July 4, 1961 K. H. JENSEN 2,990,676

BATTERY DRIVEN CLOCK

Filed July 16, 1958

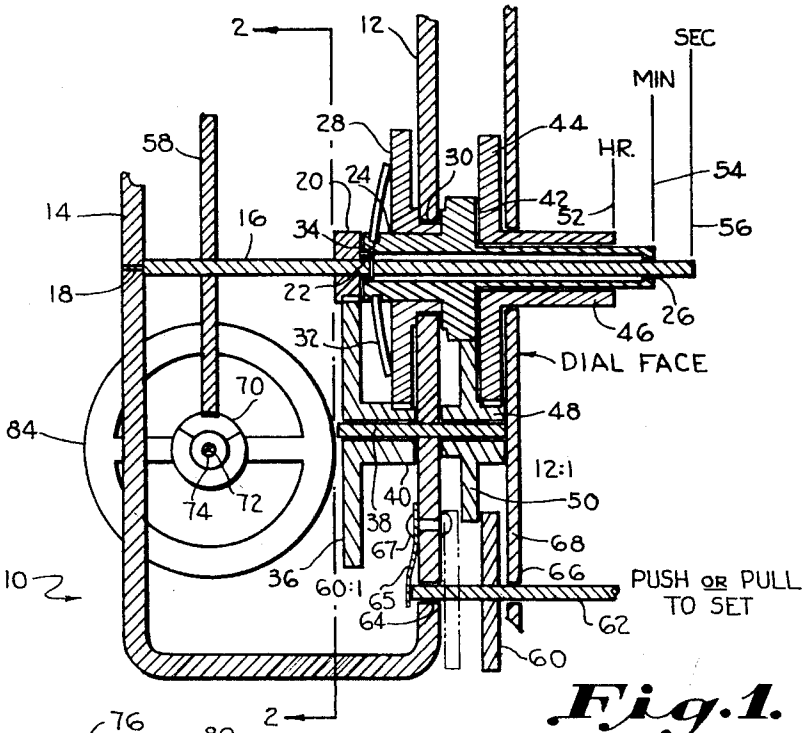

Fig. 1.

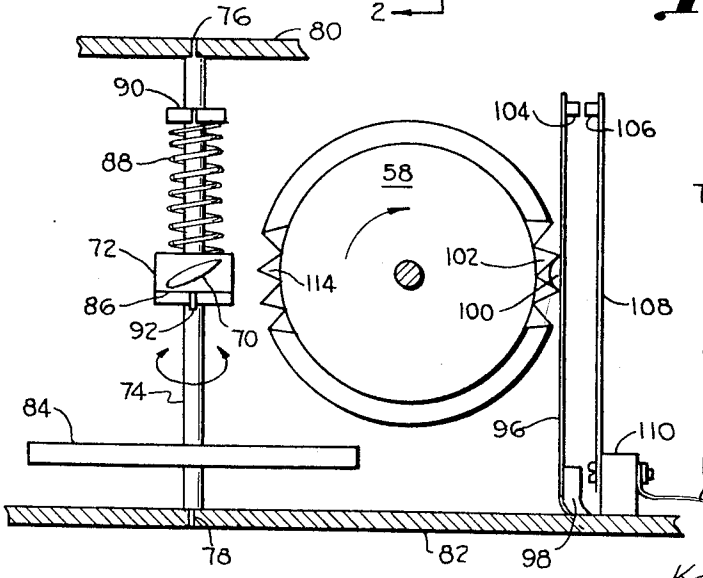

Fig. 2.

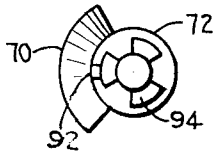

Fig. 3.

Kaj H. Jensen
INVENTOR.

BY Diggins & LaBlanc
ATTORNEYS

United States Patent Office 2,990,676 Patented July 4, 1961

2,990,676

BATTERY DRIVEN CLOCK

Kaj H. Jensen, Bareville, Pa., assignor to Hamilton Watch Company, Lancaster, Pa., a corporation of Pennsylvania

Filed July 16, 1958, Ser. No. 748,953
4 Claims. (Cl. 58—28)

This invention relates to electric clocks and more particularly relates to battery driven electric clocks of the type wherein the balance wheel serves both as the driving element and the regulating element.

