

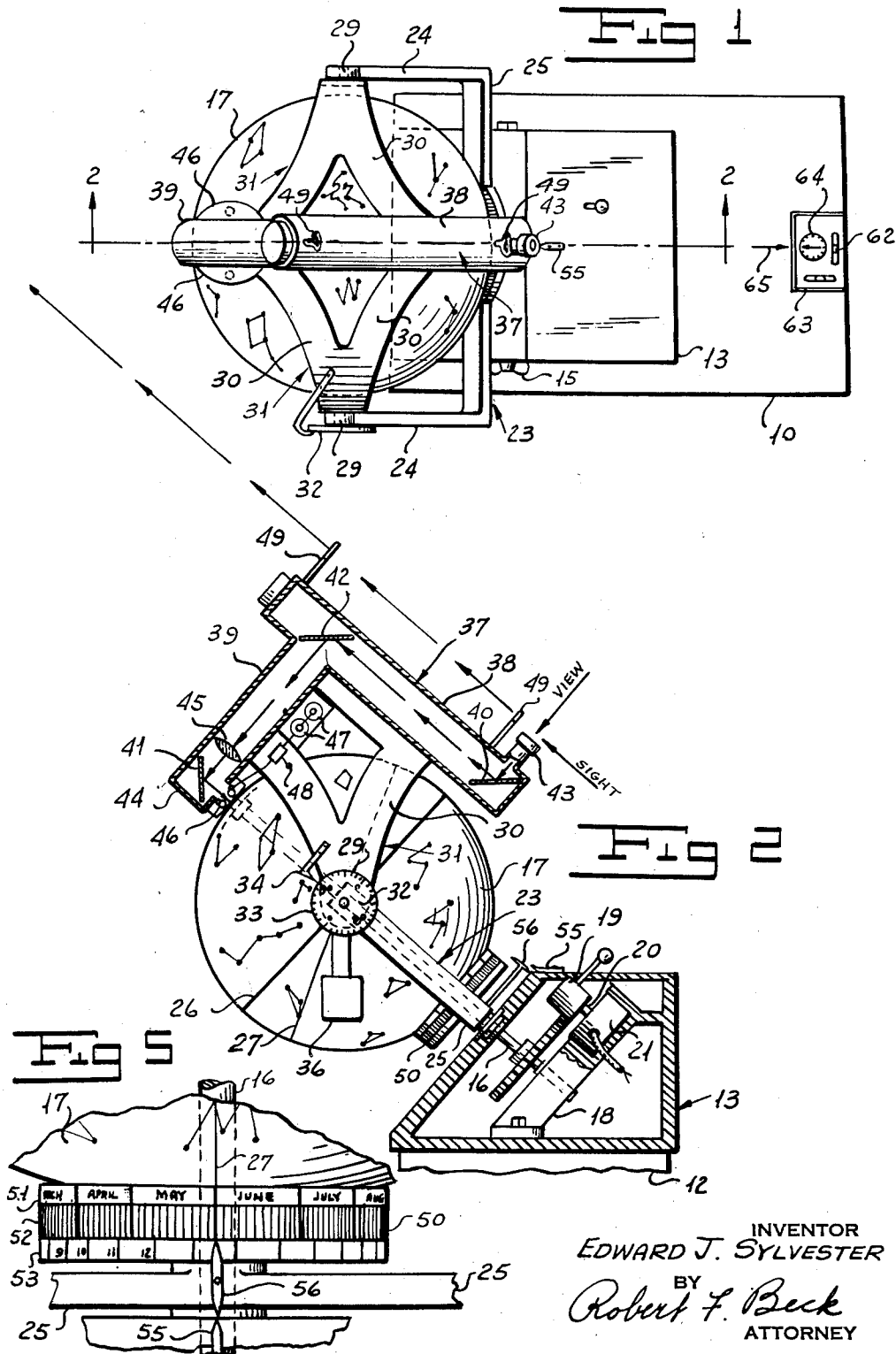
July 17, 1956

E. J. SYLVESTER
ASTRONOMICAL INSTRUMENT

2,754,597

Filed Aug. 15, 1955

3 Sheets-Sheet 1



INVENTOR
EDWARD J. SYLVESTER
BY
Robert F. Beck
ATTORNEY

