118,329

PATENT SPECIFICATION

Application Date, Aug. 24, 1917. No. 12,165/17.
Complete Left, Feb. 25, 1918.
Complete Accepted, Aug. 26, 1918.

PROVISIONAL SPECIFICATION.

Improvements in and relating to Electrically Operated Mechanism suitable for Driving Clockwork-trains or the like.

I, FRANK HOLDEN, of 83, Cannon Street, London, E.C. 4, Electrical Engineer, do hereby declare the nature of this invention to be as follows:—

This invention relates to electrically operated mechanism suitable for driving a train of wheels such as a clockwork train. The object of this invention is to provide improved and efficient mechanism of this type which is inexpensive to construct and can be operated with a very small current, and to that end it consists in a pivoted spindle normally biassed by means of a spring to occupy a central position but adapted to be rotated through a portion of a revolution by the effect of an electric current passed through a coil carried by the spindle and moving in a magnetic field, the spindle being returned by means of the spring after the circuit of the coil has been broken, so that the spindle is given a reciprocating motion which can be converted into an intermittent motion in a uniform direction and imparted to the clockwork or other train by means of a pawl and ratchet wheel or in any other suitable manner. The invention further consists in the method of arranging the contacts through which current is conveyed to the coil, and in other details of construction more particularly pointed out in the following description.

The accompanying drawings illustrate one method of carrying my invention into effect. In the drawings Figs. 1 & 2 are front elevation and plan respectively of the complete mechanism and Figs. 3 & 4 are side elevation and plan respectively of the moving element.

In the drawing *a* represents the reciprocating shaft which is supported in pivot bearings at each end. The lower bearing which is preferably a jewel is mounted on a plate *b* forming the base-plate of the mechanism. Also mounted on this base-plate is a permanent magnet *c* which is in the form of two rings of magnetic material which are joined together by means of a block *d* also of magnetic material. The lower ring may be continuous as shewn but the upper one is divided and may be provided with pole pieces *e* projecting towards the lower ring. In order to shorten the magnetic air gap a block *f* of magnetic material may be secured to the lower ring opposite the pole pieces *e*. Mounted on the spindle *a* is a three armed spider *g* one arm of which carries a coil *h* adapted to encircle the upper ring of the permanent magnet while the other two arms carry balance weights *k*. The width of the coil *h* is such that it will just pass through the division made in the upper ring of the magnet. Rigidly secured to the spindle *a* near its upper end is an arm *l* to which is secured a pin *m* projecting downwards and arranged parallel to the spindle. The pin is insulated from the arm *l* and has a sleeve *n* surrounding its lower end and

[*Price* 6*d*.]

capable of sliding and turning freely on the pin. The sleeve *n* has a contact *o* preferably formed integral with it and the sleeve and contact are held in place by means of a light helical spring *p* surrounding the pin, the upper end being fixed relatively to the pin while the lower end is fixed to the sleeve. This spring tends to keep the contact in a definite position relatively to the pin and to return it to this position when it is moved out of position by coming into contact with a fixed contact *q*. This contact *q* is carried by an adjustable plate *r* resting on but insulated from a plate *s* forming the upper part of the framework of the mechanism. The spindle *a* has one end of a helical spring *t* secured to it the other end of which is secured to the base plate *b* in such a manner that the normal position of the coil is substantially in register with the slot or division in the upper ring of the magnet.

