C. M. B. BOOS.

SPRING MOTOR.

APPLICATION FILED NOV. 27, 1909.

999,296. Patented Aug. 1, 1911.

Fig. 3.

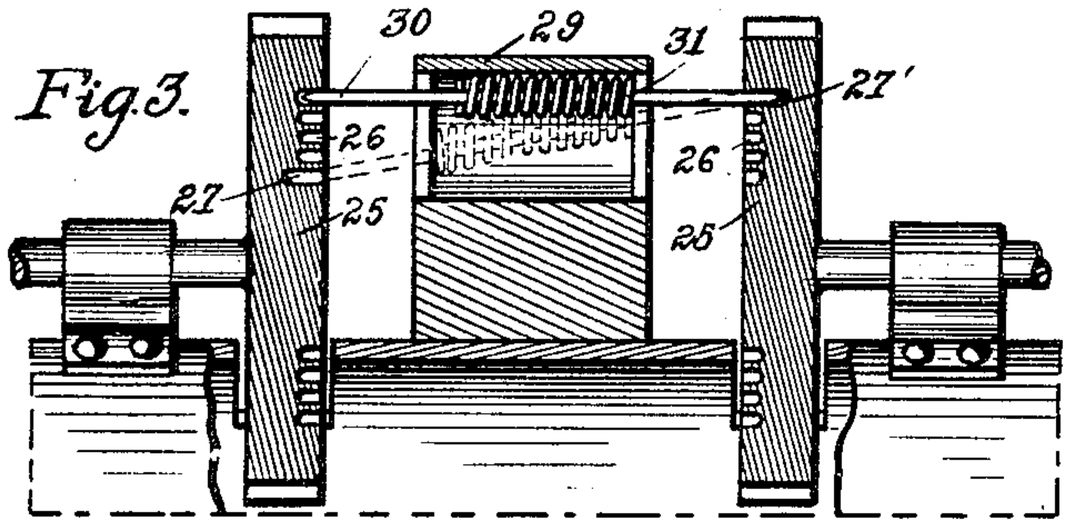


Fig. 2.

