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Complete Specification Left, 4th Nov., 1904—Accepted, 19th Jan., 1905

PROVISIONAL SPECIFICATION.

"Improvements in or relating to Electric Clocks".

I, HENRI ALFRED CAMPICHE, Manufacturer, of 7 Chemin Gourgas, Geneva, Switzerland, do hereby declare the nature of this invention to be as follows—

The invention consists of an improved electric clock of very simple construction particularly applicable for use as a navy-chronometer. It does away with the winding up of a motive spring which involves, in the marine chronometers actually in use, the reversing of the same. The instrument is furthermore arranged in such a way as to act as a time-distributor.

The electric marine chronometer according to the present invention consists of a rotating balance wheel in combination, on the one hand, with an impulse-device actuated by an electro-magnet, and on the other hand with a device which directly actuates an escapement wheel. An apparatus according to the present invention will be described in the following description.

Between two main horizontal plates is pivoted a rotatable balance-wheel provided with a strong spiral spring one of the ends of which is fastened to the upper main plate, and the other to the balance-wheel.

The said balance-wheel bears a wedged-shaped piece pivotally connected to a point situated on one of the arms of said balance-wheel and combined with a helical spring which has the tendency to press said wedge-shaped part against a projecting pin secured to the balance-wheel.

To the lower main plate is pivotally connected a rocking lever by means of a pivot, a spring mounted on which is liable to come into contact with the above-mentioned wedge-shaped part, but which is generally kept out of the way of the said piece by means of another spring fixed to the upper main plate. The rocking-lever is provided with a longitudinal aperture, through which passes the lower end of a bar lever which is pivotally connected to a horizontal pivot carried by the upper main plate.

The upper end of the bar lever is connected to the armature of an electro-magnet by means of a connecting-rod.

The shaft of the balance-wheel bears above the upper main plate a disc, the tubular axis of which is forced upon the slightly conical end of said shaft. To this disc is pivotally connected a pawl combined with a helical spring, the latter being secured on the tubular axis of the disc by means of a ring, said spiral spring tending to hold said pawl pressed against a pin which is fastened to said disc.

Beside the said disc is pivotally connected a toothed escapement wheel, in the teeth of which gears the pawl whenever the balance-wheel vibrates. When this vibration takes place in one direction, the pawl causes the escapement-wheel to rotate one tooth; on this vibration taking place in opposite direction, the spring allows the pawl to slide over from the teeth of the escapement-wheel.

A roller borne by a lever and pivotally connected to bridge bears, under the pressure of a spring, against two of the cogs of the escapement wheel for the

purpose of preventing the escape of more than one tooth at each action of the pawl.

Two insulated contact-springs are intended to be connected with one another by means of a pin on the escapement wheel: they are inserted in the circuit of the electro-magnet. The said pin carried by the escapement wheel joins, once at each rotation of the escapement wheel the said contact-springs, thus closing the circuit of the electro-magnet.

The same pin may also actuate other contact-springs inserted into the circuit of secondary clocks.

At each vibration of balance-wheel the spring operated pawl causes the advance of one tooth of the escapement wheel and at each complete rotation of this latter the pin in said escapement wheel causes the circuit of the electro-magnet to be closed.

The arrangement of the parts is such that this circuit closing takes place at the very moment when the wedge-shaped piece on the balance-wheel is within reach of the slotted rocking lever, so that the resulting attraction of armature causes an impulse to be given by said rocking-lever to the balance-wheel. The escapement-wheel is provided with 30 teeth and its shaft bears a hand marking the seconds: the balance-wheel oscillating once in a second it causes the advancing of one tooth of wheel at each second vibration and the hand carried by this wheel will, at each advance, move forward by two divisions of the seconds-dial.

The armature may be combined with a device of any well known type for moving forward the minute and hour hands of a secondary or receiving clock lodged in the neighbourhood of the just described mechanism. Said armature may be combined with a circuit of several secondary or receiving clocks, thus indicating the time in different parts of a ship.