The operation of the mechanism is as follows:—One pole of battery *v* is connected to the plate *r* while the other is connected to the baseplate *b* or other suitable part of the frame work of the mechanism. The coil *h* is electrically connected to the spindle and through the spring *t* to the framework. The coil is also connected electrically to the pin *m* and through the spring *p* to the contact *o*. If the spindle is now twisted in a clockwise direction and released, during the return movement caused by the spring the movable contact *o* will engage the fixed adjustable contact *q*. These contacts should be so adjusted relatively to each other that contact will take place when the coil *h* is entering the magnetic field between the pole-pieces *e* and the block *f*. Upon engagement of the contacts *o* and *q* a current will pass through the coil *h* from the battery *v* through the plate *r*, contact *q*, contact *o*, sleeve *n*, spring *p*, pin *m*, coil *h*, spindle *a*, spring *t*, to the framework and back to the other pole of the battery. The effect of the current passing through the coil while it is in the magnetic field is to give it an impulse to the right. The spindle rotates in an anti-clockwise direction until the spring *t* absorbs the kinetic energy of the moving element and brings it to rest and also immediately tends to return it to its central position. The weight of the moving element however is such that the spring is unable to bring it to rest immediately consequently it will oscillate about its central position and the contacts will again engage and the moving element will receive another impulse, the sequence of operations being repeated until the battery is exhausted so such an extent that it is unable to furnish sufficient current. The effect of arranging the fixed and moving contacts as above described is that when the spindle is moving in an anti-clockwise direction the contacts remain in engagement for a considerable time and have a wiping engagement with each other, whereas when moving in the opposite direction the contact is so short that no appreciable current passes through the coil. The motion imparted to the spindle may be utilised to drive a clock-train or other mechanism by mounting a pawl on the spindle or by any other suitable or well known means.

It will be obvious that the spring *t* may be provided with a device for regulating its effective length similar to that usually fitted to the hair spring of a watch or clock so that the periodicity of the oscillation may be varied.

Although I have particularly described and illustrated one form of my invention it is to be understood that the details of construction may be varied without departing from the spirit and scope of my invention. For example in place of cutting a portion out of the upper ring of the magnet and securing separate pole pieces on to the ends I may simply cut the ring through and bend the ends downwards towards the lower ring, or I may cut both upper and lower rings and provide pole pieces on each or bend them towards each other. Other modifications of construction will suggest themselves to those skilled in the art.

Dated this 24th day of August, 1917.

CHARLES H. BURGESS,
83, Cannon Street, London, E.C.

COMPLETE SPECIFICATION.

Improvements in and relating to Electrically Operated Mechanism suitable for Driving Clockwork-trains or the like.

I, FRANK HOLDEN, of 83, Cannon Street, London, E.C. 4, Electrical Engineer, 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:—

This invention relates to electrically operated mechanism of the type claimed in my prior Patent No. 14,873 of 1909 suitable for driving a train of wheels such as a clockwork train. The object of this invention is to provide improved and efficient mechanism of this type which is inexpensive to construct and can be operated with a very small current. In Figs. 4 and 5 of the drawings accompanying the Complete Specification of the above patent I illustrated mechanism comprising a pivoted spindle normally biassed by means of a spring to occupy a central position but adapted to be rotated through a portion of a revolution by the effect of an electric current passed through a coil carried by the spindle and moving in a magnetic field, the spindle being returned by means of the spring after the circuit of the coil has been broken, so that the spindle is given a reciprocating motion which can be converted into an intermittent motion in a uniform direction and imparted to the clockwork train by means of a pawl and ratchet wheel or in any other suitable manner. The present invention consists in an improved method of constructing and arranging the contacts through which current is conveyed to the coil in mechanism of the above type and in other details of construction more particularly pointed out in the following description.

The drawings left with the Provisional Specification illustrate one method of carrying my invention into effect. In the drawings Figs. 1 and 2 are front elevation and plan respectively of the complete mechanism and Figs. 3 and 4 are side elevation and plan respectively of the moving element.

The accompanying drawings illustrate an alternative contact arrangement, Figs. 1 and 2 being plan and side elevation respectively of the contacts.

