No. 641,540. **Patented Jan. 16, 1900.**

I. F. PHEILS.

GEOGRAPHICAL CLOCK.

(Application filed Sept. 29, 1898.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

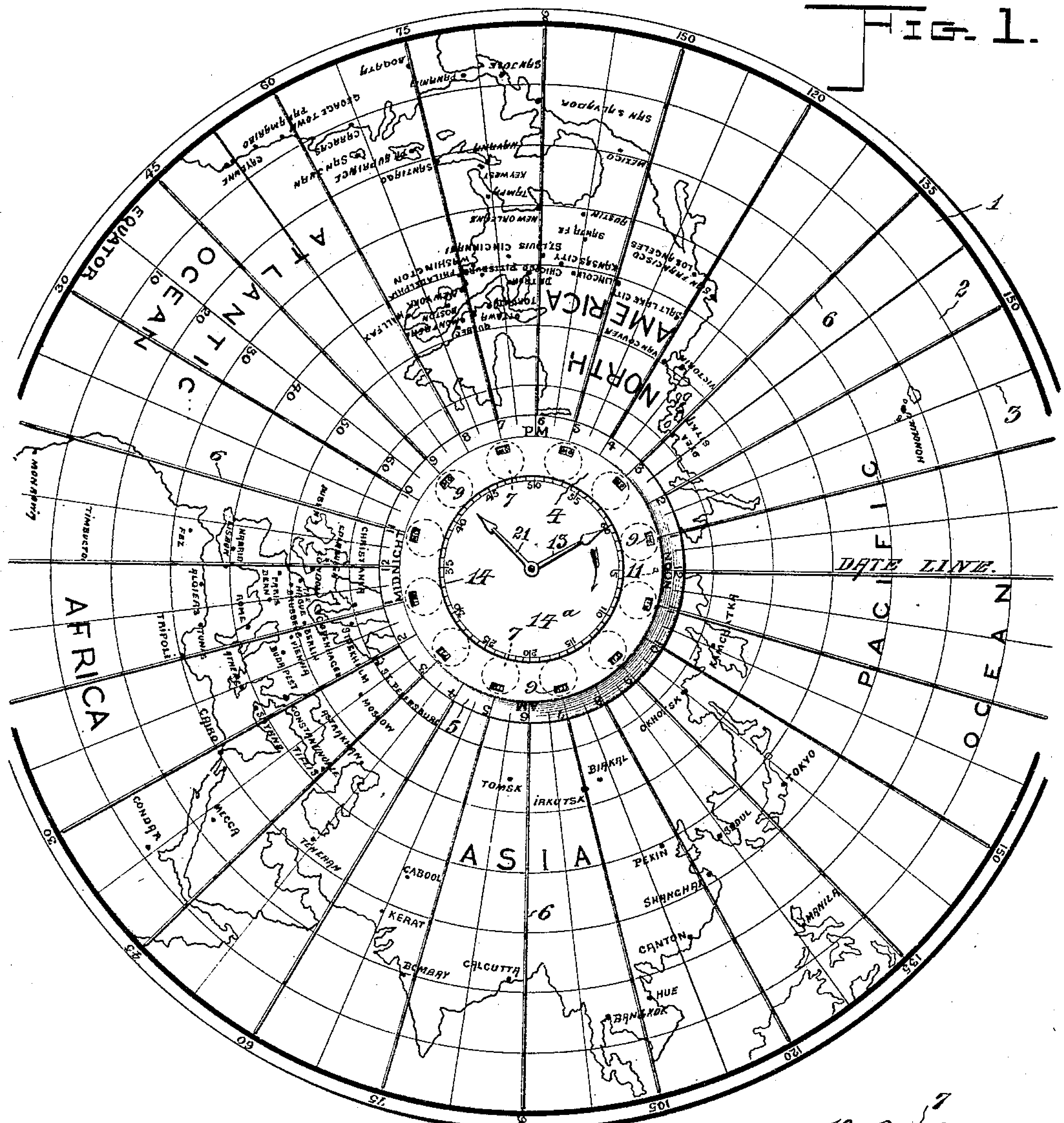


FIG. 2.

