E. S. ENSIGN.

AUTOMATIC DRIVING MECHANISM.

APPLICATION FILED MAR. 13, 1909.

953,991.

Patented Apr. 5, 1910.

2 SHEETS—SHEET 1.

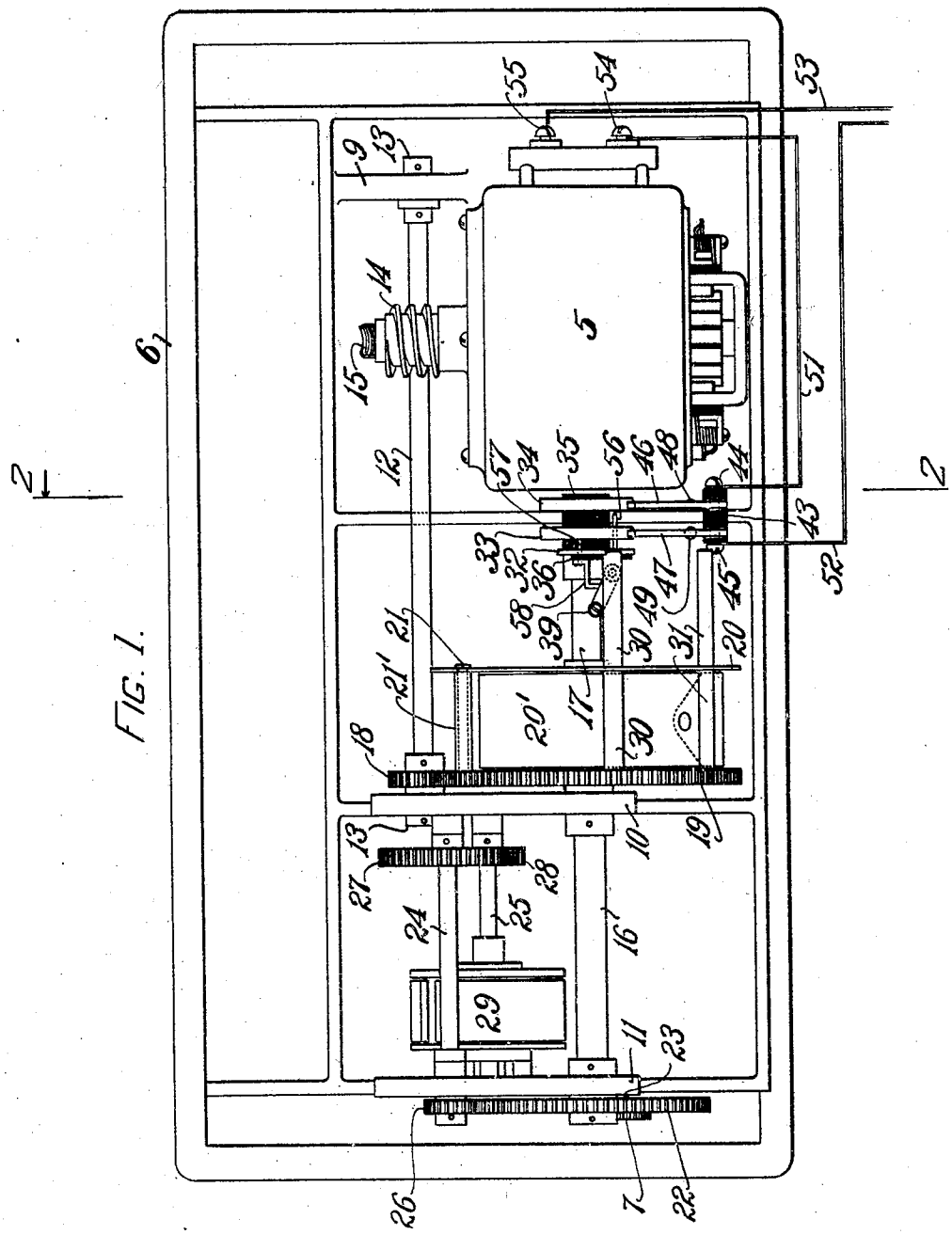

FIG. 1.