United States patent to Koehler, No. 2,662,366, issued December 15, 1953, shows an electric clock of the foregoing type wherein the balance wheel is used to drive a conventional train. The present invention relates to an improvement in that type of clock whereby the number of bearings and wheels in the train is reduced with a concomitant reduction in the cost of the clock. These advantages are made possible through a novel train arrangement cooperating with a unique drive connection and an electrically driven balance wheel.

It is accordingly a primary object of the present invention to provide an improved battery-driven electric clock.

It is another object of the invention to provide an improved battery driven electric clock having a reduced number of wheels and bearings in the train which permit of economies in its manufacture.

It is another object of the invention to provide an improved battery operated electric clock having a unique and improved drive or index connection between the electrically driven balance wheel and the train.

The foregoing and additional objects and advantages of the invention will become more apparent upon reference to the following specification and claims and appended drawings wherein:

FIGURE 1 is a partial horizontal section of a clock constructed according to one embodiment of the invention;

FIGURE 2 is a partial vertical elevation taken along the line 2—2 of FIGURE 1; and

FIGURE 3 is a bottom view of the driving cam which provides the connection between the oscillating balance staff and the fourth wheel.

Referring to FIGURE 1, there is seen a U-shaped metal member indicated generally at **10** which provides a pillar plate **12** and bridge **14**. A center staff **16** is journalled in a bearing **18** in the bridge **14** and its other end is supported by the pillar plate **12** in a manner presently to be described in further detail. The center staff carries a fourth pinion **20** having an extended shoulder **22** which is pinned to the center staff.

A center arbor **24** is mounted over the center staff and is journalled at its left and right ends respectively on the shoulder **22** and on the center staff at **26**. The center arbor **24** has a cannon pinion **28** rotatably mounted thereon and this cannon pinion is provided with an elongated barrel **30** which is received in the bearing in the pillar plate **12**. A resilient spring **32** is mounted in a peripheral groove **34** in the center arbor **24** and frictionally engages the cannon pinion to provide a frictional drive between the cannon pinion and the center arbor.

The fourth pinion **20** drives a third wheel **36** which, with a third pinion **40**, is journalled on a pin **38** mounted in the pillar plate **12**. The third pinion **40** engages the cannon pinion **28** to establish a drive to the minute hand. The center arbor **24** has a further pinion **42** formed integrally therewith and abutting the end of the barrel **30** of the cannon pinion **28**.

An hour wheel **44** having an elongated barrel **46** is mounted over the center arbor and engages a pinion **48**. The pinion **48** is formed integrally with a corresponding

wheel **50** which is pivoted on the pin **38** and which engages the integral pinion **42**. An hour hand **52** is attached to the barrel **46** on the hour wheel **44**, a minute hand **54** is attached to the outer end of the center arbor **24** and a second hand **56** is attached to the end of the center staff **16**. The center staff is driven by means of a fourth wheel **58**.

A setting wheel **60** is mounted on a shaft **62** slidably and rotatably mounted in an aperture **64** in the pillar plate **12** and in an aperture **66** in the dial face **68**. The shaft is urged outwardly by a spring **65** attached to pillar plate **12** by a rivet **67**.

The fourth wheel **58** is driven by the balance wheel as presently will be described in further detail, and drives the center arbor through the fourth pinion, third wheel, third pinion, cannon pinion, and flexible spring **32**. The hour hand is, of course, driven by the pinion **42**, wheel **50**, pinion **48** and hour wheel **44**. The movement may be set by depressing the shaft **62** to move the wheel **60** into engagement with the wheel **50**, the spring **32** slipping to permit the hands to be set.

The fourth wheel **58** is driven by means of a cam **70** carried by a collar **72** on the balance staff **74**. Referring to FIGURE 2, the balance staff **74** is pivoted in bearings **76** and **78** in plates **80** and **82** which are attached to the U-shaped frame **10** either as separate or integral parts thereof. These plates **80** and **82** extend perpendicularly to the bridge **14**, so that the balance wheel **84** is disposed perpendicularly to the wheels in the train.

The balance staff **74** carries a first split washer **86** which is frictionally secured to the balance staff. Above this washer, the collar **72** is slidably received on the balance staff and is held down by means of a spring **88**, the upper end of which bears against a second split washer **90** engaged with the balance staff **74**. The collar **72** has a depending finger **92** which is slidably received in the split washer **86** to key the collar to the washer and balance staff. This permits vertical movement of the collar against the action of spring **88**.

