F. E. PENDLETON.

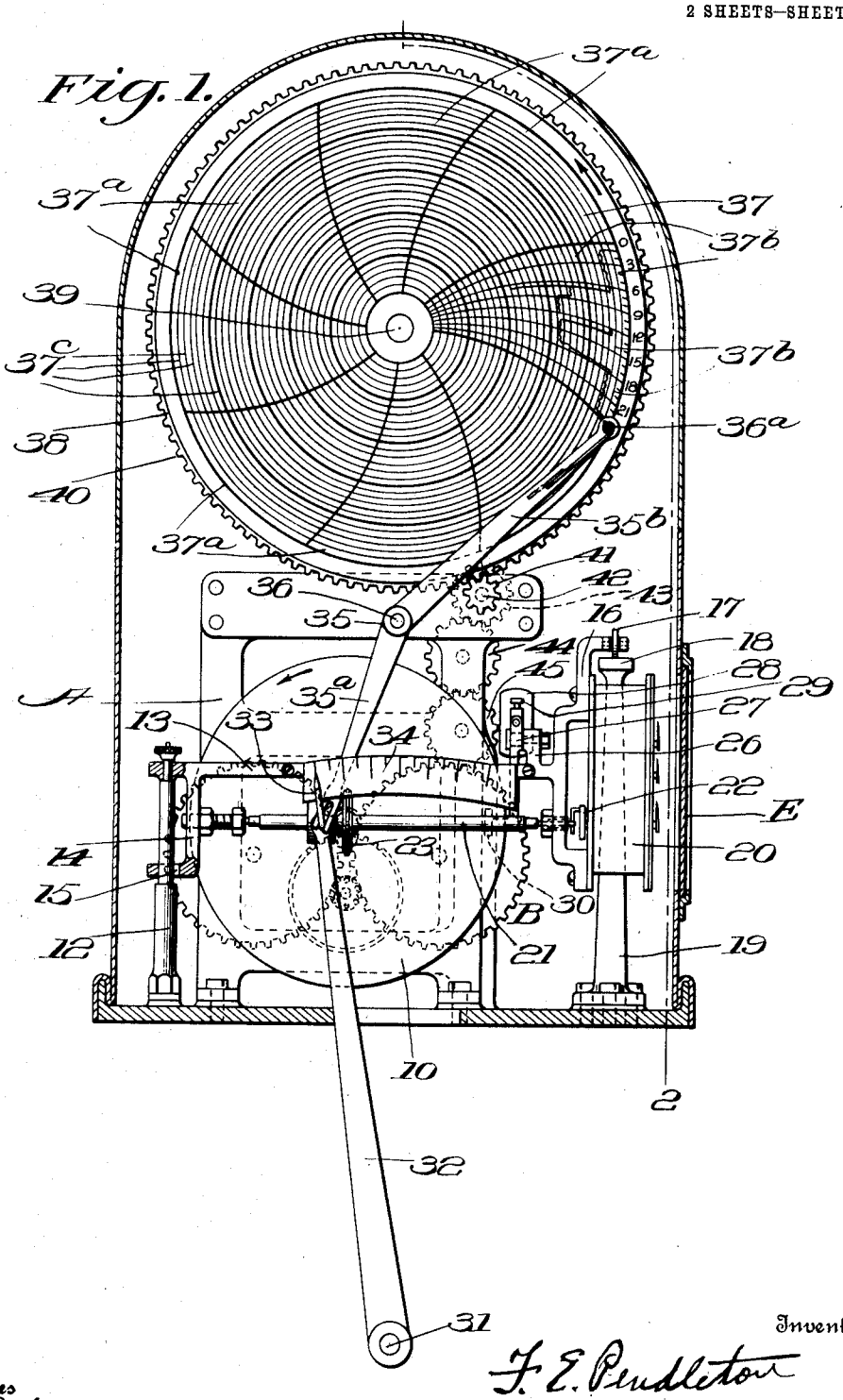
AUTOMATIC INTEGRATOR.

APPLICATION FILED JAN. 29, 1909.

