C. J. KULLMER.

ASTRONOMICAL APPLIANCE.

APPLICATION FILED JULY 5, 1910.

1,126,231.

Patented Jan. 26, 1915.

2 SHEETS—SHEET 1.

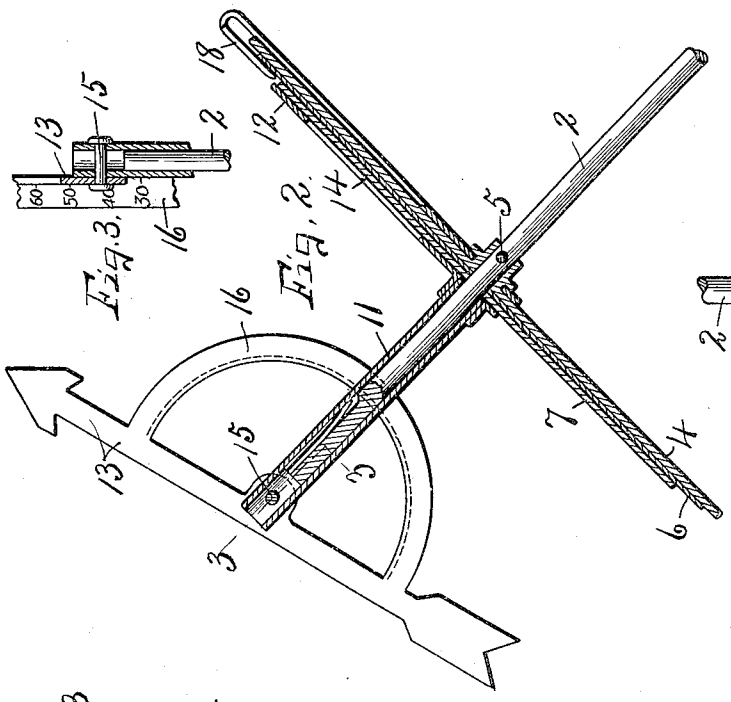


Fig. 3.

Fig. 2.

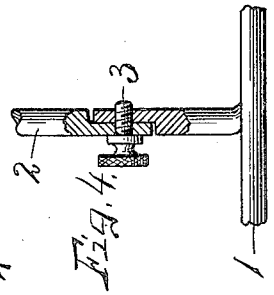


Fig. 4.

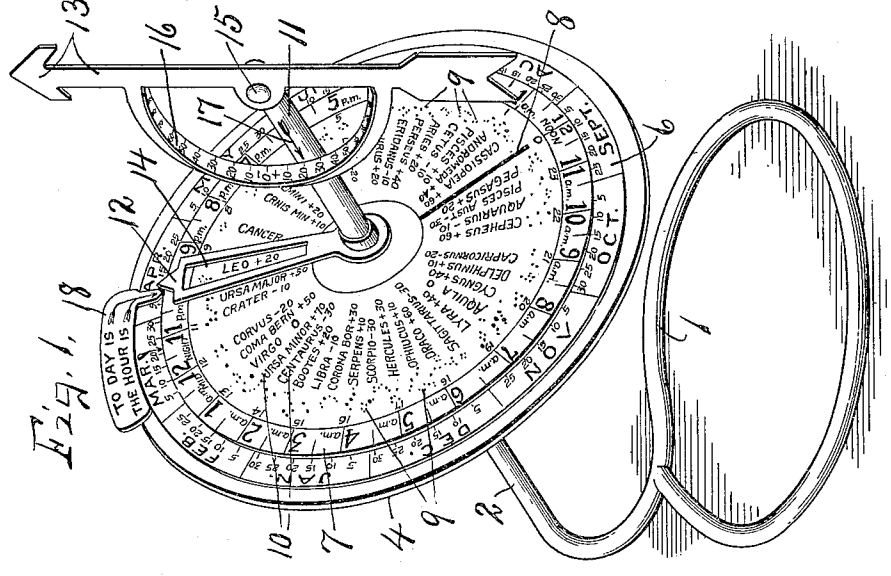


Fig. 1.

