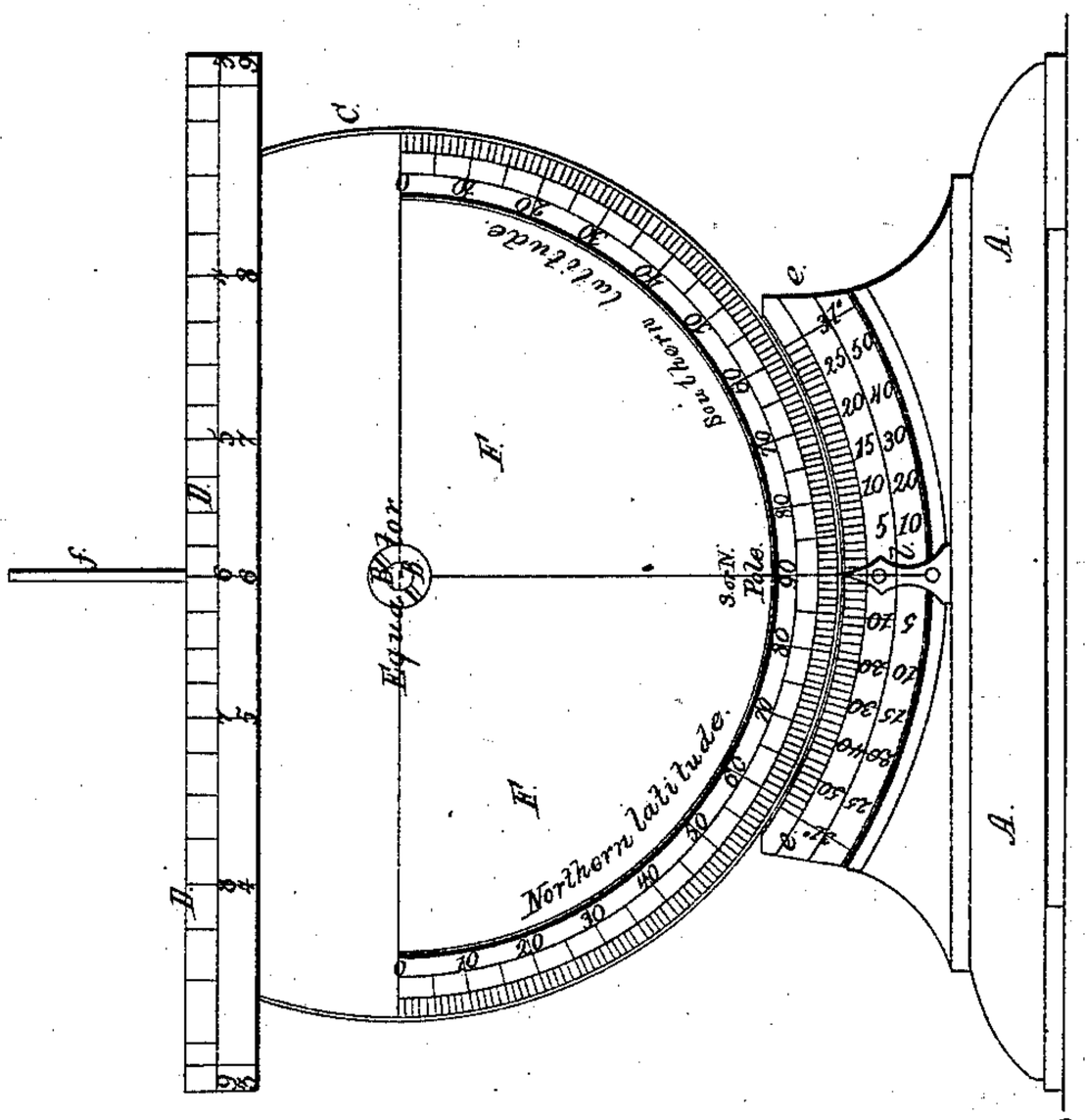


Fig. 1.



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Sheet 2 - 3 Sheets.

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Fig. 4.