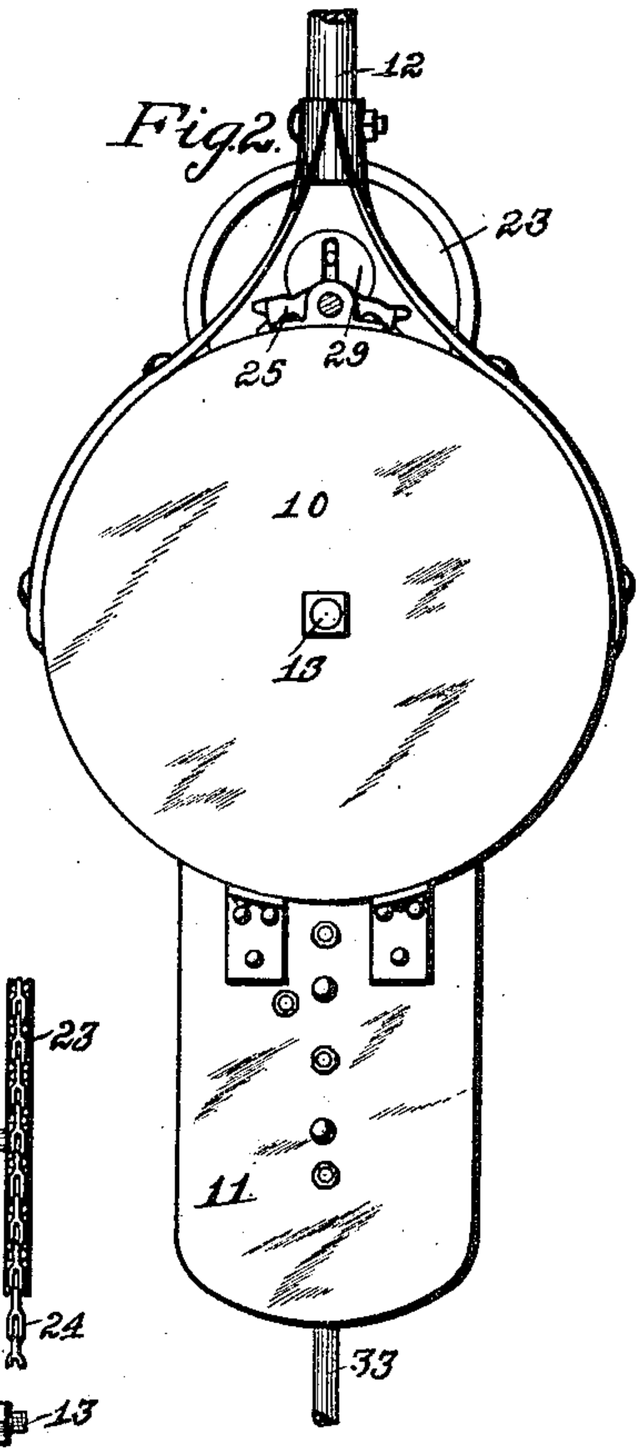


Fig. 4.

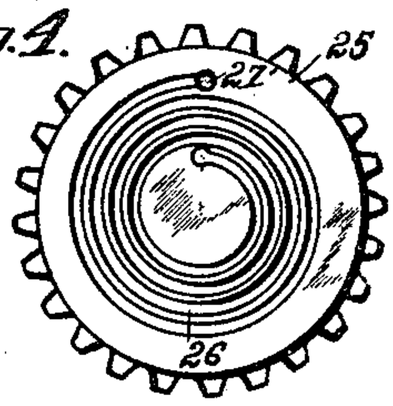


Fig. 1.

