

No. 633,520.

Patented Sept. 19, 1899.

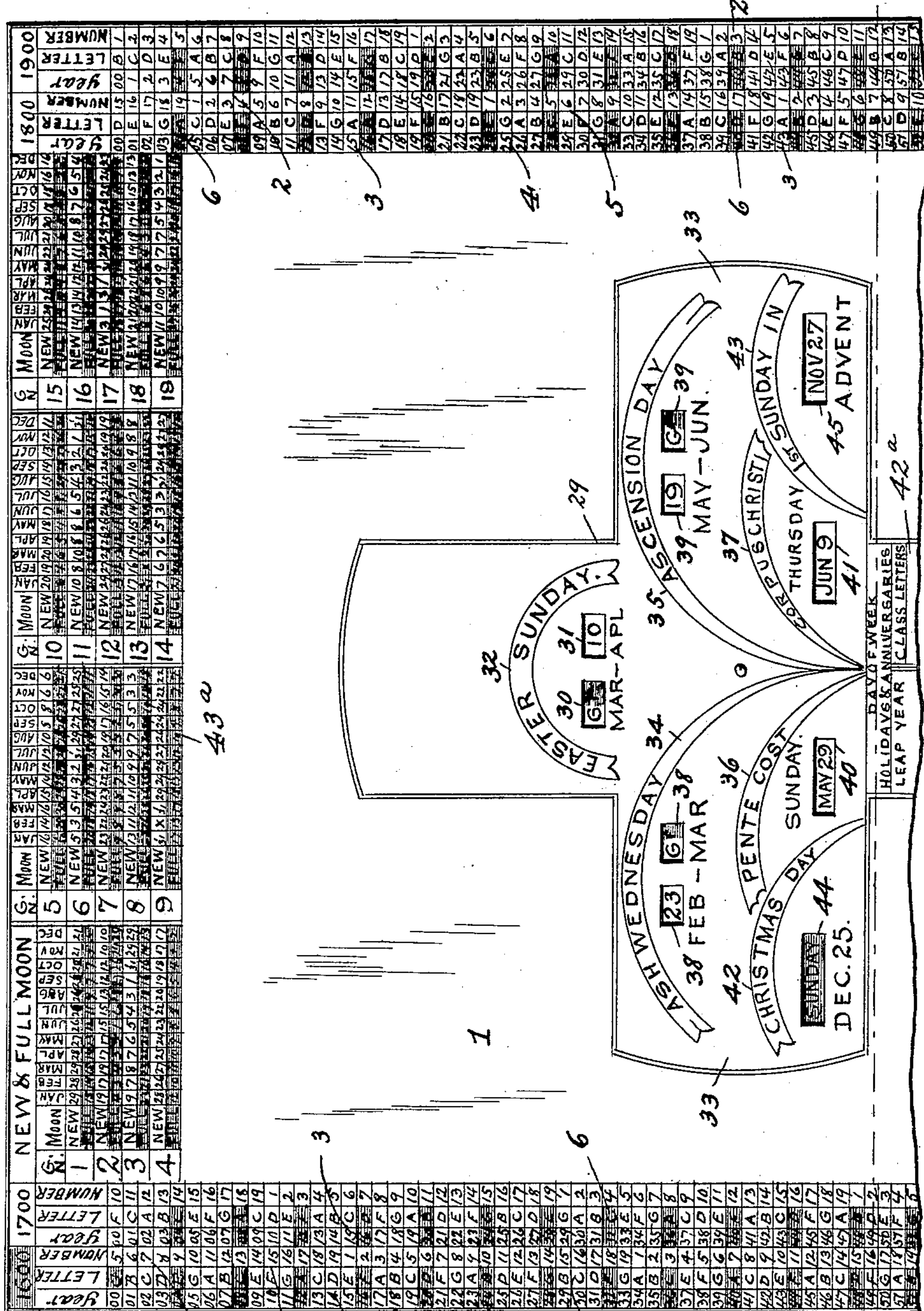
J. L. KNIGHT.  
PERPETUAL CALENDAR.