The number of teeth of the escapement wheel may vary. Said wheel may be provided with several pins with a view of producing several impulses at each rotation and thus actuating the secondary or receiving clocks several times, in order to distribute time to them by fractions of minutes.

Dated this 11th day of February 1904.

BOULT, WADE & KILBURN,
Agents for the Applicant.

COMPLETE SPECIFICATION.

"Improvements in or relating to Electric Clocks."

I, HENRI ALFRED CAMPICHE, Manufacturer, of 7, Chemin Gourgas, Geneva, Switzerland, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

The invention consists of an improved electric clock of very simple construction particularly applicable for use as a navy-chronometer. It does away with the winding up of a motive spring which involves, in the marine chronometers actually in use, the reversing of the same. The instrument is furthermore arranged in such a way as to act as a time-distributor.

The electric marine chronometer according to the present invention consists of a rotating balance wheel in combination, on the one hand, with an impulse-device actuated by an electro-magnet, and on the other hand with a device which directly actuates an escapement wheel.

The accompanying drawing shows, by way of example, one form of carrying out this invention.

Figure 1 is a plan view of the instrument without its casing: the latter may be of any kind whatever.

Figure 2 is a front elevation with section through A—B of Figure 1;

Figure 3 is a horizontal section made underneath the upper plate and showing the lower portion of the mechanism in plan view;

Figure 4 shows separately, in plan and on a larger scale the device actuating the escapement-wheel.

Figure 5 is an axial section of the device shown in Figure 4.

Figure 6 shows separately, in plan view and on a larger scale the parts constituting the impulse-device actuating the balance-wheel, and

Figure 7 shows the same parts in elevation.

Figure 8 is a plan view, Figure 9 a partial side elevation, and Figure 10 an elevation of a modified construction of wheel t and nose q.

Between the horizontal plates a and b is pivotted a rotatable balance-wheel c provided with a strong spiral spring c^1 one of the ends of which is fastened to the upper plate a, and the other to the balance-wheel.

The said balance-wheel c bears a wedge-shaped piece d pivotally connected to a point e situated on one of the arms of said balance-wheel and combined with a helical spring f, which has the tendency to press said wedge-shaped part d against a projecting pin g secured to the balance-wheel.

To the plate b is pivotally connected a rocking-lever i by means of a pivot h; a spring i^1 mounted on this rocking lever is liable to come into contact with the above-mentioned wedge-shaped part d, but is generally kept out of the way of the said piece by means of a spring i^2 fixed to the plate a (Figure 2). The rocking-lever i is provided with a longitudinal aperture, through which passes the lower end of a lever k which is pivotally connected to a horizontal pivot k^1 carried by the upper plate a.

The upper end of the lever k is connected to the armature m of an electro-magnet n by means of a connecting-rod l.

Each time the armature m is attracted by the electro-magnet n the lever k is oscillated on its pivot k^1 and its lower end, engaging the slot of lever i, moved into the position shown in Figure 3, in which it is in reach of the wedge-shaped piece d.

When the armature m is not attracted by the magnet, the spring i^2 moves the lever k into such a position that it is not in reach of the wedge-shaped piece or tooth d of the balance wheel.

The shaft c^1 of the balance wheel c bears above the plate a a disc o (Figure 4) the tubular axis o^1 of which is forced upon the slightly conical end of said shaft. To the disc o is pivotally connected at p^1 a pawl q combined with a helical spring r, the latter being secured on the tubular axis o^1 of disc o by means of a ring r^1, the said spiral spring r tending to hold said pawl q pressed against a pin s which is fastened to said disc.

Beside the said disc o is pivotally connected a toothed escapement wheel t in the teeth of which gears the pawl q whenever the balance-wheel c vibrates. When this vibration takes place in one direction, the pawl q causes the escapement wheel to rotate one tooth: on this vibration taking place in opposite direction, the spring r allows the pawl q to slide over from the teeth of the escapement wheel.