In the drawings left with the Provisional Specification *a* represents the reciprocating shaft which is supported in pivot bearings at each end. The lower bearing which is preferably a jewel is mounted on a plate *b* forming the base-plate of the mechanism. Also mounted on this base-plate is a permanent magnet *c* which is in the form of two rings of magnetic material which are joined together by means of a block *d* also of magnetic material. The lower ring may be continuous as shown but the upper one is divided and may be provided with pole pieces *e* of similar polarity projecting towards the lower ring. In order to shorten the magnetic air gap a block *f* of magnetic material may be secured to the lower ring opposite the pole pieces *e* and forming a pole piece of opposite polarity. Mounted on the spindle *a* is a three armed spider *g* one arm of which carries a coil *h* adapted to encircle the upper ring of the permanent magnet while the other two arms carry balance weights *k*. The width of the coil *h* is such that it will just pass through the division made in the upper ring of the magnet. Rigidly secured to the spindle *a* near its upper end is an arm *l* to which is secured a pin *m* projecting downwards and arranged parallel to the spindle. The pin is insulated from the arm *l* and has a sleeve *n* surrounding its lower end and capable of sliding and turning freely on the pin. The sleeve *n* has a contact *o* prefer-

ably formed integral with it, and the sleeve and contact are held in place with the contact lying at an angle to a line joining the axes of spindle *a* and pin *m*, by means of a light helical spring *p* surrounding the pin, the upper end being fixed relatively to the pin while the lower end is fixed to the sleeve. This spring tends to keep the contact in a definite position relatively to the pin and to return it to this position when it is moved out of position by coming into contact with a fixed contact *q*. This contact *q* is carried by an adjustable plate *r* resting on but insulated from a plate *s* forming the upper part of the framework of the mechanism. The spindle *a* has one end of a helical spring *t* secured to it the other end of which is secured to the base plate *b* in such a manner that the normal position of the coil is substantially in register with the slot or division in the upper ring of the magnet.

The operation of the mechanism is as follows:—One pole of battery *v* is connected to the plate *r* while the other is connected to the base plate *b* or other suitable part of the frame work of the mechanism. One end of coil *h* is electrically connected to the spindle *a* and through the spring *t* to the framework. The other end of the coil *h* is connected electrically to the pin *m* and through the spring *p* to the contact *o*. If the spindle is now twisted in a clockwise direction until contact *o* is on the left hand side of contact *q* and released, during the return movement caused by the spring *t* the movable contact *o* will engage the fixed adjustable contact *q*. These contacts should be so adjusted relatively to each other that contact will take place when the coil *h* is entering the magnetic field between the pole-pieces *e* and the block *f*. Upon engagement of the contacts *o* and *q* a current will pass through the coil *h* from the battery *v* through the plate *r*, contact *q*, contact *o*, sleeve *n*, spring *p*, pin *m*, coil *h*, spindle *a*, spring *t*, to the frame-work and back to the other pole of the battery. The effect of the current passing through the coil while it is in the magnetic field is to give it an impulse to the right. The spindle rotates in an anti-clockwise direction until the spring *t* absorbs the kinetic energy of the moving element and brings it to rest and also immediately tends to return it to its central position. The weight of the moving element, however, is such that the spring is unable to bring it to rest immediately, consequently it will oscillate about its central position and the contacts will again engage and the moving element will receive another impulse, the sequence of operations being repeated until the battery is exhausted to such an extent that it is unable to furnish sufficient current. The effect of arranging the fixed and moving contacts as above described is that when the spindle is moving in an anti-clockwise direction the contacts remain in engagement for a considerable time and have a wiping engagement with each other, owing to the contact *o* being moved toward the line joining the axes of spindle *a* and pin *m* whereas when moving in the opposite direction the contact is so short that no appreciable current passes through the coil. The motion imparted to the spindle may be utilised to drive a clock-train or other mechanism by mounting a pawl on the spindle or by any other suitable or well known means.

It will be obvious that the spring *t* may be provided with a device for regulating its effective length similar to that usually fitted to the hair spring of a watch or clock so that the periodicity of the oscillation may be varied.

