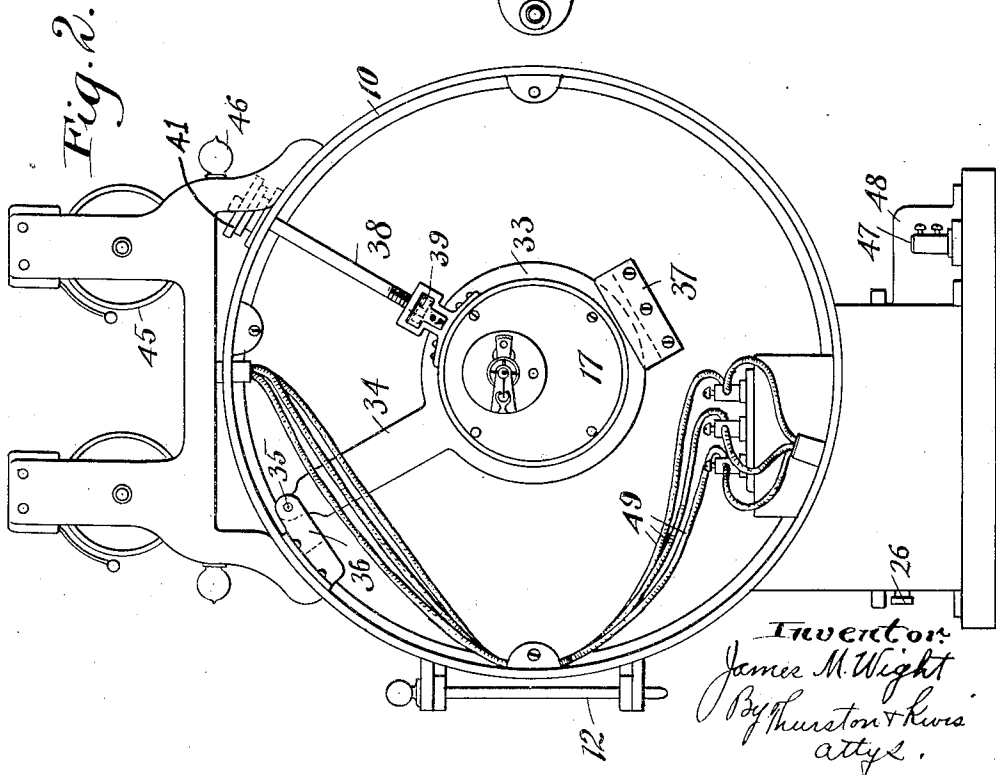
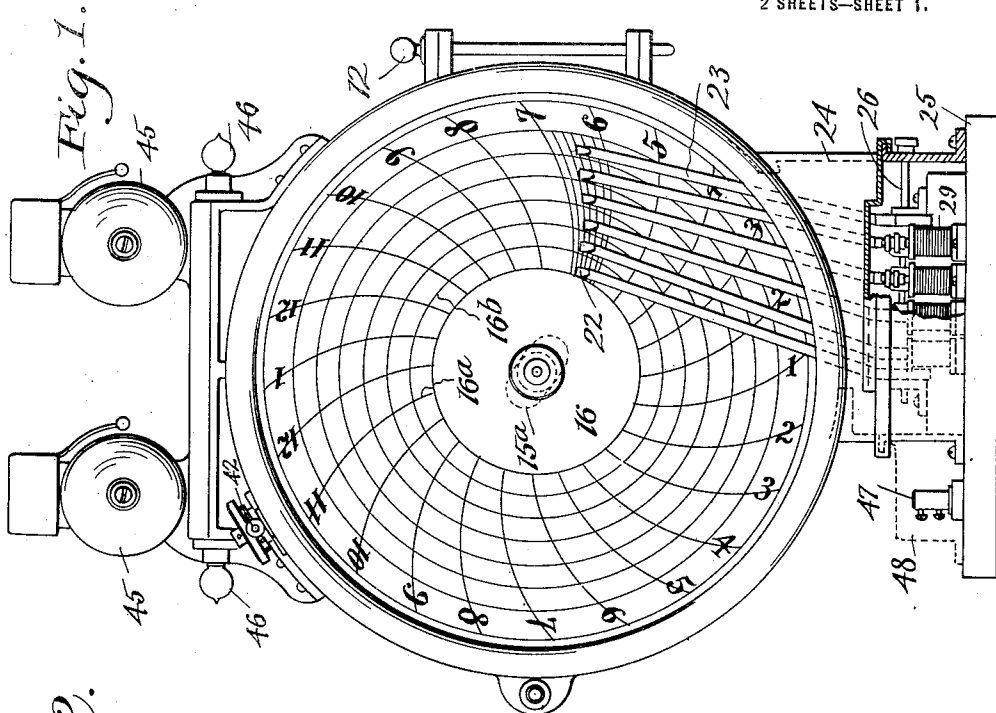