A roller u borne by a lever v and pivotally connected to bridge x, bears under the pressure of a spring u^1 against two of the cogs of the escapement wheel t for the purpose of preventing the escape of more than one tooth at each action of the pawl q.

Two insulated contact-springs y, y^1 are intended to be connected with one another by means of a pin t^1 on the wheel t, (as clearly shown in Fig. 9) they are inserted in the circuit of an electro-magnet n. The said pin t^1 carried by

the wheel t joins once at each rotation of the wheel t the said contact-springs y y^1, thus closing the circuit of the electro-magnet n.

The same pin may also actuate other contact-springs z z^1 inserted into the circuit of secondary clocks.

At each vibration of balance-wheel c the spring-operated pawl q causes the advance of one tooth of the escapement-wheel t and at each complete rotation of this latter the pin t^1 causes the circuit of the electro-magnet to be closed.

The arrangement of the parts is such that this circuit closing takes place at the very moment when the wedge-shaped piece d on the balance-wheel e is within reach of the rocking-lever i, so that the resulting attraction of the armature m causes an impulse to be given by said rocking-lever i to the balance-wheel c. The escapement-wheel t is provided with 30 teeth and its shaft bears a hand marking the seconds; the balance-wheel oscillating once in a second it causes the advancing of one tooth of the wheel t at each second vibration and the hand carried by this wheel will, at each advance, move forward by two divisions of the seconds-dial.

The armature m may be combined with a device of any well known type (not shown in the drawing) for moving forward the minute and hour hands of a secondary or receiving clock lodged in the neighbourhood of the just-described mechanism. Said armature m may be combined with a circuit of several secondary or receiving clocks, thus indicating the time in different parts of a ship.

The number of teeth of the wheel t may vary. Said wheel t may be provided with several pins such as t^1 with a view of producing several impulses at each rotation and thus actuating the secondary or receiving clocks several times, in order to distribute time to them by fractions of minutes.

The wheel t (Figs. 8 and 9) might also be provided with a supplementary pin t^2 intended to be acted upon by a suitable projection q^1 of the nose q, placed at right angles to the same, for the purpose of causing the contact-pins t^1 to be disconnected shortly after they have been put into contact with the contact-springs. The supplementary pin t^2 is acted upon by the projection q^1 immediately after the nose q has caused the pin t^1 to engage the contact springs.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In an electric clock, the combination with an electro-magnet, a balance-wheel and an escapement-wheel, of means actuated by the electro-magnet for imparting an impulse to the balance-wheel, means actuated by the oscillation of the balance-wheel to rotate the escapement-wheel, and means for intermittently closing the circuit to the electro-magnet.

2. In an electric clock, the combination with an electro-magnet, a balance-wheel and an escapement-wheel, a pin fixed in said balance-wheel, of an arm pivoted to said balance-wheel, a spring adapted to hold said arm normally against said pin, means actuated by the electro-magnet for contacting with said arm to impart an impulse to the said balance-wheel, means actuated by the oscillation of the balance-wheel to rotate the escapement-wheel, and means for intermittently closing the circuit to the electro-magnet.

3. In an electric clock, the combination with an electro-magnet, a balance-wheel and an escapement-wheel, of an arm pivoted to said balance-wheel, a pin fixed in said balance-wheel, a spring adapted to hold said arm normally against said pin, means actuated by the electro-magnet for contacting with said arm to impart an impulse to said balance-wheel, a standard, a lever having a slot therein pivotally connected to said standard, a spring fixed to said lever and adapted to contact with the end of said arm, a spring for normally holding said lever with the end of its spring away from said arm, a lever passing through the slot in the aforesaid lever, a rod connecting the end of the last aforesaid lever

with the armature of the electro-magnet, means actuated by the oscillation of the balance-wheel, and means for intermittently closing the circuit to the electro-magnet.