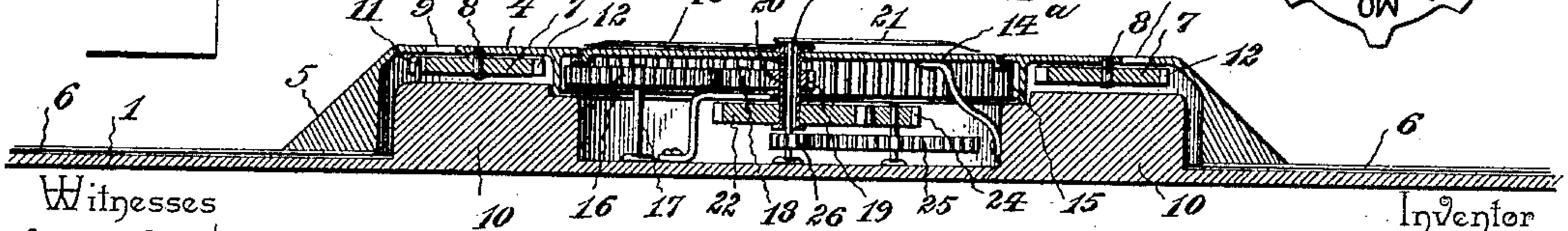
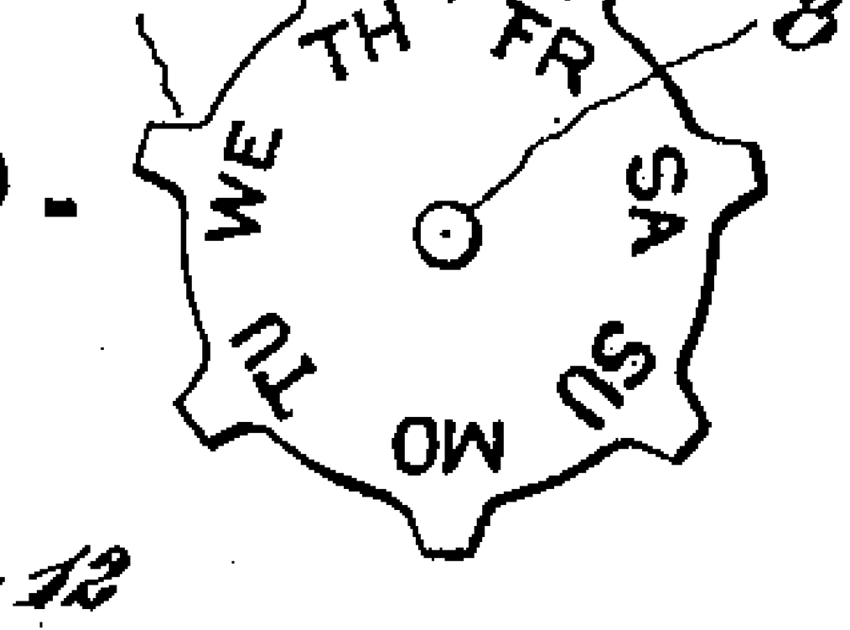


FIG. 3.



Witnesses

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FIG. 4.

