No. 681,779. Patented Sept. 3, 1901.

O. A. EN HOLM.

ELECTRIC CLOCK.

(Application filed Oct. 1, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 3

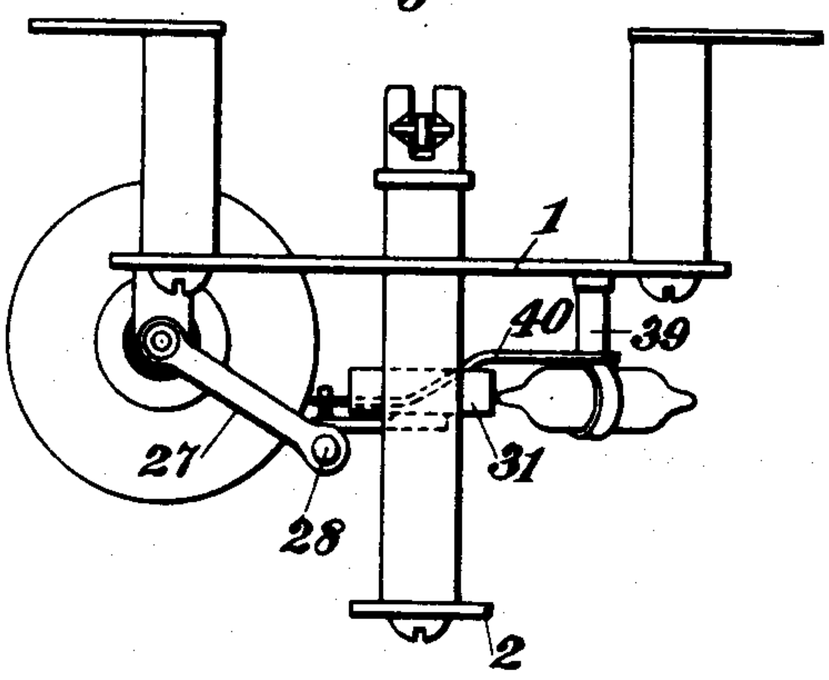


Fig. 4

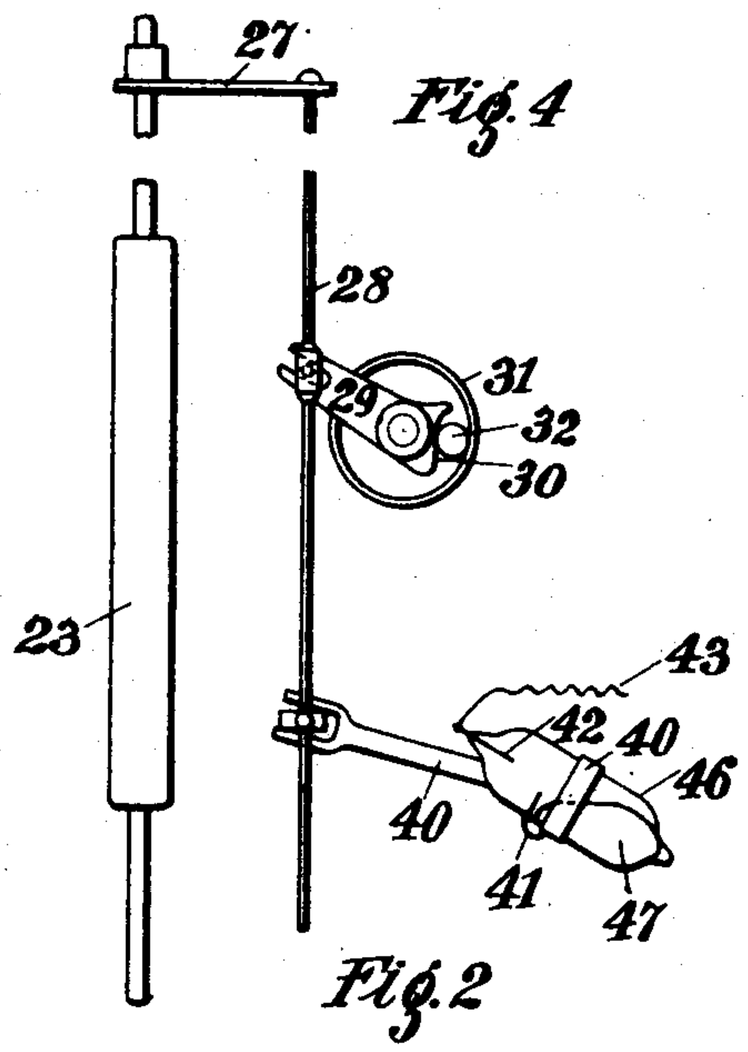


Fig. 1

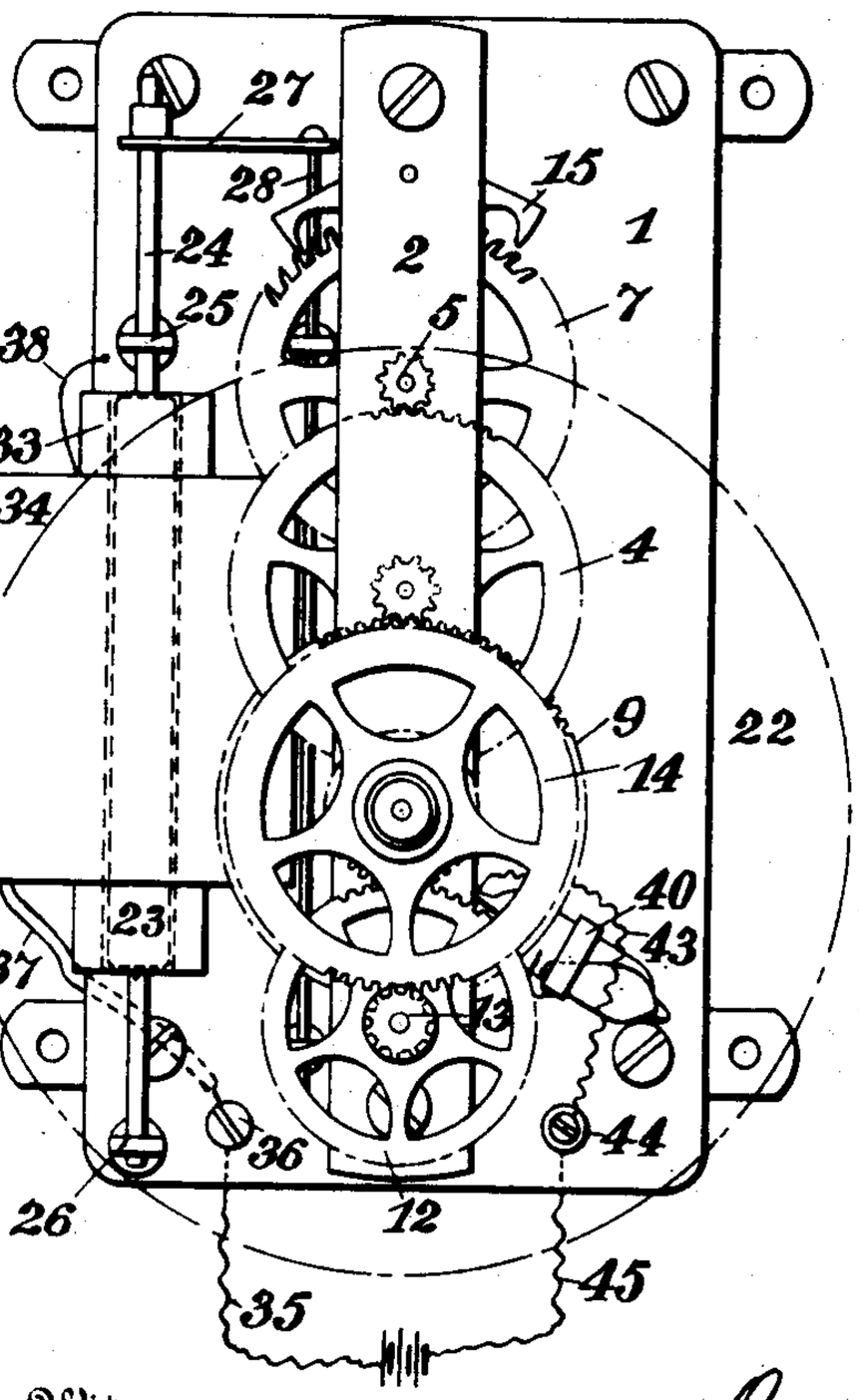
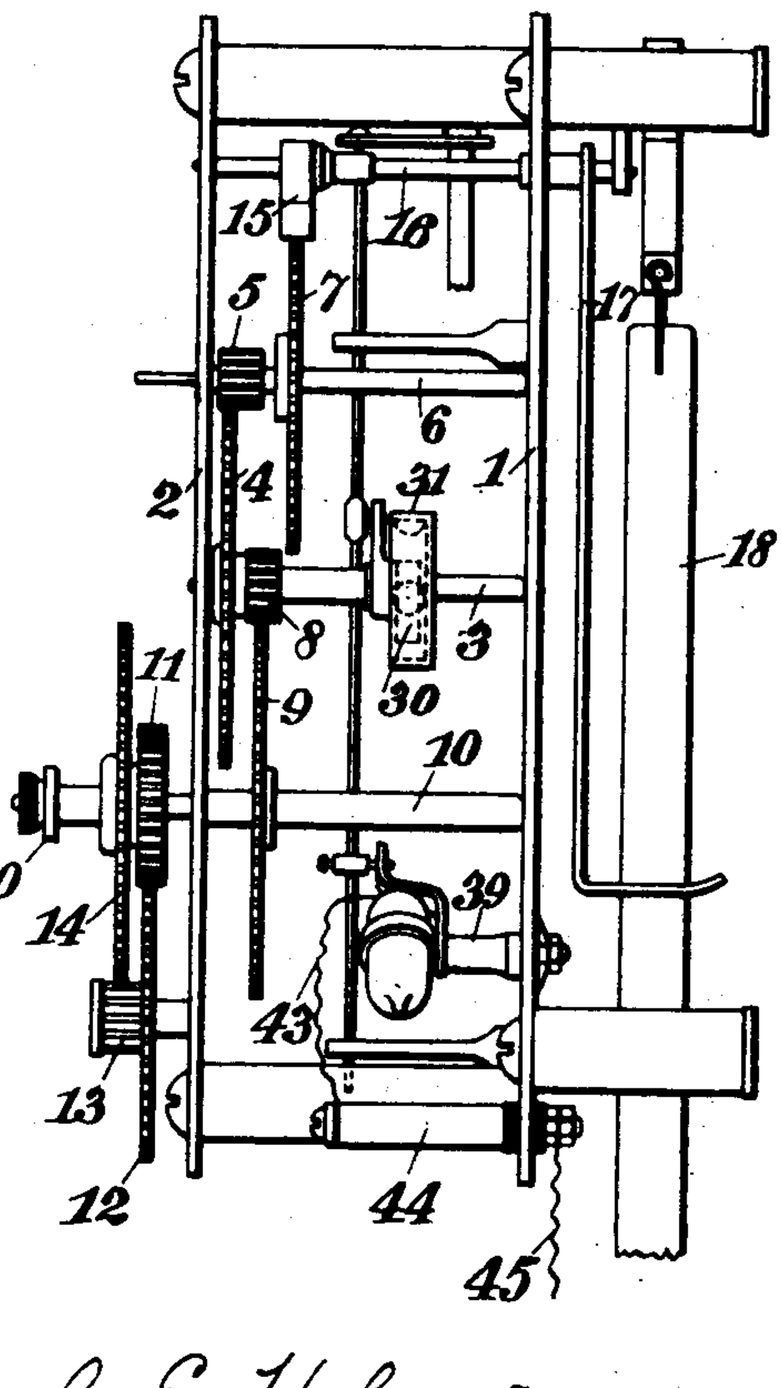