In Figs. 1 and 2 of the accompanying drawings, *a* represents the spindle carrying the coil which has been omitted for the sake of clearness. The arm *l*, is secured to the spindle as before and carries a downwardly projecting pin *m*, insulated from it. The lower end of this pin is prolonged and bent upwards as shown in Fig. 2 and forms a stop m^1 for the contact *o*, limiting its movement in a counter-clockwise direction. The contact *o* is carried by the sleeve *n*, which is connected to the upper end of the pin *m* by a light spiral spring *p*, the tension of the spring being so arranged that it will hold the contact against the stop m^1 and return it to this position after movement in a

clockwise direction. In place of having a rigidly fixed contact as in the modification above described a pivoted contact q is provided, mounted on the adjustable plate r being pivoted on a fixed pin 5 to which it is connected by means of a light spring 6, which surrounds the pin and is secured to it at its upper end. The contact q is held by the spring 6 against the fixed stop 7. With contacts arranged as described and illustrated in these figures it is found that much weaker springs can be employed than those used in the modification described above and that a more definite zero position for the contacts is obtained, also there is a smaller loss of energy in the springs.

Although I have particularly described and illustrated one form of my invention it is to be understood that the details of construction may be varied without departing from the spirit and scope of my invention. For example, in place of cutting a portion out of the upper ring of the magnet and securing separate pole pieces on to the ends I may simply cut the ring through and bend the ends downwards towards the lower ring or I may cut both upper and lower rings and provide pole pieces on each or bend them towards each other. Other modifications of construction will suggest themselves to those skilled in the art.

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 electrically operated mechanism of the type hereinbefore referred to suitable for driving a clockwork or other train, means for periodically completing the circuit of the coil comprising a contact supported from the spindle co-operating with a second contact mounted on a relatively stationary part of the mechanism the arrangement of the contacts being such that when the contact carried by the spindle is moving in one direction it only engages the second contact for a very short interval of time, but when moving in the opposite direction it engages it for a considerably longer interval.

2. In electrically operated mechanism of the type hereinbefore referred to suitable for driving a clockwork or other train, mechanism for periodically completing the circuit of the coil comprising a spring controlled contact moved by the spindle co-operating with a second spring controlled contact mounted on a relatively stationary portion of the framework, stops for both of said contacts and means for adjusting the contacts relatively to each other to vary the time of contact and the interval during which contact is maintained.

3. In electrically operated mechanism of the type hereinbefore referred to suitable for driving a clockwork or other train, a magnet comprising a pair of parallel concentric rings connected together by a magnetic path one or both being divided to form pole-pieces substantially as described.

4. Electrically operated mechanism suitable for driving a clockwork or other train constructed, arranged and operating substantially as hereinbefore described or as illustrated in the drawings.

5. In electrically operated mechanism suitable for driving a clockwork or other train as claimed in Claim 1, contact mechanism constructed arranged and operating substantially as hereinbefore described with reference to Figs. 1 and 2 of the accompanying drawings.

Dated this Twenty-fourth day of February, 1918.

CHARLES H. BURGESS,
83, Cannon Street, London, E.C.,
Agent for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1918

[This Drawing is a full-size reproduction of the Original.]

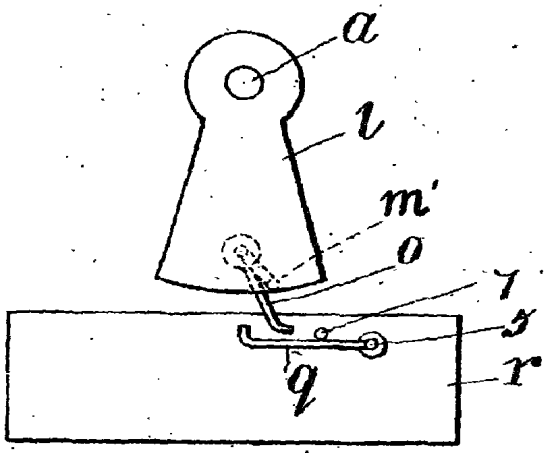

Fig. 1.

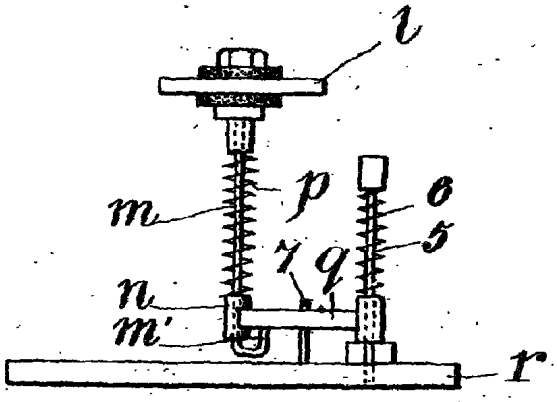

Fig. 2.