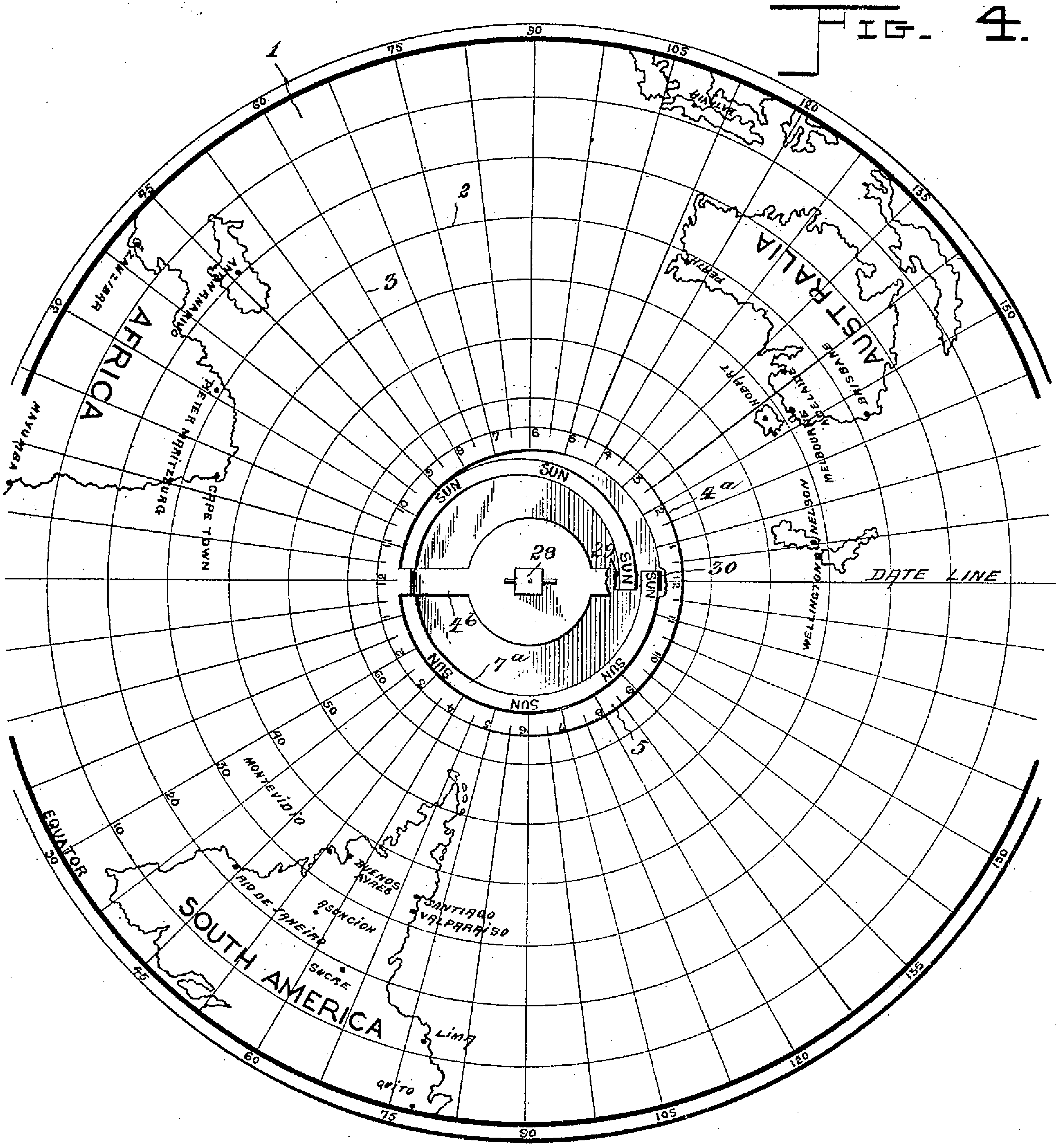
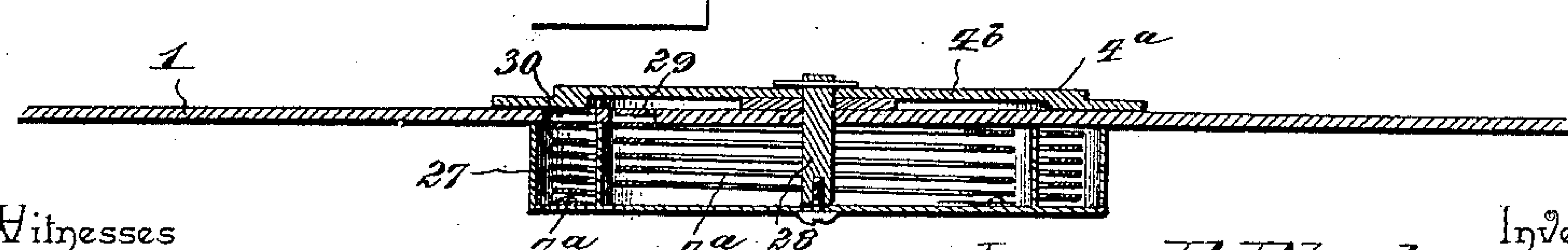


FIG 5



Witnesses

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UNITED STATES PATENT OFFICE.

