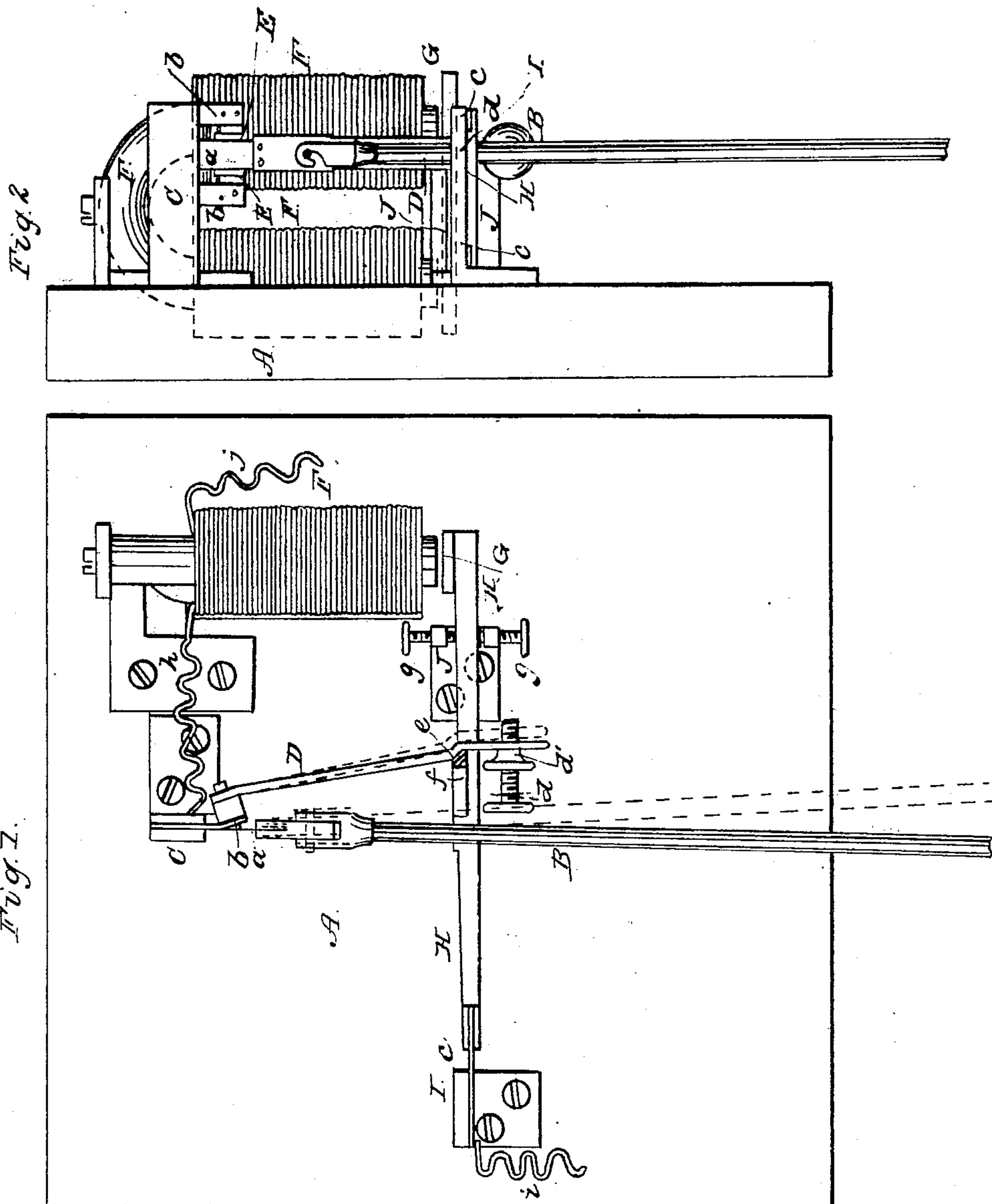


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Electric Clock.