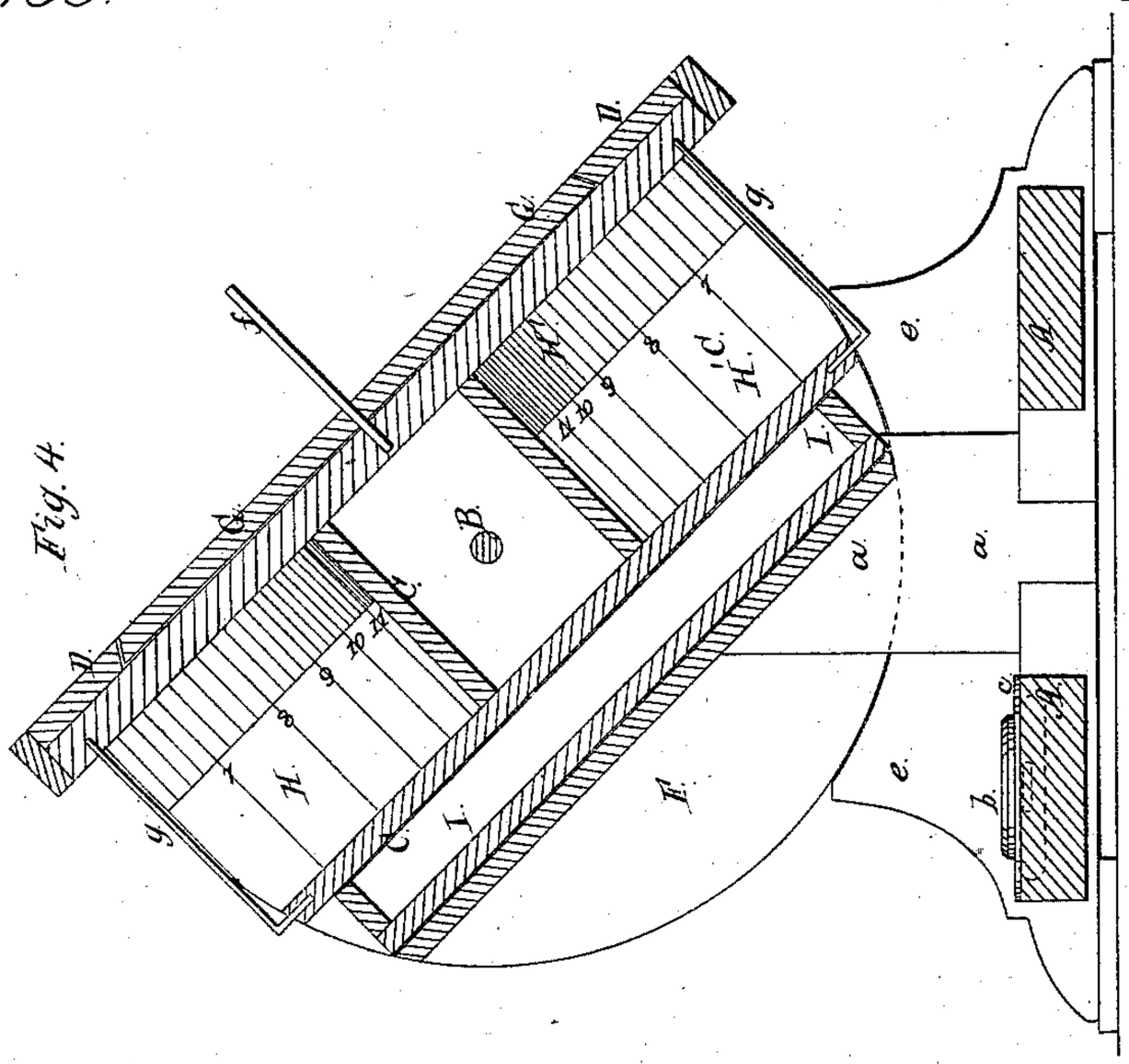