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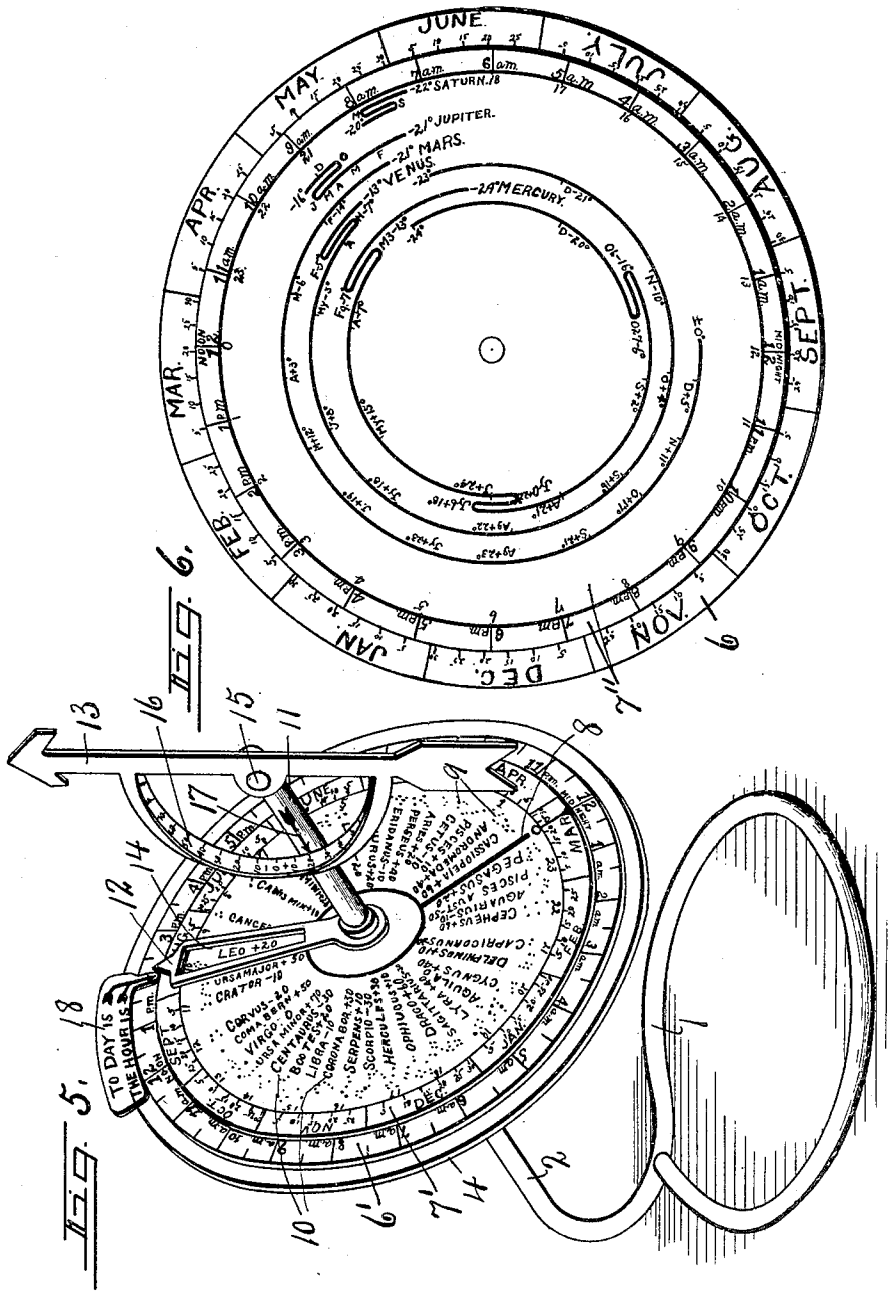
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2 SHEETS—SHEET 2.



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ASTRONOMICAL APPLIANCE.

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To all whom it may concern:

Be it known that I, CHARLES J. KULLMER, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Astronomical Appliances, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in astronomical appliances for educational and scientific purposes.

The object is to afford a simple and comparatively inexpensive yet comprehensive means for easily and quickly locating the positions and indicating the names, symbols, declination and right ascension of the more characteristic celestial bodies or constellations at any predetermined time. In other words I have sought to incorporate in a single instrument means for obtaining and imparting a more practical comprehension of the fundamental principles of astronomy, or rather of the relative positions and movements of celestial bodies or constellations so that any person, even the most unskilled, may readily acquire a general knowledge of such fundamental principles and movements.