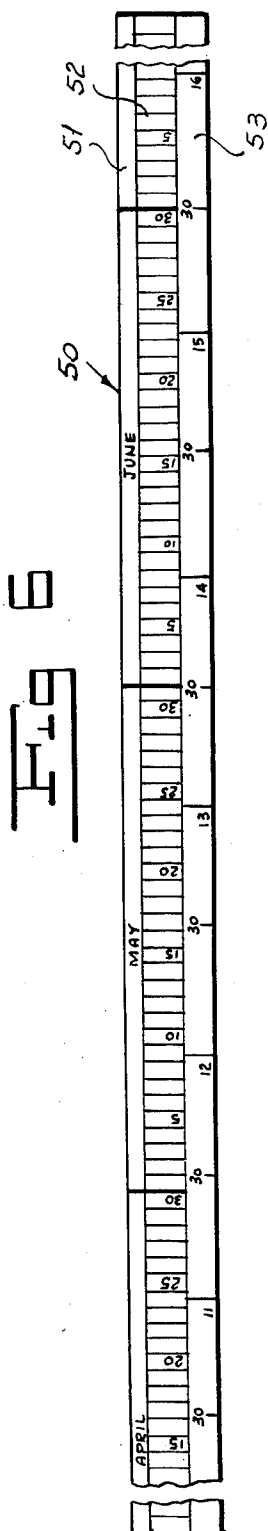
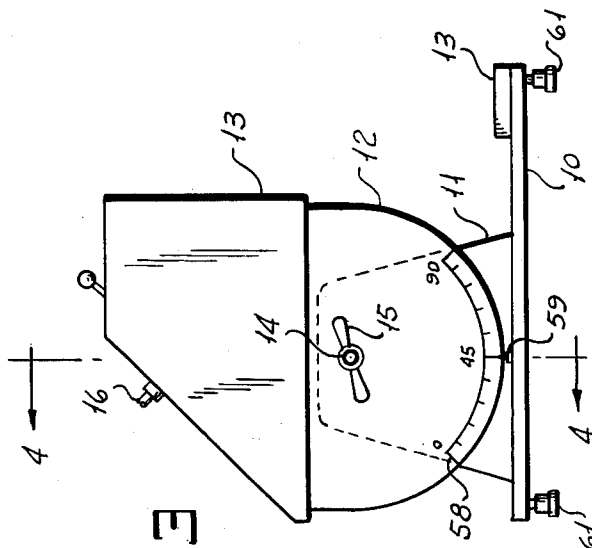
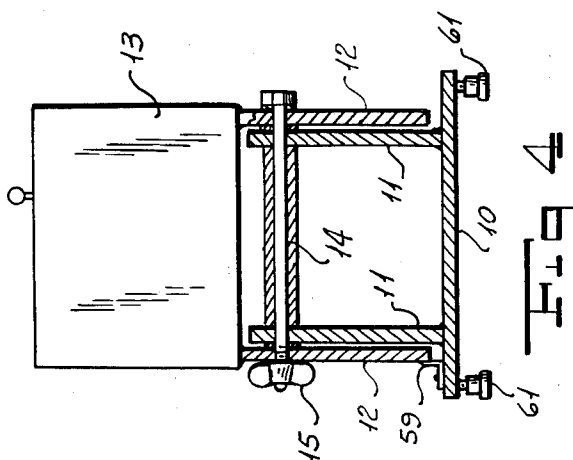
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BY
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ATTORNEY