4. In an electric clock, the combination with an electro-magnet, a balance-wheel and an escapement-wheel, of means actuated by the electro-magnet for imparting an impulse to the balance-wheel, a disc, an arm pivotally connected to said disc, a pin fixed in said disc, a spring adapted to maintain said arm normally in position against said pin, the end of said arm being adapted to engage the teeth of the escapement-wheel, and means for intermittently closing the circuit to the electro-magnet.

5. In an electric clock, the combination with an electro-magnet, a balance-wheel and an escapement-wheel, of means actuated by the electro-magnet for imparting an impulse to the balance-wheel, a disc, an arm pivotally connected to said disc, a pin fixed in said disc, a spring adapted to maintain said arm normally in position against said pin, the end of said arm being adapted to engage the teeth of the escapement-wheel, a contact-pin carried by said escapement-wheel, and a pair of spring-contacts against which the said contact-pin is adapted to bear to close the circuit to the electro-magnet.

6. In an electric clock, the combination with an electro-magnet, a balance-wheel and an escapement-wheel, of means actuated by the electro-magnet for imparting an impulse to the balance-wheel, a disc, an arm pivotally connected to said disc, a pin fixed in said disc, a spring adapted to maintain said arm normally in position against said pin, the end of said arm being adapted to engage the teeth of the escapement-wheel, a contact-pin carried by said escapement-wheel, and a second pair of spring contacts against which the said contact-pin is also adapted to bear to close a circuit to secondary clocks.

7. The complete electric clock mechanism substantially as described or illustrated in the accompanying drawings.

Dated this 4th day of November 1904.

BOULT, WADE & KILBURN,
Agents for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1905.

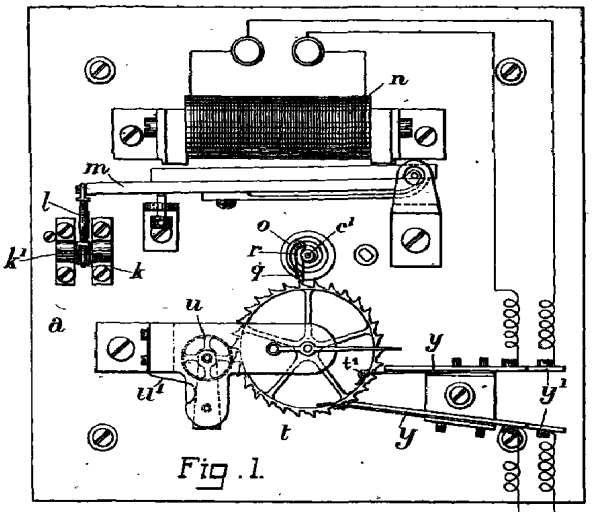


Fig. 1.

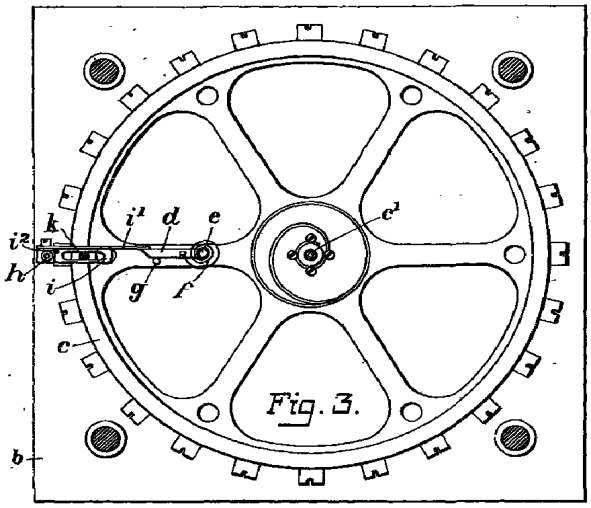


Fig. 3.

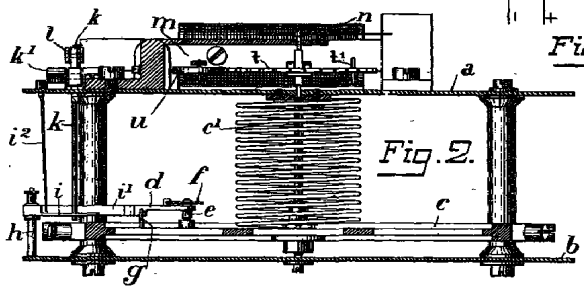


Fig. 2.