Other objects and uses relating to specific parts of the instrument will be brought out in the following description.

In the drawings: Figure 1 is a perspective view of an astronomical appliance embodying various features of my invention. Fig. 2 is an enlarged sectional view, through the dial, dial support, and indicators, showing a portion of the standard upon which the dials and indicators are mounted. Fig. 3 is a transverse sectional view of a portion of the indicator, taken on line 3—3, Fig. 2. Fig. 4 is a sectional view of a modified connection between the base and standard. Figs. 5 and 6 are respectively a perspective view and a face view of modified forms of my invention, Fig. 5 showing the hour graduation on the fixed dial and the month and day graduations on the movable dial, while Fig. 6 shows a planet dial in place of the constellation dial.

In the illustrated embodiment of my invention is shown a substantially flat supporting base —1— of wire bent into the form of a ring and provided with an integral standard —2— which, when adjusted for use with the base in a horizontal position, is disposed at substantially right angles to the equator or parallel with the axis so as to point in the direction of the celestial pole, the angle of the standard depending upon the latitude in which the device is used.

In the construction shown in Fig. 1, the standard may be brought to the desired angle by simply bending it toward or from the base, but in some instances the standard and base may be made in separate pieces, as shown in Fig. 4 and pivotally connected by a screw —3— which also serves to clamp the standard in its adjusted position.

Rigidly secured to the standard —1— at right angles thereto and a suitable distance from the base —1— is a circular metal disk —4— held in place concentrically with the axis of said standard, and therefore in a plane substantially parallel with the equator by any suitable fastening means, as a key or pin —5—, or by soldering the hub of the disk to the standard.

Secured to the upper face of the disk —4— concentric with the axis of the standard —2— is a circular dial —6— having its outer marginal edge divided into a series of, in this instance twelve, spaces which are marked in sequence with the names of the months and are subdivided by additional graduations representing the days of each month, arranged so that March 21, the vernal equinox, is uppermost in the plane of the meridian. An additional circular dial —7— is rotarily mounted upon the standard —2— in close proximity to the upper face of and of somewhat smaller diameter than the dial —6— so as to leave the graduations and names of the months and days on said dial —6— exposed. The marginal edge of the dial —7— is also divided by graduations into a series of, in this instance twenty-four, equal spaces arranged and numbered consecutively in sets from 1 to 12, inclusive, representing hours of the day, the hour spaces being also subdivided into fractions of the hour, those of one set representing forenoon and marked A. M., while those of the other set represent afternoon and are marked P. M.

Registered with the noon graduation on the dial —7— is a radial meridian line —8— from which a portion of the dial con-

centric with the hour graduations is divided by graduations into twenty-four spaces numbered consecutively from 1 to 24, inclusive, representing the degrees or hours of right ascension.

Printed or otherwise impressed upon the surface of the dial —7—, preferably in proximity to the hour graduations and concentric therewith, are a series of constellation maps or symbols —9— each located at its proper degree of right ascension, the conventional names or titles, as —10—, of the constellations, together with their degrees of declination plus or minus, as the case may be, being printed or otherwise impressed upon the dial in radial alinement therewith. These maps are chartographically projected on the coördinates of right ascension and declination of the most characteristic star-grouping at the heads of their respective radial lines of right ascension and co-radial with their corresponding names and declination.

A sleeve —11— is rotatably mounted upon the outer end of the standard —2— coaxial with the dials —6— and —7— and plate —4— and is provided with an index finger —12— and a pointer —13— both of which extend in the same radial direction, the index finger —12— being extended radially to a point in proximity to the graduations on the dials —6— and —7— around which it is adapted to travel as the sleeve is rotated.

The index finger —12— preferably lies close to the upper surface of the dial —7—, and is provided with a central lengthwise sight opening —14— adapted to register with any one of the constellation maps and its corresponding name and degree of declination when the index finger is registered with any of the indicated degrees or hours of right ascension corresponding to such constellation map.

The pointer —13— which extends in substantially the same radial direction as the index finger —12— is centrally pivoted at —15— to one side of the outer end of the sleeve —11— and is provided with a pendent sector —16— of substantially 180°. This sector is graduated and numbered consecutively from a central zero point to represent degrees of declination, those at one side of the zero point being represented by a plus sign, while those at the opposite side are represented by a minus sign. These graduations are adapted to be moved into registration with a fixed index line —17— on the adjacent side of the sleeve —11—.