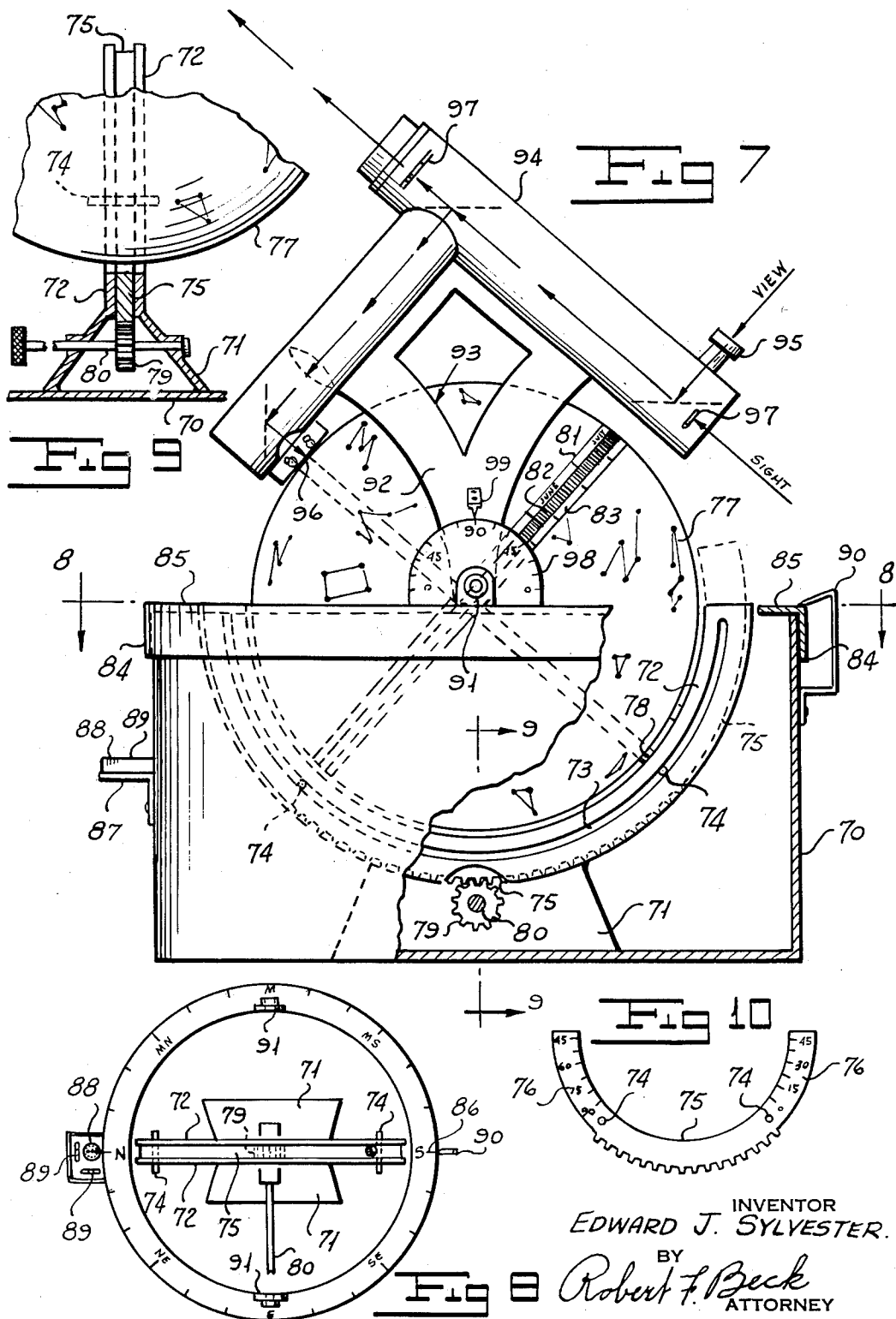
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ATTORNEY

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ASTRONOMICAL INSTRUMENT

Edward J. Sylvester, Hackensack, N. J.

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5 Claims. (Cl. 35—43)

My invention relates to astronomy and more particularly to an instrument for identifying heavenly bodies and various locations relative thereto.

One of the objects of my invention is to provide an instrument of the foregoing described character equipped with means whereby a heavy body may be selectively viewed together with means for identifying said body.

Another object of my invention is to provide an instrument of the foregoing described character equipped with means for identifying various locations relative to heavenly bodies.

An important object of my invention is to provide an instrument of the foregoing described character which is simple in construction, durable in use, efficient in operation and economical in manufacture.

With the above and other objects in view, as will hereinafter appear, the invention consists in the combination and arrangement of parts hereinafter set forth and illustrated in the accompanying drawings from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

Referring to the drawings wherein like reference characters designate like parts throughout the several views:

Figure 1 is a top plan view of my invention.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1 with the base being removed.