WITNESSES

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2 SHEETS—SHEET 2.

FIG. 2.

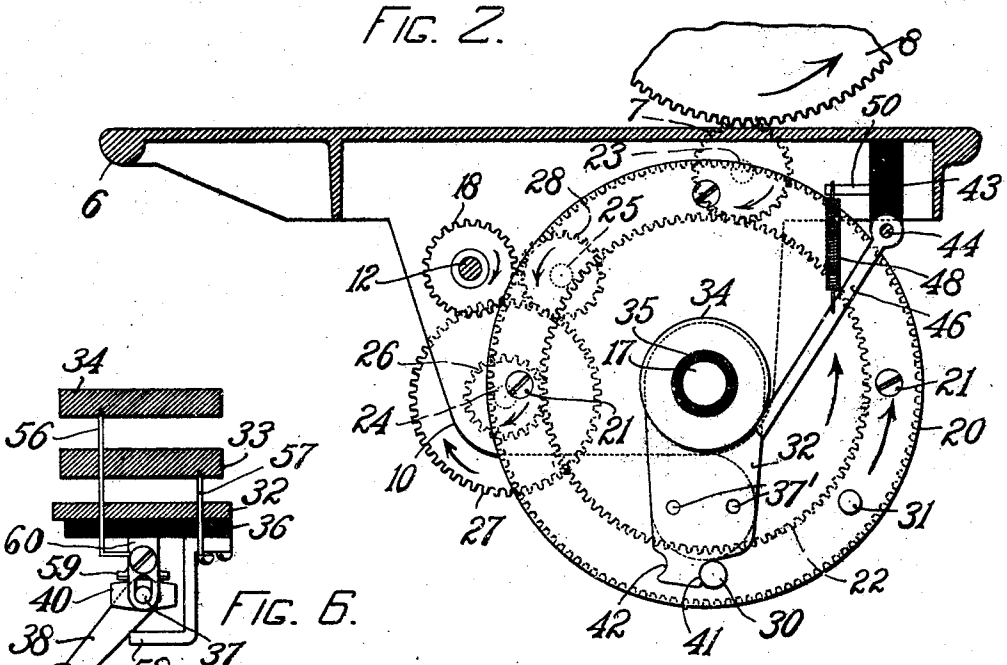

FIG. 6.

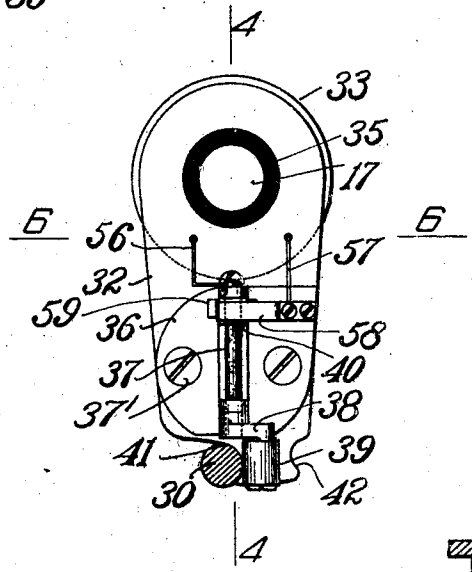

FIG. 3.

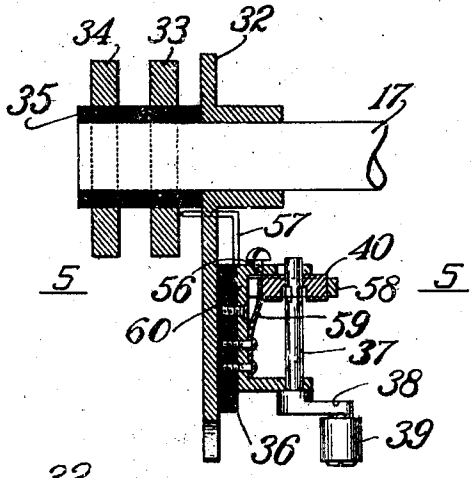

FIG. 4.