987,165. **Patented Mar. 21, 1911.**

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

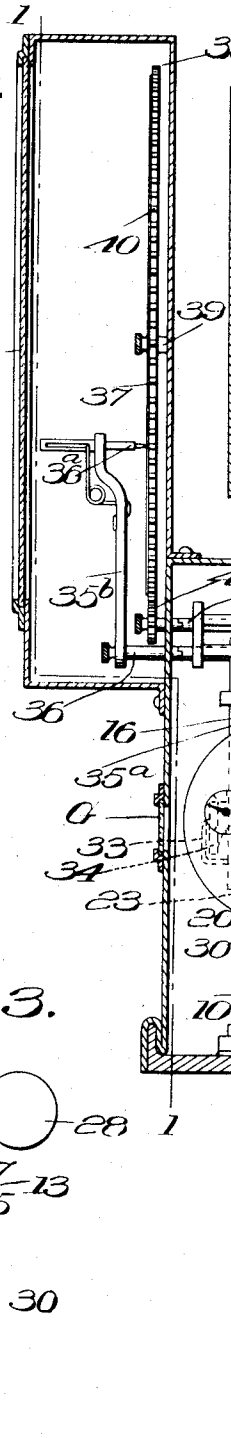


Fig. 4.

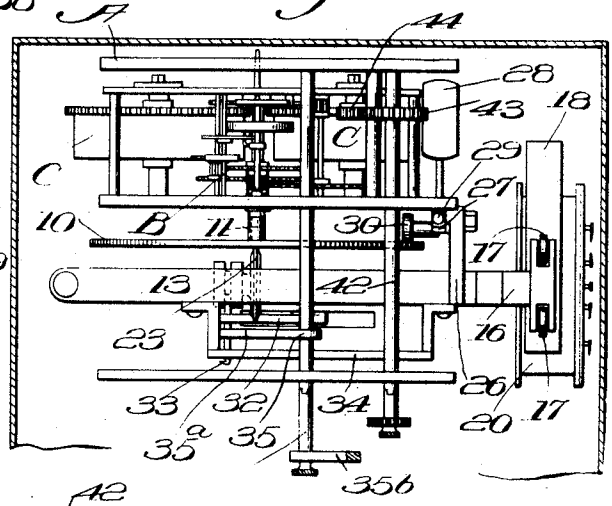
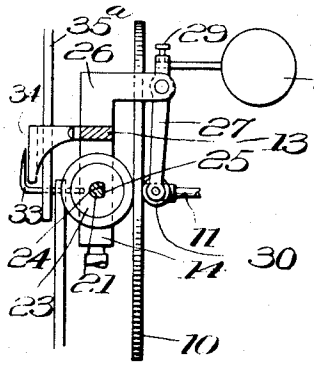


Fig. 3.



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AUTOMATIC INTEGRATOR.

987,165. Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed January 29, 1909. Serial No. 475,039.

To all whom it may concern:

Be it known that I, FRANK E. PENDLETON, a citizen of the United States, and a resident of Montclair, Essex county, and State of New Jersey, have invented certain new and useful Improvements in Automatic Integrators, of which the following is a specification.

My invention relates to improvements in automatic integrators and consists of novel features and parts and combinations, the objects of which are fully set forth hereinafter.

Referring to the drawings accompanying and forming part of this application, in which the same reference character indicates the same part in the several views, Figure 1 is a section on line 1 of Fig. 2. Fig. 2 is a section on line 2 of Fig. 1. Fig. 3 is a detail view. Fig. 4 is a top plan view.

The part marked A is a frame supporting the clock mechanism B, having double springs C.

10 is a disk connected to the shaft 11 of the clock mechanism and adapted to be rotated thereby in the direction of the arrow, at the rate of one complete revolution per hour.

12 is a post to which is pivotally secured one end of the bridge 13. This end of the bridge has a downwardly projecting arm 14 with an opening 15 therein, slotted in shape. The other end of the bridge has an arm 16, the upper end of which carries the rollers 17 which rest on top of a bracket 18, forming a part of the standard 19 which supports this end of the bridge.

Secured to the arm 16 of the bridge is a counter registering device 20. Pivotally mounted between the arms 14 and 16 of the bridge and parallel to the face of the disk 10, is a shaft 21. One end of this shaft is connected to the counter 20 by any suitable means, such as the connection shown at 22, and rotates the said counter mechanism. Secured on this shaft is a wheel 23 which contacts with the outer face of the disk 10 and normally bears against the center thereof. The shaft is provided with a flat surface 24 and the contact wheel is provided with a corresponding flat portion 25 co-acting therewith, which prevents the wheel from rotating but permits free longitudinal movement on said shaft.