(Application filed Apr. 28, 1898.)

(No Model.)

3 Sheets—Sheet 1.

FIG. 1.



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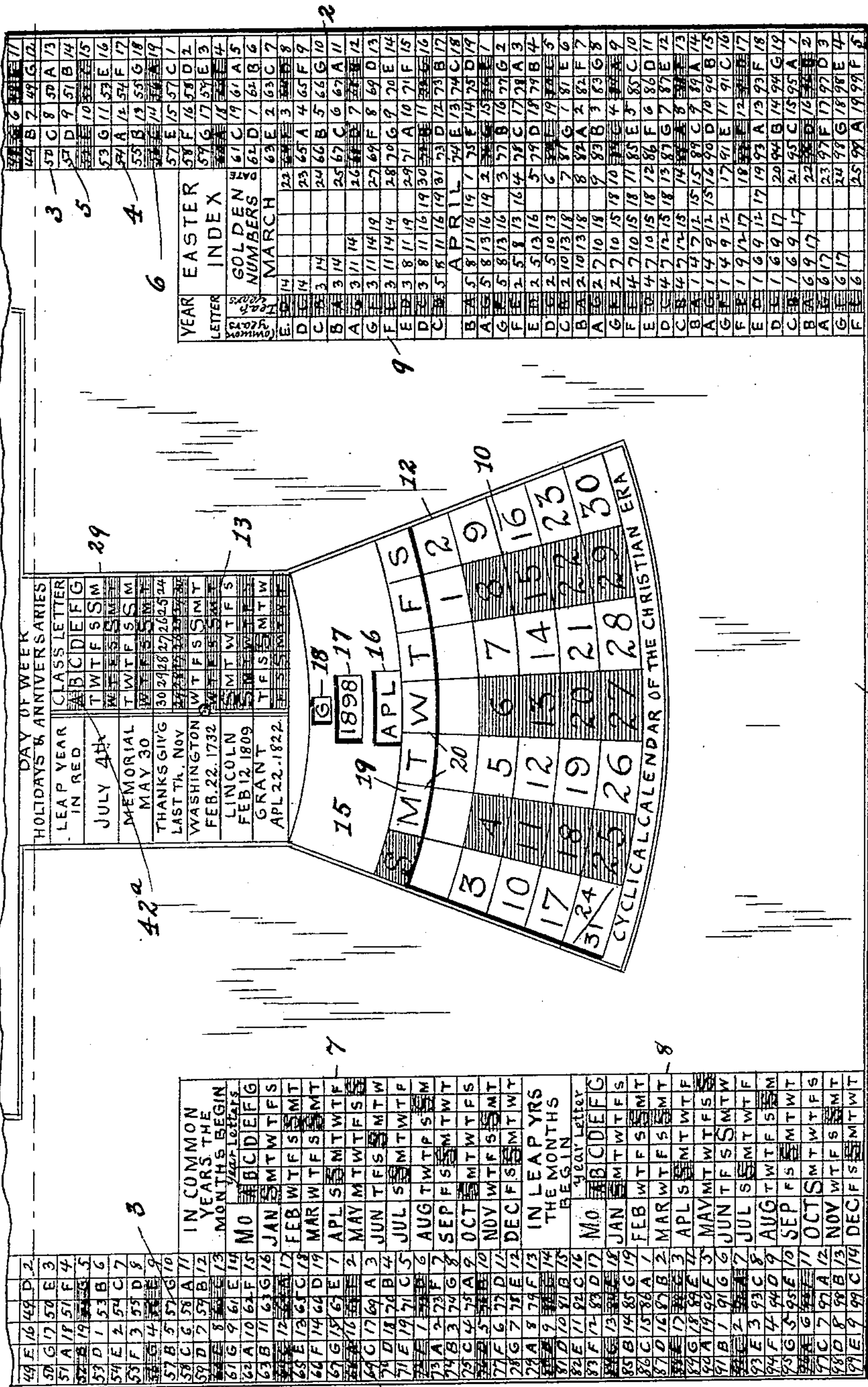
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3 Sheets—Sheet 2.