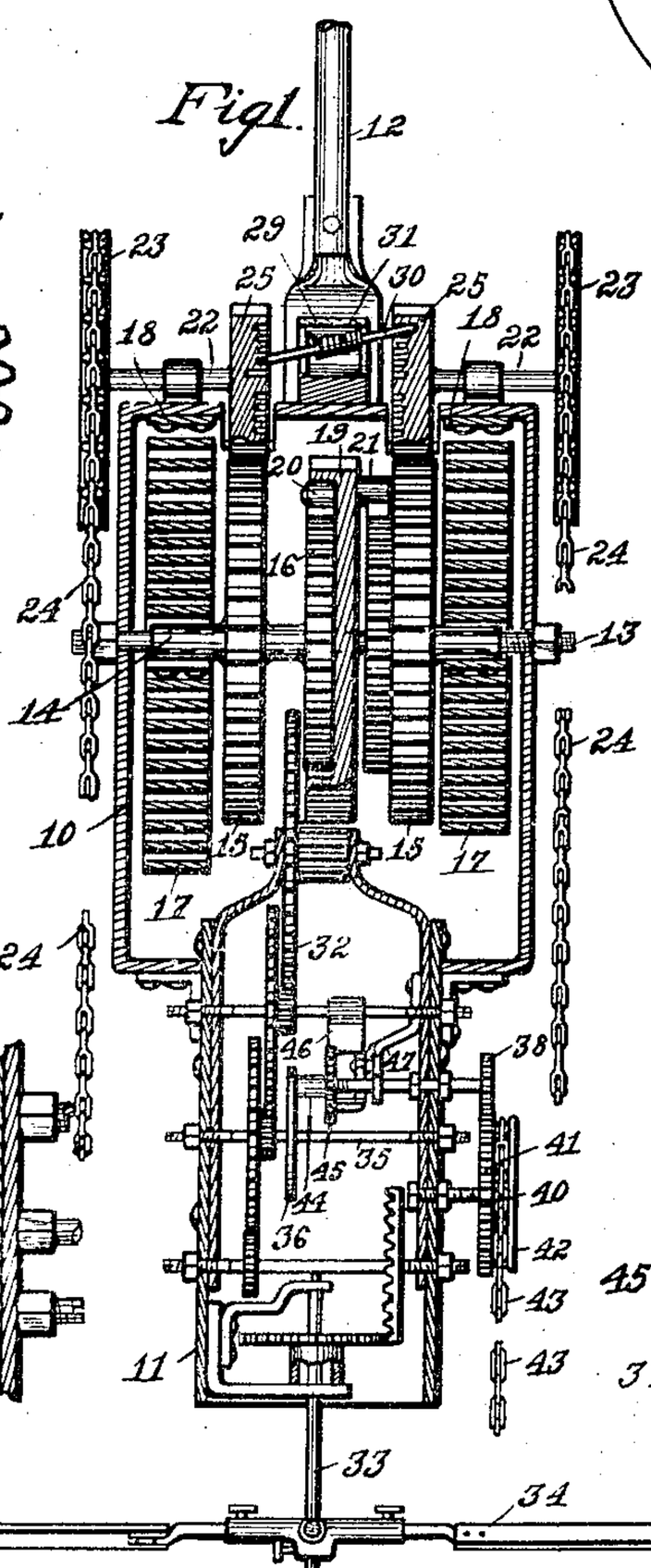


Fig. 5.

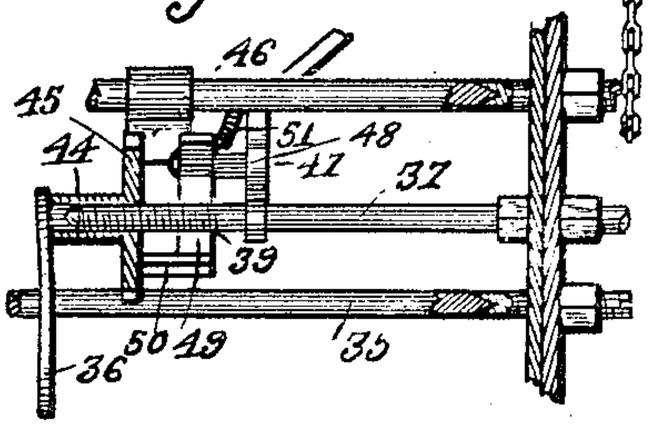
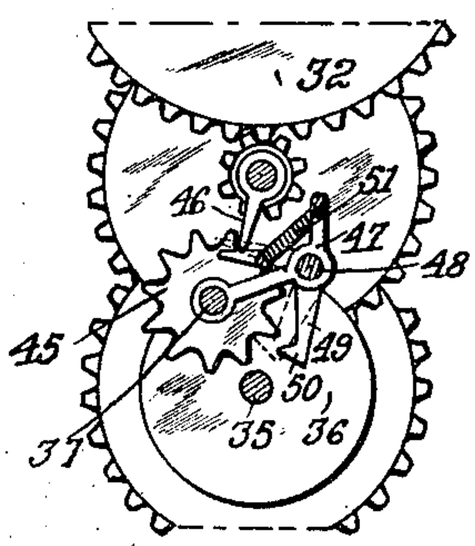


Fig. 6.



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UNITED STATES PATENT OFFICE.

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SPRING-MOTOR.

999,296. Specification of Letters Patent. **Patented Aug. 1, 1911.**

Application filed November 27, 1909. Serial No. 530,159.

To all whom it may concern:

Be it known that I, CASPER M. B. BOOS, a citizen of the United States, residing at Oklahoma city, in the county of Oklahoma and State of Oklahoma, have invented a certain new and useful Spring-Motor, of which the following is a specification.

The object of my invention is to provide a spring motor especially adapted for operating devices such as fans.

More specifically it is my object to provide a motor of this class in which a number of springs are employed and which springs are so arranged that they will be successively brought into operation so that all of the springs may be wound up at one time and they will continue to operate the driven shaft for a comparatively long time. In this connection it is my object to provide improved means for automatically throwing one of the springs into operative position as soon as the preceding spring has been unwound to such an extent that it will not further operate the driven shaft.

My invention consists in certain details, in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, in which—

Figure 1 shows a vertical, central, sectional view of a spring motor embodying my invention as applied to a fan. Fig. 2 shows a side elevation of same without the fan. Fig. 3 shows an enlarged, detail view illustrating the automatic means for successively throwing the springs into operative positions. Fig. 4 shows an enlarged, detail view of one of the pinions with spiral grooves forming part of the automatic device for successively throwing the springs into operation. Fig. 5 shows a detail view, partly in section, for illustrating the means for applying variable friction to the driven shaft, and Fig. 6 shows a detail, side view illustrating the means for actuating the variable resistance device,

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate the main casing of the spring motor and 11 a supplemental casing below it. The main casing is preferably supported by means of a hanger 12. Mounted in the central portion of the main casing is a transverse shaft 13 having two independent spring motor devices arranged thereon, each of which comprises a sleeve 14 rotatably mounted on the shaft 13 and having fixed thereto a large gear wheel 15 and a smaller ratchet 16, and also having fixed to and wound thereon a convolute spring 17, the other end of which spring is attached to the casing at 18 as shown in the Fig. 1.