Figure 3 is a longitudinal sectional view of the base.

Figure 4 is a sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a fragmentary plan view showing the dial.

Figure 6 is a fragmentary plan view of the scale band.

Figure 7 is a side elevation, partly in section, of a modified form of my invention.

Figure 8 is a sectional view taken on the line 8—8 of Figure 7 with the globe being removed for clarification.

Figure 9 is a detailed sectional view taken on the line 9—9 of Figure 7.

Figure 10 is a side view of the segment-rack disclosed in the modified form.

In practicing my invention, as illustrated in Figures 1 to 6, inclusive, of the drawings, I provide a base 10 equipped with a pair of upwardly disposed brackets 11 to which segmental ears 12 of a housing 13 are pivotally connected by means of a headed rod 14 having threaded thereon a wing nut 15 effective for clamping the ears to the brackets to maintain the housing in fixed relation with the base when tightened against the adjacent ear. The housing 13 is fashioned with top and bottom walls and an angular related side wall through which extends a shaft 16 having its outer end fixed to a globe 17 and its opposite end journaled in a bearing supported by a bracket 18 mounted within the housing, the axis of the shaft 16 constituting the axis of the globe 17 at all times. The shaft 16 is connected by clutch mechanism 19 of any suitable and ordinary construction to the drive shaft 20 of a power unit, for instance, an electric motor 21 fixed to

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the bracket 18, the motor 21 operating to revolve the globe 17 once in approximately twenty-four hours.

The shaft 16 has sleeved thereon, between the side wall of the housing and the globe 17, a substantially U-shaped yoke 23 embracing the lower portion of the globe and provided with side and cross arms 24 and 25, respectively, as clearly illustrated in Figure 1 of the drawings. The surface of the globe 17 is provided with circles 26 and 27, denoting the equator and the ecliptic, respectively, and other circles delineating latitude and longitude or declination and right ascension. The surface of the globe is also provided with suitable indicia defining the various bodies of the heavens in reverse order for a purpose hereinafter made apparent.

The free ends of the arms 24 of the yoke 23 are provided with trunnions 29 on which are journaled the side members 30 of a somewhat U-shaped frame 31. One of the arms 24 has fixed thereto a disc 32 provided with scale markings 33 while the adjacent member 30 is provided with a pointer 34. The scale markings 33 on the disc 32 are circumjacently arranged into two groups of 180° each indicative of the Northern and Southern Hemispheres, respectively, and with each group being divided into a pair of quadrants of 90° each, including minutes and seconds, for cooperation with the pointer 34 to permit precisional adjustment between the yoke 23 and the frame 31.

The disc 32 is so arranged on the yoke that the markings 0° denote the equator 26 on the globe 5 while the markings of 90° coincide with the axis of the globe at all times and which, by way of example, is 41° for use of the instrument in northern New Jersey. However, when the instrument is used in other localities in the Northern Hemisphere, it may be necessary to adjust the housing relative to the base to dispose the axis of the globe at another angle to compensate for any difference in latitude as is well understood in the art. A weight means 36 is connected to the frame 31 in a manner for counterbalancing the frame to insure ease of operation and the maintaining thereof in an adjusted position relative to the globe.

The frame 31 has mounted thereon for movement therewith a periscope 37 comprising a pair of right-angularly related tubular sections 38 and 39 which have secured within their distal ends angularly arranged mirrors 40 and 41, respectively. The opposite end of the section 38 is provided with a similar mirror 42 disposed in oblique relation with the adjacent end of the section 39. The distal end of the section 38 is provided with a sight or eye-piece 43 arranged in proximity to the mirror 40 while the coincident end of the section 39 is formed with a sight-opening 44 proximate to the surface of the globe 17 whereby that portion of the surface of the globe, adjacent the opening 44, may be readily viewed through the eye-piece 43 by reason of the arrangement and instrumentality of the mirrors 40, 41 and 42.

