March 16, 1937. E. S. COLE ET AL 2,073,782

CLOCK MECHANISM

Filed Nov. 22, 1930

Fig. 1.

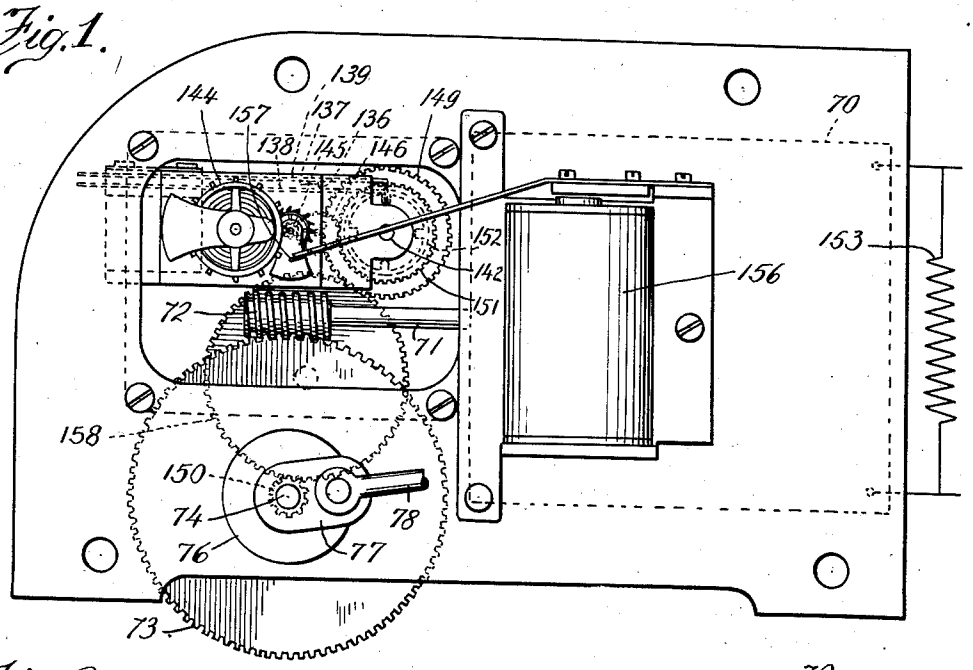


Fig. 2

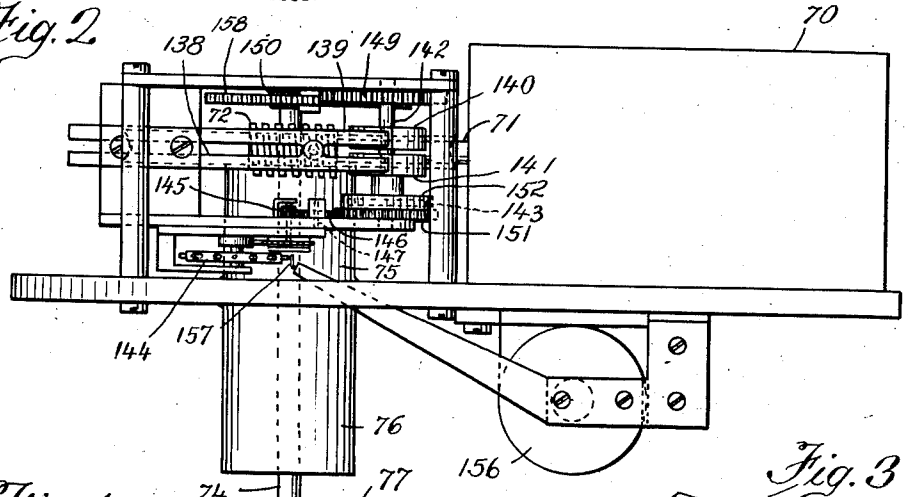


Fig. 4,

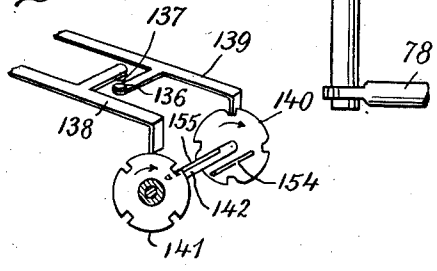
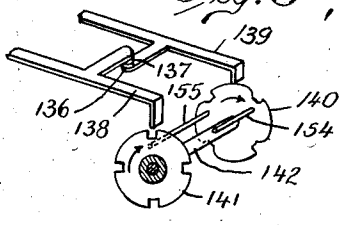


Fig. 3,



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CLOCK MECHANISM

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6 Claims. (Cl. 200—30)

The present invention relates in general to integrating the clock mechanism and the switch controlled thereby, and associated parts used on devices for integrating or totalizing instantaneous measurements with respect to time and more particularly to such devices as are adapted for use in connection with ship logs so that measurements of instantaneous speed of a ship may be totalized or integrated with respect to time to give the total distance traveled.