Rotatably mounted upon the shaft 13 is a gear wheel 19 having mounted thereon two pawls 20 and 21 designed to engage respectively the ratchets 16 of both spring motor devices, said parts being so arranged that either one of the sleeves 14 may be rotated in one direction as required to wind up the spring without turning the gear wheel 19, and when either one of the sleeves 14 is operated in the direction in which it would be turned by this spring, the corresponding pawl will carry the gear wheel 19 around with the ratchet 16. As will hereinafter appear the driven shaft is operated by power from this gear wheel 19.

To provide means whereby both of the springs may be wound up and one of them may unwind first and then the second one be automatically placed in position to begin unwinding, I have provided the following mechanism: On top of the casing 10, are two counter-shafts 22 each having at its outer end a sprocket wheel 23 having a chain 24 thereon and a pinion 25; the latter is provided at its inner face with a spiral groove 26 as clearly shown in Fig. 4. This groove on one of the pinions 25 has a releasing recess 27 at its inner end, as clearly illustrated in Fig. 3. The spiral groove 26 is the same in both pinions, except that in the pinion shown at the right of Fig. 3, the recess 27′ is at the outer end of the groove. Between these two pinions 25 is a support 29 having slotted ends and having a rod 30 extended through it and through said slots. This rod is of a length to enter the spiral grooves in both pinions 25, and fixed to said rod is an extensible coiled spring 31 to engage the rod at one end and the interior of the support 29 at its other end to thereby yieldingly hold the rod 30 toward one of the pinions 25.

When both of the springs are wound up the rod 30 will be in the position shown in Fig. 3 of the drawings; that is to say, with its ends respectively in the outer ends of the spiral grooves, one end being in the locking recess 27′ of the right-hand pinion

25 serving to lock said pinion 25 against rotation until the rod is removed from said recess. The other end of the rod being in the spiral groove of the left hand pinion will not interfere with the rotation of that pinion. When one of the springs begins to unwind, the end of the rod 30 in the spiral groove of the corresponding pinion 25 will traverse the said spiral groove until the spring has been wholly unwound at which time said end will enter the recess 27 at the inner end of said spiral groove. This will permit the rod 30 to move lengthwise far enough to release the pinion 25 at the opposite end of the rod and to lock the pinion 25 corresponding to the spring that has been unwound. The dotted lines in Fig. 3 show the rod 30 in the position last named. The slots at the ends of the support 29 permit up and down movement only of the rod 30. By this arrangement it is obvious that one of the spring devices must first unwind before the other can commence to unwind and when the springs are wound up the ends of the rod 30 will be at the outer ends of the spiral grooves.

The means for operating a device, such for instance as the shaft of a fan, comprises a speed increasing train of gears indicated generally by the numeral 32 and operatively connected with the shaft 33 of the fan 34. Any desired number of said speed-increasing gears may be used to meet the requirements of the case. In this connection, however, I have provided means for applying a variable friction to the train of gears for controlling the speed of the driven shaft as follows: On the shaft 35 of one of the gearing devices is a flat disk 36 preferably made of thin flexible metal. Adjacent to it I have provided a shaft 37 having on its outer end a small pinion 38, and having its inner end screw threaded at 39. It is necessary, at certain times, to turn the shaft 37 manually and for this purpose I provide a supplemental shaft 40 having a large pinion 41 and a sprocket wheel 42 rotatably mounted thereon, the pinion 41 being in mesh with the pinion 38 and the sprocket wheel 42 being provided with a chain 43 by which it may be rotated. Mounted upon the screw threaded portion of the shaft 37 is a screw threaded sleeve 44 having fixed thereto a notched disk 45, said sleeve being in position to engage the adjacent surface of the flexible friction disk 36. Mounted on one of the shafts of the train of gearing wheels adjacent to the notched disk 45 is an arm 46 so arranged as to co-act with said notched disk 45 and to turn said notched disk one notched space during each revolution of the arm 46.