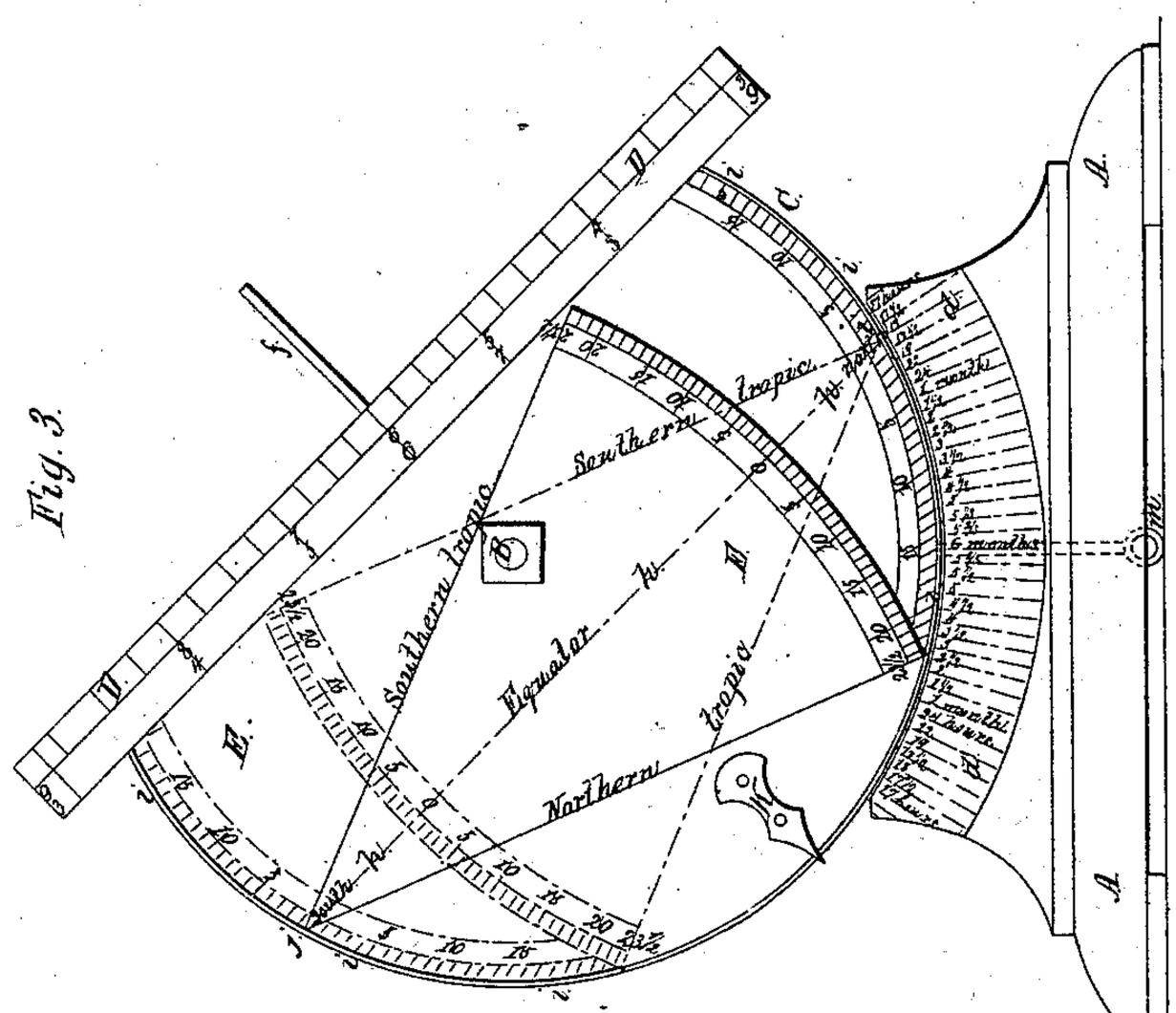


