(No Model.) 2 Sheets—Sheet 1.

H. E. WALTER.

APPARATUS FOR WORKING PUNKAS.

No. 459,663. Patented Sept. 15, 1891.

Fig. 2.

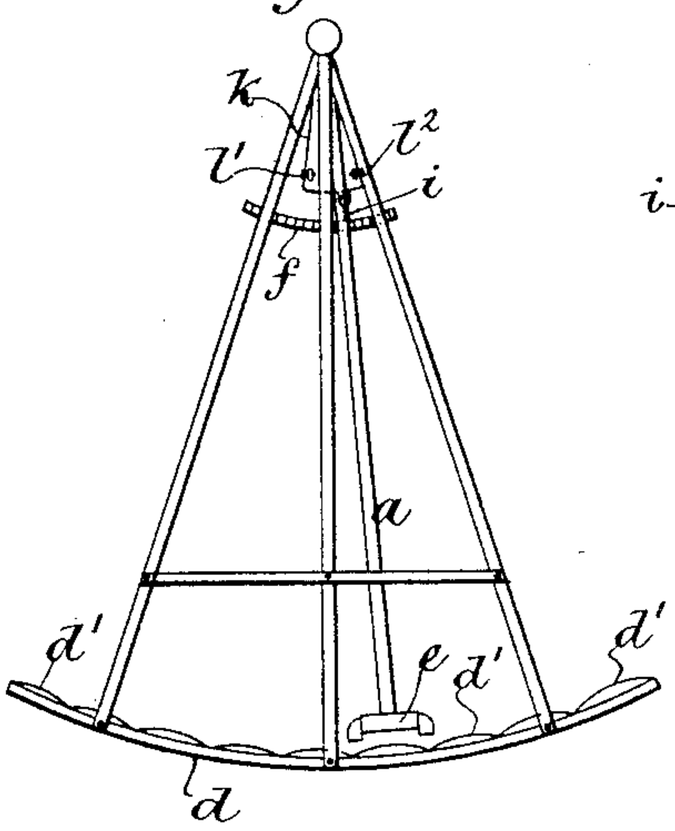


Fig. 1.

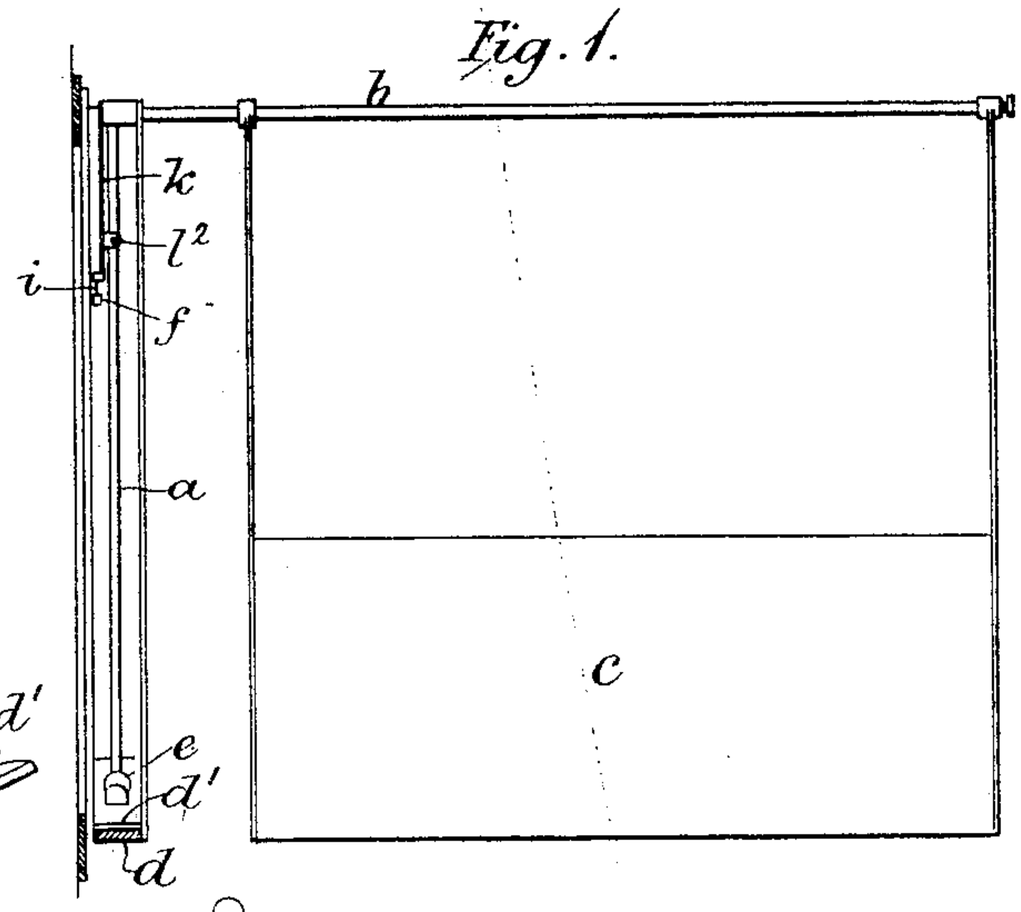


Fig. 4.