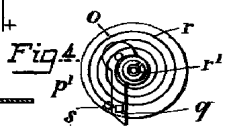


Fig. 4.

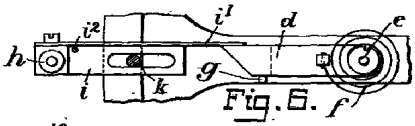


Fig. 6.

Fig. 5.

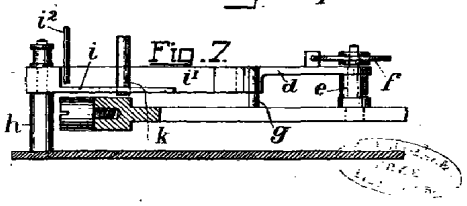


Fig. 7.

Malby & Sons, Photo-Litho.

[This Drawing is a reproduction of the Original on a reduced scale.]

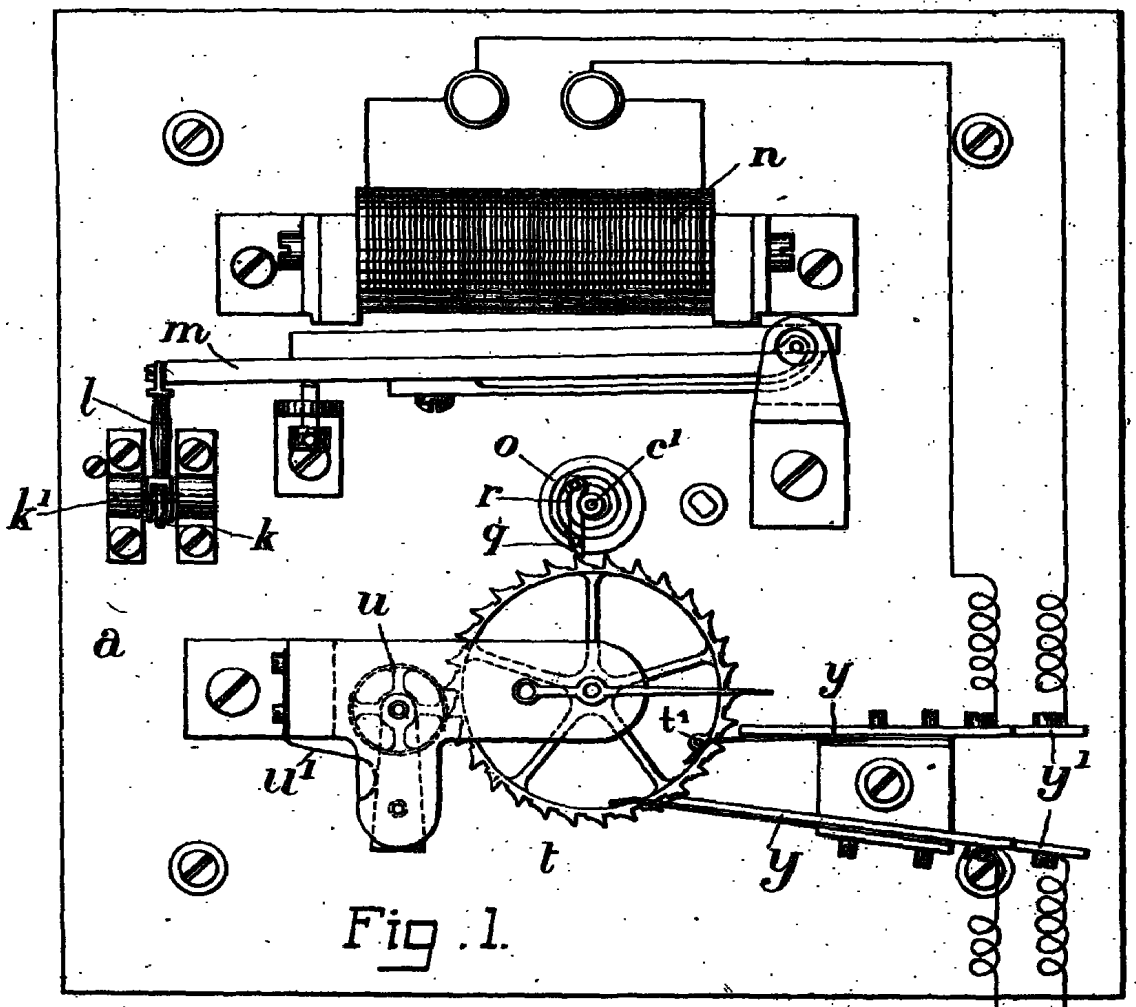


Fig. 1.

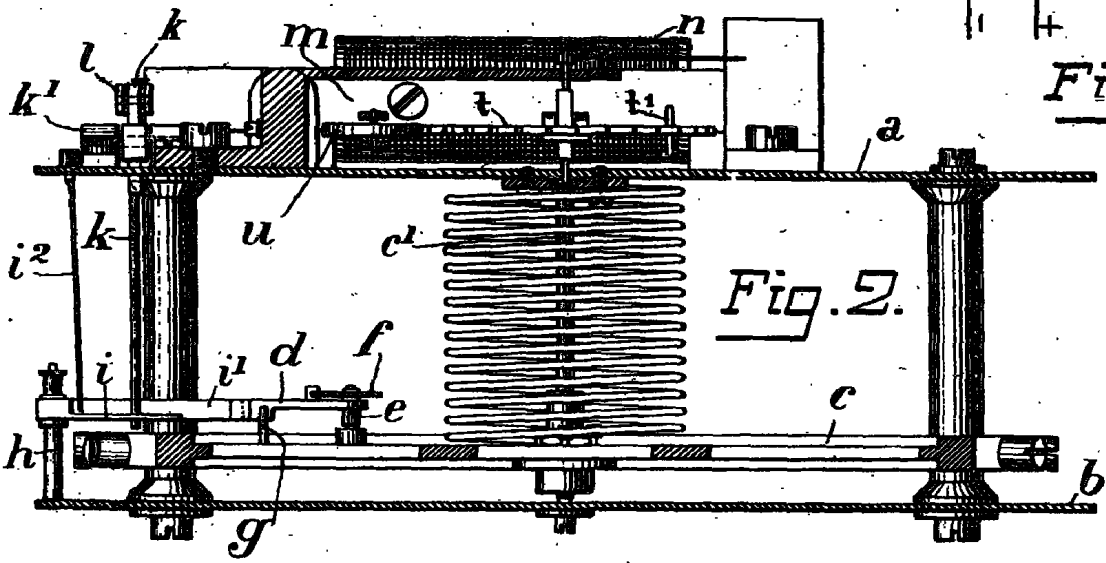


Fig. 2.