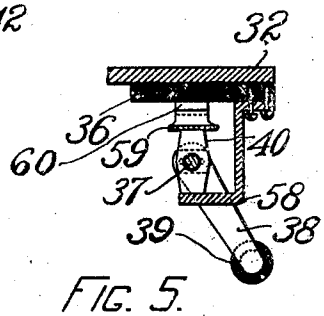

FIG. 5.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC DRIVING MECHANISM.

953,991. Specification of Letters Patent. Patented Apr. 5, 1910.

Application filed March 13, 1909. Serial No. 483,628.

To all whom it may concern:

Be it known that I, EMORY S. ENSIGN, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Automatic Driving Mechanism, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to an improved automatic driving mechanism to be used with calculating machines of all kinds and particularly with a machine such as is shown in my United States Patent, No. 889,668, dated June 2, 1908.

The objects of my invention are to provide a spring motor wound by an electric motor with means in said motor circuit for the making of the circuit when the spring motor has run down to a certain prearranged point and for the breaking of the circuit when the spring motor has been wound up to a certain prearranged point; with means whereby the spring motor may be wound without revolving its shaft; and with means whereby the spring is wound up at a speed faster than it unwinds when driving, and which may be wound while driving without affecting the mechanism so as to drive at a uniform power.

A full understanding of my invention can best be given by a detailed description of a construction embodying the various features of my invention, and such a description will now be given in connection with the accompanying drawings.

In the accompanying drawings, Figure 1 is a bottom plan view of my automatic driving mechanism. Fig. 2 is a vertical section on the plane of the line 2—2 of Fig. 1 looking toward the left, with mechanism right side up. Fig. 3 is a vertical view, partly in section, of the snap switch and its adjacent parts. Fig. 4 is a vertical section on the line 4—4 of Fig. 3. Fig. 5 is a cross-section on the plane of the line 5—5 of Fig. 4. Fig. 6 is a cross-section on the plane of the line 6—6 of Fig. 3.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Referring to the drawings, it is seen that the mechanism including the electric motor 5 is suspended from the under side of the table or plate 6. This plate being provided with a suitable slot through which the pinion 7 extends to mesh with a gear 8 of a calculating or other machine to be driven by this operating mechanism.

Extending downward from the plate are supports 9, 10 and 11 and in bearings carried by the supports 9 and 10 the shaft 12 is mounted to turn, being prevented from endwise movement by collars 13. The worm 14 of the electric motor 5 engages with the teeth of the worm gear 15 on shaft 12. Shaft 16 is mounted in bearings carried by the supports 10 and 11 and extends through and beyond the support 10 as at 17. A pinion 18 on shaft 12 meshes with a gear 19 loosely mounted on the portion 17 of the shaft 16.

A circular disk or plate 20 loosely mounted on the portion 17 is attached to the gear 19 by any suitable means such as stud screws 21. The plate is on the side of the gear opposite to the support and suitable separators 21′ are carried by the stud screws separating the plate a proper distance, from the gear to allow of the reception of a coiled spring 20′, termed the driving spring, being attached at its inner end to the shaft 16 and its outer end around one of the stud screws 21 or around one of the separators 21′. The shaft 16 also extends through and beyond the support 11 and the gear 22 is mounted thereon and meshes with the pinion 7 on stud pin 23; this pinion 7 being the pinion that extends partly through the plate 6 meshing on the upper side of the plate with the gear 8 of the machine to be driven. It is obvious that a sprocket and chain, can when desired be substituted, as in my said former patent, for the gear 22 and pinion 7. It is thus seen, that when the shaft 16 is turned by the unwinding of the driving spring 20′ the machine will be driven by the driving spring through the shaft 16, gear 22 and pinion 7 and that the unwinding of the spring by the turning of the shaft 16 does not turn the gear 19, loosely mounted upon the shaft; but when the electric motor is set in motion, the shaft 12 is turned by the worm gear, and the gear 19 being turned by the pinion 18 on the shaft 12, the spring is wound up. It is apparent that as a worm gear is used back lashing or uncoiling of the driving spring is prevented (except when it uncoils as the driving spring operates the machine) and without using a pawl.