No. 41,217.

Patented Jan. 12, 1864.



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UNITED STATES PATENT OFFICE.

JAMES HAMBLET, JR., AND B. F. EDMANDS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN ELECTRO-MAGNETIC PENDULUMS.

Specification forming part of Letters Patent No. 41,217, dated January 12, 1864.

To all whom it may concern:

Be it known that we, JAMES HAMBLET, JR., and B. F. EDMANDS, both of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Electro-Magnetic Pendulums for Clocks and Other Purposes; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view of a pendulum and the electro-magnet and appliances by which it is operated. Fig. 2 is a view of the same at right angles to Fig. 1.

Similar letters of reference indicate corresponding parts in both figures.

The principal object of our invention is to apply to the pendulum power obtained from an electro-magnet to maintain and also, if desired, to initiate its motion without subjecting it to the direct attraction of the magnet or in any way attaching it to an armature, a fixed magnet, or any piece of metal subject to the attraction of a magnet.

The invention consists, chiefly, in the employment of wedge-shaped pallets in combination with the armature of the electro-magnet, and with one or more impulse bars and springs, whereby the above result is obtained. It also consists in so applying the said pallets in the circuit in which the electro-magnet is placed that the opening of the circuit to produce the necessary intermissions of the current takes place between the said pallets.

To enable others skilled in the art to make and use our invention, we will proceed to describe its construction and operation.

A is a standard to which the pendulum, the electro-magnet, and their appurtenances are attached. This standard may be of wood, or, if the parts are properly insulated from it, may be of metal.

B is the pendulum, suspended by a thin spring, *a*, in the usual manner, from a bracket, C, attached to the stand A, and having no part whatever of the actuating apparatus connected with it. The same bracket C has attached to it by two springs, *b b*, of steel plate, what we call the "impulse-bar" D, which is arranged on one side of the pendulum and attached to the said springs by means of a strap-block, E, which

is curved in such manner as to prevent contact with the pendulum or its suspending-spring *a* and to allow the springs *a b b* to be arranged all in the same plane. The said springs are insulated from each other. The pressure of the springs *b b*, which may be termed the "impulse-springs," is toward the pendulum. The impulse-bar is fitted near its lower end with a screw, *d*, the head of which is toward the pendulum, and this screw is fitted with a set-nut, *d'*, to secure it firmly in the bar. The said screw is so adjusted that when the apparatus is at rest, the pallet *e* resting against *f*, and the pendulum O hanging perpendicular, the head of the screw will be just out of contact with the pendulum-rod.

F is the electro-magnet. G is an armature to the said magnet, attached to one end of a nearly-horizontal lever, H, which is arranged below the magnet, and the other end of which is attached by a spring or springs, *c*, of steel plate, to a stud, I, which is secured to the stand A. This spring exerts a slight downward pressure on the lever H, and so tends to draw the armature away from the poles of the magnet when the circuit is open, but is not sufficient to prevent the armature from being lifted by the attraction of the magnet when the circuit is closed. Adjusting-screws *g g* are applied in a fixed stud, J, to limit the upward and downward movement of the said lever.

e and *f* are the wedge-shaped pallets, which constitute the principal feature of our invention, one attached to the impulse-bar D and the other to the armature-lever H. These are so arranged and have their faces so formed that the pallet *f*, attached to the armature-lever, moving upward in contact with the other pallet, *e*, will act like a wedge upon it, and so press the impulse-bar away from the pendulum, thereby acting in opposition to the pressure of the springs *b b*.

The pallets should be faced with platinum, to prevent oxidation as much as possible; but the rubbing produced by their wedge-like action will tend to keep them free from oxide.