FIG. 2.



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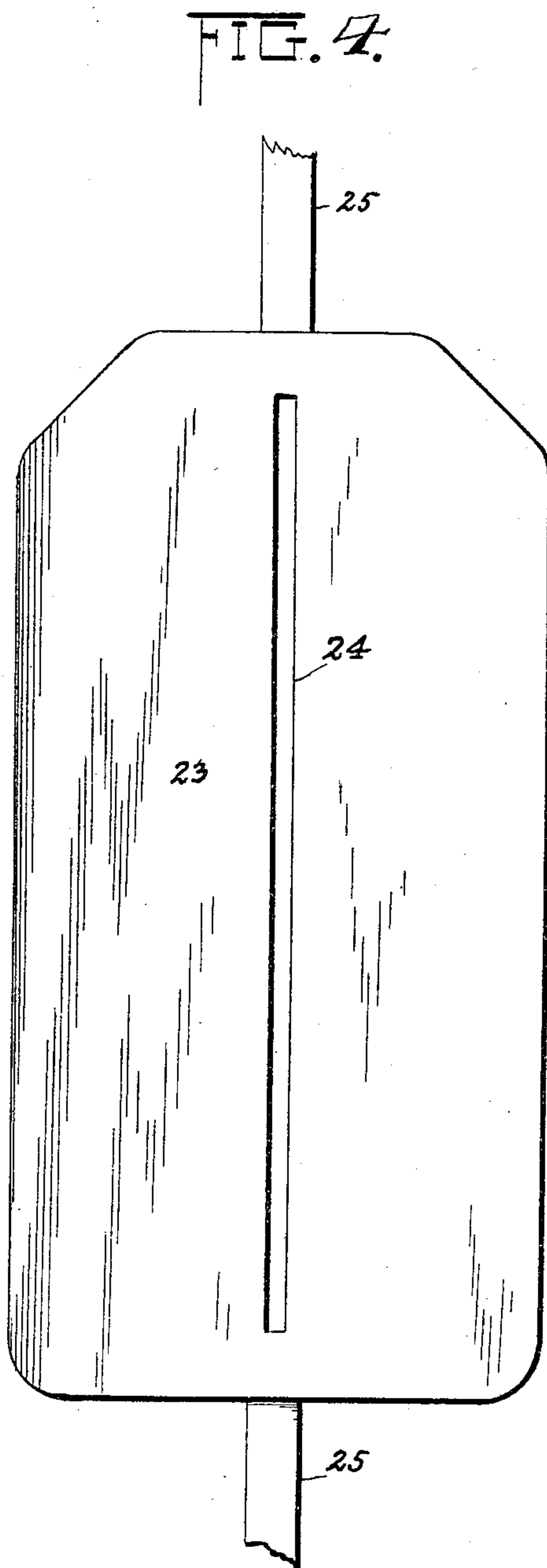
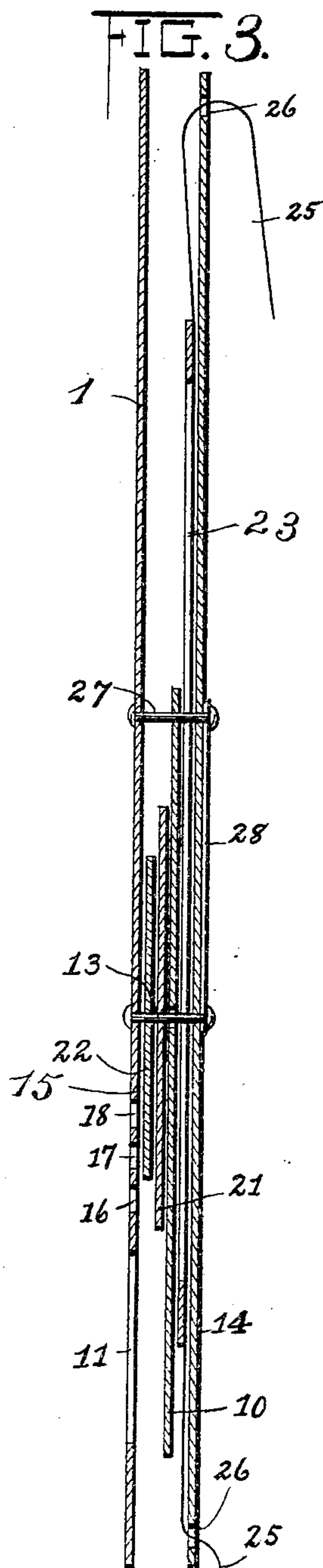
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# UNITED STATES PATENT OFFICE.

