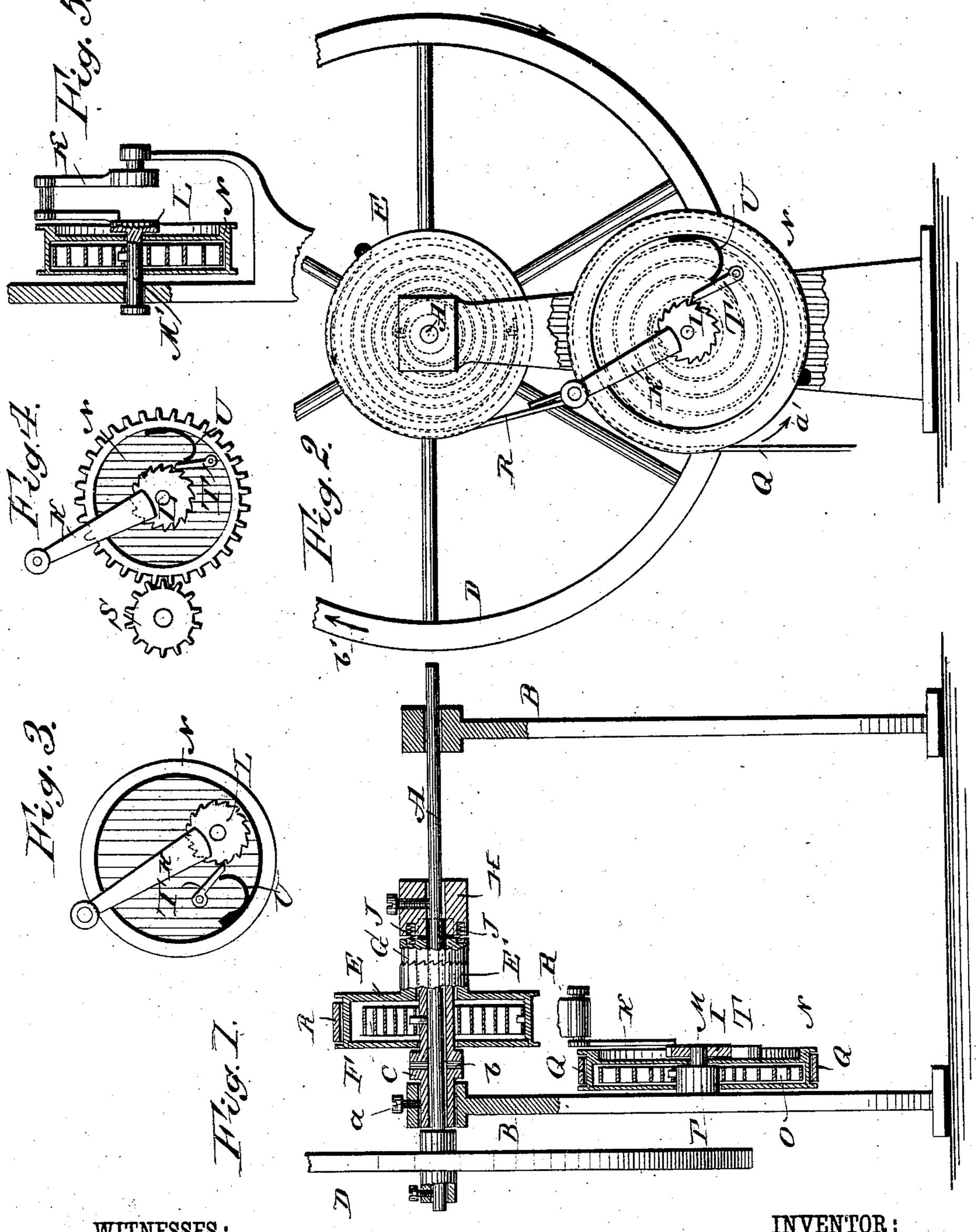
(Model.)

S. N. SILVER.

MOTOR.

No. 281,571. Patented July 17, 1883.



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SAMUEL N. SILVER, OF AUBURN, MAINE.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 281,571, dated July 17, 1883.

Application filed December 13, 1882. (Model.)

To all whom it may concern:

Be it known that I, SAMUEL N. SILVER, of Auburn, in the county of Androscoggin and State of Maine, have invented a new and Improved Motor, of which the following is a full, clear, and exact description.