26 is an arm secured to the bridge. Pivoted to this arm is a lever 27. One end of this lever carries the weight 28 which is adjustable in the arm and is secured in position by the set screw 29. Pivoted at the free end of the other arm of the lever is a roller 30 which contacts with the inner face of the disk 10.

31 is a rock shaft connected to a valve of a water meter, to a governor of a speed motor or to similar devices. On this rock shaft is an arm 32. The free end of this arm is connected to the contact wheel 23 and moves the said contact wheel therewith. The free end of this arm is connected to a pointer 33 which moves in front of the scale 34 secured to the bridge 13.

35 is a lever pivoted on the shaft 36. One arm 35^a of this lever is connected to the arm 32. In the construction shown in the drawing the free end is bifurcated and straddles the pointer 33 connected to the said arm 32. The other arm 35^b of this lever carries a pencil 36 which bears against the face of the chart 37, which is properly divided and ruled into eight parts 37^a, each indicating a day, and into other parts 37^b indicating three hours each, and also ruled or divided into concentric circles 37^c fifteen one hundredths of an inch apart. This chart is carried by the disk 38 pivoted at 39. The periphery of the disk is provided with teeth 40. Meshing with these teeth is a pinion 41 which is connected to a shaft 42 driven by clock mechanism through the gears 43 and 44, these gears being of such number and so proportioned that the disk 38 will travel in the same direction as the disk 10, as indicated by the arrow thereon, and will make one complete rotation in eight days.

D is a casing inclosing the mechanism. The pivots or shafts 36 and 42 are so connected that they may be separated to permit the casing to be removed. Said casing is provided with openings E, F and G covered by transparent material so that the counters 20, the chart 37 and the scale 34 may be read without removing the casing. The transparent material covering the opening F is carried by a door or slide so that the said opening may be readily uncovered to permit access to the chart 37.

The mechanism described is for use where the variable is a function of time, such as speed, horse power, flow of fluid in cubic feet per unit of time, flow of electric current in amperes per unit of time, etc. The position of the contact wheel 23 when

opposite the center of the disk 10 is to correspond with zero speed, horse power, flow, etc. Equal movements of the contact wheel from the center, toward the right as shown in the apparatus illustrated, are to be proportional to equal measurements of speed, horse power, flow, etc. Thus the arm 32 when swung to the right so that the distance of the contact wheel 23 from the center of the disk will be proportional; for example, to the cubic feet of water flowing per hour through a valve, the movement of which produces the rocking movement of the shaft 31 which causes the arm 32 to swing to the right.

The operation of the apparatus is as follows: With the parts in the position shown in the drawing and the clock mechanism running, the rotation of the disk 10 produces no movement of the contact wheel 23, and of course, there is no movement of the counter mechanism 20. If the contact wheel 23, however, is moved to the right by the swinging of the lever 32, caused by the increase of the flow of water, or the increase in horse power, or the increase in flow of electric current, it will be rotated by the disk 10 and the speed of rotation will correspond to the distance from the center of the disk, and this speed will be transmitted to the shaft 21 and will be indicated on the counter 20. If the contact wheel 23 having unit radius, is moved to the right unit distance corresponding to unit speed, and if disk 10 completes one revolution in unit time, then the counter 20 shows unit distance passed over. If the contact wheel 23 is moved a distance of two units from the center of the disk 10 and remains there during unit time, then the counter will show two units of distance passed over, etc., and if the contact wheel 23 remains at such distance from the center of the disk two units of time then the counter will show 4 units of distance passed over or the productions of units of speed and units of time. In like manner, at all intermediate positions of the contact wheel 23 the counter continually shows the product of all the increments of distance. When the arm 32 is swung to the right, the arm 35^a of the lever 35 being in contact therewith causes the other arm 35^b of the lever to move to the left toward the center of the chart 37 and the pencil carried by that arm will indicate momentarily the speed, horse power, flow, etc. As this chart is moved in the direction of the arrow at a uniform speed the inward and outward movement of the pencil over the chart caused by the difference in the speed, horse power, flow, etc., will mark a curve to be traced on the chart which shows a graphic record of the relative speed, horse power, flow, etc., throughout the day or even a week, the chart being intended to be changed weekly. The mechanism is such that the disk 10 and contact wheel 23 are in close contact at all times, and this is accomplished by the lever and weight 27 and 28. As this lever is pivoted to the arm 26 and the roller 30 carried by said arm is bearing against the inner surface of the disk 10, which acts as a fulcrum at that point, the weight P throws the free end of the bridge 13, which carries the contact wheel 23, toward the disk 10 and thus maintains at all times contact between said disk and wheel. The pressure of the disk and contact wheel may be varied by adjusting the position of the weight 28 carried by the lever 27. Moving the weight closer to the lever causes less pressure, and extending it farther of course causes greater pressure. The rolling contact 17 of the bridge on the bracket 18 causes the weight to freely pull the bridge toward the disk 10. In order to swing the bridge away from the disk when it is desirable to do so for any purpose, the scale 34 is removed from the bridge; then the arm 32 and the arm 35^a can be disconnected and moved out of the way, whereupon the bridge can be freely moved or swung upon the post 12 away from the disk.