Fig. 3.



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Sheet 3-3 Sheets.

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Fig. 6.

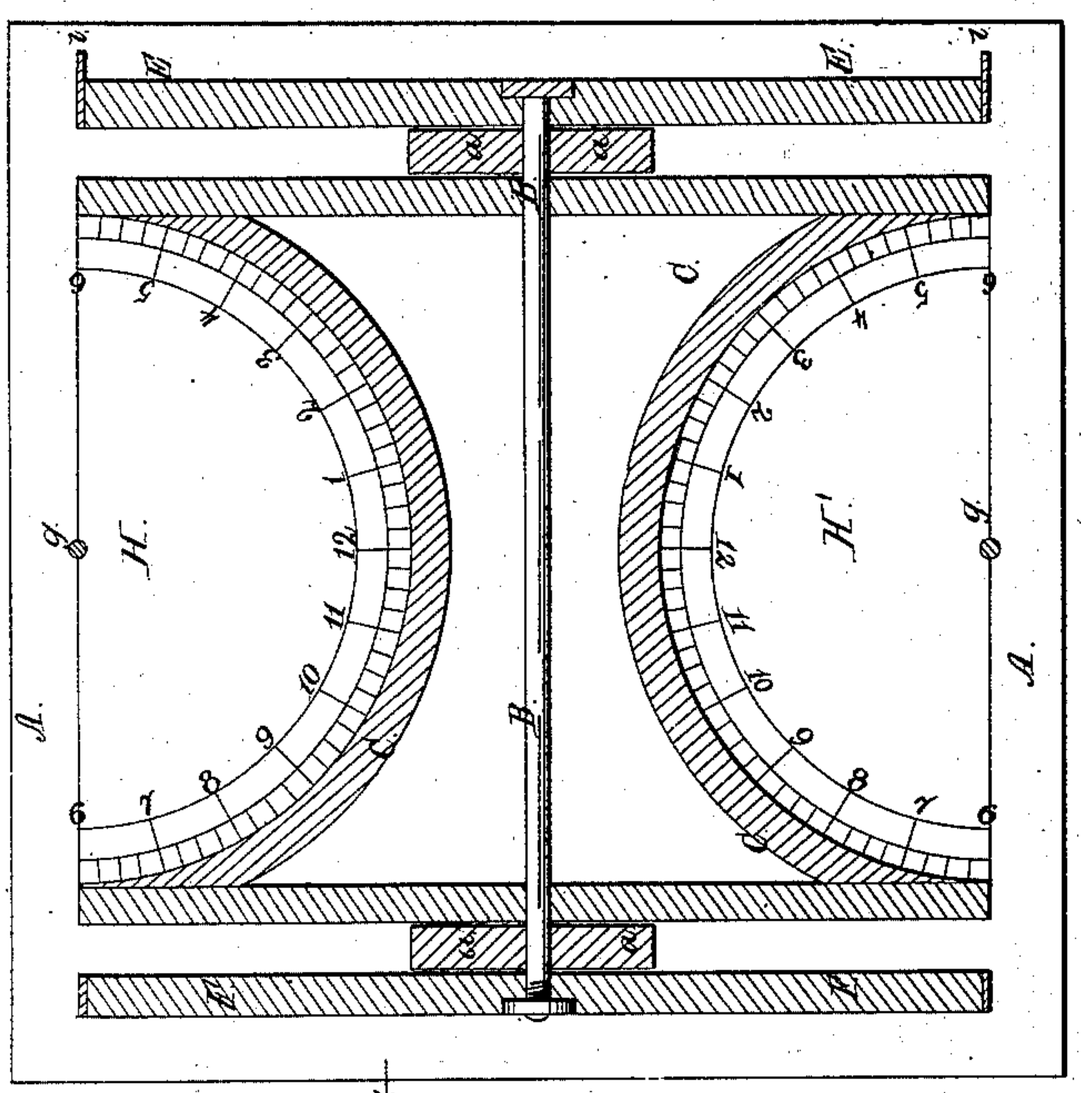
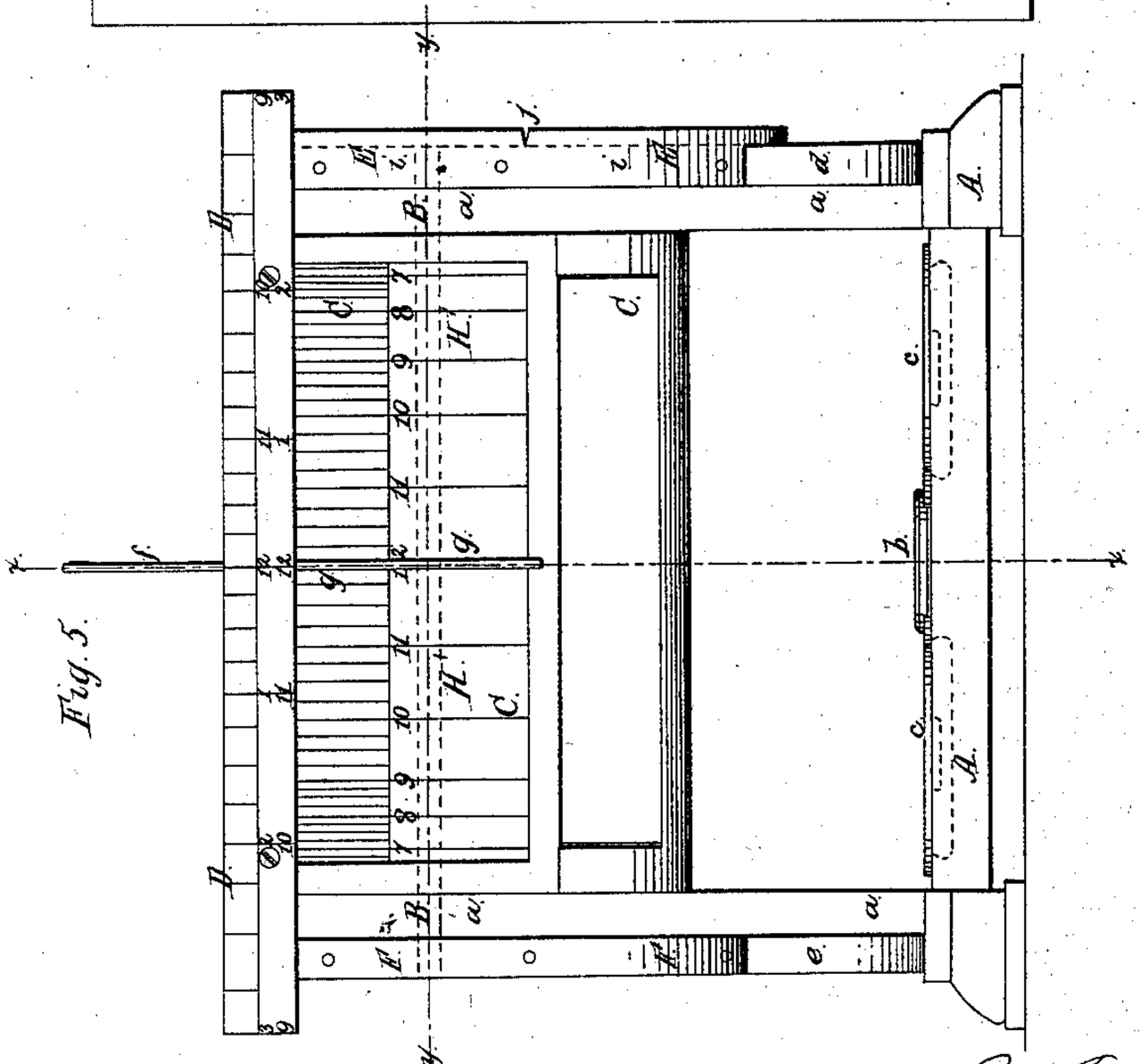