As heretofore stated, the surface of the globe 17 is provided with suitable indicia defining the various bodies of the heavens in reverse order, whereby, when viewed through the periscope there is presented the illusion of viewing the bodies from the surface of the earth and from within the celestial sphere. In order that the indicia may be readily discerned and clearly defined for viewing, the section 39 of the periscope has interposed therein, between the mirrors 41 and 42, a lens 45 for magnifying the indicia. Also, the section 39 has mounted thereon, adjacent the opening 44, an electric lamp 46 for illuminating the portion of the globe thereunder. The electric lamp 46 is energized by a power source 47, for example, batteries or the like, mounted on the frame 31 and controlled by a suitable switch 48. Exteriorly, the section

38 of the periscope has mounted thereon, in proximity to its ends, a pair of spaced sights 49 for sighting heavenly bodies and when thus sighted, the bodies may be readily identified by viewing the globe through the periscope, it being understood that the position of the bodies depicted on the globe and viewed through the periscope coincides with the position of the bodies in the heavens when viewed through the sights.

The shaft 16, between the nadiral portion of the globe 17 and the yoke 23, has fixed thereto a cylindrical scale dial 50 for indicating positions of the globe relative to the bodies in the heavens, the scale dial comprising a band having a ternary of scales 51, 52 and 53, respectively. The scale 51 is divided into twelve zones indicating the twelve months of the year while the scale 52 is calibrated to denote the days of the months, respectively, with the time of each day being pre-established at 9:00 p. m. as a norm. The scale 53 is graduated in a manner to indicate, for use in the Northern Hemisphere, right ascension (R. A.) hours which are each divided into five minute intervals, it being understood that each right ascension hour is equal to 15° rotation of the dial 50 with one-half month of right ascension time being equal to one hour of clock or Greenwich time. The top wall of the housing has fixed thereto a pointer 55 for cooperation with scales on the dial 50 for indicating setting positions of the globe 17 at various periods in accord with the positions of the bodies in the heavens while the cross arm 25 of the yoke 23 has fixed thereupon a dual pointer or indicator 56 for use in setting the yoke relative to the globe and housing for a purpose hereinafter more fully disclosed. The ears 12 of the housing 13 each constitute a segmental scale plate 58 divided into 90 degrees for cooperation with an indicator 59 on the base whereby to denote the angularity of the shaft 16.

To condition the instrument for use, for instance, in northern New Jersey, it is leveled by adjusting the feet 61 on the base 10 relative to its support in accordance with the indications of the levels 62 mounted in a case 63 on the base and then moving the instrument relative to the support in a manner to aim or extend the axis of the globe 17 towards the north star, Polaris, by aligning the needle of the compass 64 in the case 63 when in its north denoting position, with an axis mark 65 provided on the base and also, as a matter of course, with the pointer 55. When the instrument is thus adjusted, the yoke 23 is rotated about the shaft 16 to align the indicators 55 and 56, one above the other, and the frame 31 moved relative to the yoke 23 to position the pointer 34 as denoting 90° on the disc 32, thereby, arranging the periscope for initial operation.

To permit the user to view various bodies in the heavens and identify the same, assuming that the instrument has been conditioned for use in the foregoing described manner, that it is located in the Northern Hemisphere and arranged in the open with a full view of the sky at night on May 10th, at 8:00 p. m., that the axis of the globe extends at an angle of 41° for use in the aforementioned area, and that shaft 16 is disconnected from the power unit 21 to permit free rotation of the dial 50, the globe is rotated to position the dial 50 in a manner wherein the pointer 55 indicates the tenth day position on the scale 52 and when so positioned it will be indicative of 9:00 p. m., May 10th, and also 12 H. 5' (approximately) R. A., on scale 53. The dial 50 is then clockwise rotated to a position wherein the pointer 55 denotes 11 H. 5' R. A., on the scale 53 and which is the position of the globe at 8:00 p. m. on May 10th, whereupon the shaft 16 is connected to the power unit by operation of the clutch mechanism 19 and the globe rotated by the unit 21 in substantial unison with the earth thereby enabling the user to sight various bodies through the sights 49 and identify them on the globe 17 by the use of the periscope 37.