As many changes could be made in the above construction and many apparently widely different embodiments of my invention could be made without departing from the scope thereof, I intend that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent is—

1. In a device of the class described, a pivoted bridge, a shaft carried by the bridge, a wheel slidably mounted on said shaft and means for sliding said wheel on the shaft, means for graphically recording the movement of said wheel, a counter carried by the bridge and connected to said shaft, a disk with which the wheel contacts, and means for rotating said disk.

2. In a device of the class described, an arm, a post, a bridge connected to and adapted to swing thereon, a counter carried by the bridge, a shaft carried by the bridge, a wheel slidably mounted on said shaft, means for graphically recording the movement of said wheel, a disk with which the wheel contacts, and means for rotating the disk.

3. In a device of the class described, an arm, a swinging bridge, a counter carried by the bridge, a shaft carried by the bridge, a contact wheel slidably mounted on the shaft, means for sliding the wheel on the shaft, means for graphically recording the movement of said wheel, a disk with which the wheel contacts, means for operating the

said disk, and means for holding the disk and wheel in contact.

4. In a device of the class described, a rock shaft, an arm, a swinging bridge, a counter carried by the bridge, a shaft carried by the bridge, a contact wheel slidably mounted on the shaft and connected to said arm, means for graphically recording the movement of said wheel, a disk with which the wheel contacts, and means carried by the bridge for holding the disk and wheel in contact.

5. In a device of the class described, a rock shaft, an arm carried thereby, a bridge, a shaft carried thereby, a counter connected to the shaft, a wheel slidably mounted on said shaft and connected to said arm, a disk with which the wheel contacts, a lever having one arm connected to said first mentioned arm, a disk having a chart, means for rotating the disk, and a pencil carried by the other arm of the lever and contacting with said chart.

6. In a device of the class described, an arm, a pivoted bridge, a shaft carried by said bridge, a wheel slidably mounted on said shaft and connected to said arm, a counter carried by said bridge, and means actuated by said arm for graphically recording the movement of said wheel.

7. In a device of the class described, an arm, a bridge, a shaft carried by said bridge, a wheel slidably mounted on said bridge and connected to said arm, a counter carried by said bridge and actuated by said shaft, and means for graphically recording the movement of said wheel upon the shaft, said means including a lever, one arm of which is connected to said first-mentioned arm and adapted to be rocked thereby, and a marker carried by the other arm of said lever.

8. In a device of the class described, an arm, a bridge, a shaft carried by said bridge, a wheel slidably mounted on said shaft and connected to said arm, a counter carried by a disk with which the wheel contacts, means for rotating the disk, and means for graphically recording the movement of said wheel upon the shaft, said means including a lever, one arm of which is connected to said first-mentioned arm, a disk geared to said first-mentioned disk, a chart carried by the other arm of the lever and contacting with the chart.

9. In a device of the class described, a clock-driven mechanism, a disk carried thereby, a bridge, a shaft carried by said bridge, a wheel slidably mounted on said shaft and contacting with said disk counter mechanism actuated by said wheel, an arm adapted to slide said wheel upon the shaft, a second disk geared to said clock-driven mechanism, a chart carried thereby, and means connected to said arm to record on the chart the sliding movement of said wheel.

In witness whereof I have hereunto set my hand at the city, county and State of New York, this 26th day of January, 1909.

FRANK E. PENDLETON.

In presence of—
AGNES C. O'CONNELL,
JOHN J. RANAGAN.