Fig. 5.



Witnesses.

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CONRAD FRIEDRICH LUDWIG RISCH, OF HUNTINGBURG, INDIANA.

Letters Patent No. 78,133, *dated May* 19, 1868.

IMPROVEMENT IN HELIOMETERS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, CONRAD FRIEDRICH LUDWIG RISCH, of Huntingburg, in the county of Dubois, and State of Indiana, have invented a new and improved Heliometer; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

Figure 1, Sheet I, represents a side elevation of my improved heliometer, showing its west side.

Figure 2, Sheet I, is a plan or top view of the same.

Figure 3, Sheet II, is an elevation of the east side of the same.

Figure 4, Sheet II, is a vertical sectional view of the same, the plane of section being indicated by the line *x x*, fig. 5.

Figure 5, Sheet III, is an elevation of the south side of the same.

Figure 6, Sheet III, is a horizontal sectional view of the same, the plane of section being indicated by the line *y y*, fig. 5.

Similar letters of reference indicate corresponding parts.

By the use of this invention, the exact degree of latitude at which an observation is made can be ascertained; also, by the aid of a suitable guide-book, the date at which the observation is made, as well as the time of day, and the angle formed by the rays of the sun, at noon of each day, upon the level or water-line.

With the aid of a small guide-book, this instrument will be of great use and interest to all travellers, and to all men who desire to study the higher branches of geography.

It is made so that it can be used for every degree of latitude between the north and south poles, and will be of equal value at the equator as at Cape Horn, and in Iceland.

The apparatus is set upon a stationary frame, A, which consists of a horizontal bed, and two upright posts or plates, *a a*.

Upon the bed are arranged a compass, *b*, and a level, *c*, as shown in fig. 5.

In the posts *a* are the bearings for a horizontal axle, B, upon which a semi-cylindrical block, C, is mounted, between the posts, as shown.

The upper face of this block, C, is covered with a square plate, D, from the east and west sides of which plates E and F are respectively suspended, said plates being on the outside of the posts *a a*, and connected by the axle B with the block C, as is clearly shown in fig. 6.

The plates E and F are both a little larger than semicircular, as shown in figs. 1 and 3, the circles being struck from the axis B as centre.

Upon the frame A are formed, on its east and west sides, small concave plates, *d* and *e*, respectively, which fit around part of the curve of the plates E and F, as shown in figs. 1 and 3, the curves on *d* and *e* corresponding to those on E and F.

The plate D is provided with a pin or gnomon, *f*, projecting vertically from its centre, as shown in figs. 1 and 2.

The shadow of the same falls upon the face of the disk D, and indicates thereon the time of day, the necessary dial being for the purpose marked, and formed on the plate D.

As the shadow of the sun describes a full circle upon the dial during each astronomical day, and as this shadow turns in opposite directions on the northern and southern hemispheres, two rows of figures have been marked on the dial D, in opposite directions, as is clearly shown in fig. 2, thereby adapting the apparatus to both the northern and southern hemispheres.

A small revolving dial, G, is arranged around the gnomon *f*, within or upon the plate D. Its edge is divided into twenty-four parts, like the dial. The inner corresponding edge of the outer dial is divided into three hundred and sixty parts, to indicate the meridians, and thus, by the aid of the revolving dial G, the difference in the time of day between any two places on the globe can be ascertained.

The lines of the main dial D are carried around the edge of the plate D, as shown in figs. 1, 2, 3, and 5, to allow their transfor for the construction of a stationary sun-dial for a certain latitude.

In the south and north sides of the block C are, in each, semi-cylindrical depressions H and H′, respectively, each having a gnomon, *g*, which is parallel with the gnomon *f*, as is clearly shown in figs. 4, 5, and 6.

These depressions are the dials for winter-time for both hemispheres, that on the north side of the apparatus being for the southern hemisphere, and that on the south side for the northern hemisphere.

Upon the face of the plate E, on the east side of the apparatus, fig. 3, are drawn two triangles, which are both of equal form or shape.

They are both divided into equal parts by a straight line, *h*, which is parallel with the surface of the dial. This line *h* represents the equator.

The angle of each triangle at the ends of the equator is forty-seven degrees, *i. e.*, twenty-three and a half degrees on either side of the equator.