JONATHAN LEE KNIGHT, OF LEAVENWORTH, KANSAS.

## PERPETUAL CALENDAR.

SPECIFICATION forming part of Letters Patent No. 633,520, dated September 19, 1899.

Application filed April 28, 1898. Serial No. 679,107. (No model.)

*To all whom it may concern:*

Be it known that I, JONATHAN LEE KNIGHT, a citizen of the United States, residing at Leavenworth, in the county of Leavenworth and State of Kansas, have invented certain new and useful Improvements in Perpetual Calendars; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to that class of devices known as "perpetual calendars" and differs materially from the common form of calendar in that it measures both solar and lunar time. By the use of a dual series of indices and specially adapted mechanical means it not only supplies a complete calendar for any month of any year for centuries, but also by the same means presents much other interesting information—as, for instance, dates of new and full moons, the date of Easter Sunday for any year past, present, and future, together with the dates of other movable church festivals, the day of the week on which holidays and anniversaries fall, the day of the week on which each month begins in both common and leap years, and other useful matter.

The operation of the calendar is based upon the principle of cyclical sequences, and hence perpetual within the limits of space for indexing.

The invention consists of the features of construction, combination, and arrangement of parts, which will be more fully hereinafter described and claimed.

In the accompanying drawings, Figure 1 is an elevation of the upper portion of the preferred form of the calendar. Fig. 2 is a similar view of the lower portion of the same calendar. Fig. 3 is a section through the center of the calendar shown by Figs. 1 and 2, illustrating, on an exaggerated scale, the inner movable parts and their relation to each other. Fig. 4 is a detail elevation of the festival-slide used in connection with the device.

Referring to the drawings, wherein similar numerals of reference are employed to indicate corresponding parts in the several views, the numeral 1 designates a face-plate of the improved calendar, which is formed of suit-

able material and has an outer margin or border 2 on opposite sides, which is in the form of an index of years arranged in cyclical sequence and, as shown, extending over a period of four hundred years—that is, from A. D. 1600 to A. D. 1999. The said margin or border may be the same in all forms of the calendar, and it will be observed that the head-line of each commences with zero and increases arithmetically, and opposite each set of year-numerals, as at 3, a letter designating the class-letter and a numeral following the letter will be found. The said letters and numerals are not arranged in regular order, but their arrangement is in accordance with another scale which will be presently set forth. Each border in the present instance embodies two centuries and is composed of horizontal lines and vertical dividing-lines, as at 4 and 5. The class-letters run from "A" to "G," and the numbers, which are golden numerals, are from "1" to "19," inclusive. This index relates to a solar division of time, and a number of the letters and numerals are given a distinctive coloring, preferably red, as shown by the shaded portions at 6, for a purpose which will now be set forth.