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GEOGRAPHICAL CLOCK.

SPECIFICATION forming part of Letters Patent No. 641,540, dated January 16, 1900.

Application filed September 29, 1898. Serial No. 692,229. (No model.)

To all whom it may concern:

Be it known that I, ISAAC F. PHEILS, a citizen of the United States, residing at Woodville, in the county of Sandusky and State of Ohio, have invented a new and useful Universal Time-Indicator, of which the following is a specification.

My invention relates to time-indicators, and particularly to an apparatus adapted for determining the relative times between places at different points upon the earth's surface and also for obtaining the absolute time at a given place when that at another point is known.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a plan view of an apparatus constructed in accordance with my invention. Fig. 2 is a sectional view of the same. Fig. 3 is a detail view of one of the day-indicators. Fig. 4 is a plan view of a slightly-modified construction of indicator. Fig. 5 is a sectional view of the same.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

The device embodying my invention is adapted for use in connection with either a geographical globe or a representation in plan of either the northern or the southern hemisphere; but for the purposes of illustration it will be sufficient to show the same in connection with a flat base or disk 1, upon which is a representation of one of the hemispheres, with the parallels of latitude 2 and meridians of longitude 3 suitably indicated. Also represented upon the surface of the base or disk is a "date-line" which, as is well known, is the imaginary line, corresponding with the one hundred and eightieth meridian, occurring in the Pacific ocean, from which the change between the days is calculated, as the time twelve o'clock noon is calculated from the meridian of Greenwich.

In connection with the base or disk is a dial 4, mounted for rotary movement concentrically with the disk or base 1 and provided with a peripheral scale 5 of hours, preferably arranged upon a beveled edge of the dial, whereby the graduations thereof are directly comparable with the meridian-lines of the disk. This dial forms the hub or center of a spider, of which the radiating arms or rods 6 are adapted to lie respectively upon the meridian-lines of the disk or to occupy any desired positions between said meridian-lines, said arms springing from the dial 4, respectively, in the planes of the graduations of the latter. Thus by placing the twelve o'clock midnight of the dial to correspond with the meridian of Greenwich it will be seen that the times at the various meridians will be designated by reference to the dial, it being noon on the one hundred and eightieth meridian or date-line, &c.; also, by turning the dial to arrange one or the other of the arms thereof or to arrange one or the other of the graduations of said dial in line with a given city or place represented upon the disk, thus assuming that it is a given time in such place, it may be ascertained by comparison with time at any other place upon the surface of the disk by referring to the graduation of the dial which is radially opposite the selected point of the disk. Inasmuch, however, as the transit from one day to the next makes it necessary in calculating differences in times to know whether the resulting time is ahead or behind that which is assumed, or, in other words, is of the day ahead or the day behind, I have found it desirable to employ day-registers 7, consisting of disks pivoted, as at 8, upon the dial 4, preferably in the interior or cavity of the latter, said dial being hollow for this purpose. These disks 7 are capable of a number of positions corresponding with the number of days of the week and are inscribed to designate the several days of the week successively, as shown clearly in Fig. 3, only one of the day characters being exposed through an inspection-opening 9, formed in the upper wall of the dial, as shown in Fig. 1. In a fixed position, as upon an enlargement 10 of the disk or base 1, is arranged an operating-pin 11, adapted for contact successively by spurs 12, arranged peripherally upon the day-registers 7, and as the dial 4 is turned in either direction these peripheral spurs of the day-registers come in contact with the stationary op-

