S. W. BALCH.
GEOGRAPHICAL CLOCK.
APPLICATION FILED JUNE 29, 1918.

1,378,085. Patented May 17, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

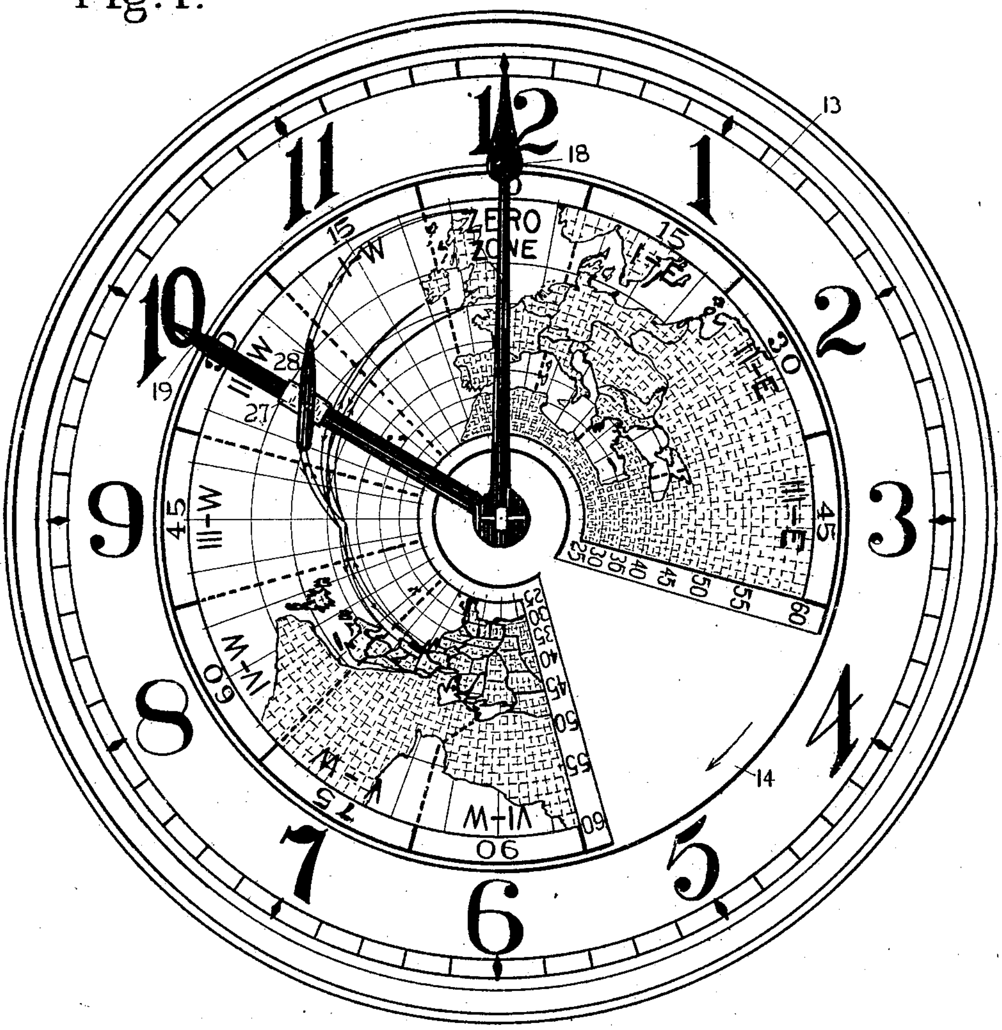

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Fig. 2.