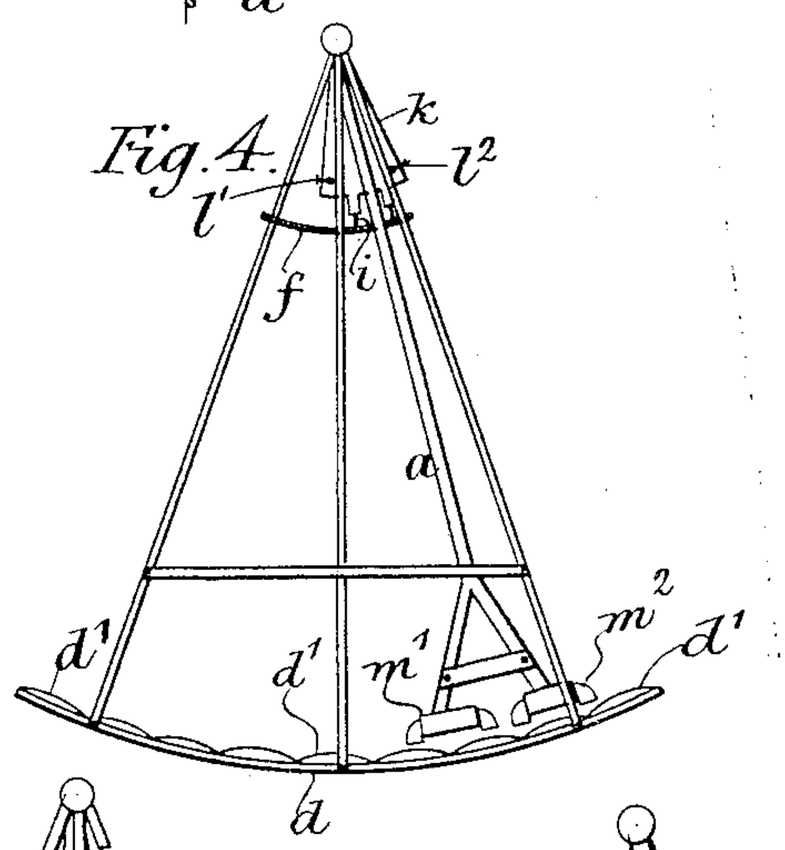


Fig. 5.