In many instances, a particular heavenly body may be

readily located, for example, the star Dubhe of the group Ursa Majoris, and which star is located, according to a table for citing mean places of stars, at 11 H., 0' 36" of R. A., and plus 62° 1' 36" declination. In this exemplification—assuming it is 8:00 p. m., May 10th and the globe 17 has been set in the aforementioned manner—the yoke 23 is rotated relative to the housing to position the indicator 56 as denoting 11 H., 0' 36" R. A., on the scale 53 and the frame 30 pivoted on the yoke to position the pointer 34 as indicating plus 62° 1' 36" on the disc 32, whereby, the user looking through the sights 49 will view the star Dubhe and by peering into the periscope 37 will view the indicia denoting this star on the globe 17. This operation of the instrument is especially useful when it is desired to view a certain star in the heavens which is not listed in the table but appears on the globe with others of a known group with at least one of the others being suitably identified in the table. In this instance, the group on the globe is located by means of one of the other stars listed in the table and when so located it is scanned, through the periscope, until the certain star is thus located on the globe whereupon it may be then actually viewed in the heavens through the sights. Furthermore, my invention may be readily utilized for other purposes relating to astronomy, for instance, the ascertainment of latitude and longitude in conjunction with either the stars or the sun for reckoning positions upon relative adjustment of the various components in accord with the herein disclosed scales and/or modifications thereof as the case may be. Obviously, the various settings and calculations referred to herein are in many instances only approximately accurate, for example, while the earth makes a complete revolution in 23 hours 56 minutes, the globe 17, as disclosed herein, requires 24 hours to make a complete revolution. Thus any minor differential with respect to accuracy is occasioned by the extremely simple construction of my invention as it is not believed to be practical to construct an instrument having a high degree of accuracy without it being of an extremely complex construction and exorbitant cost.

In the modified form of my invention, as disclosed in Figures 7 to 10 of the drawings, I provide a cylindrical casing 70 in which is mounted a base 71 having attached thereto a pair of spaced semi-circular tracks 72 formed with aligned slots 73 through which extend a pair of spaced guide pins 74 for operation therein. Disposed between the tracks 72 is a segment-rack 75 of gearing through which the pins 74 extend. The rack is provided on the intermediate section of its outer circumferential face with the usual teeth and on the sides of its end sections with suitable scale markings 76. The markings 76 cooperate with the end faces of the tracks 72 to denote the angularity of the axis of the globe 77 which has its nadiral portion positioned within the confines of the tracks 72 as clearly illustrated in Figure 6 of the drawings.

The globe 77 is rotatably mounted on a shaft 78 which is fixed to the rack 75 in any convenient manner, the teeth of the rack meshing with the teeth of a pinion 79 of the aforementioned gearing. The pinion 79 is fixed to a shaft 80 journaled in the base 71 and extending outwardly through the casing 70 and adapted to be provided with a finger knob for rotating the shaft 80 to cause angular displacement of the shaft 78 through the medium of the gearing.

The globe 77 is provided with the usual equator defined by a band having a ternary of scales 81, 82 and 83 which correspond to the scales 51, 52 and 53, respectively, heretofore disclosed. The casing 70 has rotatably mounted thereon a ring 84 provided with a substantially horizontally disposed flange 85 extending over the rim of the casing and spaced therefrom a sufficient distance to permit movement of the end sections of the rack 75 therebetween.

The flange is provided with a scale 86 denoting points

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of the compass with the positions east and west being diametrically reversed as clearly illustrated in Figure 8 of the drawings. The casing 70 is provided with a bracket 87 on which is mounted a case containing a compass 88 and levels 89 corresponding to those disclosed in the preferred embodiment. Diametrically opposite to the compass 88, the casing is equipped with a pointer 90 for cooperation with the scale 86 for a purpose hereinafter made apparent.

The flange 85 of the ring 84 is provided with a pair of upwardly extending ears 91 to which are pivoted the side arms 92 of a frame 93, the latter corresponding somewhat to the frame 30 and having mounted thereon a substantially identical periscope 94 equipped with the eye-piece 95, sight opening 96 and the sights 97. One of the ears has fixed thereto a sectoral elevational scale 98 divided into a pair of connected sectors each calibrated to 90° with their line of jointure being indicative of 90°. One of the arms 92 of the frame is provided with a suitable indicator 99 for cooperation with the scale 98 to indicate the angularity of the periscope relative to horizontality.