The electric motor can be adjusted so that

the driving spring 20′ will be wound up at a speed faster than it unwinds in driving, and when simultaneously driving and being wound the operation of the driven machine is substantially uniform, the driving always being controlled by a suitable governor 29.

In bearings carried by the supports 10 and 11 are the shafts 24 and 25; the shaft 24 also extending through and beyond the support 11 carrying on said extension the pinion 26 which is in mesh with the teeth of the gear 22. A gear 27 on shaft 24 is in mesh with the pinion 28 on shaft 25 so that when gear 22 is turned by the shaft, the shaft 25 is also turned and the governor 29 mounted on said shaft is operated.

Carried by the gear 19 on the same side as the driving spring 20′ and supported by the plate 20 is the large arm 30 and small arm 31, both preferably tubular and of the same length, extending beyond the plate a sufficient distance to meet or be met by the switch arm 38 of the snap switch to turn on the electric current when the driving spring has unwound to a certain prearranged point and to turn off the electric current when it has been wound to a certain prearranged point.

On the outer end of the portion 17 of the shaft 16 is secured an insulation ring 35 and on the portion 17 adjacent to this ring is the hub of the arm 32 which arm supports and carries the snap switch mechanism hereinafter described. Like parallel disks 33, 34 are secured upon the ring; the disk 34 being near the outer end thereof and the disk 33 between disk 34 and the arm 32. An insulating block 43 is suspended from the underside of the plate 6 and this block carries the two stud screws 44, 45 inserted into the blocks from opposite sides thereof and on which are mounted the oscillating bars 46, 47.

From one pole 54 of the electric motor 5 extends the current wire 51, its other end being secured around the stud screw 44 or pressed by the head of the screw against the side of the block. A second current wire 52 is similarly fastened by the stud screw 45; the wire 52 passing with the third wire 53, attached to the other pole 55 of the motor, from underneath the plate 6 to some outside source for supplying electric current to the electric motor. The stud screws 44, 45 must not be so long that when screwed within the block 43 their inner ends would touch, otherwise there would be short circuiting of the current.

The lower end of the upper flat side of the bar 46 is held against the periphery of the disk 34 by the spring 48 carried by the pin 50 of block 43, and the current passes from the electric motor 5 through the current wire 51, stud screw 44, bar 46 into disk 34. From disk 34 the current is carried by wire 56 to bracket 60 and its spring 59 of the snap switch mechanism. The wire 56 is covered with insulating material to allow it to be passed through the disk 33 and arm 32 without causing a short circuit.

The insulating plate 36 is secured by screws 37′ to arm 32, and the bracket 60 screwed to the plate 36 has upper and lower outward extending arms carrying the stud pin 37 provided with the switch arm 38 preferably having a roller 39 on its outer end. The inner portion of the stud pin carries the switch plate 40 and when the circuit is broken one side of the switch plate would be resting against the spring 59 of the bracket 60 as shown in Fig. 6, but when the switch arm has been swung in the other direction by the large arm 30 into its other position, as shown in Figs. 4 and 5, the switch plate would have received a one-half turn so that one end is pressed against the bar 58 by the spring 59 pressing its opposite end. The current from the wire 56 passes through the switch plate 40 into bar 58, and from bar 58 through wire 57 to plate 33, as shown in Figs. 1, 3 and 6, and against which plate the bar 47 is held by its spring 49. The bar 47 and its co-acting parts are constructed and arranged in the same manner as bar 46. The large arm 30 is used to turn on the snap switch by swinging the switch arm from the position shown in Fig. 6 to the position shown in Fig. 5 when the driving spring has run down to the desired point and the small arm 31 is used to turn off the snap switch by swinging the switch arm in the opposite direction after the driving spring has been wound to the desired point by the turning of the gear 19. By bringing the arm 30, 31 closer together the spring would unwind still further and would not have to be wound so often and by separating them still further the spring would not run down so far before the circuit would be complete. It is thus seen that the setting of the tension of the spring is controlled by the arms 30, 31 and the amount of winding to be desired up to one revolution is also controlled by these arms.