Malby & Sons, Photo-Litho.

SHEET 1

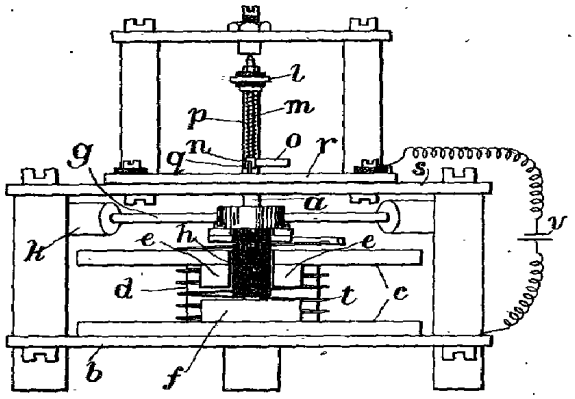

Fig. 1.

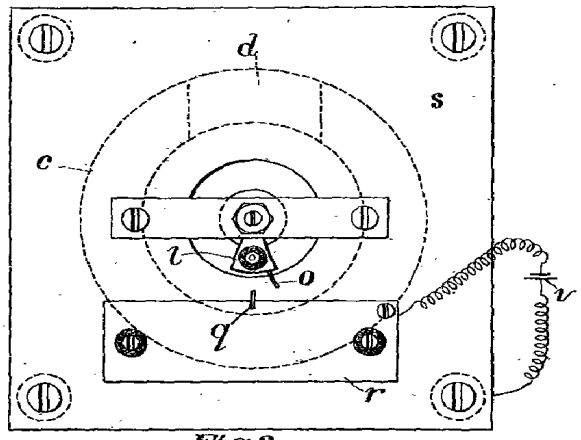

Fig. 2.

SHEET 2.

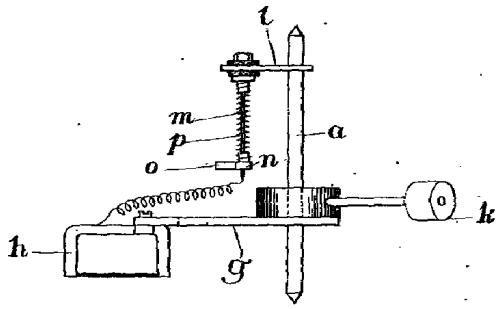

Fig. 3.

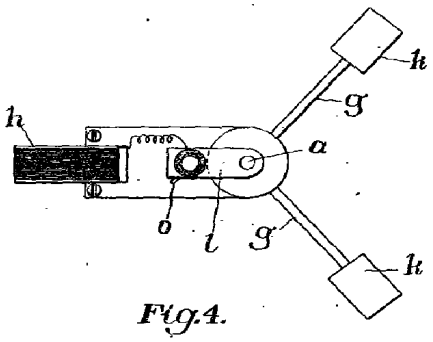

Fig. 4.