Fig. 4

p¹

s

q

o

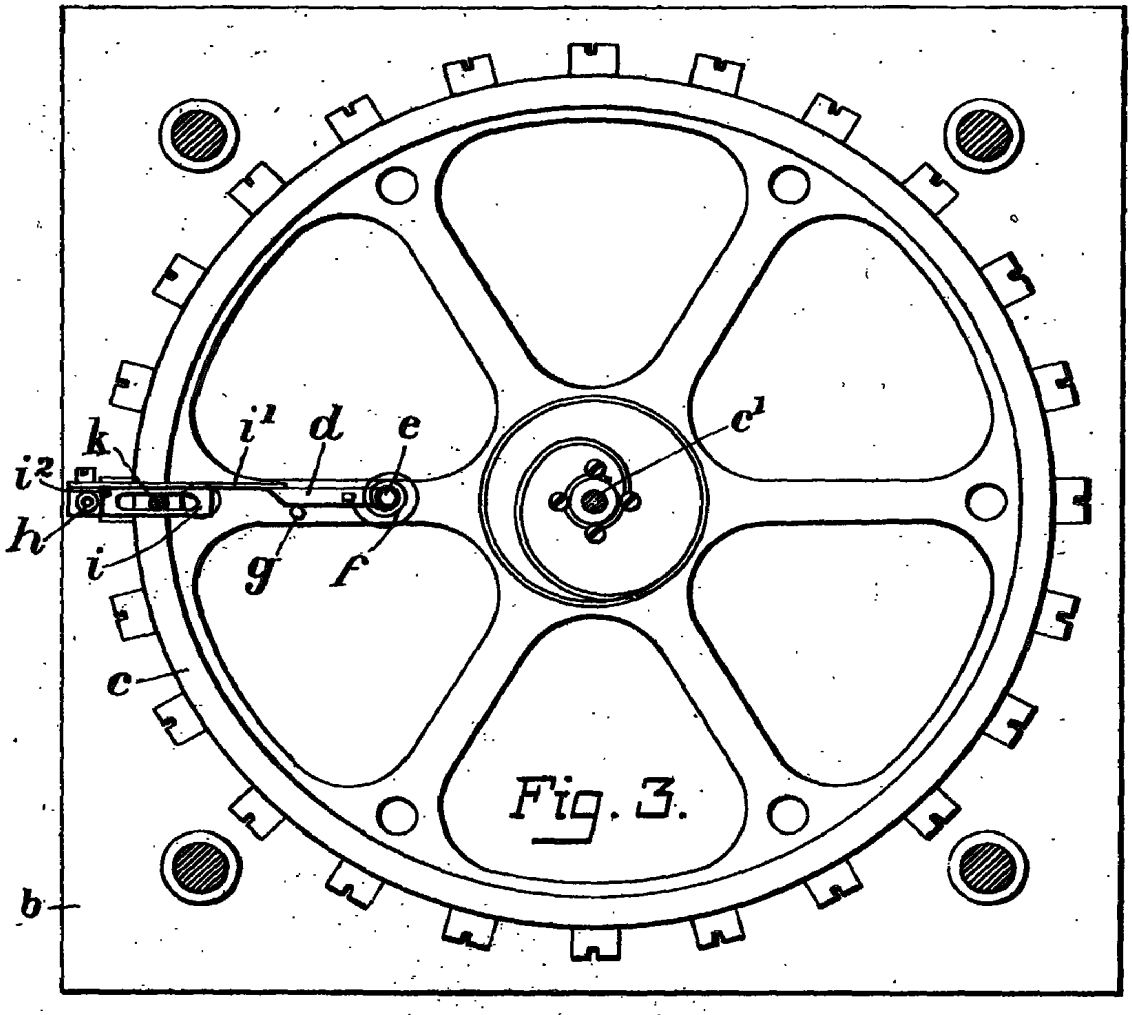
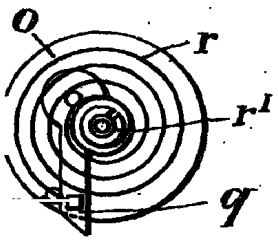


Fig. 3.



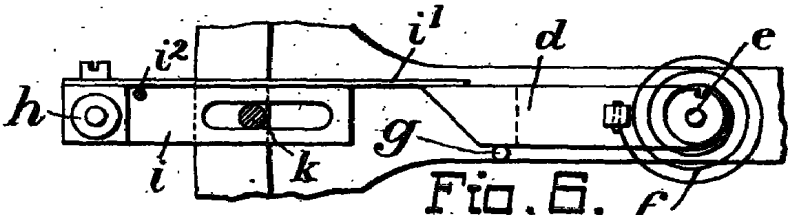


Fig. 6.

Fig. 5.