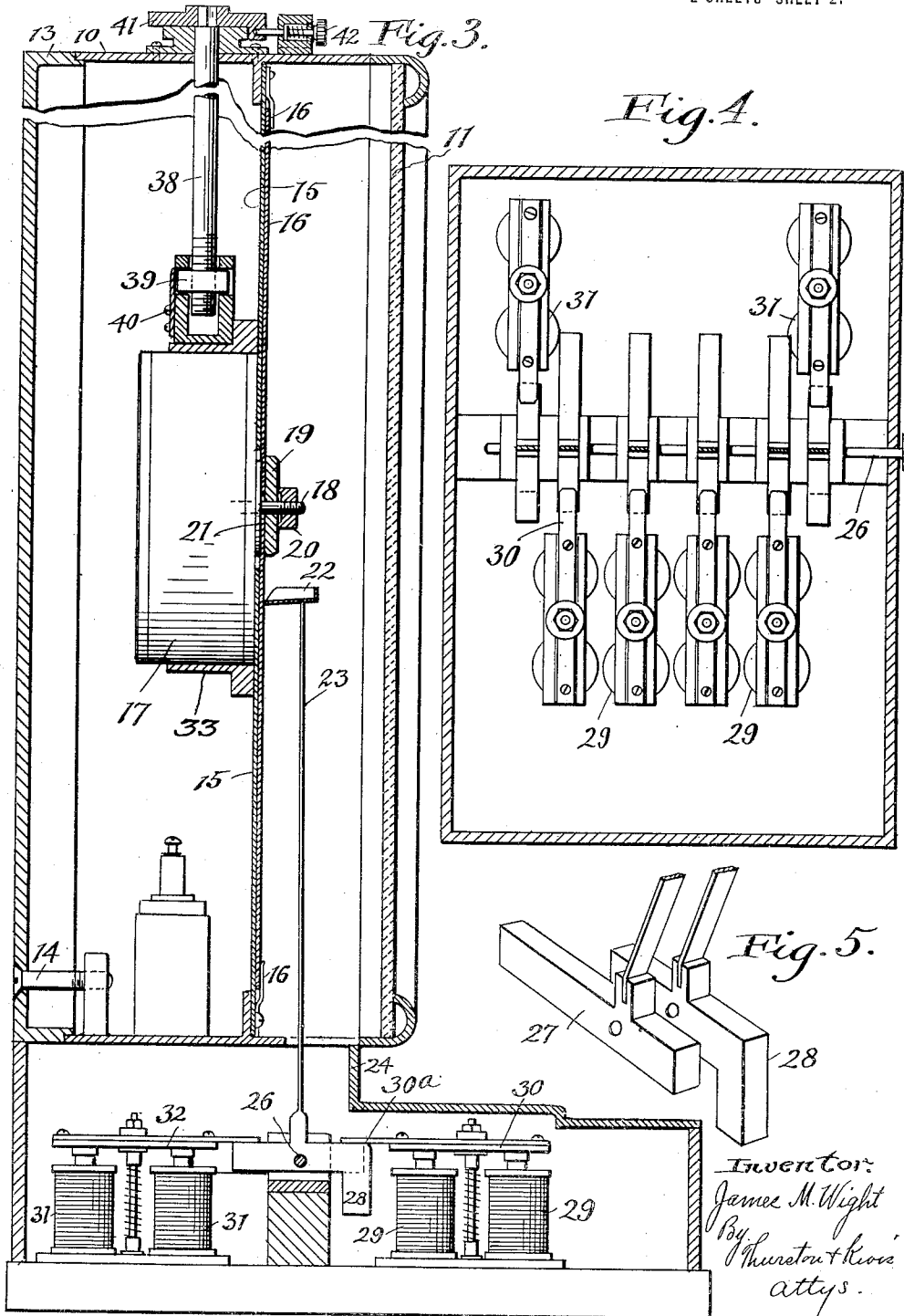
1,364,227.