The object of my invention is to provide a new and improved motor and device for applying power in an effective and economical manner.

The invention consists in a motor formed of a spiral spring contained in a casing loosely mounted on a shaft and provided with devices for transmitting its motion to the shaft, which casing is connected by suitable devices with a crank which is connected to a wheel or a spring-casing which can be rotated by a strap, by a treadle, by belts, or in any other suitable manner, whereby the spring on the shaft will be brought in tension and will be suddenly released, and thereby will rotate the said shaft.

The invention also consists in various parts and details of construction, all as will be fully set forth and described hereinafter.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal sectional elevation of my improved motor. Fig. 2 is an end elevation of the same. Figs. 3 and 4 are side elevations of the wheel with which the crank is connected. Fig. 5 is a cross-sectional elevation of another modification of the same.

A shaft, A, is journaled in a suitable standard, B, and in a sleeve, C, in another standard, B, which sleeve can be locked in position on the said standard by means of a binding-screw, *a*. A fly-wheel, D, of any suitable construction, is mounted on the shaft A. A circular box or hollow drum, E, or other suitable collar or arm, is loosely mounted on the sleeve C, and contains or has attached to it a coiled or spiral spring, F, one end of which is fastened to the said box E, and the other end is fastened to the sleeve C. The sleeve C is provided with a series of radial apertures, *b*, for inserting a key, for the purpose of turning the sleeve C to adjust the tension of the spring F. The box E is provided at one end with a collar, E′, the outer edge of which is provided with teeth projecting in the same direction in which the shaft A is to be revolved. A clutch, G, loosely mounted on the shaft A, has the edge adjoining the toothed edge of the collar E′ provided with teeth projecting in the inverse direction of the collar E′. The said clutch G engages with a fixed clutch, H, mounted on the shaft A. Springs J, contained in recesses in the adjoining ends of the loose clutch G and the fixed clutch H, press the toothed edge of the loose clutch G against the toothed edge of the collar E. A crank, K, is attached to or made integral with a ratchet-wheel, L, provided with a central pintle, M, which is journaled in one of the standards B, on which pintle M a circular casing, N, is loosely mounted, which circular casing N contains a spiral spring, O, one end of which is attached to the circular casing N, and the other end of which is attached to a boss, P, surrounding the pintle M and secured to the standard B. The periphery of the casing N is grooved to receive a strap, Q. A strap, belt, or rope, R, attached to the outer end of the crank K, is attached to the periphry of the box E; or, if desired, a connecting-rod can be pivoted to the side of the box E and to the end of the crank K.

Instead of journaling the pivot M in the standard B, the said pivot can be fixed in the said standard B, and the ratchet-wheel L can be journaled on the said pivot; or, if desired, the crank K can be made double, as shown in Fig. 5—that is, the pivot M can be replaced by a shaft, M′, which has a bearing at each end, and is provided with a crank between one end and the side of the casing N. In Figs. 1, 2, 4, and 5 the ratchet-wheel L is mounted centrally on the casing N; but, if desired, it can be mounted eccentrically, as shown in Fig. 3, in case it is to give varying speed and power at different parts of its revolution.

If desired, the edge of the casing N can be provided with gear-teeth, as shown in Fig. 4, which engage with a pinion, S, which is rotated by a belt or some other suitable device, and thereby operates the crank-shaft. A pawl, T, pivoted on the side of the casing N, is pressed against the ratchet-wheel L by a spring, U.

If desired, a series of boxes, E, corresponding clutches, and corresponding casings, N, and

suitable connections may be combined with one and the same shaft, so that power can be applied to the same at different points at the same time.