Inside the border at one lower corner two tables 7 and 8 are placed and indicate the days of the week on which the months begin, according to the class of year, the one table 7 being for common years and the other 8 for leap-years. In the opposite corner an Easter-index 9 is located, by means of which the date of Easter Sunday may be ascertained. This index is primarily a table of the thirty-five dates on any one of which Easter Sunday may occur—that is, from March 22 to April 25, inclusive—each date having a dual index—that is, the class-letter of the year "A" to "G" and the golden number "1" to "19" of the lunar cycle. The date of Easter, which determines the dates of other movable festivals, is fixed by two factors—viz., a Sunday of the week and the date of full moon, and both the solar and lunar indices must be correlated to find its date. Hence by the class-letter the time is measured from the beginning of the year in periods of weeks or weeks and fractions of a week ending on Sunday, the fraction being one-seventh to six-sevenths of a week, according to the day of the week on



which the year began, as indicated by its class-letter, and by the golden number or lunar cycle the time is measured in periods ending with full-moon dates, the last of these periods to end with or next after the vernal equinox—that is, March 21. It is apparent that the day of the week on which the lunar period ends, coupled with the condition that the Easter date must be on Sunday, renders the month date of Easter variable, even in years when the full-moon-month dates are the same, and when to this is added the broken sequence caused by the intercalary day of leap-year a necessity is found for a third index, or, rather, a division of the solar index into two distinct parts, one for common years and the other for leap-years, and by so dividing it the indices are made complete. This division is indicated by printing the solar-index letters in red for leap-years and in black for common years, as shown by the shaded portions in the accompanying drawings and hereinbefore referred to.

The second essential part of this invention is the month-date pendulum-slide 10, which shows through the pyramidal base 11, which is formed by cutting a slot 12 in the face-plate 1. This pendulum-slide 10 may be of any size and is pivotally mounted to swing or move in the arc of a circle on a pivot 13 and held between the said face-plate 1 and a back plate 14. On this slide numerals "1" to "31," inclusive, with the necessary duplications, are arranged in thirteen radial columns, and above the said slot 12 the pyramidal outline is continued by a solid web 15, which is part of the face-plate 1, having vertical slots 16, 17, and 18 in the center thereof. Directly below the slot 16 the web 15 is divided to represent the days of the week, as at 19, and commencing with Sunday to the left, and between each initial letter are radial lines 20, which are adapted to coincide with similar lines on the pendulum-slide 10. Rotatably mounted on the pivot 13 in front of the pendulum-slide are disks 21 and 22 of different sizes, the smaller disk 22 being arranged next to the face-plate 1 and the larger disk 21 between said disk 22 and the pendulum-slide. The projecting marginal portion of the disk 21 is provided on its outer face adjacent to its periphery with the names or abbreviations of the months, which are arranged to be consecutively exposed through the slot 16, and the disk 22 bears the year-numerals and the class-letters forming the index of years, which are respectively arranged to be exposed through the slots 17 and 18, as clearly shown in Figs. 2 and 3. The pendulum-slide and disk or dials may be moved or set by any convenient means, such as small holes in which to insert a pointed piece of wood or by a thread attached to them and projecting through holes in a back plate, all of which are well-known arrangements.

The third and the distinctively especial part of the improved calendar is the festi-