Fig. 2



Witnesses:
Bert B. Jones.
Geo. W. Hess.

Oscar A. En Holm Inventor
By his Attorney C. A. Edwards

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(No Model.) 2 Sheets—Sheet 2.

Fig. 7

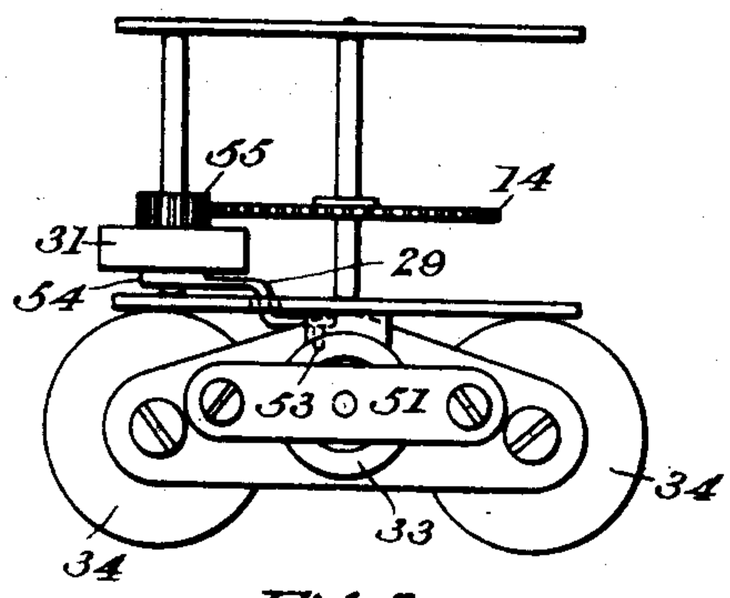


Fig. 5

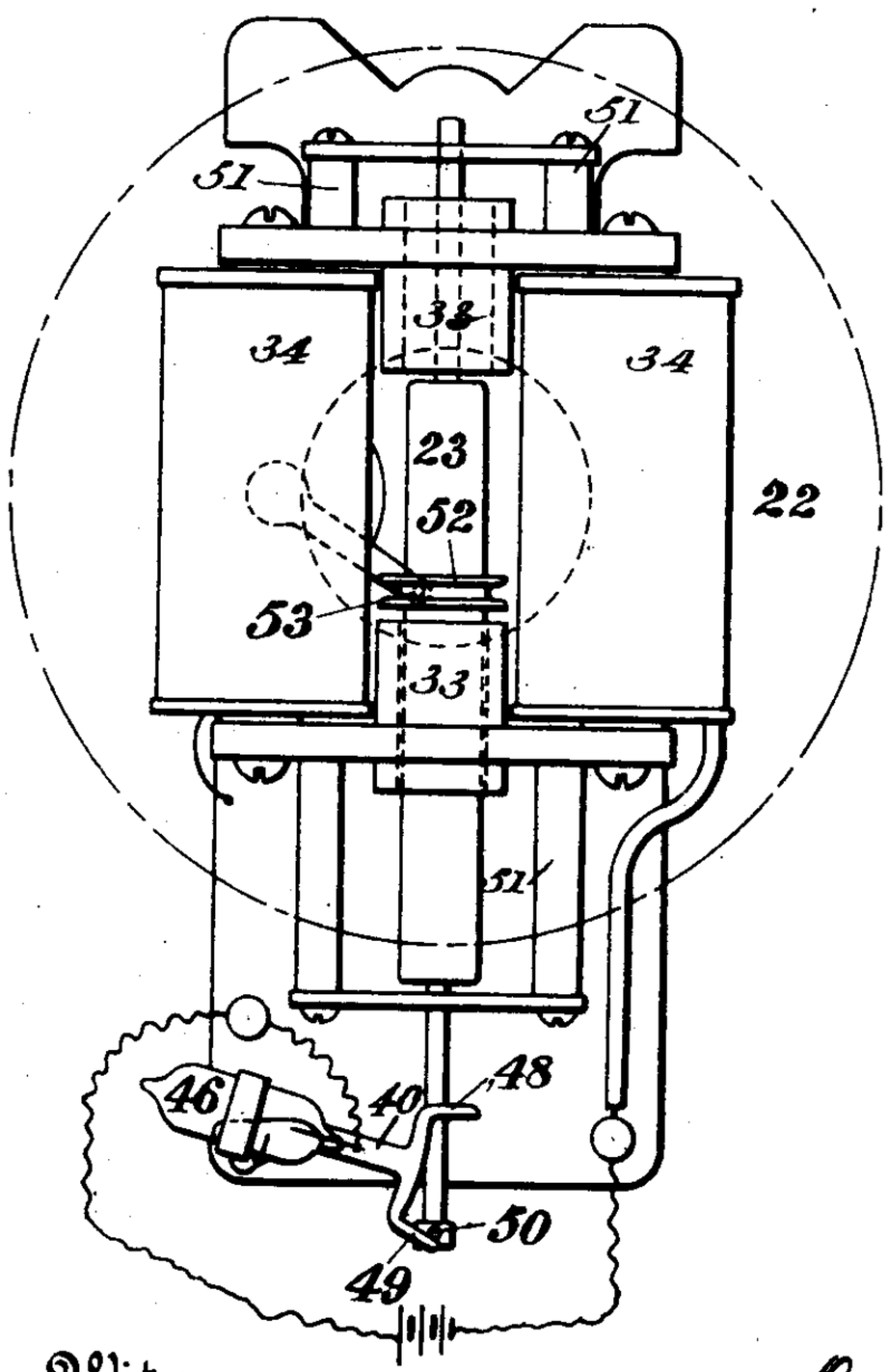
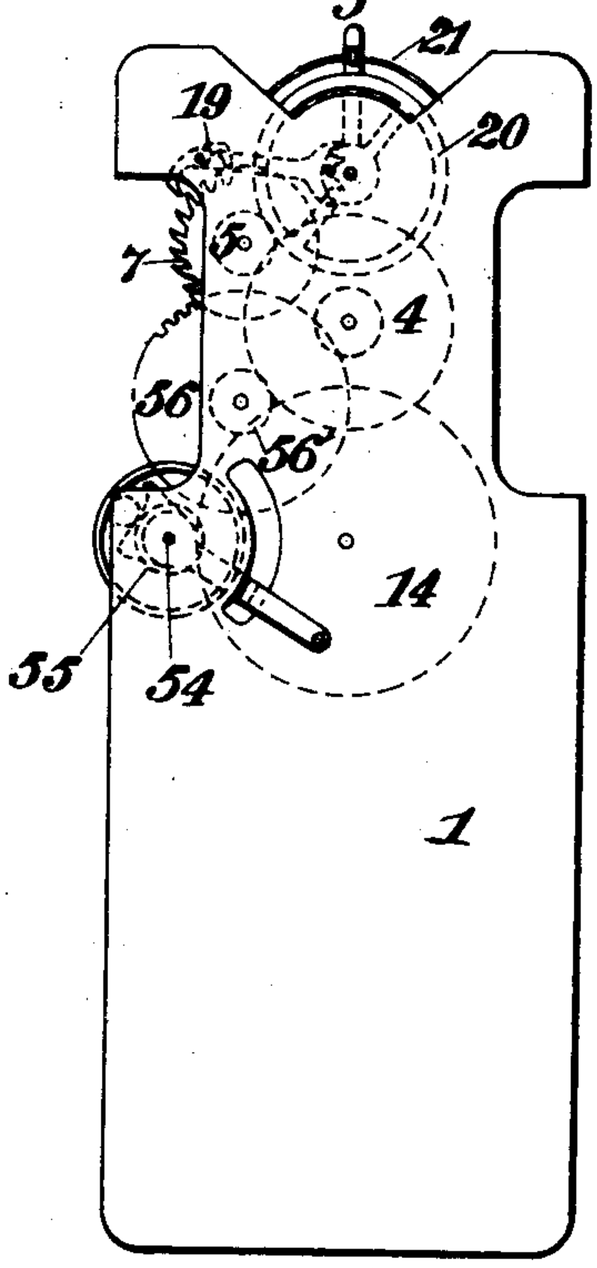