In conditioning the modified form of the instrument for use, for instance, in northern New Jersey, the casing 70 is leveled through the medium of the levels 89 and located in a manner wherein the compass 88 indicates north, whereupon, the ring 84 is rotated on the casing to a position wherein the pointer 90 indicates due south on the scale 86. When the ring is thus adjusted, frame 93 is pivoted relative to the ring 84 to dispose the periscope 94 in a manner whereby the scales 81, 82 and 83 are discernible through the eye-piece and the globe 77 subsequently rotated on the shaft 78 to bring the desired month, day and hour, as shown on the scales 81, 82 and 83 through the opening 96, into view in the periscope. Having obtained this setting, the ring 84 is again rotated to a position wherein the pointer 90 denotes due north on the scale 86 and the frame pivoted, relative to the ring, to position the sights 97 in aligned relation with the North Star. Inasmuch as the axis of the globe or shaft 78 is initially and arbitrarily set at an angle of 45°, the shaft 80 is rotated to dispose the axis of the globe 77 at an angle of 41° for said use in northern New Jersey. When the foregoing components of the instrument are thus adjusted, the ring and frame are moved relative to each other and/or the casing to align any desirable body in the heavens within the sights, whereupon, by viewing the globe through the periscope the body may be identified on the globe, the latter being substantially identical with the globe 17 and provided with the usual ecliptical band and the aforementioned body-identifying indicia or astrography in reverse order.

Without further elaboration, the foregoing will so fully explain the invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service. Moreover, it is not indispensable that all the features of the invention be used conjointly since they may be employed advantageously in various combinations and subcombinations.

It is obvious that the invention is not confined solely to the use herein disclosed in connection therewith as it

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may be utilized for any purpose to which it is adaptable. It is therefore to be understood that the invention is not limited to the specific construction as illustrated and described, as the same is only illustrative of the principles involved which are capable of extended application in various forms, and the invention comprehends all construction within the scope of the appended claims.

What I claim is:

1. In an instrument of the class described, a globe provided with astrography in reverse order, a periscope disposed circumjacent said globe for viewing said astrography and equipped with sights for sighting a body in the heavens, said periscope being adjustable relative to the globe to identify said body on said globe by said astrography when said body is viewed through said sights.

2. In an instrument of the class described, a base, a globe mounted on said base and provided with astrography in reverse order, a periscope for viewing said astrography and equipped with sights for sighting a body in the heavens, said periscope being adjustable relative to the globe to identify said body on said globe by said astrography when said body is viewed through said sights.

3. In an instrument of the class described, a base, a globe mounted on said base and provided with astrography in reverse order, a periscope for viewing said astrography and equipped with sights for sighting a body in the heavens, said periscope being adjustable relative to the globe to identify said body on said globe by said astrography when said body is viewed through said sights, said globe being adjustable relative to said base to conform to a pre-established sighting time.

4. In an instrument of the class described, a base, a globe mounted on said base and provided with astrography in reverse order, a periscope for viewing said astrography and equipped with sights for sighting a body in the heavens, said periscope being adjustable relative to the globe to identify said body on said globe by said astrography when said body is viewed through said sights, said globe being angularly adjustable and rotatable relative to said base to conform to a pre-established sighting time, and power means for effecting rotation of said globe in accord with changes in said sighting time.

5. In an instrument of the class described, a base, a shaft, a globe rotatably mounted on said shaft and provided with astrography in reverse order, a yoke sleeved on said shaft, a frame pivoted to said yoke, a periscope mounted on said frame for viewing said astrography and equipped with sights for sighting a body in the heavens, said frame being adjustable relative to said yoke and said shaft to dispose said periscope in position whereby said body may be identified on said globe through said periscope by said astrography when said body is viewed through said sights, adjustable means connecting said shaft to said base to permit varying the inclination of said shaft and thus position said globe to accord with a predetermined location relative to the heavens, and power means effective for rotating said globe to accord with the rotation of the earth.

No references cited.