The electro-magnet has metallic connection with the mechanism through the wire *h*, and with the battery by the wires *i* and *j*. The electric current will, when the circuit is closed, pass from the battery by the wire *j* to and through the magnet-coil, and thence by the wire *h*, springs

b b, strap-block E, bar D, pallets *e* and *f*, lever H, springs *c*, stud I, and wire *i* to the battery. On receiving the electric current the magnet will attract and lift the armature G, which will carry with it the lever H and pallet *f*, and so produce the action upon the pallet *e* and impulse-bar which has just been described, the effect of the impulse-springs *b b* on the bar D being overcome by the force due to the attraction of the magnet on the armature acting through the lever H and wedge-shaped pallets.

The pendulum, on being put in motion by hand, will, in swinging toward the right, bring its rod against the head of the screw *d*, and by its momentum will cause the impulse-bar D and its pallet to move with it, and so break the contact between the pallets and open the circuit, and, the magnetism then ceasing, the armature and lever G descend by gravity with or without the aid of pressure from the spring or springs *c*. The pendulum holds the circuit open till, upon its return vibration to the left, it permits the impulse-bar to return the pallet *e* to contact with the pallet *f*, and the circuit being closed again the armature is attracted and the lever H and pallet *f* raised again. On the return of the pendulum to the right the circuit is opened again, as first described, and in every oscillation of the pendulum back and forth the above-described operation of the mechanism is repeated.

The maintaining power is given to the impulse-springs *b b* by the wedge-like action hereinbefore described of the pallet *f* upon pallet *e*, by which the movement of the impulse-bar away from the pendulum is produced, such movement of the impulse-bar having the effect of bending and straining the springs to a slight extent, and the degree of reaction which is due to this bending or straining constitutes the maintaining power. This power acts in the following manner: At the instant when the movement of the pendulum causes the break or opening of the circuit between the pallets, the pallet *f* stands lifted to its highest allowed position, but as soon as the break is made the said pallet falls with the lever H to its lowest allowed position. (Shown in Fig. 1.) In the latter position of the pallet *f* the impulse-bar is allowed to approach nearer to the center of oscillation of the pendulum than in the former position of the said pallet; and hence it follows that the pendulum is under the pressure of the impulse-springs during a greater portion of its swing from the right toward the said center than of its swing from the said center to the right. This difference of pressure is obtained by the reaction of the impulse-springs due to the pressure produced upon them by the action of the pallets produced by the attraction of the magnet.

In the above-described example of our invention the impulse is only given to the pendulum in one direction; but by the application of an impulse-bar and one or more impulse-springs in the same manner on each side of the pendulum, and furnishing the lever H with two pallets—viz., one to operate in combination with a pallet on each impulse-bar—the impulse may be given in both directions alternately.

In the arrangement of the impulse-bar and its set-screw *d*, which we have described, the pendulum requires to be started by hand or by some other means, the electro-magnet only furnishing the maintaining power; but for some purposes it may be desirable to have it also furnish the power to initiate the movement of the pendulum. To do this the pendulum is shortened to bring the bob very near to the pallets *e f*, and to make the relative weight of the bob and power or strength of the impulse-springs *b b* such that the latter should be able to overbalance the gravity of the pendulum in a degree to hold the pendulum a little out of its natural perpendicularity, and also to hold the pallet *e* in contact with the pallet *f* when at rest, as when the parts are not under the influence of the magnet. To insure this position of the pendulum, the adjusting-screw *d* must be screwed the requisite distance toward the pendulum-rod. Upon closing the circuit at some convenient point between the instrument and the battery the vibration of the pendulum will at once commence, and will continue so long as the circuit is closed between the instrument and the battery.

The maintaining power and the initiating power also may be obtained by using the force of gravity as a substitute for that of impulse-springs *b b*, reducing the thickness of the said springs to make them constitute mere suspension-strips, and attaching weights to the impulse bar or bars.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The employment of wedge-shaped pallets *e f*, applied, in combination with the armature of the electro-magnet and with one or more impulse bars and springs, to operate substantially as and for the purpose herein specified.
2. So applying the said pallets in the circuit in which the electro-magnet is placed that the breaking of the circuit to produce the necessary intermissions in the current takes place between the said pallets.

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