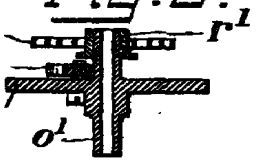
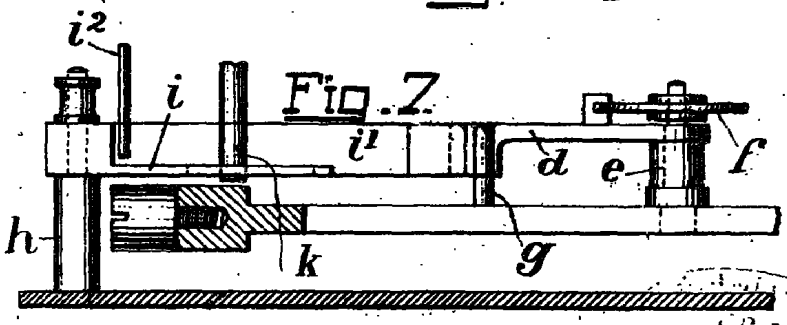


Fig. 7.



[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 9.

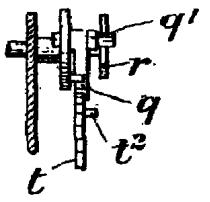
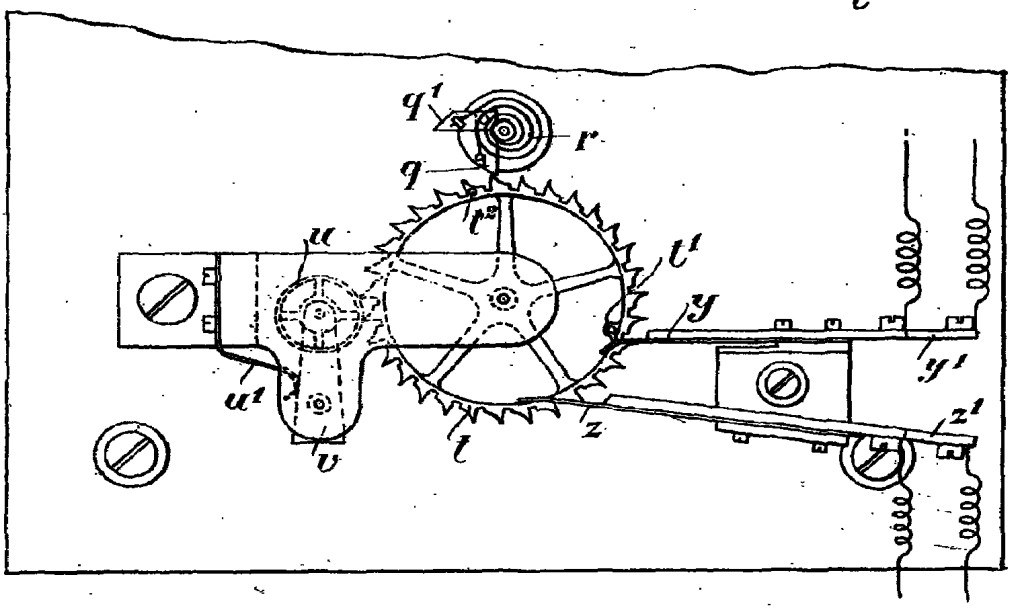


Fig. 8.



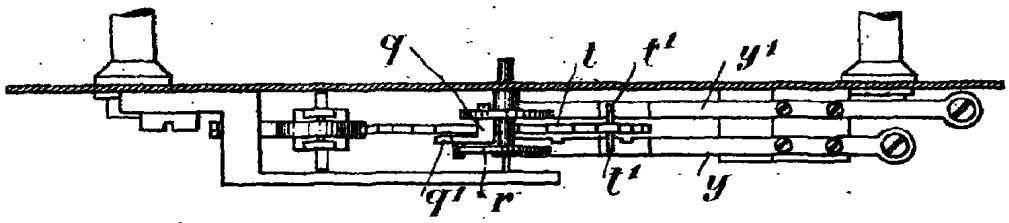


Fig. 10.

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