The line opposite to the angle at the end of the equator is a curve, or part of a circle, struck from the end of the equator, as shown.

The edge of the plate E is partly or wholly surrounded by a sheet-metal flange, *i*, in which, at each end of the equator, *h*, a small hole or slot, *j*, is cut, as shown.

When the apparatus has been set to any certain degree of latitude, so that the block C is set at the required angle, the ray of the sun, which falls though the slot *j* at noon of each day, falls upon that degree on the curve (which is struck from that point at which the ray enters) above which the sun stands perpendicular. The hole *j*, at the south side of the apparatus, and the triangle starting from it, are used during observations on the northern hemisphere, while the opposite hole, *j*, and its triangle, are used for observations upon the southern hemisphere.

The small curved plate, *d*, below the plate E, is provided with a table showing the longest day. A pointer, K, at the plate E, shows upon it the longest day at any degree of latitude.

The west plate, F, is divided, around its semicircular edge, into one hundred and eighty degrees. A pointer, *l*, is secured to the curve *e* in a direct vertical line below the axis B, as shown in fig. 1.

This pointer shows on the plate at what angle the apparatus is to be set for a certain degree.

In fig. 1 the apparatus is set for one of the poles, but by turning it it may be set to any degree.

The curve *e* is divided into thirty-one degrees, on each side of the pointer *l*. The space occupied by these thirty-one degrees is equal to that occupied by thirty degrees on the edge of the plate F, for the purpose of enabling greater exactness in the setting of the plate.

When the apparatus is to be used in any known degree of latitude, the block C is turned until the pointer *l* covers, on the plate F, that degree of northern or southern latitude from which observations are to be made.

The sun-dial is then, also, at the proper inclination, that is, if the apparatus has been adjusted in accordance with the compass and level.

The plate E is then, also, in the right position to show the length of day, and the degree in the torrid zone above which the sun stands.

By the aid of a little table, the degree of latitude can by this apparatus be found, if the date is known, and *vice versa*.

Such a table would contain the following:

On the 21st of April the sun stands vertical above 0° 28′, northern latitude.
On the 22d of April, 0° 54′, north latitude.
On the 23d of April, 1° 18′, north latitude.
On the 24th of April, 1° 40′, north latitude.
On the 25th of April, 2° 40′, north latitude.
On the 21st of June, 23° 30′, north latitude.
On the 22d of December, 23° 30′, north latitude.

Now, if it is desired to find under what degree of latitude the observations are being taken, the block C must be turned until the ray of the sun falls through the hole *j* on the plate E, upon that degree which corresponds with the date; for example, if observations are to be made on the 24th day of April, on any unknown part of the northern hemisphere, the block C must be-turned until the ray of the sun at noon falls upon 1° 40′ on the plate E.

The hand *l* will then show, on the plate F, under what degree of latitude the observation is taken.

The opposite course should be pursued to find the date, if the latitude is known.

m is a small set-screw, to clamp the plate E or F, or either, and, with the same, the block C, in any desired position to the stationary frame.

A table, to show the variations of the sun-dial with a correct clock, and the variations of the magnetic needle, should be added to the instruction-book C.

To the under side of the block C may be secured a drawer or shelf, I, which serves as a receptacle for the instruction-book, instruments, &c., (see fig. 4.)

I claim as new, and desire to secure by Letters Patent—

1. A heliometer, constructed and arranged to operate in the manner herein shown and described.

2. The plate E, when arranged as herein shown and described, and when provided with a pointer, K, in combination with the curve *d* on the stationary frame A, all made as set forth.

3. The plate F, when arranged as set forth, in combination with the curve E and pointer *l*, on the stationary frame A, all made and operating substantially as herein shown and described.

4. The sun-dial H, on the revolving block C, when combined with the plates E and F, all made and operating substantially as herein shown and described.

5. The sun-dial D and gnomon *f*, in combination with the semi-cylindrical dials H and H′, and their gnomons *g*, all made as described.

6. The manner herein shown and described of making, dividing, and arranging the plate E.

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Witnesses:

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F. A. GRAETZ.