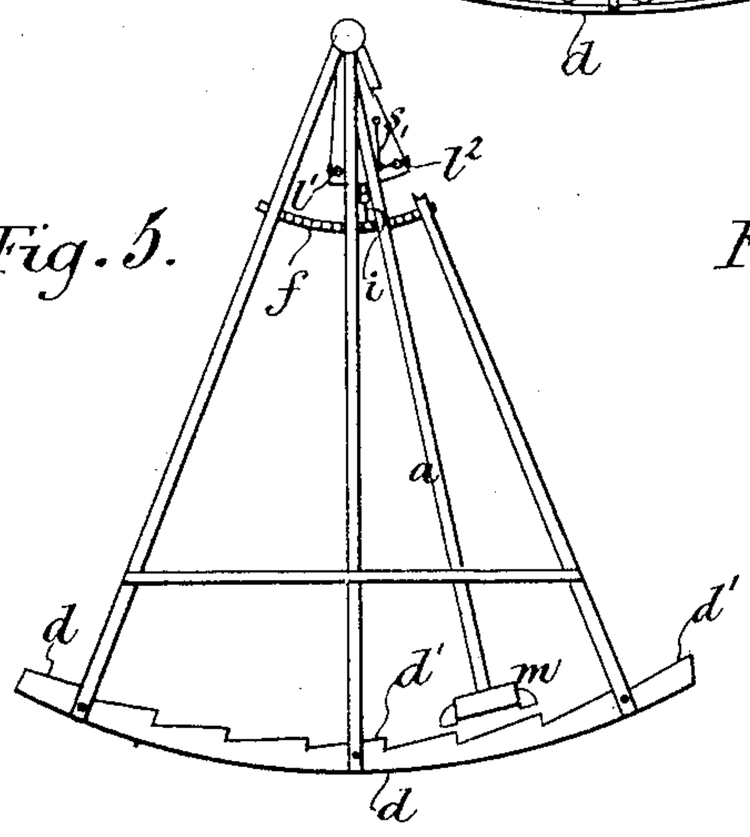
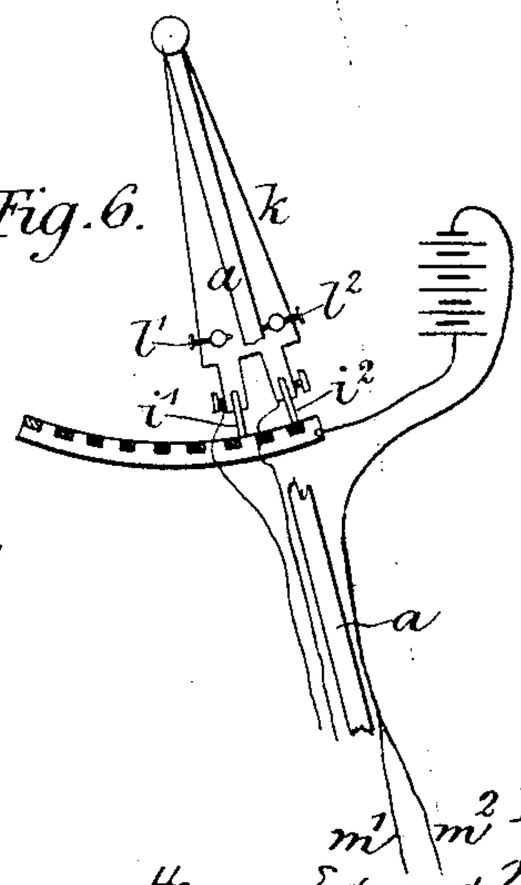


Fig. 6.



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(No Model.) 2 Sheets—Sheet 2.

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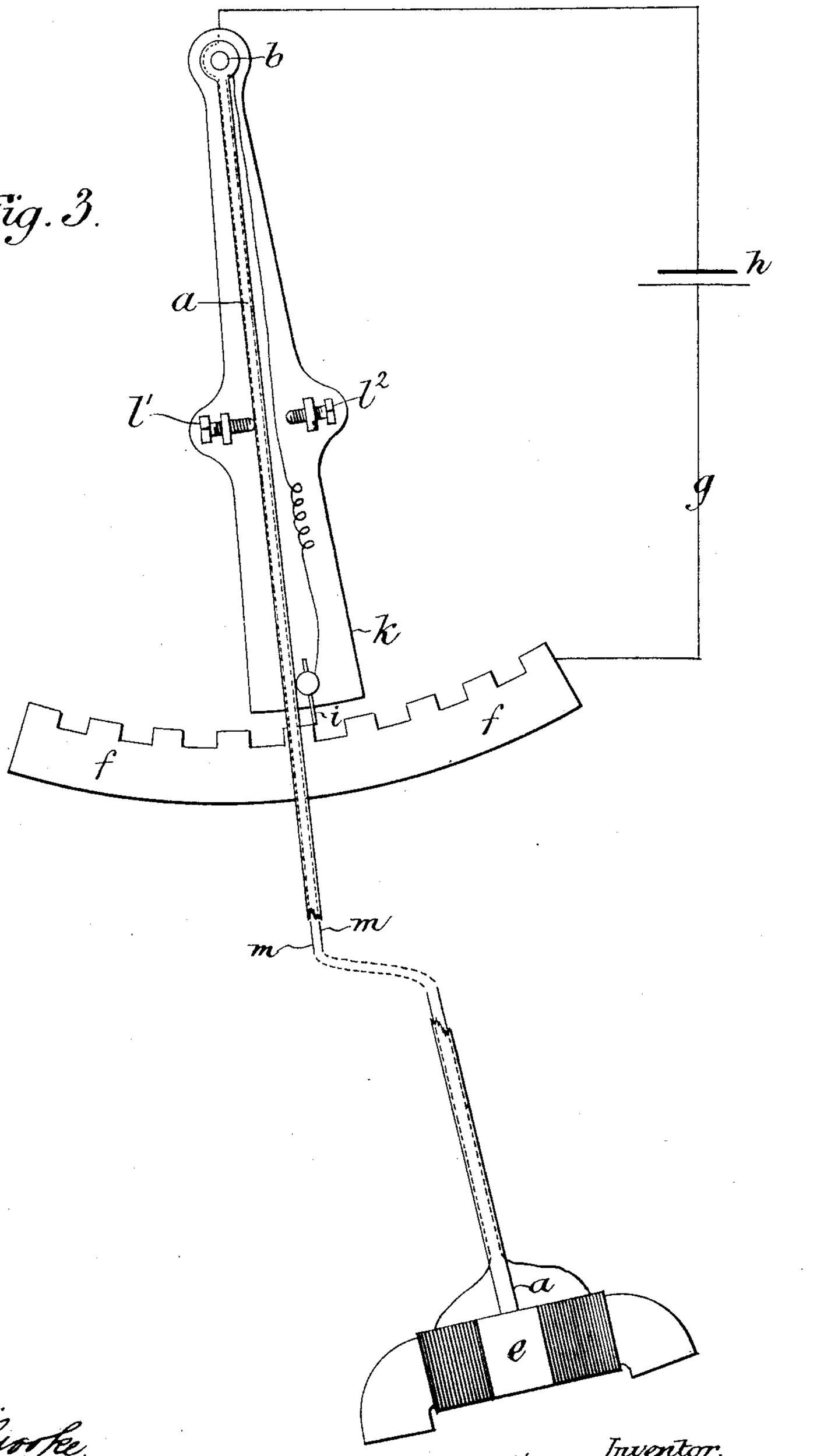
Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRY EDMOND WALTER, OF LONDON, ENGLAND.