val-slide 23, (shown in detail in Fig. 4,) having a central slot 24 of considerable length running longitudinally thereof and opposite end tapes or ribbons 25 for operating the same. These tapes or ribbons 25 are movable through slots 26 in the upper and lower edges of the back plate 14. A second pin 27 is fitted in the slot 24, the two pins being held at the back by a metal plate 28, which reinforces them and gives them a rigidity of support. On this festival-slide 23 the Easter and other dates of festivals are so arranged and correlated that setting the slide to the Easter date simultaneously sets it to the dates of all other named festivals for the year, and in the upper portion or top extension of the outline of a cross 29, which is represented on the face-plate and rests on the pyramidal base, two slots 30 and 31, Fig. 1, are shown, arranged in alinement and under them the abbreviations of the months March and April, while over the same is an outline 32 in the form of a century-plant leaf in the arc of a circle and bearing therein the words "Easter Sunday." Radiating from the lower central portion of the cross-arm 33 of the cross are scrolls 34, 35, 36, and 37, also representing century-plant leaves, the one 34 having the words "Ash Wednesday" therein and two alined slots 38 below the same, with the words "February" and "March" in abbreviated form thereunder. The one 35 on the right has the words "Ascension Day" imprinted therein, and below the same are two alined slots 39, under which are abbreviations or representations of the months May and June. In the radiating leaf 36 is the word or words "Pentacost" and below the same the word "Sunday" and under the latter a slot 40. In the leaf 37 are the words "Corpus Christi" and below it the word "Thursday," under which is a slot 41. In the outer portions of the arm 33, at the lower part thereof, are opposite scrolls 42 and 43, also representations of century-plant leaves, and in the scroll 42 are the words "Christmas Day," below which is a slot 44, having thereunder "Dec. 25th." In the scroll 43 the words "1st Sunday in" are placed, and below is a slot 45, having thereunder the word "Advent." The said festival-slide has thereon in regular alinement columns of numerals, black and red letters, names of months with following numbers, and names of days which are correlated to accurately designate through these several slots in the cross the dates, months, and days on which the several festivals or church holidays occur by setting the Easter-Sunday date properly in accordance with the index 9. Between the cross-arm 33 of the cross and the pyramidal base is an index 42<sup>a</sup>, having a heading entitled "Day of Week, Holidays and Anniversaries," and the column on the left indicates that leap-years are in red, and then consecutively follow the annual holidays, such as Fourth of July, Memorial Day, Thanksgiving, &c. In the column on the right, which is specially divided by hori-



zontal and vertical lines, and in front of "Thanksgiving," which always occurs on the last Thursday of November, numerals are placed to designate the exact date in both common and leap years on which said holiday will fall. At the top of the face-plate 1 is a border 43", having four divisions with the total number of the rows running from "1" to "19," inclusive, with said numbers at the beginning and representing the golden numbers of the year. At the top of each column are the letters "G. N.," or the initials of the words "Golden Number," the word "Moon," and abbreviations of the names of the months of the year. Under the word "Moon" in each column are the words "New" and "Full," the former being in black and the latter in red, and opposite said words are lines of numerals in corresponding colors. This index relates to new and full moons, and the dates on which they occur are shown in the row which corresponds to the golden number of the proper year in the index 4 or marginal border on either side of the face-plate.

The manner of using the calendar will be described as follows: For convenience in verification the year 1898 will be used. In the border-column "1800," near the bottom, the numerals "98" are located and printed in black, which indicates that it is a common year. The class-number of this year is "G" and the golden number "18." With these two indices a very great amount of useful information can be ascertained by examining the different parts of the calendar to which they apply, and first a glance at the table of holidays and anniversaries shows the day of the week on which each one falls in all common years of class "G," and hence the days on which they fall for 1898. Now by setting the year and letter disks or dials a reference-record is made for the entire year of 1898. Looking at the table it is found that January began on Saturday, February on Tuesday, &c., and the pendulum-slide can be set accordingly for each month of the year and at the same time show the current month at the opening or slot 12. Referring to the top border-table opposite the golden number of the year, which is "18," a list of the new and full moon dates for each month of the year are accurately indicated. By reference to the Easter-index it will be found that on the line on which "G," black, and "18" both occur (and they both occur on the same line but once in the entire table) the date given is April 10, which is the date of Easter Sunday. Setting the festival-slide to show this date at the opening in the face-plate brings the dates of Ash Wednesday, Ascension Day, &c., and for the year of 1898 to their respective openings or slots, and thus the entire list of festivals for the year are shown on the cross. To find the day of the week on which any date of any month in any year falls or will fall in the future, as birthdays, &c., the given year is first found in the border or mar-