Patented Jan. 4, 1921.
 2 SHEETS—SHEET 1.



1,364,227.

Patented Jan. 4, 1921.
2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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RECORDER.

1,364,227.

Specification of Letters Patent.

Patented Jan. 4, 1921.

Application filed December 15, 1916. Serial No. 137,102.

To all whom it may concern:

Be it known that I, JAMES M. WIGHT, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Recorders, of which the following is a full, clear, and exact description.

This invention relates to a recorder such as a water level recorder, although the recorder may be used for other purposes.

The main object of the invention is to provide a recorder which is efficient and will give a clear and easily readable record of the series of incidents or conditions, such as the changes in water level of a boiler. A further object is to provide a recorder which includes a motor driven dial or record sheet which can be used for a long period of time without requiring the insertion of a new record sheet in the apparatus. More specifically considered, the invention aims to provide means whereby a recording dial or record sheet which makes one complete revolution in a given time, such as twenty-four hours, may be employed for a considerably longer period of time, such as seven days, without causing the record made on one day to be confused with, or to interfere at all with the record made on any succeeding day.

The invention may be briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings I have shown my invention as embodied in a water level recorder, and in the drawings Figure 1 is a front view of the recorder with a portion of the base or magnet casing broken away to show the actuating magnets which actuate the pens or markers; Fig. 2 is a rear elevation, with the rear plate removed; Fig. 3 is a vertical sectional view on an enlarged scale; Fig. 4 is a horizontal sectional view through the magnet casing, showing the actuating magnets and the counterweighted markers; and Fig. 5 is a perspective view of the lower portions of adjacent markers showing how the counterweights are disposed so that one of the markers will normally engage the dial or marking sheet, and the other marker will

normally be out of engagement with the dial.

The recorder includes an annular or cylindrical shaped casing 10, provided with a glass front 11 connected to the casing by a hinge 12 so that the recorder can be viewed from the front, and permitting the front part of the casing to be opened so that the dial or record sheets may be inserted or removed, and the marking pens (if ink records are made) can be cleaned or refilled with ink. The casing 10 is also provided with a rear door or wall 13, normally held in position by screws 14, which can be removed so as to permit access to the motor or to the electric connections, or conductor wires within the casing.

Between the front and rear ends of the casing there is a stationary disk 15, preferably of metal, against which is lightly pressed by fingers 15^a, one of which is shown in Fig. 3, a dial or circular record sheet 16, which is designed to be rotated and preferably to be given a complete rotation in twenty-four hours by a spring motor or clock 17, which is provided with a spindle 18 which projects forwardly through the plate 15 and through the dial or record sheet. The latter is held onto the spindle so that it will rotate therewith, by a disk 19 and nut 20 which clamp the sheet against a disk 21 which projects slightly beyond the face of the plate 15. The manner in which the motor 17 is supported and adjusted will be explained subsequently.

The dial or record sheet 16 is provided with equally spaced time lines 16^a which preferably divide the sheet into twenty-four spaces, these lines being arc-shaped, and if extended inwardly, would pass through the center of the sheet. Preferably also, the spaces between the lines 16^a is divided into subdivisions of time by additional evenly spaced time lines, all of which may for convenience be termed "isotempo" lines. Additionally the sheet is divided by concentric, evenly spaced circles 16^b into spaces or divisions, which in this instance indicate different water levels of the boiler with which the recorder is employed.