APPARATUS FOR WORKING PUNKAS.

SPECIFICATION forming part of Letters Patent No. 459,663, dated September 15, 1891.

Application filed May 19, 1891. Serial No. 393,302. (No model.) Patented in England November 23, 1889, No. 18,839.

To all whom it may concern:

Be it known that I, HENRY EDMOND WALTER, electrician, a subject of the Queen of Great Britain, residing at 3 Princes Mansions, Victoria Street, London, England, have invented certain new and useful Improvements in Apparatus for Working Punkas, (for which I have received Letters Patent in Great Britain, No. 18,839, dated November 23, 1889,) of which the following is a specification.

For actuating punkas I employ an arm or pendulum kept swinging to and fro by the action of one or more electro-magnets in the following manner: The electro magnet or magnets are carried by the pendulum with the poles brought into close proximity to an arc of rounded teeth or undulations, which is held from moving; or the arc might be on the pendulum and the magnet or magnets fixed. Preferably I use either one magnet of horse-shoe form, with the two magnet-poles at a distance apart equal to the distance between the summits of two adjacent undulations, or two similar magnets with the poles of the one over the summits of two adjacent undulations and the poles of the other over the next two depressions, one on each side of the summit of the next undulation. As the pendulum swings to and fro when the magnet-poles are farthest from the summit that is between them over the depression an electric current is caused to pass through the magnet-coils and the magnet is so energized. Each magnet-pole is then attracted to the summit of the next undulation. When the summit is reached, the circuit is broken, and when the poles are again midway between the summits of the undulations the circuit is again completed, and so on. For controlling the passage of the current to the magnet-coils a spring or brush carried by the pendulum may be made to work over an arc of fixed contact-plates.

In order that my said invention may be fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

Figure 1 is a front elevation of a punka and electro-magnetic apparatus by which it is actuated. Fig. 2 is an end view of the same. Fig. 3 shows to a larger scale the contact-maker and circuit arrangements. Figs. 4, 5, and 6 show modifications.

In Fig. 2, showing the single-magnet arrangement with undulations, *a* is the pendulum-rod. It is fixed to the axis *b*. The punka *c* is also carried by the axis *b*. *d* is an iron arc provided with rounded teeth or undulations *d' d'*. This arc is fixed to a frame which may also aid in supporting the axis *b*. *e* is an electro-magnet which forms the bob of the pendulum. It is fixed upon the rod *a*, or it may be adjustable thereon, so that as the pendulum swings the magnet-poles just clear the undulations *d'*.

The electro-magnet is included in circuit with a galvanic battery or other source of current and with a contact-maker which opens and closes the circuit during the swing of the pendulum. The circuit is closed while the magnet-poles are approaching the summits of the undulations opposite to which they are, and it is open while the poles recede from the summits of the undulations. This may be effected in the manner shown in Fig. 3. *f* is a metallic arc suitably fixed and insulated from the other parts of the apparatus, excepting the wire *g*, which connects it with one pole of a battery *h* and the metallic circuit-closing brush *i*, which makes contact with it intermittently during the swing of the pendulum. The brush *i* is carried by a piece *k*, which is movable around the axis *b*, but with a little friction applied by a spring attached to the wall or something at rest, so that the piece *k* remains at rest, except when propelled by the pendulum-rod *a*, bearing against one or other of the adjustable stops *l' l²*. *m m* are a pair of wires led up the pendulum-rod *a* from the electro-magnet *e* to its upper end, thence one of the wires is conducted to the other pole of the battery *h* or to the pole which is not already connected with the wire *g*. The other wire *m* is connected with the metallic contact-brush *i*.