The operation is as follows: If the wheel or casing N is turned in the direction of the arrow *a'*, the crank K will swing downward in the same direction and will turn the drum or box E in a like direction; as indicated by the arrow. The box E is loosely mounted on the sleeve C and on the shaft A, and can turn in the direction of its arrow without turning the shaft in the same direction; but by the said movement of the box E the coil-spring F within the box will be drawn taut. When the crank K has been turned downward to such an extent that its lower end has passed beyond the vertical line extending downward from the center of rotation of the crank, the spring F, contained in the box E, will uncoil suddenly, and will very rapidly throw the shaft A and the wheel D in the direction of the arrow *b'*, and thereby draw the crank K up suddenly, to complete its revolution very rapidly—that is, much more rapidly than the casing N. By turning the casing N in the direction of the arrow *a'*, the spring O has been coiled, and as soon as the crank K is drawn upward rapidly to complete its revolution the spring O throws the casing N back in the inverse direction of the arrow *a'*, so that if the casing N is again turned in the direction of the arrow *a'* the pawl T will catch on the ratchet-wheel L and will turn the crank K downward in the direction of the arrow *a'*. The device operates the same if the casing is rotated continuously in the direction of the arrow *a'*, instead of being rotated partially in the direction of the arrow *a'*, and then thrown back by its spring O. The movement of the shaft A can be adjusted by means of the sleeve C, for by turning the same more or less the tension of the spring F can be adjusted as may be desired. The power can be applied to the casing N by means of a treadle, or from any other suitable motor by means of belts, and the power may be applied by a rotary movement or a reciprocating movement, as has been stated above.

The above-described device can be attached to or used in a bicycle, a tricycle, or any other foot or hand power machine. It can be used for converting a slow movement into a rapid movement, for converting a reciprocating movement into a circular movement, and for accumulating power to be used a second time, for by moving the crank downward or outward the spring F is brought in great tension and is allowed to suddenly react, and the force and impulse produced by the action of this spring will propel a vehicle—for instance, a velocipede—a long distance on a level road. In going uphill or up a grade the reaction of this spring will not propel the vehicle so far, and the operator will have to tread oftener. The advantage of my improved device is that on a level road he would not have to tread as often as he would have to on an incline, or, in other words, the power consumed will always be in relation to the resistance, whereas in other machines he must always operate the same whether the resistance is greater or less. Again, if the device is applied to a steam or other engine, a better result is obtained than by the expansion principle, as it requires the full power of the engine to bring the spring in tension, and if the spring is allowed to suddenly react upon the shaft, to which a fly-wheel of sufficient weight is attached, the entire force and capacity of the spring are constantly stored in the fly-wheel, and this fly-wheel then carries the entire load until it falls below a certain required speed, at which instant an automatic regulator—for instance, an engine-governor with suitable connections—causes the engine to start, again causing the same to bring in tension the spring in the box E, and allowing it to act upon the shaft, and so on. It will be plainly seen that the fly-wheel would keep to its required speed longer with a light load, or if part of the load were thrown off, than if fully loaded, thus allowing a longer interval of time between the strokes of the engine, thereby saving unnecessary wear and friction of the engine, besides obtaining as good results as are obtained by the expansion of steam.

The spring F, which is coiled around the shaft, is shown and described in the casing E; but that is not necessary, as the casing E can be dispensed with and the spring can be attached to an arm or other suitable device, or left entirely open to view. Instead of the clutch G H, a friction-clutch may be used. In case the motor is attached to a velocipede or other vehicle, the fly-wheel D can be dispensed with. The box E need not always be turned in the same direction as the crank-arm K, but in certain cases may have to be turned in the reverse direction. The crank K need not be below the shaft A, but can be above it or at one side of the same, and it need not always turn downward from the shaft, but can turn upward or laterally.

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

1. In a motor, the combination, with the driving-shaft with a spring connected thereto, by the reaction of which it is revolved, of a crank arm or shaft caused to move in a circular path and to complete its revolution at a suddenly-increased and rapid rate of speed upon the relaxation of said spring, the means for causing the said arm or shaft to perform part of its revolution being returned by a spring to its original position to enable the crank-arm to be again acted upon, substantially as and for the purpose set forth.

2. In a motor, the combination, with the driving-shaft carrying the case or inclosure clutched thereto and acted upon by a spring connected to a sleeve, said sleeve loosely surrounding said shaft and fixed in position, of the loosely supported or journaled case or frame having a spring connected thereto and

to a fixed point, and the crank arm or shaft connected to the former case and to a ratchet acted upon by a spring-pawl of the latter case, substantially as and for the purpose set forth.

3. In a motor, the driving-shaft A, with a surrounding sleeve, C, connected to a spring, F, connected to a case, E, clutched to said shaft, whereby the action of the spring is caused to revolve the shaft, in combination with the spring O, secured to a fixed point and to a journaled case, N, said case having the operating-strap Q, and the crank arm or shaft K, strapped, as at R, to the spring-case E and fastened to the ratchet L, supported on a fixed shaft, M, and engaged by a spring-pawl, T, pivoted to the case N, substantially as and for the purpose set forth.

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Witnesses:
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