Fig. 6



Witnesses
Burt B. Jones
Geo. W. Hess.

Oscar A. En Holm Inventor
By his Attorney C. C. Edwards.

UNITED STATES PATENT OFFICE.

OSCAR A. EN HOLM, OF PLEASANTVILLE, NEW YORK, ASSIGNOR OF ONE-HALF TO HOMER W. HEDGE, OF NEW YORK, N. Y.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 681,779, dated September 3, 1901.

Application filed October 1, 1900. Serial No. 31,611. (No model.)

To all whom it may concern:

Be it known that I, OSCAR A. EN HOLM, a citizen of the United States, residing at Pleasantville, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Electric Clocks, of which the following is a full, clear, and exact specification.

This invention relates to electric clocks; and its object is to construct a clock of such character which shall be of simple and efficient construction and be substantially continuous in its operation.

The invention is applicable to clock mechanism of every description, including pendulum-regulated, lever-escapement, and the like. Primarily it consists in providing means whereby the driving power is made practically continuous and applied in such a manner as not to interfere with the normal operation of the mechanism. Thus in a weight-driven clock when the weight has moved downward to its lowermost position it must be lifted and restored to an operative position.

In carrying out my invention I provide means whereby the lifting of the weight or restoration of the parts will be accomplished at and during times when it is not necessary that the mechanism of the clock shall receive power from the driving-shaft in order to continue the normal operation of the clock. In order to aid in effecting this purpose and decrease the length of time required to restore the parts, I preferably, although not necessarily, shorten the length of traverse of the weight. The invention also comprehends other features of advantage, such as the improved clutch mechanism for avoiding any lost motion of the parts and the switch mechanism for controlling the electrical current without injury to the apparatus by sparking or otherwise.