The action is as follows: As represented in Fig. 3, the pendulum is supposed to be swinging from right to left, and the rod *a* is bearing against the stop *l'* and by driving the piece *k* is just bringing the brush *i* into metallic contact with the arc *f*. The magnet *e* is consequently commencing to be energized. Fig. 2 shows the position of the magnet relatively to the undulations *d'*. As the pendulum swings toward the left the attraction of the

magnet for the undulation toward which it is moving imparts an impulse. As soon as the magnet-poles are above the summits of the undulations the brush i ceases to be in contact with the arc f and the magnet becomes passive. As the next undulation d' is approached by the magnet-pole the action is repeated, and so on until the pendulum comes to the end of the arc of undulations. On completing the swing gravity causes the pendulum to return, and as it does so it receives afresh a series of impulses. The contact-brush i, carried by k, is now driven by the pendulum-rod a, bearing this time against the stop l^2, and the contacts consequently are differently timed, so that now the magnet is energized when its poles are on the left side of the summits of the undulations which they are approaching, whereas previously the attraction took place when the poles were to the right of the summits. On reaching the end of the undulations and after gravity brings it back to them the brush i is now driven by the pendulum-rod bearing on the stop l' again, (on k,) and thus the motor is moving under the first-named conditions again. In this way the swing of the pendulum is constantly maintained.

The above conditions describe the action of one magnet swinging along undulations. In the case of two magnets, as before referred to and as shown in Fig. 4, there are two brushes on the piece k, one connected to each magnet. The action for each magnet is practically the same as if the other one were not used; but the poles of one magnet being over two adjacent summits while the poles of the other are over two adjacent depressions, it is evident that while one is active with its poles approaching a pair of summits the other is passive in leaving a pair of summits, in which latter condition there is no current.

In Fig. 6 the brush i^2 is connected to the magnet m^2 and the brush i' to the magnet m', and the other ends of the coils of both magnets are connected to the wire running up the pendulum-rod to the battery, from the other pole of which battery a wire runs to the contact-arc, leaving each brush and magnet to complete their own circuit.

Instead of using undulations an arc of ratchet-like teeth may be used, as shown in Fig. 5. The action in this case is: When the magnet-poles have fully reached the summits of the teeth opposite them, the circuit is opened, and when just past them the circuit is immediately closed again. The poles are then attracted to the summits of the next teeth, and when opposite them the circuit is again opened. It will be seen in Fig. 5 that the pendulum-rod bearing against the right side of the piece k presses the spring s against the stop l^2, making contact with it and completing the circuit; but when the end of the swing is reached the pendulum-rod then falls till it bears against the stop l, which is insulated, so that no current passes through the magnet. Thus the magnet (and punka) has to complete the return swing by its own inertia, and for this may be weighted a little.

As it is economical that the pole-pieces of the magnets should swing as near as possible to the arc—that is, to the summits of the undulations or teeth of the same—the arc may be carried by suspension-rods from the axis of the pendulum and be held to a wall to restrain it from swinging to and fro. The punka may be on the same axis as the pendulum of the motor, or it may be on an axis parallel with it and be coupled to the pendulum by a connecting-rod. The pendulum-motor may be in a separate room from that in which the punka works and the axis or connecting-rod be carried through the division-wall, or the motor may be inclosed in a casing at one side or end of the room.

What I claim is—

1. The combination of a pendulum, a punka connected therewith, an electro-magnet, a toothed arc of magnetic metal with its teeth in proximity to the magnet-poles, and contact mechanism for completing a circuit through the coils of the electro-magnet as the magnet-poles approach the summits of the teeth and for breaking the circuit as the poles are receding from them.

2. The combination of a pendulum, a punka connected with and operated by the pendulum, electro-magnetic devices substantially such as described for driving the pendulum, and contact mechanism operated by the pendulum for opening and closing an electric circuit in which the magnet is included, substantially as and for the purpose set forth.

3. The combination of a pendulum, a punka connected therewith, an electro-magnet carried by the pendulum, a toothed arc of iron with its teeth in proximity to the magnet-poles, and a pivoted contact-carrying piece adapted to oscillate independently of the pendulum, but also to move therewith.

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