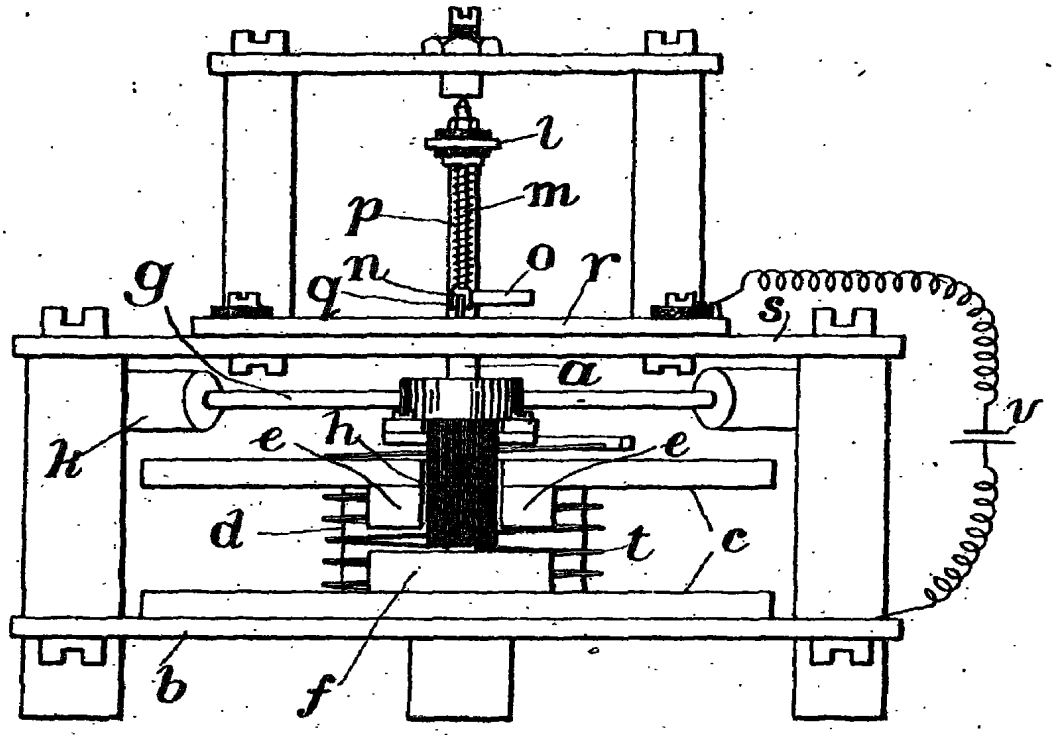

Fig.1.

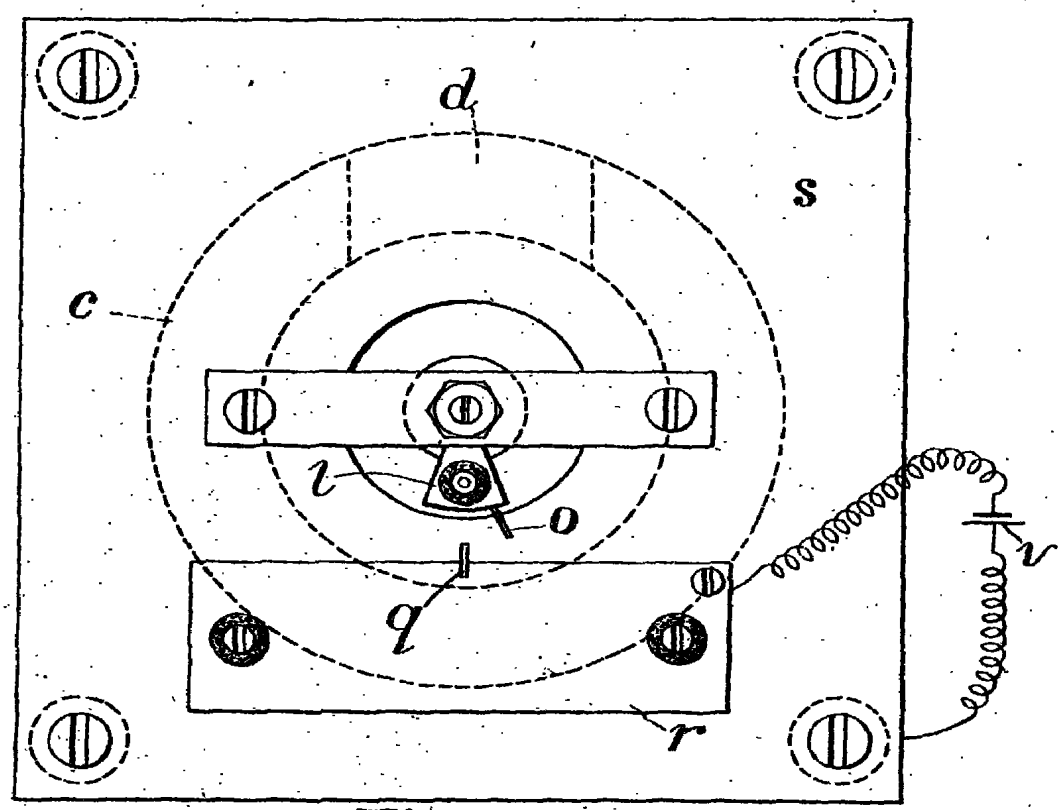

Fig.2.