When the zero graduation of the sector is registered with the fixed graduation —17—, the pointer —13— is disposed in a plane substantially parallel with that of the dials and is adapted to be tilted in either direction 90° from such position and in a plane at right angles to said dials so as to be directed to any point in the celestial sphere.

In order that the index finger —12— and coöperating pointer —13— and dial —7— may be more easily and accurately set to any predetermined time of day of any month, I provide an auxiliary indicator —18— which is adjustable circumferentially around the marginal edges of the dials —6— and —7— and disk —4— and is preferably journaled on the hub of the disk —4—, as best seen in Fig. 2. This indicator is adapted to be registered with any one of the graduations representing the days of the month on the dial —6— and also with the graduations representing the hours of the day on the dial —7—.

In operation assuming that it is desired to ascertain the position of the constellation "Leo" at any hour, as 10 o'clock P. M. of any day, as April 10th, then by supporting the instrument with its base in a horizontal position and the standard —2— pointing due north, the dial —7— and index finger —12— will be rotated by hand either together or separately until the hour graduation 10 on the dial —7— is registered with the graduation representing April 10th, at which the indicator —18— is also set by hand. The index finger —12— is then adjusted rotarily to bring its sight opening —14— into registration with the constellation name "Leo" and also embraces the corresponding map or symbol and degree of declination, in this instance plus 20. The pointer —13— is then adjusted about its pivot —15— until the graduation plus 20 is registered with the fixed index —17—, thereby directing the pointer toward the constellation "Leo" and by sighting along the pointer this constellation may be readily located. If it is desired to determine when this constellation rises and sets on this day, it is simply necessary to rotate the sleeve —11— to the east or to the west around the dial —7— leaving the pointer —13— in its adjusted position until said pointer is brought to a horizontal position and then to note the hour with which the index finger —12— may be registered, such hour indicating the time of rising or setting. In like manner the position of any other constellation for any predetermined time may be ascertained and its degree of right ascension and declination indicated on the dial. Or if a particular star is observed and it is desired to ascertain the name of the constellation to which it belongs, the pointer —13— may be directed to such star and the dial —7— rotated to bring the hour at which the observation is made into registration with the day of the month on the dial —6—, whereupon the constellation to which the star belongs together with the map and degree of declination will be near

or registered with the sight opening in the index finger —12—, the degree of declination being also indicated by the graduated sector —16—.

As a further illustration of the utility of the device assuming that it is desired to determine the location of the constellation Libra at 10 P. M. on May 30th, then it is simply necessary to adjust the dial —7— to bring the graduation 10 P. M. into registration with the graduation May 30th on the dial —6—, whereupon the index finger —12— is brought into registration with the name Libra which indicates that the degree of declination is minus 10. Now by adjusting the pointer —13— until the graduation minus 10 of the sector —16— is registered with the fixed index —17—, the pointer will be directed to the constellation Libra.

Although I have shown and described a device for ascertaining the positions, names, symbols and degrees of right ascension and declination of the fixed stars and constellations, it is evident that the month and day graduations and hour graduations may be placed respectively on the movable and fixed dials as shown in Fig. 5, or a similar principle may be employed in locating the position of other celestial bodies, such as planets as shown in Fig. 6, by simply changing the printed matter upon the dials to correspond to the relative positions of such planets in the celestial sphere, and therefore I do not limit myself to the order of arrangement or to the construction shown and described.

In Fig. 5, I have shown a fixed dial —6′— and a coaxial rotary dial —7′—, the dial —6′— having a circular row of hour graduations numbered in reverse order from that shown on dial —7—, Fig. 1, while the rotary dial —7′— is provided with a circular row of day and month graduations in reverse order from that shown on the dial —6—, Fig. 1, and having the March 21 graduation (the vernal equinox) coincident with the zero right ascension graduation. Otherwise this rotary dial is the same as that previously described.