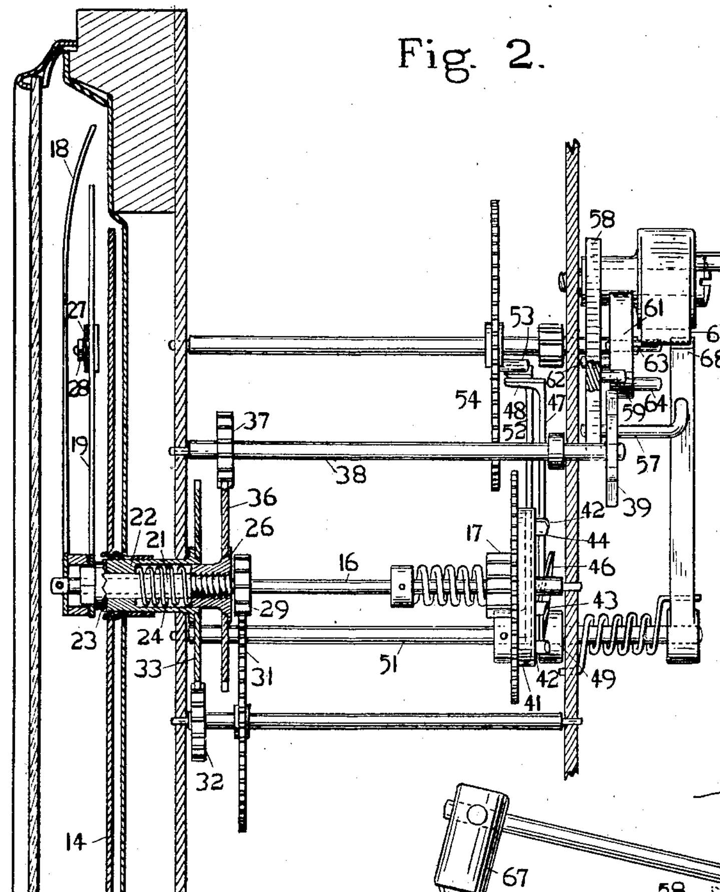
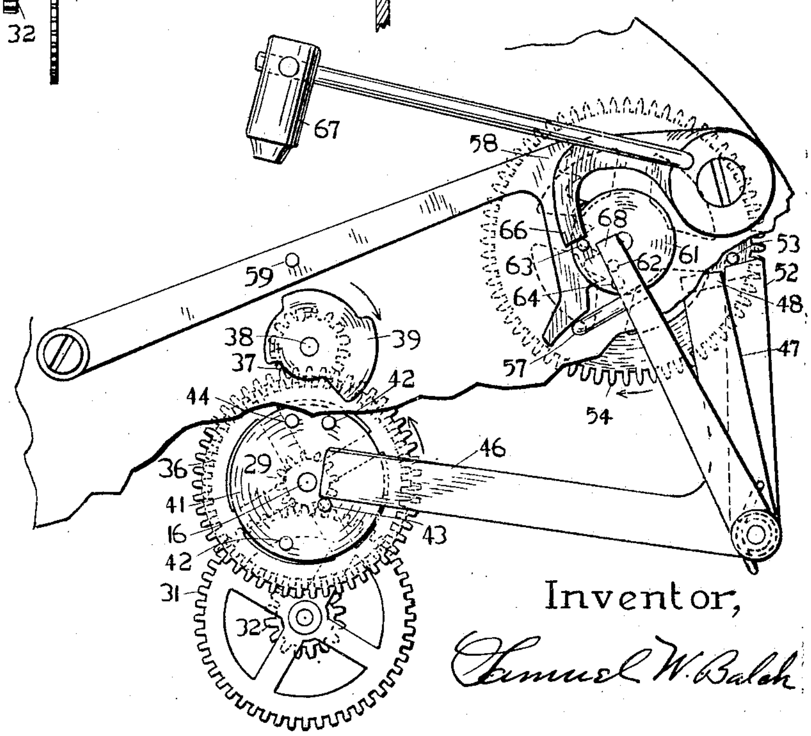


Fig. 3.



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UNITED STATES PATENT OFFICE.

SAMUEL W. BALCH, OF MONTCLAIR, NEW JERSEY.

GEOGRAPHICAL CLOCK.

1,378,085. Specification of Letters Patent. Patented May 17, 1921.

Application filed June 29, 1918. Serial No. 242,564.

To all whom it may concern:

Be it known that I, SAMUEL W. BALCH, a citizen of the United States of America, and a resident of Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Geographical Clocks, of which the following is a specification.

An object of this invention is to provide a clock for ships and other vehicles, and particularly for those which observe standard times. A further object is to combine with the clock and drive from the clock mechanism a disk bearing a map which includes the course traversed by the ship or vehicle. A further object is to so project the map of a course on the northern hemisphere of the earth that positions having different times may be concurrently brought adjacent to the hour indications of the times which belong to them with the hour indications located in the usual clockwise direction around the dial. A further object is to so project a map embracing any portion of the surface of the earth so as to meet these conditions in association with a dial having twelve hour subdivisions in its circumference, and on which the hands mark time in their usual positions. A further object is to provide a clock in which the hour hand is carried by the clock-driven disk and capable of adjustment thereon by the navigating officer to the several hour positions as he finds that the ship is crossing from one time zone to another. A further object is to provide a clock which will show the time zone for which it is set and the difference between the time which it is marking and Greenwich mean time. A further object is to provide a clock in which the operation of setting the clock to the time of the time zone also sets a marker on the map to show the time zone in which the ship is located, and to provide a marker which will in addition show the latitude and direction of travel. A further object is to provide a connection between the hour hand and the striking mechanism so that with any shifting of this hand the strike indication will be altered to correspond to the hour while features of the strike which distinguish between the hour and fractions thereof will not be disturbed.