In order to prevent the notched disk 45 from turning more than one notched space at a time, I have provided the following: Fixed to the stationary support is an arm 47 having one end mounted upon the shaft 37 and also having a pivot pin 48 mounted in said arm. Said pivot pin 48 is arranged to receive a bell crank lever 49 having a hooked end 50. One end of the lever 49 is designed to be engaged by the arm 46 when it is in position adjacent to the notched disk 45 and when it is thus engaged it will hold the other end of the bell crank lever 49 out of engagement with the notched disk, and when the arm 46 moves to position away from the bell crank lever the hooked end of the lever 49 will engage the notched disk 45 and hold it against rotation. The dotted lines in Fig. 6 show the bell crank lever in position for retarding the movement of the notched disk 45. The hooked end of this bell crank lever 49 is normally held by a spring 51 in position in engagement with the notched disk so that when the shaft 37 is turned manually by the chain 43 the notched disk will be held stationary and will be moved longitudinally of the shaft 37 by the screw threads. Assuming that the flexible friction disk 36 and the sleeve 44 are in the positions shown in Fig. 5, then it is obvious that considerable friction will be applied by said sleeve to the friction disk to retard the movement of the driven shaft. As the spring is unwound and becomes weaker the screw threads on the sleeve 44 will operate to slowly move said sleeve away from the friction disk to thereby gradually apply a less amount of friction as the spring is unwound so that during the initial movement of the spring motor the amount of friction will be sufficient to maintain the fan shaft at normal speed, and then as the power of the spring motor diminishes the amount of friction is correspondingly reduced so that the driven shaft may be maintained at the same speed.

In practical operation, the chains 24 and 43 are preferably extended to a position where they may be easily grasped by an operator. By pulling upon the chains 24 both of the springs may be wound up, then when the device is released one of the main springs commences to unwind and the power thus developed will be transmitted through a speed-increasing train of gears to the fan shaft. The other spring will be held against rotation until the first spring has been wholly unwound; then as soon as the first spring has been unwound the rod 30 will move to position for releasing the second spring, and the operation of the fan will then be continued so long as there is power in the second spring. Furthermore the amount of resistance applied to the spring disk may be readily and easily varied by the operator by a manipulation of the chain 43 so that the speed of the fan may be controlled at any time during the

operation of the device, or it may be wholly stopped by turning up the sleeve 44 tightly against the friction disk 36.

I claim as my invention:

1. In a spring motor, the combination of a casing, a stationary shaft mounted therein, a pair of rotatable sleeves on said shaft, a spring fixed at one end to each sleeve and at the other end to the casing, a gear wheel fixed to each sleeve, a pinion in mesh with each gear wheel, one of said pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a spring-pressed rod adapted to engage said locking recess at one end and the spiral groove of the first mentioned pinion at the other end for automatically releasing said second pinion when the spring associated with said first pinion has become unwound, a driven shaft, and driving connections between said gear wheels and said driven shaft.

2. In a spring motor, the combination of a casing, a stationary shaft mounted therein, a pair of rotatable sleeves on said shaft, a spring fixed at one end to each sleeve and at the other end to said casing, a gear wheel fixed to each sleeve, a pair of counter-shafts mounted on top of said casing, a pinion secured to each counter-shaft and meshing with one of said gear wheels, one of said pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a spring-pressed rod adapted to engage said locking recess at one end and the spiral groove of the said first-mentioned pinion at the other end for automatically releasing the said second pinion when the spring associated with said first-mentioned pinion has become unwound, a driven shaft, and driving connections between said gear wheels and said driven shaft.

3. In a spring motor, the combination of a casing, a stationary shaft mounted therein, a pair of rotatable sleeves on said shaft, a spring fixed at one end to each sleeve and at the other end to said casing, a gear wheel fixed to each sleeve, a pair of counter-shafts mounted on top of said casing, a pinion secured to each counter-shaft and meshing with one of said gear wheels, one of said pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a spring-pressed rod adapted to engage said locking recess at one end and the spiral groove of the said first-mentioned pinion at the other end for automatically releasing said second pinion when the spring associated with said first-mentioned pinion has become unwound, a driven shaft, and driving connections between said gear wheels and said driven shaft, and means for actuating each of said counter-shafts to wind up the associated spring.