As an illustration of the operation of the device shown in Fig. 5, assuming that it is desired to locate the position of any constellation, as "Libra," at any hour, say 10 P. M. of any day, as May 30, the auxiliary indicator —18— will then first be set by hand to register with the hour graduation 10 P. M. on the fixed dial, and the dial adjusted rotarily to bring the month graduation May 30 into registration with the indicator, whereupon the index finger —12— will be adjusted to bring its sight opening into registration with the name "Libra" and also with the corresponding map and degree of right ascension and declination which latter is in this instance indicated as minus 10, after which the pointer —13— will be adjusted to bring the minus —10— graduation of its sector into registration with the fixed index thus directing the pointer directly toward this constellation.

In Fig. 6 is shown a revoluble disk —7″— in place of the dial —7— associated concentrically with the dial —6— and having hour and right ascension graduations substantially the same as shown in Fig. 1 and also bearing the names of the planets, their relative positions and paths of movement in right ascension for a given year, together with their degrees of declination for different periods of such year.

Each line or path of movement in right ascension is marked off in sequence with the abbreviations of the months and declination in radial alinement with the corresponding angles of right ascension and therefore by setting the dial —7″— to register any one of its hour graduations with any one of the day graduations on the dial —6— and then adjusting the index finger and pointer to correspond to the indicated position in right ascension and declination of any one of the planets may be sighted along the pointer.

What I claim is:

1. An astronomical appliance of the character described comprising dials having concentric scales representing divisions of time, one of the dials being adjustable rotarily and provided with representations of celestial bodies arranged in their proper order of right ascension, means for supporting said dials with their axis extending north and south, a pointer movable about said axis and also adjustable to different angles relatively thereto and means for indicating such angles of adjustment.

2. An astronomical appliance of the character described comprising co-axial dials having coöperative circular scales representing divisions of time, one of said dials being adjustable rotarily and provided with representations of constellations arranged in their order of right ascension, means for supporting said dials substantially parallel with the earth's equator, and a pointer adjustable around the dials and also to different angles relatively to the axis thereof, and a graduated sector on the pointer.

3. An astronomical appliance of the character described comprising a stationary dial, a rotary dial co-axial therewith, said dials having coöperative circular scales representing divisions of time, one of the dials having constellation names in their order of right ascension, means for supporting said dials with the axis thereof pointing north and a pointer adjustable rotarily about said axis to register with any one of said names and also adjustable to different angles relatively to said axis, and means for indicating the degree of the last named adjustment.

4. An astronomical appliance of the character described comprising two co-axial dials having concentric graduations representing divisions of time, one of said dials being adjustable rotarily and having representations of celestial bodies and their degrees of declination impressed thereon in their order of right ascension, means for supporting said dials with their axis pointing north, a sighting device movable about said axis into registration with any one of the representations of celestial bodies, and also adjustable to different angles relatively to said axis, and means for indicating the degree of the last named adjustment.

5. In an astronomical appliance of the character described, a standard disposed to point toward the north, a stationary dial mounted thereon, a rotary dial co-axial therewith, said dials being provided with concentric scales representing divisions of time, the rotary dial being provided with constellation maps impressed in their order of right ascension, a pointer rotarily mounted upon the standard to register with any one of said maps and having an independent adjustment to different angles relatively to said standard, and means for indicating the angle of the last named adjustment.

6. In an astronomical appliance of the character described, a stationary dial, means for supporting said dial with its axis extending north and south, a rotary dial movable about said axis, said dials being provided with coöperative circular scales representing divisions of time, the rotary dial being provided with constellation names arranged in radial lines in their order of right ascension, and a pointer adjustable rotarily about the axis of said rotary dial and also adjustable to different angles relatively to said axis and provided with a scale corresponding to the angles of declination.

7. An astronomical appliance of the character described, comprising two co-axial disks having coöperative circular scales representing divisions of time, one of said disks being adjustable rotarily and provided with constellation names and the degrees of declination of the corresponding constellations impressed radially thereon, an index finger movable into registration with any one of said names, and a sighting device actuated by said index finger and having an independent adjustment to different angles relatively to the plane of the disks, and means for indicating the degree of the angle of the last named adjustment.

8. In an astronomical appliance of the character described, a stationary dial having a circular scale representing divisions of time, means for supporting said dial with its axis pointing to the north, a rotary dial movable about said axis and provided with representations of celestial bodies arranged in their order of right ascension and also provided with time graduations, a sighting device adjustable rotarily about said axis and to different angles relatively thereto and provided with means for indicating the degree of such angular adjustment and a pointer movable with said sighting device around said time graduations.