For the purpose of making a record on the sheet 16, I employ markers, which in this instance, although not necessarily, make ink lines on the sheet and consist of pens 22 which are supported on the upper ends of

light and somewhat flexible fingers 23 which extend downwardly from the dial casing into a magnet casing 24 which constitutes a hollow column for the upper part of the recorder and is mounted on a base 25. At the lower ends, the fingers 23 are provided with counterweighted heads which are pivotally mounted on a pin or spindle 26 (see Figs. 1, 3 and 4).

The arrangement of these counterweighted heads of the markers and of the magnets which actuate them is important, because when the recorder is used for a certain purpose, such, for example, as the recording of the water level in a boiler, it is desirable in order that good and easily readable records may be made that part of the markers normally engage the record sheet, and at intervals, or on the occurrence of predetermined conditions be lifted therefrom so as to normally mark the record and when lifted from the sheet to leave a break in the mark or line, and that other markers be normally out of engagement with the record sheet, and at intervals, or on the occurrence of other predetermined conditions be drawn forward into engagement with the record sheet so as to make marks or lines thereon. In this instance, the innermost and the outermost markers, that is to say, the marker which indicates or records the lowest water condition, and the one which indicates or records the highest water condition are normally out of engagement with the record sheet, and when the water reaches either the predetermined low level or when it reaches the predetermined high level, one of these two markers is drawn into engagement with the record sheet. On the other hand, the intermediate markers, or those which record intermediate water levels normally engage and draw lines on the record sheet, and when the water level reaches a position corresponding to one of these markers, that marker is drawn from the record sheet so as to leave a space or a break in the line which it normally marks or draws. In other words, the water level record on any sheet is read by the breaks or spaces in the lines except for high and low water conditions which are read by the marks or lines themselves.

This is done because the high and low level conditions are maintained usually for very brief periods. For example, the low level condition would be recorded frequently by the fireman blowing out his gage glass, which a careful fireman does at regular periods. It has been found by experience that if it is attempted to record the time of blowing out or cleaning the gage glass by lifting a pen from the record sheet, it would be difficult, if not impossible to determine when this was done, because the pen would be restored onto the record sheet so quickly after

it was lifted that it would not leave, in many instances, a discernible break in the line. On the other hand, if the pen is normally out of engagement with the paper and comes in contact therewith only for a short time, the time of blowing out the gage glass is clearly recorded.

With this explanation, reference will again be had to the construction of the markers, and by referring to the drawings it will be observed that the four intermediate markers are provided with heads 27 with counterweighting or counterbalancing rearward extensions which press the pens of these intermediate markers against the record sheet with just sufficient pressure to make good lines or marks thereon. On the other hand, the innermost and the outermost markers are provided with heads 28 which have forward counterweighting or counterbalancing extensions which tend to swing the innermost and the outermost markers outwardly away from the record sheet.

These markers are shifted away from their normal positions by magnets, four of which, designated 29, are in the front part of the magnet casing 24, and are provided with armatures 30 having extensions 30^a, which when the several magnets are energized, rock the markers so as to move the pens away from the record sheet and thus cause breaks to occur in the lines which they normally make or draw on the record sheet. The innermost and outermost markers are actuated by magnets 31 having armatures 32 which as will be observed by reference to the drawings, tip these two markers in the reverse direction so as to cause the pens to engage the record sheet. It will be understood, of course, that these magnets will be energized separately, or one at a time, the particular magnet which is energized depending upon the level of the water in the boiler or gage glass. It will be understood also, that when the head of the marker is released by the corresponding magnet armature, said magnet will drop back to normal position by gravity.

It may be stated at this point that there will be employed with this recorder, a battery or other source of current and a series of electric contacts associated in some manner with the boiler, as with the gage glass, and there will be utilized a float controlled contact maker which will rise and fall with the change of water level and engage the several contacts so as to complete the circuit separately through the several magnets. I prefer to employ in connection with the recorder here described, the float controlling mechanism illustrated and claimed in my prior Patent No. 1,179,486, granted on the 18th day of April, 1916.