One of the objects of the present invention is the provision of a simplified self-winding clock mechanism.

Another object is to connect this clock mechanism so as to control the integration of instantaneous speeds periodically with respect to time.

A further object is to provide a simple, rugged and highly accurate clock.

Another object is to provide clock mechanism of this character adapted to operate electrical contacts in an efficient manner.

There are other objects of the invention which, together with the foregoing, will be described in the detailed specification which is to follow, taken in conjunction with the accompanying drawing forming a part thereof.

It will be obvious to those skilled in the art that the invention may be applied to the integration of any series of physical measurements, but for the sake of simplicity the invention is illustrated and described in connection with ship logs of the pitot tube type.

Referring now to the drawing:—

Fig. 1 is a side elevation of the integrating mechanism including the clock and its associated motor;

Fig. 2 is a diagrammatic top plan view showing the details of the clock and motor mechanism; and

Figs. 3 and 4 are a detail of the contact making mechanism.

The details of the clock and motor contact mechanism are shown in Figs. 1, 2, 3, and 4 an electric motor **70** mounted on a base plate carries on its shaft **71** a worm **72** which engages in the large worm wheel **73**. This wheel is rigidly attached to the shaft **74** rotatable on the bearings **75** and **76**. A crank arm **77** which serves to drive the integrator mechanism proper through a rod **78** is fastened to one end of shaft **74**, the other end carries a pinion **150** which drives the clock. Shaft **142** to which is fastened gear **149** and star wheel **140** is driven by pinion **150** through the intermediate gear **158**. Star wheel **141** which is fastened to spring barrel **152** and gear **151** as one unit, is free to turn on shaft **142** but is flexibly attached to it by means of the main spring **143** located in the spring barrel and with one end fastened thereto—the other end being secured to the shaft. This spring is always under tension but is prevented from driving the spring barrel and gear unit, parts **141**, **152**, and **151**, beyond a certain rate of speed, as determined by the escapement to which it is geared, through the intermediate gear **146** engaging the escape wheel pinion **145**. The escapement is of usual construction and need not be described in detail. The main spring is also prevented from unwinding entirely by means of the stop pins **154** and **155**, which project from the adjacent sides of the star wheels in such a manner as to strike and so prevent spring barrel **152** from advancing beyond a certain point, relative to the gear **149**. The contact springs **138** and **139** which control the operation of the motor are mounted in such a manner as to allow their points to bear upon the periphery of the star wheels.

The operation of the clock mechanism will be more easily understood by reference to Figs. 1, 2, 3, and 4. Fig. 4 shows the clock with the contacts in the open position, contact spring **139** being at the bottom of the slot in star wheel **140**. The main spring is under tension. Upon closing the clock circuit the motor drives the worm wheel **73** by means of the worm **72**. Pinion **150** drives the gear **149**, shaft **142** and star wheel **140** through the intermediate gear **158**. Because of the shape of the slot in the periphery of the star wheel **140** the contact spring **139** rises, and the contact spring **138**, resting upon contact spring **139**, also rises, lifting its point out of the slot in star wheel **141**. The contacts being closed the motor continues to run, contact spring **138** being held up by contact spring **139**, which rests upon the periphery of star wheel **140** which in turn is driven by the motor. This condition is shown in Fig. 3.

As the stop pins are no longer in contact the clock main spring now drives the spring barrel and gear **151** and **152** at the rate of speed determined by the escapement to which it is geared, and the star wheel **141** turns slowly relative to the star wheel **140** so that when the point of contact spring **139** drops into the next slot in its star wheel **140**, the star wheel **141** will have advanced to a point where the slot is no longer directly under the point of contact spring **138** which falls upon the periphery of its star wheel **141**, while contact spring **139** continues to fall to the bottom of the slot in star wheel **140**—thus open-

ing the contacts quickly and causing the motor to stop. The star wheel 141 driven by the main spring continues to turn at the rate determined by the escapement, contact spring 138 riding on its periphery, as shown in Fig. 4, until the next slot in the star wheel 141 comes under the point of the spring 138. It then drops, causing the contacts to close quickly—thus starting the motor and repeating the cycle. It will be noted that the stop pins never come in contact except when the clock stops, due to failure of the source of current supply, in which event the clock will continue to run until the stop pins meet. It will be noted also that under all circumstances the clock will stop with the contacts closed ready to start again when the current supply is restored.