Referring to FIGURE 3, the cam **70** extends outwardly from the collar **72** in a sector-like fashion and is helically cocked as is best seen in FIGURE 2. Oil passages **94** may be provided in the collar **72** to permit the retention of oil to facilitate sliding of the collar on the balance staff **74**.

Referring to FIGURE 2, a spring **96** is attached to an upstanding lug **98** on the plate **82** and supports intermediate its ends a cam **100** which it forces into engagement with the teeth **102** of the fourth wheel. A contact **104** is mounted at the upper end of the spring **96** and cooperates with a second contact **106** carried by a second spring **108** mounted adjacent and parallel to the spring **96**. The spring **108** is carried by an insulating block **110** and is connected by a wire **112** to one of the terminals of the coil driving the clock. This coil and the electric and magnetic arrangement of the driving mechanism is similar to that shown in the previously mentioned Koehler patent and is not described in further detail herein.

As the balance staff **74** oscillates in a counter clockwise direction, the helically cocked cam **70** engages the adjacent tooth **114** of the fourth wheel **58**. The engagement is between the underside of the cam and the top of the tooth and raises the collar **72** against the action of the spring **88**. The cam **100** and spring **96** holds the fourth wheel in position during this movement so that no appreciable movement of the fourth wheel occurs. As the balance staff **74** undergoes its return motion and rotates in a clockwise direction, the upper surface of the helically cocked cam **70** engages the underside of tooth **114** of the fourth wheel **58** and forces this tooth up. It will be seen that this upward movement of the tooth is caused by the fact that the cam **70** cannot slide downward on balance

staff 74 by reason of the engagement of collar 72 with the first split washer 86.

As the cam 70 causes a one-tooth clockwise advancement of fourth wheel 58, cam 100 on spring 96 is forced outwardly causing contacts 104 and 106 to engage. This energizes the electric drive arrangement of the clock as is explained in detail in the aforementioned Koehler patent.

It will be apparent from the foregoing that the clock of this invention utilizes a smaller number of bearings and wheels than is conventional and thus may be manufactured at a lower cost. The elimination of bearings also diminishes the number of possible points of failure and reduces the wear and lubrication problem.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a clock movement having a driven center staff, a center arbor mounted over said staff, a generally U-shaped frame member having a bridge and pillar plate as parallel legs thereof, said center staff being journalled in said bridge and pillar plate, a cannon pinion frictionally drivingly engaged with said arbor, a fourth pinion fixed to said center staff, a third wheel and third pinion forming a driving connection between said cannon pinion and driven center staff, a pin in said pillar plate extending toward but terminating short of said bridge, said third wheel and pinion being journalled on said pin, and an electrically impulsed balance staff extending perpendicular to said center staff and positioned between the end of said pin and said bridge.

2. In a clock movement, a center arbor journalled in a pillar plate and having a driven center staff passing therethrough, a cannon pinion mounted over said center arbor and connected thereto by a flexible spring, a fourth pinion connected to said center staff, and a third pinion and third wheel journalled on a pin in said pillar plate and providing a driving connection between said fourth pinion and said cannon pinion, a further pinion fixed on said arbor, an hour wheel on said arbor, and a wheel and pinion journalled on said pin in said pillar plate and having a driving connection between said further pinion on said arbor and said hour wheel.

3. A clock movement as set out in claim 1 wherein said frictional driving connection between said cannon pinion and arbor comprises a resilient washer received within a peripheral groove in said arbor and bearing against said cannon pinion.

4. A clock movement as set out in claim 2 wherein said last named wheel and pinion is mounted on the other side of said pillar plate from said third wheel and third pinion, said pin in said pillar plate extending therethrough.

References Cited in the file of this patent

UNITED STATES PATENTS

1,203,690	Borresen	Nov. 7, 1916
1,752,446	Marti	Apr. 1, 1930
1,797,912	Hammond	Mar. 24, 1931
1,911,062	Conrad	May 23, 1933
1,913,481	Gody	June 13, 1933
2,084,226	Strahm	June 15, 1937
2,589,052	Chiffelle	Mar. 11, 1952
2,618,118	Harris	Nov. 18, 1952

FOREIGN PATENTS

544,715	France	July 1, 1922