It should be observed in passing, that the pens 22 of the markers are arranged in an

arc of a circle corresponding to the curved isotempo lines as shown in Fig. 1.

An additional important feature of my invention resides in the manner of mounting
 5 and adjusting the motor and the record sheet so as to adapt it for a longer period of time than is represented by a complete revolution of the record sheet. For an understanding of this feature reference is had particularly to Figs. 2 and 3. It will be observed
 10 by referring to these figures that the motor 17 which rotates the record sheet is mounted in a ring or circular head 33 which has a laterally projecting arm 34, pivoted at 35 to a bracket 36 near the periphery of the casing
 15 10. Diametrically opposite from the arm 34 there is a guide 37 for the clock holding ring or head 33. For the purpose of shifting the clock and hence the recording sheet,
 20 there is provided a shifting spindle 38, which at its lower end is threaded and engages a nut 39 rather loosely mounted in a boss or chamber 40 carried by the clock supporting ring or head 33. The outer
 25 portion of the bolt 38 extends through the annular casing wall 10, and at its outer end is provided with a small hand wheel 41 which may be turned to swing the clock about the pivot point 35. Associated with
 30 this hand wheel 41 is a spring actuated locking pin 42 with a point which is adapted to enter into an opening in a lug on the lower side of the hand wheel 41.

The object of this arrangement or construction is believed to be now apparent.
 35 It will be apparent that when a twenty-four hour record has been made, instead of placing a new record sheet in the recorder, the operator simply pulls out the locking
 40 pin 42 and turns the motor shifting spindle or bolt 38 through one revolution, the pin being then allowed to snap back into locking position. This swings the motor and the record sheet a short distance to the left
 45 or right as the case may be, so that the pens will be displaced from the record lines which they made in the preceding twenty-four hours. This can be done repeatedly, the
 50 pens each day making records independently of those made on the preceding day or days. In practice, I find that a seven day record can be conveniently made on a record sheet which makes a complete revolution
 55 each twenty-four hours. It might be stated that the stationary dial plate 15 contains an elongated slot 15^a (shown by dotted lines in Fig. 1) through which slot project the turning spindle for the record sheet, and the disk 21 against which the sheet is pressed
 60 by the holding disk 19.

In order that accurate records may be made from day to day it is important that the clock be shifted in a predetermined direction with respect to the isotempo lines,
 65 or with respect to the curved line formed

by the several marking pens. To this end the pivotal axis 35 about which the clock is turned or swung, is the center of the arc of the several pens, or the center of the isotempo line when arranged directly under 70 or opposite the marking points of the pens.

Although in the above I have described the principal novel features of the invention, the construction is preferably provided also with suitable high and low water 75 alarms which include electric bells 45 and signal lamps 46 which are energized when high and low water conditions are reached.

The connections for the several magnets will be made by binding posts 47 arranged 80 in a binding post chamber 48 which is mounted on the base 25, and the connections with the alarm bells and lamps will be made to the magnets which actuate the high and low water recording pens by conductors 49 85 which are indicated in Fig. 2.

While I have described the preferred construction of the recorder and have explained the preferred use to which the recorder may be put, I do not wish to be confined either 90 to the details of construction herein disclosed, or to a recorder used for indicating water level conditions of a boiler, as the construction may be modified without departing from the broad principles of the invention, and I am aware that the essential 95 features of the recorder may be used for other purposes than that herein mentioned.

Having thus described my invention, what I claim is:

1. In a recorder, a motor for moving a record sheet; a plurality of markers cooperating with the record sheet which is to be shifted by the motor, part of said markers normally engaging the record sheet and 105 adapted to be shifted therefrom, and part of the markers normally out of engagement with the record sheet and adapted to be shifted into engagement with the same.

2. In a recorder, a motor for moving a record sheet; a plurality of markers cooperating with the record sheet which is to be shifted by the motor; and means for shifting part of the markers in one direction from normal position and the other markers 115 in the reverse direction from normal position.