4. In a spring motor, the combination of a casing, a stationary shaft mounted therein, a pair of rotatable sleeves on said shaft, a spring fixed at one end to each sleeve and at the other end to said casing, a gear wheel fixed to each sleeve, a central gear member rotatably mounted on said shaft between said gear wheels, a pawl pivoted to said gear member on either side thereof, a ratchet secured to each sleeve and arranged to be engaged by one of said pawls, a pinion in mesh with each gear wheel, one of said pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a spring-pressed rod adapted to engage said locking recess at one end and the spiral groove of the first-mentioned pinion at the other end for automatically releasing said second pinion when the spring associated with said first-mentioned pinion has become unwound, a driven shaft, and driving connections between said central gear member and said driven shaft.

5. In a spring motor, the combination of a casing, a stationary shaft mounted therein, a pair of rotatable sleeves on said shaft, a spring fixed at one end to each sleeve and at the other end to said casing, a gear wheel fixed to each sleeve, a pair of counter-shafts mounted on top of said casing, a pinion secured to each counter-shaft and meshing with one of said gear wheels, one of said pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a spring-pressed rod adapted to engage said locking recess at one end and the spiral groove of the first-mentioned pinion at the other end for automatically releasing said second pinion when the spring associated with said first-mentioned pinion has become unwound, a central gear member rotatably mounted on said shaft between said gear wheels, a pawl pivoted to said gear member on either side thereof, a ratchet secured to each sleeve and arranged to be engaged by one of said pawls, a driven shaft, and driving connections between said central gear member and said driven shaft.

6. In a spring motor, the combination of a casing, a stationary shaft mounted therein, a pair of rotatable sleeves on said shaft, a spring fixed at one end to each sleeve and at the other end to said casing, a gear wheel fixed to each sleeve, a pair of counter-shafts mounted on top of said casing, a pinion secured to each counter-shaft and meshing with one of said gear wheels, one of said

pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a slotted support on top of said casing, a rod projecting at both ends through the slots in said support, a spring normally tending to force said rod in one direction, so that said rod engages said locking recess at one end and the spiral groove of the first-mentioned pinion at the other end for automatically releasing said second pinion when the spring associated with said first-mentioned pinion has become unwound, a driven shaft, and driving connections between said gear wheels and said driven shaft.

7. In a spring motor, the combination of a casing, a stationary shaft mounted therein, a pair of rotatable sleeves on said shaft, a spring fixed at one end to each sleeve and at the other end to said casing, a gear wheel fixed to each sleeve, a central gear member rotatably mounted on said shaft between said gear wheels, a pawl pivoted to said gear member on either side thereof, a ratchet secured to each sleeve and arranged to be engaged by one of said pawls, a driven shaft, driving connections between said central gear member and said driven shaft, and automatic mechanism connected with said gear wheels for locking one of said springs against movement during the operation of the other spring and releasing said locked spring when said other spring has become unwound.

8. In a spring motor, the combination of a pair of suitably supported pinions, one of said pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a rod movably mounted between said pinions to engage said spiral grooves, a spring for yieldingly holding one end of said rod in the spiral groove of said first-mentioned pinion, while the other end of said rod engages the locking recess of the other pinion, a power spring operatively connected with each pinion, driven shaft, and driving connections between said power springs and said shaft.

9. In a spring motor, the combination of a casing, a pair of alined shafts mounted on said casing, a pinion secured to the inner end of each shaft, said pinions being on their opposing faces provided each with a spiral groove, the spiral groove of one pinion terminating in a releasing recess at its inner end, and the groove of the other pinion terminating in a locking recess at its outer end, a rod slidingly and tiltingly supported between said pinions, a spring for holding one end of said rod in the spiral groove of said first-mentioned pinion, while the other end of said rod engages the locking recess in the other pinion, a pair of power springs mounted within said casing and operatively connected with said pinions, a driven shaft, and driving connections between said power springs and said driven shaft.