The invention will be more particularly described with reference to the forms thereof shown in the accompanying drawings, in which—

Figure 1 is a front view of the mechanism of a clock embodying my invention. Fig. 2 is a side view of the same. Fig. 3 is a detail top view showing the magnet, clutch, and switch. Fig. 4 is a detail side view of the clutch and switch. Fig. 5 is a rear view of a mechanism, showing a modified type of magnet and adjacent parts. Fig. 6 is a detail showing the manner of attaching the magnet shown in Fig. 5 to a lever-escapement clock, and Fig. 7 is a detail top view of the parts shown in Fig. 5.

Referring more particularly to the drawings, in Figs. 1 to 4 the invention is shown as applied to a pendulum-regulated mechanism and in Figs. 6 and 7 to a lever-escapement mechanism. The principles involved, however, are the same irrespective of the clock mechanism employed, and therefore in the following description like parts are indicated by like figures of reference.

In the drawings, 1 and 2 represent the usual base and front plates of the frame, in which are mounted the various parts. Upon the power-shaft 3 are the usual gear-wheel 4, into which the pinion 5 on the shaft 6 of the escapement-wheel 7 meshes, and the pinion 8, meshing with gear-wheel 9 upon the shaft 10 of the hands-moving mechanism. The hands mechanism is shown as comprising the usual shaft 10, carrying the minute-hand, and the reduction-pinions 11 and 13 and gears 12 and 14, moving the hour-hand. The escapement-wheel 7 in Fig. 1 is regulated by the verge 15 on shaft 16, to which are fixed the pendulum-arms 17, moved by the pendulum 18. In Fig. 6 the escapement-wheel is regulated by the lever-escapement 19, operated in the usual manner by the balance-wheel 20 and hair-spring 21. The face or dial-plate is represented by 22. The mechanism thus far described is similar to that found in clocks of well-known construction, and it is to be understood that any suitable type of such mechanism may be used instead of the mechanism herein shown. The driving power is stored in the weight or core 23, carried by the rod 24, which is suitably guided in the standards 25 and 26, the core being arranged by a suitable connection 27 to carry or simultaneously move a rod 28, to which is suitably pivoted or otherwise connected the lever 29. Lever 29 is loosely mounted upon shaft 3, as shown in Fig. 2, and is provided with the cam or wedge shaped surface 30. Rigidly attached to shaft 3 and surrounding that part of lever 29 having the cam-surface is a rim 31. A ball 32 is retained in position between the rim 31 and the wedge

surface 30 by any suitable means, such as the shape of the clutch-rim—*i. e.*, by including the outer edge of the rim toward the center to form an interior annular groove in the rim or by grooving the cam-surface, as shown in Fig. 2. The cam-surface is so shaped that when the lever 29 is moved downward the ball is wedged against the rim 31, and thus clutches the lever and shaft. When the lever is moved upward, however, the parts are disengaged. By reason of the shape of the parts the ball is always in position to instantly grip or release the parts. Although the clutch herein shown is extremely sensitive and accurate and highly satisfactory in its operation, nevertheless any suitable clutch or ratchet mechanism of sufficient sensitiveness may be employed instead. The length of the travel of the weight may, of course, vary in different constructions; but I prefer to so adjust this distance and the power employed to lift the weight that the work of lifting will be performed during the normal stoppage of the mechanism due to the escapement in order that smoothness of operation of the working parts of the clock will not be interfered with. For this purpose I prefer to limit the length of travel of the weight to as short a distance as possible. The weight or core 23 or some attached part is of magnetic material surrounded by the pole 33 of an electromagnet energized by coil 34, the circuit of the magnet-coil including terminal 35, insulated binding-post 36, wire 37, coil 34, wire 38, base-plate 1, standard 39, arm 40, switch-terminals 41 and 42, wire 43, binding-post 44, and terminal 45. The switch shown in the drawings comprises a glass bulb 46, carried by the arm 40 and containing a few drops of mercury 47, the terminals 41 and 42 projecting into the interior of the bulb at one end thereof. The bulb is held in an inclined position by the arm 40, so that the mercury normally rests in the end of the bulb, out of contact with the terminals. The arm 40 is suitably pivoted or otherwise connected with rod 28 in such a manner that when the weight drops to its lowermost position the arm 40 will be moved downward sufficiently to so change the position of the bulb 46 that the mercury will roll into contact with the terminals 41 and 42. An efficient connection is shown in Fig. 5, wherein the end of the arm 40 is bifurcated and the branches 48 and 49 are adapted to be engaged and moved by the pin 50 on rod 28. Such arrangement insures that the switch shall not be opened until the weight is fully raised. In Figs. 5 to 7 the magnet is shown as comprising two poles 33, surrounding the weight and mounted in the frame 51, the coils 34 being mounted on the sides of the frame. This arrangement permits a more compact arrangement of the mechanism inasmuch as instead of using one coil of large diameter the same amount of wire may be used occupying a space of only half the thickness or diameter. Such arrangement also permits the arm 29 to be connected directly to the core or its shaft. Thus in Figs. 5 to 7 the core is provided with an annular slotted collar 52 and the end of arm 29 is provided with a pin 53, engaging and sliding in said slot. In this instance to secure further compactness the arm 29 should be loosely mounted upon a shaft 54, upon which the clutch-rim 31 is fixedly mounted, and this shaft geared to shaft 3 by the pinion or gear-wheel 55 and pinion 56′.