In the accompanying two sheets of drawings which form a part of this application—

Figure 1 shows the face of a clock embodying this invention,

Fig. 2 is a vertical section through the center arbor of the works, and

Fig. 3 is a rear view of the works with the rear plate broken away, the striking mechanism being in the position when the striking has completed at an hour point.

A fixed dial 13 carries the usual twelve hour designations in the customary spacing and direction. In front of and concentric with this is a map disk 14 which bears a map of such a portion of the earth's surface as may be desired, the portion selected being such as will include the usual sailing course of the ship on which the clock is carried. In projecting the map, radial lines are drawn to indicate meridians, but with an angular spacing which is double the differences in longitude that they are to denote. For example, meridian 15 degrees east and meridian 75 degrees west, while actually separated by 90 degrees, are drawn on the map 180 degrees apart. Circular arcs, preferably concentric, or nearly so are drawn for the parallels of latitude, the outer line being used to denote the most northern latitude which is to be included. By drawing lines of equal latitude difference with progressively diminishing spacing toward the center as shown, it is possible to avoid material distortion of small areas. For example, the relative east and west as compared with the north and south dimensions of Scotland are nearly correctly shown, as are also the north and south and the east and west dimensions of Spain, so that the outline of neither country is noticeably distorted and each is readily recognized, but the scale of the former is about double that of the latter.

A center arbor 16 is driven through a pinion 17 in frictional connection with the arbor from the time train. The arbor carries a minute hand 18. An hour hand 19 is carried by an hour-hand carrying sleeve 21, which has a head that seats against the end of a map-disk carrying sleeve 22, the bearing surfaces mating each with twelve radial flutes 23. Within the map-disk carrying sleeve is a spring 24 which bears against a collar 26 that is screwed onto the hour-hand carrying sleeve at the other end from the head which seats the flutes. A twelve position slip connection is thereby made between the two sleeves and between the map-disk and the hour hand which they carry. The hour hand can therefore be changed from the indication of the time of one time zone to that of another spaced one-twelfth of the circle without disturbing the position of the minute hand or map-disk as is required when the ship carrying the clock passes from one time zone to another, and such setting brings the hour hand opposite the center of the time zone in which the ship is sailing so as to show which zone time the clock is indicating.

The hour hand carries a slide 27 to which a marker 28 is pivoted so that it can be set opposite the latitude of the course of the ship and turned so as to show the direction of travel.

A gear train consisting of a pinion 29, gear 31, pinion 32 and gear 33 connects the center arbor with the map-carrying sleeve in the ratio of twelve to one. Should the clock require setting by reason of its having stopped or to take up error in its rate, this is effected by turning the minute hand and, through the gearing, the map-disk and hour hand.

The hour-hand carrying sleeve is connected through a gear 36 and pinion 37 with a snail arbor 38 which carries a snail 39 that determines the strokes at hour-distant points. If it should be desired to make a clock with the striking mechanism here detailed but without the geographical features the gears to the snail-arbor will also serve as the first two of the train which connects the center arbor to the hour-hand sleeve.

As the clock is intended for use at sea, a mechanism for striking ship's bells is shown. Such striking is from one to eight at intervals of half an hour, the even numbered strokes being at the hour points and the odd numbered strokes being at the half hour points. The series of strokes is governed by the snail and the gearing is in the ratio of one revolution of the hour-hand sleeve to three revolutions of the snail-arbor, as the series of strokes repeats at intervals of four hours. The connection between the hour hand and the snail is through positive gear connections without slip joints and independent of the clock train and of the driving connections to the map-disk so that setting of the hour hand independently of the map-disk will keep the strike in agreement with the time to which the hour hand points on the fixed dial.