10. In a spring motor, the combination of a pair of oppositely mounted pinions, one of said pinions being on its inner face provided with a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a locking recess on its inner face, a spring-pressed rod held yieldingly at one end in said spiral groove, while the other end of said rod rests in said locking recess to prevent operation of said second-mentioned pinion until the rod enters the releasing recess of said first-mentioned pinion, a spring operatively connected with each pinion, a driven shaft, and driving connections between said springs and said driven shaft.

11. In a spring motor, the combination of a pair of oppositely mounted pinions, a spring-pressed rod shiftably supported between said pinions and arranged to lock one of said pinions against rotation while the other pinion is free to operate, said other pinion being provided with means for automatically causing said rod to release said first-mentioned pinion after a predetermined amount of operation of said other pinion, a spring operatively connected with each pinion, a driven shaft, and driving connections between said springs and said driven shaft.

12. In a spring motor, the combination of a casing, a pair of alined shafts rotatably mounted on said casing, a pinion fixed to the inner end of each shaft, a spring-pressed rod shiftably supported between said pinions and arranged to lock one of said pinions against rotation while the other pinion is free to operate, said other pinion being provided with means for automatically causing said rod to release said first-mentioned pinion after a predetermined amount of operation of said other pinion, a spring operatively connected with each pinion, a driven shaft, and driving connections between said springs and said driven shaft.

13. In a spring motor, the combination of a casing, a pair of gear wheels rotatably supported therein, a spring rigidly connected at its inner end with each gear wheel and at its outer end secured to said casing, a pinion in mesh with each gear wheel, one of said pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a spring-pressed rod adapted to engage said locking recess at one end and the spiral groove of the first-mentioned pinion at the other end for automatically releasing

said second pinion when the spring associated with said first-mentioned pinion has become unwound, a driven shaft, and driving connections between said gear wheels and said driven shaft.

14. In a spring motor, the combination of a casing, a pair of gear wheels rotatably supported therein, a spring rigidly connected at its inner end with each gear wheel and at its outer end secured to said casing, a pair of counter-shafts mounted on top of said casing, a pinion secured to each counter-shaft and meshing with one of said gear wheels, one of said pinions having a spiral groove which terminates at its inner end in a releasing recess, the other pinion having a spiral groove which terminates at its outer end in a locking recess, a spring-pressed rod adapted to engage said locking recess at one end and the spiral groove of said first-mentioned pinion at the other end for automatically releasing said second pinion when the spring associated with said first-mentioned pinion has become unwound, a driven shaft, and driving connections between said gear wheels and said driven shaft.

15. In a spring motor, the combination of a casing, a pair of gear wheels rotatably supported therein, a spring rigidly connected at its inner end with each gear wheel, and at its outer end secured to said casing, a pair of counter-shafts mounted on top of said casing, a pinion secured to each counter-shaft and meshing with one of said gear wheels, a spring-pressed rod shiftably supported between said pinions and arranged to lock one of said pinions against rotation while the other pinion is free to operate, said other pinion being provided with means for automatically causing said rod to release said first-mentioned pinion after a predetermined amount of operation of said other pinion, a driven shaft, and driving connections between said gear wheels and said driven shaft.

16. In a spring motor, the combination of a casing, a pair of alined shafts rotatably mounted on said casing, a pinion fixed to the inner end of each shaft, a spring-pressed rod shiftably supported between said pinions and arranged to lock one of said pinions against rotation while the other pinion is free to operate, said other pinion being provided with means for automatically causing said rod to release said first-mentioned pinion after a predetermined amount of operation of said other pinion, a spring operatively connected with each pinion, a driven shaft, driving connections between said springs and said driven shaft, and means for actuating said alined shafts to wind up the springs.

17. In a spring motor, the combination of a casing, a pair of alined gear wheels mounted in said casing so as to rotate independently of each other, a spring rigidly connected at its inner end with each gear wheel and at its outer end secured to the casing, mechanism on the outside of said casing operatively connected with said gear wheels for holding one of said gear wheels locked against rotation during the operation of the other gear wheel and automatically releasing said locked gear wheel when the spring of the other gear wheel has become unwound, a driven shaft, and driving connections between said gear wheels and said driven shaft.

Des Moines, Iowa, Nov. 24, 1909.

CASPER M. B. BOOS.

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