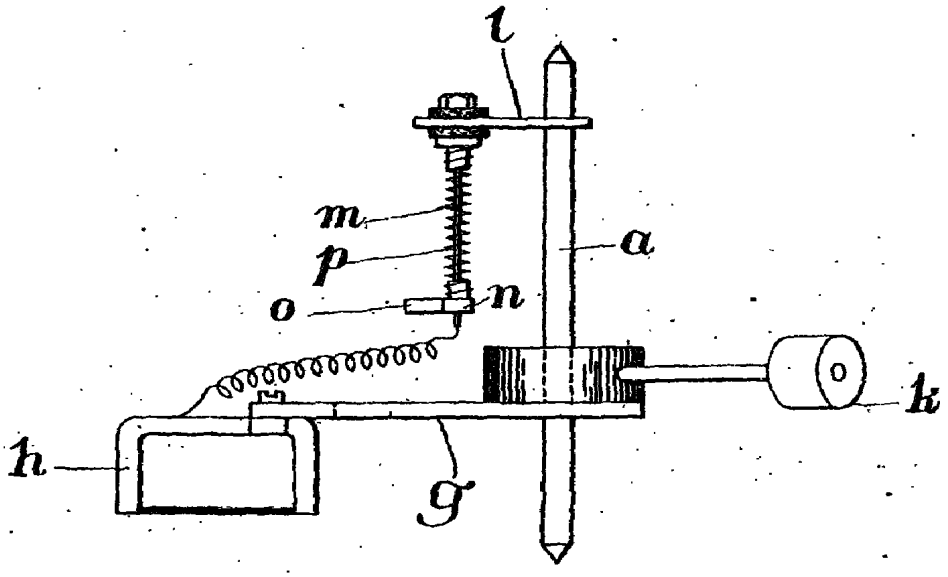

Fig. 3.

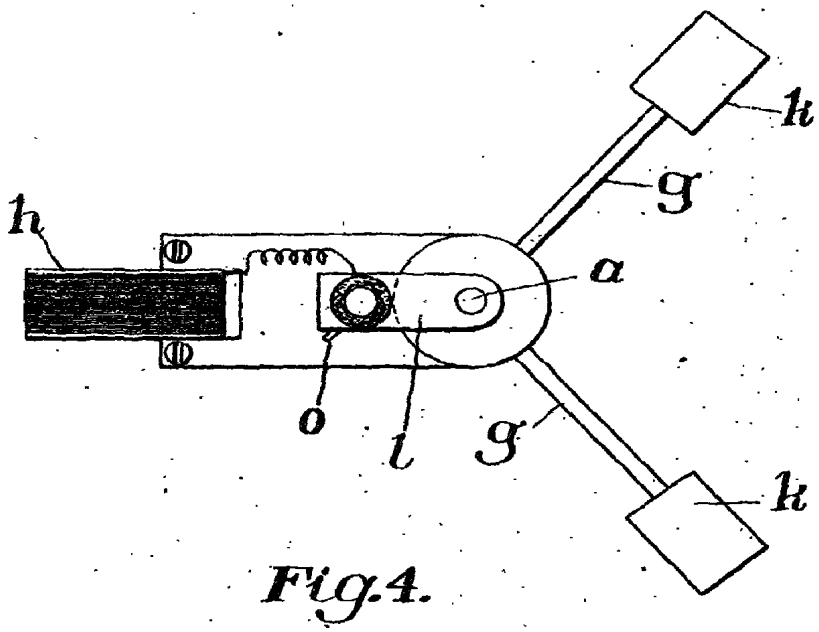

Fig. 4.