ginal table or index. Then from its class-letter it is ascertained in the proper table what day of the week the given month began on, and the month-date pendulum-slide being set, with the figure "1" under that day of the week, a complete calendar for the given month of the given year is thus obtained and by it can be seen the day of the week for every date of that month. If it is desired to know the condition of the moon at the date given, whether new or full or how far from each or either, the golden number of the given year is noted and reference made to the top border-table opposite that golden number, and under the name of the month both the dates of the new and full moon are found. These dates are only computed to an average of mean solar days, not to exact hours and minutes, and hence might indicate a date as the "10th" when the almanacs would give the "9th" or "11th." The variation from the time must always be less than twelve hours and is near enough exact for all popular purposes. In addition it will be noted that the movable feast dates are incorrectly given whenever they occur during February of leap-years and that the computation of moon-phase dates on an average of mean solar days gives a wrong date for Easter once in a century—viz., for the years 1640, 1792, both leap years, and 1849, now half a century ago, and for the year 1906. The Easter-date error of the latter year arising from average date computation instead of actual date computation, as in 1849, will, however, be corrected, owing to the correction of the lunar phase basis of the Gregorian Calendar to occur at the beginning of the year 1900. As the object of this invention is to provide a calendar for popular and not for scientific use and as the errors noted occur at comparatively long intervals, the dates given are regarded as near enough exact for popular information, since it would be impracticable within the space available to take the moon-phase date to the exact hour and minute instead of taking them on an average of mean solar days, as has been done.

What has here been set forth in regard to the year 1898 can be shown in like manner for any other year from 1600 to 1999. The year 2000 and those following it up to 2399 will be exactly the same in their solar-letter classification as the years 1600 to 1999, but their golden numbers or lunar-cycle indices will not be the same. A. D. 1600 has golden number "5," while A. D. 2000 will have golden number "6." A. D. 1614 has golden number "19," the end of a lunar cycle, and A. D. 2014 will have golden number "1," the beginning of a cycle. In the grand solar cycle of four hundred years there are twenty-one lunar cycles of nineteen years each and a remainder of one year— $19 \times 21 = 399 + 1$ . Hence a perfect dual cycle, solar four hundred years, and a lunar nineteen years could only occur in  $19 \times 400 = 7,600$  years, a period so vast that it is incomprehensible.



In the details of construction, proportions, and dimensions changes might be made and substituted for those shown and described without in the least departing from the nature or spirit of the invention or sacrificing any of the advantages thereof.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is—

10 A calendar having a face-plate on which is an index showing the class-letter and golden number of any year, and having tables for common and leap years and moon phases arranged to show in connection with such data,  
15 the day of the week on which each month begins throughout the year as well as the date of new and full moon, a Christian cross being outlined on the face-plate and resting on a substantially pyramidal-shaped base having  
20 an enlarged slot in the greater portion thereof and other small slots above the same in vertical alinement, the cross-arm portion and head of the cross having small slots arranged in pairs and singly therein under church holiday or festival names, and below the same  
25 secular holidays and anniversaries arranged

adjacent to data which in connection with the index shows the week-day on which each occurs, a pendulum-slide shiftably mounted behind the face-plate and having groups of month-numerals thereon in regular sequence for exposure through the enlarged slot in the pyramidal base, a group of concentrically-arranged superimposed rotatable disks between the face-plate and pendulum-slide and respectively having thereon class-letters, year-numerals and month-names in predetermined positions to show through the series of vertical slots in said outline base, and another slide having festival dates thereon in regular and calculated order for successive display through the series of small slots in the cross-arm and head of the cross outline so as to indicate the date of each of said church holidays when Easter is properly indicated.

In testimony whereof I affix my signature in presence of two witnesses.

JONATHAN LEE KNIGHT.

Witnesses:

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W. W. BYERS.