erating-pin 11, and at each contact of a spur with said pin the register is turned to expose the next successive day of the week. For instance, if the dial is turned in the direction indicated by the arrow in Fig. 1 to cause the rods or arms 6 to sweep across the surface of the disk from east to west, thereby corresponding with the diurnal movement of the earth's surface from west to east, each day-register as it reaches the operating-pin 11 will be turned to expose the next successive day in the regular order of progress of the week. Thus by placing the pin 11 at the date-line or at that point upon the surface of the disk which, being regulated by the meridian at Greenwich, represents that point at which one day merges into another at twelve o'clock midnight it will be seen that as the day-registers successively reach the date-line they receive a step-by-step motion which successively exposes the characters representing the days of the week in their regular order. Assuming that twelve o'clock midnight of the dial is alined with the date-line and that it is Monday, with all of the day-registers exposing the character representing Monday through the inspection-opening 9, any movement of the dial in the direction of the arrow shown in Fig. 1 will cause the first day-register in rear of the point twelve o'clock midnight of the dial to be turned to Tuesday, thus indicating that upon the portion of the earth's surface between the meridian occupied by twelve o'clock midnight of the dial and the date-line it is Tuesday, while throughout the rest of the surface of the earth it is still Monday. Thus when twelve o'clock midnight of the dial reaches the opposite position of the date-line or is upon the meridian at Greenwich throughout one-half of the earth's surface it is Tuesday—namely, as shown in Fig. 1, from the date-line around toward the west to the meridian of Greenwich and covering that portion of the earth's surface which includes a portion of Africa—while throughout the remainder of the earth's surface or to the west of the twelve o'clock midnight character of the dial and including that portion of the surface of the disk upon which the Americas are represented it is still Monday. The time at the seventy-fifth meridian, or that nearest to Washington, is seven o'clock p. m. on Monday, while the time at St. Petersburg, which is approximately upon the thirtieth meridian east, is two o'clock a. m., Tuesday. In this way the actual or relative times at different points upon the earth's surface or such of those as are represented upon the base or disk 1 may be ascertained, the adjustment of the day-registers being automatic and corresponding accurately with the position of the dial. It will be seen that said day-registers will turn in either direction to correspond with the position of the dial and that movement of the dial in either direction will not cause disarrangement of said registers. Suppose, for instance, with the parts in the position indicated in Fig. 1, it is desired to ascertain the time and day at Washington when it is twelve o'clock midnight on Monday at St. Petersburg, Russia. It is simply necessary to turn the dial back or in the opposite direction to that indicated by the arrow in Fig. 1 until the arm or rod at the twelve-o'clock midnight character of the dial rests over the meridian at St. Petersburg, or that nearest thereto—as, for instance, the thirtieth meridian—and then turn to Washington and follow the nearest meridian to the dial. This will indicate that when twelve o'clock midnight on Monday at St. Petersburg it is five o'clock in the afternoon of Monday at Washington, and it is also Monday, approximately, at 11.30 p. m. at Honolulu, while at Irkutsk it is five o'clock a. m. on Tuesday. It is frequently desirable, however, for accuracy to be able to ascertain more closely than by days and hours the difference in times or the absolute time, and hence in connection with the above-described mechanism I have shown a minute index or pointer 13, which is movable independently of the dial and is adapted to complete one revolution, representing sixty minutes, as referred to the scale 14 on stationary disk 14^a, while the dial moves throughthe angular interval of fifteen degrees represented by the distance between the one hundred and fiftieth and one hundred and sixty-fifth meridians, &c. The means employed for accomplishing this movement of the minute index or pointer does not constitute an important feature of my invention, inasmuch as various modifications thereof may be adopted; but in the construction illustrated a circular rack 15 is carried by the dial, preferably depending from the upper wall thereof, and meshes with a gear 16, mounted upon a fixed spindle 17. The gear 16 communicates motion through an idler 18 to a pinion 19, which is fixed to the spindle 20 of the minute-index. Also when it is desired to reduce the time to seconds an auxiliary or second index 21 may be employed, and the means for operating the same may consist of a gear 22, carried by the spindle 20 of the minute-index, said spindle being preferably tubular to allow the spindle 23 of the second index to pass therethrough, a pinion 24 meshing with the gear 22 and having its spindle provided with a gear 25 and a pinion 26 meshing with the gear 25 and fixed to the spindle 23. Obviously the relative number of teeth in the several gears should be regulated to secure the desired relative angular movements of the index or pointers. With this construction and arrangement of parts it is possible to arrange the spider with one of its arms or rods 6 in any desired position upon the surface of the disk to indicate the desired point, such as a city or other geographical location, and then by reference to the dial ascertain ac-