9. An astronomical appliance of the character described, comprising a stationary dial, means for supporting the dial with its axis pointing to the north, said dial being provided with graduations representing divisions of time, a rotary dial having representations of constellations arranged in their order of right ascension to move into radial alinement with any one of the time graduations of the stationary dial, said rotary dial being also provided with time graduations an index finger rotarily adjustable about the axis of the rotary dial into registration with any one of said representations and graduations, and a sighting device actuated by said index finger and provided with means for indicating the degree of declination of the particular constellation with which the index finger is registered.

10. An astronomical appliance of the character described, comprising a stationary dial having a circular scale representing time graduations, means for supporting said dial with its axis extending north and south, a rotary dial movable about said axis and provided with a circular scale representing divisions of time for registration with those on the stationary dial, said rotary dial having constellation names and the degrees of declinations of the corresponding constellations printed thereon in the order of their right ascension, an index finger movable about said axis into registration with any one of said names, and a sighting device actuated by said index finger and provided with means for indicating the degree of declination of any constellation to which it may be directed.

11. An astronomical appliance of the character described, comprising a standard positioned so as to extend north and south, a disk secured to said standard and provided with a circular row of graduations representing divisions of time, a rotary dial co-axial with the stationary dial and provided with a circular row of graduations representing divisions of time for registration with any one of the graduations on the stationary dial, said rotary dial being provided with representations of celestial bodies arranged in their order of right ascension, a rotary sleeve on the standard having an index finger movable around the time graduations and provided with a sight-opening for registration with any one

of the representations of celestial bodies and a pointer pivoted to said sleeve at right angles thereto, and provided with a graduated sector coöperating with the sleeve to indicate the angle of adjustment about the axis of the pivot.

12. An astronomical appliance of the character described comprising coaxial dials having circular rows of graduations representing divisions of time, those of one row representing months and days of the month, and those of the other row representing hours and fractions of an hour, one of the dials being rotatable relatively to the other dial and provided with constellation names arranged in the order of right ascension of their corresponding constellations, a sighting device movable about the axis of the dials to register with any one of said names and having an independent adjustment to different angles relatively to said axis and means for indicating the degree of the last named adjustment.

13. In an astronomical appliance of the character described, a dial disposed in a plane substantially parallel with the equator and having printed or otherwise impressed thereon a circular series of names of celestial bodies together with their degrees of declinations, a pointer movable about the axis of the dial into registration with any one of said names and also tiltable upon a separate axis to any of such degrees of declination and means for registering the degree to which the pointer is tilted.

14. In an astronomical appliance of the character described, a rotary dial having impressed thereon a circular series of constellation bodies arranged at their proper angles of right ascension, said dial bearing a circular series of numbers representing the hours of the day, a fixed dial coaxial with the rotary dial and bearing a circular series of month and day graduations, a rotary support coaxial with said dials and provided with an index finger movable around the hour and day graduations and into registration with any one of said names, and a pointer rotatable with said support and having an independent rocking movement in a plane at substantially right angles to the dials, and provided with a sector graduated in degrees in opposite directions from a zero point and representing angles of declination.

15. In an astronomical appliance of the character described, coaxial coöperative dials one of which is rotatable relatively to the other dial, a circular series of month and day graduations on one of the dials, a circular series of hour graduations on the other dial, one of said dials having impressed thereon a circular series of names of constellation bodies together with their degrees of declination, a pointer rotatable about the axis of said dials and having an independent rocking movement in a plane at right angles thereto, and a sector secured to said pointer and graduated in degrees representing angles of declination.

16. In an astronomical appliance, the combination of a stationary circular dial graduated to represent months and days and supported on an axis extending substantially north and south, a movable circular dial on the same axis graduated to represent hours and having radially arranged star symbols on its surface, a pointer movable about said axis to register with the star symbols, and a separate pointer movable in a plane parallel to that of the first named pointer and having a separate adjustment in a plane at right angles thereto, and a scale to measure the degree of movement in the last named plane.

In witness whereof I have hereunto set my hand on this 18th day of June 1910.

CHARLES J. KULLMER.

Witnesses:
H. E. Chase,
H. L. Humphrey.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."