In the operation of the device current being applied to the terminals of the circuit from a convenient source the weight is lifted to its highest position and released. Immediately upon being released it pulls the end of arm 29 downward, and thus clutches and turns shaft 3 and operates the clock mechanism. The continued downward movement of the weight finally brings the latter into its lowermost position, at which time the arm 40 will be turned downward, which turns the glass bulb 46 and brings the mercury 47 into contact with the switch-terminals, thus closing the switch and establishing a circuit from terminal 35, binding-post 36, wire 37, coil 34, wire 38, plate 1, standard 39, terminals 41 and 42, wire 43, binding-post 44, and terminal 45. The coil 34 being energized raises the weight or core 23 into its uppermost position, the relative positions of the core and coil being adjusted to that end. The upward movement of the weight does not affect the working of the clock mechanism, because at that time the clutch mechanism releases. Furthermore, the act of raising the core requires but an instant of time and occurs at a time when the escapement-lever is in action, and therefore the operation of the clock does not require the application of driving power at that instant. The raising of core 23 also raises arms 29 and 40 and breaks the electric circuit, which allows the weight to drop and clutch the parts, as heretofore described.

It will be understood that the device above described may be modified in various respects without departing from the invention, and I therefore desire it to be understood that I do not limit myself to the precise construction herein shown and illustrated.

Having thus described my invention, I declare that what I claim as new, and desire to secure by Letters Patent, is—

1. In clock mechanism, the combination with an electric circuit, of a vertically-moving driving-weight of magnetic material, a coil surrounding said weight and adapted, when energized, to raise the same, and connections whereby when said weight reaches a predetermined point in the path of its movement said coil will be energized, substantially as described.

2. In clock mechanism, the combination with an electric circuit, of a vertically-moving driving-weight of magnetic material normally connected with the driven parts, means for disconnecting said weight, a magnet com-

prising a coil surrounding said weight and adapted, when energized, to raise the same, and means whereby when said weight reaches a predetermined point in the path of movement said coil will be energized and said disconnecting means will be operated, said means being so constructed that said coil is maintained energized until said driving means are restored; substantially as described.

3. In clock mechanism, the combination with an electric circuit, of a vertically-moving driving-weight of magnetic material, a coil surrounding said weight and adapted, when energized, to raise the same, a clutch connecting said weight with the driving parts of the clock during its downward movement, and connections whereby when said weight reaches the limit of its movement said coil will be energized, substantially as described.

4. In clock mechanism, the combination with an electric circuit, of a vertically-moving driving-weight of magnetic material, a coil surrounding said weight and adapted, when energized, to raise the same, a pivoted sealed bulb containing interior switch-terminals in one end thereof and a body of mercury, connections between said terminals and said coil, a lever rigidly attached to said bulb and having a bifurcated end, said bifurcations being separated a distance nearly equal to the length of travel of the weight, and a rod moved by said weight and adapted to engage the respective bifurcations of said lever, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

OSCAR A. EN HOLM.

Witnesses:

C. V. EDWARDS,

GEO. W. HESS.