In the bottom plan view of the mechanism, shown in Fig. 1, the driving spring 20′ through the turning of its shaft 16 has been driving the operated machine and as the shaft turns, the switch arm 39 is in the position shown in Fig. 6 but when the shaft has turned to the desired point at which it is desired to again switch on the current, the roller end 39 of the switch arm is brought against the large arm 30 causing the switch arm to be turned to the position shown in Figs. 1 and 5 and the electric circuit made complete, by which the electric motor is started and the driving spring 20′ wound by the turning of its gear 19. As the spring starts to wind the arms 30 and 31 are moved

with the gear 19 and its plate 20 and continues to revolve with the plate until the small arm 31 reaches the switch arm when the switch arm is swung back into the position shown in Fig. 6 by the small arm 31 and the current shut off. When this switch arm has been turned a sufficient distance by the small arm 31, the end of the small arm passes into the recess 42 of the arm 32 and is stopped by said arm and also when the snap switch mechanism is carried around by the turning of the shaft 16 and the switch arm is brought in contact with the large arm 30, and turned, the end of the large arm 30 passes into a recess 41 in the opposite outer side of the arm 32, so that there is no liability of the switch arm being broken off by too far turning.

When the driving spring is not being wound the gear 19, plate 20, and arms 30, 31 remain stationary even though the shaft 16 is turning; but it frequently happens that the driving spring is being wound at the same time that the shaft 16 is being driven by its driving spring in which case the shaft 16 with its snap switch mechanism would be turned a greater distance before the small arm 31 would overtake the switch arm to throw it into the position to disconnect the current.

What I claim is:—

1. In automatic driving mechanism, a shaft, a spring having its inner end attached to the shaft, a motor circuit, a switch in said circuit carried by the shaft, a motor in said circuit for winding the spring about said shaft, means connecting the motor and the spring, and a projection carried by said means for operating the switch to make and break the circuit.

2. In automatic driving mechanism, a spring, a shaft extending through the spring to which the inner end of the spring is attached, a motor circuit, a switch in said circuit carried by the shaft, a motor in said circuit, means connecting the motor and spring by which the motor may wind the spring about said shaft, and projections attached to and moved by said means by which the switch is swung to a position for the making and breaking of the circuit.

3. The combination of a motor circuit, an electric motor in said circuit, a driving shaft, a gear loosely mounted on the shaft and driven by the motor, means connecting the gear and motor, a spring having its inner end attached to the shaft and its outer end to the gear, a switch arm within the motor circuit and carried by the shaft, means carried by the gear against which the switch arm is pressed to turn the switch arm to a position for the making of the circuit and additional means carried by the gear and revolved with it to strike and turn said switch to break the circuit.

4. In electric operating means for calculating machines, a motor circuit, a driving shaft, an arm on the shaft and revolved with it, a switch carried by said arm within the motor circuit, a gear, a volute spring having its inner end attached to the driving shaft and its outer end to the gear, an electric motor in said circuit whereby the gear may be revolved to wind up the spring without revolving the shaft, means connecting the motor and gear, and means carried by the gear for moving the switch to open or close the circuit.

5. In electric operating means for calculating machines, a driving shaft, a driving spring for the shaft having its inner end attached to the shaft, a gear on the shaft to which the outer end of the spring is attached, arms carried by the gear, an insulation ring on the outer end of the shaft, disks carried by the ring, an arm carried by the shaft, a switch arm carried by the arm, a motor circuit having the disks and switch arm within the motor circuit, an electric motor within said motor circuit, and means connecting the motor and gear.

6. In electric operating means for calculating machines, an electric motor, an insulation block, a driving shaft, an insulation ring, disks carried by the ring, pivoted bars carried by the block in contact with their respective disks, an arm carried by the shaft, a switch carried by the arm, a motor circuit having the motor, bars, disks and switch within said circuit, a driving spring having its inner end attached to the shaft, a gear loosely mounted on the shaft and driven by the motor, means connecting the motor and gear, arms carried by the gear and revolving with it to strike and turn said switch to break the circuit and against which the switch is swung to a position for the making of the circuit.

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

EMORY S. ENSIGN.

Witnesses:

CHARLES F. A. SMITH,

ETHEL M. POTTER.