On the center arbor and in fixed relation to the minute hand is a lifting cam consisting of a block 41 with two tripping pins 42, 42 diametrically opposite and equi-distant from the center, and two stop pins 43, 44 at different distances from the center. The tripping pins are positioned in relation to the minute hand so as to release a tripping lever 46 at the hour and half-hour points and the stop pins are positioned where the lever will fall on them when tripped. The lever is laterally flexible and inclined near the end so that the pins can push it to one side and pass if the clock is turned backward. It is part of a tripping element the other part of which is a spacing dog 47 which ends in a toe 48. This element has a hub 49 through which freely passes a rock shaft 51 of a locking element which includes a locking dog 52 fastened thereto which is normally in the path of a stop pin 53 in one of the wheels 54 of the strike train. Also fastened to the rock shaft is a rack-detent 57 the end of which falls under the end of a rack 58 when the striking mechanism has completed its run at an hour or half-hour point, excepting the last stroke or trip of the hammer. The rack detent engages the rack teeth successively and detains the rack while the striking is in progress. As the tripping lever approaches the end of its lift by either of the lifting pins of the lifting cam the rack-detent is lifted from under the end of the rack, thereby permitting the rack to fall until a pin 59 in the side of its arm is stopped by the snail. At the same time the toe of the spacing dog pushes the end of the locking dog out from the path of the pin in the strike train and this toe is instead shifted into the path of the pin. By making the spacing dog shorter than the locking dog the strike train is permitted to move a little if desired for the customary warning in advance of the striking. When the tripping lever falls from the tripping pin of the lifting cam the spacing dog withdraws from under the stop pin and the strike train is released as the locking dog will not follow at once and reëngage the stop pin by reason of the obstruction of the rack-detent by the rack. In this cycle by which the strike train is released, in strike mechanisms, as heretofore constructed, contact between a part of the tripping element and a part of the locking element, between a different part of the locking element and a part of the strike train, and between a different part of the tripping element and a different part of the strike train has been involved, there being the provision of six separate elements, two for each of the three contacting functions. By this construction but three elements are required, the toe of the spacing dog, the end of the locking dog, and the stop pin, each of which is involved in two of these three contacting functions.

On the projecting rear end of the arbor, preferably of the wheel of the strike train which carries the stop pin, and usually the third wheel of the strike train, is a hub 61 with a gathering pin 62 which lifts the rack teeth until the detent falls under the end of the rack and the locking dog connected therewith rocks into the path of the stop pin. This hub also carries an odd-stroke hammer-pin 63 and an even-stroke hammer-pin 64 so spaced that the even-stroke pin follows the odd-stroke pin at one quarter of a revolution and the odd-stroke pin follows the even-stroke pin at three-quarters of a revolution so as to give the double strokes characteristic of ship's bells. These pins alternately engage a hammer-tail 66 of a hammer 67 and ordinarily cause the hammer to make two strokes to each revolution and each tooth lift of the rack. The gathering pin lifts the rack concurrently with the lift of the hammer by the even-stroke pin, but on the last lift of the rack, when the detent falls under the end and the locking dog rocks into the path of the stop pin, the strike train is not at once arrested owing to the location of the stop pin sufficiently back to allow the tripping of the hammer by the even-stroke pin and continued revolution until the hammer is again lifted by the odd-stroke pin but not tripped. When this takes place at an hour point the final even stroke is sounded as the tripping lever rests against the stop pin of the lifting cam which holds the parts in such a position that the hammer is not obstructed. At a half-hour point the tripping lever falls a different distance to the stop pin of the lifting cam and an extension 68 of the rack detent forming a hammer-stop falls under the raised hammer tail and holds the hammer in its raised position while the even-stroke pin passes from under the hammer-tail without tripping and the odd-stroke pin comes under the tail and holds the hammer in readiness for the first stroke of the next hour.

What I claim, is—

1. A disk bearing a map of a portion of the earth's surface so projected that the angular spacing with respect to the center of the disk of any two portions will be double their difference in longitude, in combination with a concentric dial bearing twelve hour designations in a complete circle in consecutive order in the west to east direction of the map, the dial and disk being capable of being angularly set with respect to each other, substantially as described.

2. A clock having a fixed dial with circularly disposed hour designations, a concentrically disposed disk bearing a map and revolved by the clock mechanism, an hour hand carried by the disk and adjustable thereon, and a marker for the map carried by the hand and longitudinally and angularly adjustable thereon, substantially as described.

3. A striking clock having a fixed dial with circularly disposed hour designations, a concentric disk bearing a map, a sleeve carrying the hour hand, a sleeve carrying the map disk, a slip connection between the sleeves, means for driving the map-disk carrying sleeve from the clock train, and a connection between the hour-hand carrying sleeve and the means for determining the strike at the hour points which is independent of the map-carrying sleeve, substantially as described.

SAMUEL W. BALCH.