curately the time at that place, the indexes or pointers 13 and 21 giving the minute and second.

In Figs. 4 and 5 I have illustrated a modification of the apparatus embodying my invention, corresponding in general features with that above described, but having a day-register of a different form. Referring to Figs. 4 and 5, 4^a represents the dial, which consists of a ring open at its center and provided with a diametrical arm 4^b, and 7^a represents a spiral strip constituting the day-register, of which the body portion is arranged in a casing 27, carried by and revoluble with the dial 4^a, by means of a central post 28, with the extremities of said strip attached to the casing or otherwise connected with the dial, so as to be operated thereby. At an intermediate point constituting a complete circle the strip 7^a is exposed, the two sides of the loop formed thereby extending through the guide-openings 29 and 30, located adjacent to the date-line, as marked upon the disk or base. As the dial is turned to bring the different portions of its rim in the plane of different meridians the strip 7^a coils out of the casing at one side and into the same at the other. This strip is provided with characters representing the days of the week, arranged at intervals, enough of each character being provided whereby when all are exposed the entire circle will be filled to represent when twelve o'clock midnight of the dial is upon the date-line that it is the same day throughout the world. As the dial is moved from this position with twelve o'clock midnight upon the date-line the portion of the strip representing the succeeding day will appear, while that portion representing the last day will begin to disappear, and this relative motion will continue until the last day has entirely disappeared, at which time twelve o'clock midnight of the dial will have made the complete circuit of its course and will have reached again its position upon the date-line.

It will be understood from the foregoing description that various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. A time-indicator having a stationary disk provided with a field containing a superficial geographical representation including radiating meridian-lines and an international date-line, an annular time-dial revolubly mounted at the center of said disk with its axis at the point from which said meridian-lines radiate, and provided with a scale of time characters adapted for respective registration with the meridian-lines, and a fractional-time-indicating device mounted within the space encircled by the time-dial and concentric therewith for indicating the fractions of the periods represented upon the time-dial, said fractional-time-indicating device having a movable element operatively connected with for actuation by the time-dial, substantially as specified.

2. A time-indicator having a stationary disk provided with a field containing a superficial geographical representation including radiating meridian-lines and an international date-line, an annular time-dial revolubly mounted at the center of said disk in an opening of the field with its axis at the point from which said meridian-lines radiate, and provided with a scale of time characters adapted for respective registration with the meridian-lines, arms radiating from the time-dial and terminating at the periphery of the field for arrangement in coincidence with the radial planes of points representing geographical locations upon the surface of the disk, and a fractional-time-indicating device mounted within the space encircled by the time-dial for indicating the fractions of the periods of time represented upon the time-dial, said fractional-time-indicating device having a movable element operatively connected with for actuation by the time-dial, substantially as specified.

3. A time-indicator having a stationary base provided with a field containing a superficial geographical representation including meridian-lines and an international date-line, a revoluble time-dial mounted with its axis at the point from which said meridian-lines radiate, and provided with a time-scale including characters for registration with said meridian-lines, and an adjustable day-register actuated by said dial, and having an annular series of characters representing days of the week arranged at intervals around the axis of the time-dial, the change from one day to the next occurring at said date-line, substantially as specified.