3. In a recorder, a motor for moving a record sheet; a plurality of markers cooperating with the record sheet which is to be shifted by the motor; and a plurality of magnets associated with the markers adapted to be successively energized, part of the magnets when energized shifting the associated markers in one direction away from 125 the sheet, and the remainder when energized shifting the associated markers in the reverse direction toward the sheet.

4. A recorder comprising a motor for shifting a record sheet; and a plurality of 130

markers for making a record on the sheet which is shifted by the motor, said markers having means associated therewith for moving the markers to normal position and for normally retaining them in such position, said means moving part of the markers in one direction away from the sheet and another part in the reverse direction toward the sheet.

5. A recorder comprising a motor for shifting a record sheet; and a plurality of markers for making a record on the sheet which is shifted by the motor, said markers having counterweights which tend to move part of the markers in one direction away from the sheet and part in the reverse direction toward the sheet.

6. In a recorder, a motor for shifting a record sheet; a plurality of pivoted markers having marking points adapted to make marks on the record sheet; and electrically operated means for shifting part of said markers from normal position away from the sheet and for shifting the remainder of the markers from normal position toward the sheet.

7. In a recorder, a motor for shifting a record sheet; a plurality of pivoted markers having marking points adapted to make marks on the record sheet; electrically operated means for shifting part of said markers from normal position away from the sheet and for shifting the remainder of the markers from normal position toward the sheet; and means associated with said markers for restoring the markers to normal position when the magnets are deenergized.

8. In a recorder, a motor for shifting a record sheet; a plurality of pivoted markers having marking points adapted to make marks on the record sheet; and electrically operated means for shifting part of said markers from normal position away from the sheet and for shifting the remainder of the markers from normal position toward the sheet, said markers having counterweights which restore the markers to normal position when the magnets are deenergized.

9. In a recorder, a motor for rotating a flat, circular record sheet in the plane of said sheet; marking means for making a record on the sheet; and means for shifting the motor and the associated record sheet laterally with reference to the marking means, whereby the record marks made in one period of time will be displaced with reference to the record marks made in a preceding period of time.

10. In a recorder, means for rotating a flat, circular record sheet including a support for the record sheet normally having a rotary movement only; marking means

adapted to make a record on the sheet; and means for shifting said support laterally with reference to the marking means whereby the record made in a predetermined given time will be displaced with reference to the marking means.

11. In a recorder, a casing; a motor for rotating a flat circular record sheet in the plane of said sheet; marking means adapted to make a record on the sheet; and means for shifting the motor laterally with reference to the marking means so that the marks made in one revolution of the sheet will be displaced with reference to the marks made in another revolution thereof.

12. In a recorder, a casing; a motor having a rotating supporting and driving spindle for rotating a flat, circular record sheet in the plane of said sheet; marking means for making a record on the sheet; and means for shifting the spindle laterally with reference to the marking means so that the record made by the marking means in one revolution of the record sheet will be displaced with reference to the record made in another revolution thereof.

13. In a recorder, a casing; a pivotally supported motor having a spindle for rotating and supporting a flat, circular record sheet; marking means for making a record on the sheet; and means for swinging the motor laterally with reference to the marking means whereby the record made in one revolution of the record sheet will be displaced with respect to that made during another revolution thereof.

14. In a recorder, a casing; a motor and motor driven spindle for rotating a flat, circular record sheet in the plane of said sheet; a plurality of markers having marking points arranged in a line; and means for shifting the spindle laterally with reference to the markers and in the direction of the line of the marking points whereby the record made during one revolution of the sheet will be displaced with respect to the record made during another revolution thereof.

15. In a recorder, a casing adapted to accommodate a circular record sheet or dial to be rotated; a spindle for rotating said sheet and adapted to extend substantially centrally therethrough; marking means for making a record a predetermined distance from the spindle; and means for shifting the spindle so that at one revolution of the spindle and sheet a record will be made at a different distance from the spindle than during another revolution.

In testimony whereof, I hereunto affix my signature.

JAMES M. WIGHT.