In the case of the clock, shown in Figs. 1 and 2, the shaft 74 is made to turn one complete revolution for each time interval, but the rotation of shaft 74 may be varied from a fraction of one revolution to more than one revolution by using a suitable gear ratio between the shafts 74 and 142.

In order that the motor may not overrun, a simple dynamic brake is provided in the form of a small resistance unit 153, permanently connected across the terminals of the motor armature 70.

The time keeping properties of this mechanism, when the device is properly constructed, are remarkably accurate. The main spring is rewound at every motor impulse, which occurs at intervals of fifteen seconds in the apparatus described, but which can be varied within wide limits, and this makes it possible to dispense with many of the gears usually employed between the main spring and the escapement. Further, the main spring is kept at a substantially constant tension, so that the torque applied to the escapement is approximately constant.

In order that the clock may start automatically when the power is restored to the motor, a small electromagnet with an arm carrying a light quill 157, is arranged as shown. When the power is restored, the electromagnet being connected to the same supply circuit is energized and the quill is passed lightly along the periphery of the balance wheel as shown—thus setting the clock in motion.

While we have illustrated and described a certain specific embodiment of our invention, it will be understood many changes, modifications and deviations may be made therefrom without departing from the spirit and scope thereof, as indicated in the appended claims.

We claim:

1. The combination with a clock and switch means arranged to be operated by the clock, said switch means comprising a rotary member rotated by the clock, a second rotary member operated by a different instrumentality and spring contacts co-operating with said rotary members and provided with means whereby they will be brought into contact with one another by said rotary members at predetermined intervals of time.

2. The combination with a clock and switch means arranged to be operated by the clock, said switch means comprising a rotary member rotated by the clock, a second rotary member operated by a different instrumentality and spring contacts co-operating with said rotary members and provided with means whereby they will be brought into contact with one another by said rotary members at predetermined intervals of time and kept in contact for predetermined periods of time.

3. The combination with a clock and switch means arranged to be operated by the clock, said switch means comprising a rotary member rotated by the clock, a second rotary member operated by a different instrumentality and spring contacts co-operating with said rotary members and provided with means whereby they will be brought into contact with one another by said rotary members at predetermined intervals of time, said rotary member comprising star wheels with circumferential notches, and the spring contacts comprising metal strips with bent ends adapted to enter said notches.

4. The combination with a clock and switch means arranged to be operated by the clock, said switch means comprising a rotary member rotated by the clock, a second rotary member operated by a different instrumentality and spring contacts co-operating with said rotary members and provided with means whereby they will be brought into contact with one another by said rotary members at predetermined intervals of time, said rotary member comprising star wheels with circumferential notches, and the spring contacts comprising metal strips with bent ends adapted to enter said notches, and the star wheel turned by an independent device having its peripheral notches inclined at one side to permit the bent end of a spring entering the same to be lifted by a rotation of said wheel.

5. The combination with an electric circuit and a clock, of a rotary star wheel having notches and mounted on a shaft driven by the clock, an escapement controlling the operation of said star wheel, a second star wheel mounted on the same shaft as the first mentioned star wheel and arranged to be rotated independently thereof, a pair of contact strips each having a bent end co-operating with notches in said star wheel, said contact strips having transversely extended portions providing contacts to co-operate with one another to make and break said circuit, said contact strips being arranged to co-operate to open said circuit when the first mentioned star wheel contact strip rides on the periphery of said wheel and to close the circuit when the second mentioned star wheel contact strip rides on the periphery of said first mentioned star wheel.

6. In a device of the class specified, an electric circuit switch means comprising a star wheel mounted on a shaft, a second star wheel mounted on the same shaft as the first mentioned star wheel and arranged to be rotated independently thereof, a pair of contact strips each having a bent end co-operating with notches in said first mentioned star wheel, said contact strips having transversely extended portions providing contacts to co-operate with one another to make and break said circuit, said contact strips being arranged to co-operate to open said circuit when the first mentioned star wheel contact strip rides on the periphery of said second mentioned star wheel and to close said circuit when the second mentioned star wheel contact strip rides on the periphery of said first mentioned star wheel.

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