4. A time-indicator having a stationary base provided with a superficial geographical representation including meridian-lines and an international date-line, a time-dial revolubly mounted upon the base with its axis at the point from which said meridian-lines radiate, day-registers consisting of revoluble disks mounted upon and carried by the dial, and a stationary pin carried by the base on said date-line, for contact with spaced spurs on the registers, to impart a step-by-step movement in one direction to the registers as they cross said date-line, substantially as specified.

5. A time-indicator having a base provided with a superficial geographical representation, a time-dial revolubly mounted upon the base and having time characters for registration with meridian-lines of said geographical representation, day-indicating devices consisting of independently-revoluble disks actuated by said time-dial, and auxiliary time-indicating devices, concentric with and actuated by said time-dial, for indicating frac-

tions of time, and including a pointer traversing a stationary time-scale, substantially as specified.

6. The herein-described time-indicator having a base provided with a superficial geographical representation including radiating meridian-lines and an international date-line, a revoluble time-dial mounted upon the base with its axis at the point from which the meridian-lines radiate, said time-dial having its body portion elevated above the plane of the base and provided with peripheral beveled surfaces inscribed to represent divisions of time for registration with the meridian-lines of the base, a time-indicating device having a fixed time-scale arranged in a central opening of the time-dial, and indexes or pointers mounted coaxially with the time-dial for traversing said time-scale, day-registers consisting of disks revolubly mounted upon the under surface of the time-dial, a fixed pin arranged in the plane of said date-line and adapted for successive engagement by peripheral spurs on said day-register disks, and gearing for communicating motion from the time-dial to the spindles of said indexes or pointers, substantially as specified.

7. The herein-described time-indicator having a base provided with a superficial geographical representation including radiating meridian-lines and an international date-line, a revoluble time-dial mounted upon the base with its axis at the point from which the meridian-lines radiate, said time-dial having its body portion elevated above the plane of the base and provided with peripheral beveled surfaces inscribed to represent divisions of time for registration with the meridian-lines of the base, a time-indicating device having a fixed time-scale arranged in a central opening of the time-dial, and indexes or pointers mounted coaxially with the time-dial for traversing said time-scale, day-registers consisting of disks revolubly mounted upon the under surface of the time-dial, a fixed pin arranged in the plane of said date-line and adapted for successive engagement by peripheral spurs on said day-register disks, and gearing for communicating motion from the time-dial to the spindles of said indexes or pointers, the same including an annular master-gear carried by the time-dial, intermediate gears between said master-gear, and a pinion on the spindle of one of the indexes or pointers, and speed-multiplying gearing connecting the spindles of the pointers, substantially as specified.

8. A time-indicator, comprising a stationary body and a revoluble body, one of said bodies being provided with a geographical representation including meridian-lines, the other body being provided with a time-scale, a plurality of disks mounted on one of said bodies in a concealed manner with the exception of a small portion of each, each of said disks being provided with a series of characters representing the days of the week only one of which characters is exposed on each disk, and means to successively expose said characters.

9. A time-indicator, comprising a body having a superficial geographical representation including meridian-lines, a second body mounted at a point of said first body from which said meridian-lines radiate and provided with a time-scale, one of said bodies being revoluble, a plurality of disks mounted on one of said bodies in a concealed manner with the exception of a small portion of each, each of said disks being provided with a series of characters representing the days of the week only one of which characters is exposed on each disk, and means to successively expose said characters.

10. A time-indicator, comprising a stationary body having a superficial geographical representation including merdian-lines, a disk mounted at a point of said first body from which said meridian-lines radiate said disk being provided with a time-scale and with characters adapted to register with said meridian-lines, means to rotate said disk, a plurality of disks mounted beneath said time-scale disk which is provided with a corresponding number of slots therethrough, each of said last-named disks being provided with a series of characters representing the days of the week one of which characters is always exposed through the corresponding opening, and means to rotate said last-named disks whereby the said day-indicating characters are successively exposed through said openings.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ISAAC F. PHEILS.

Witnesses:
LENA MILLER,
C. C. LAYMAN.