(No Model.) 2 Sheets—Sheet 1.

J. A. LEE, Sr. & E. S. REED.

SPRING MOTOR.

No. 440,482. Patented Nov. 11, 1890.

Fig. 1.

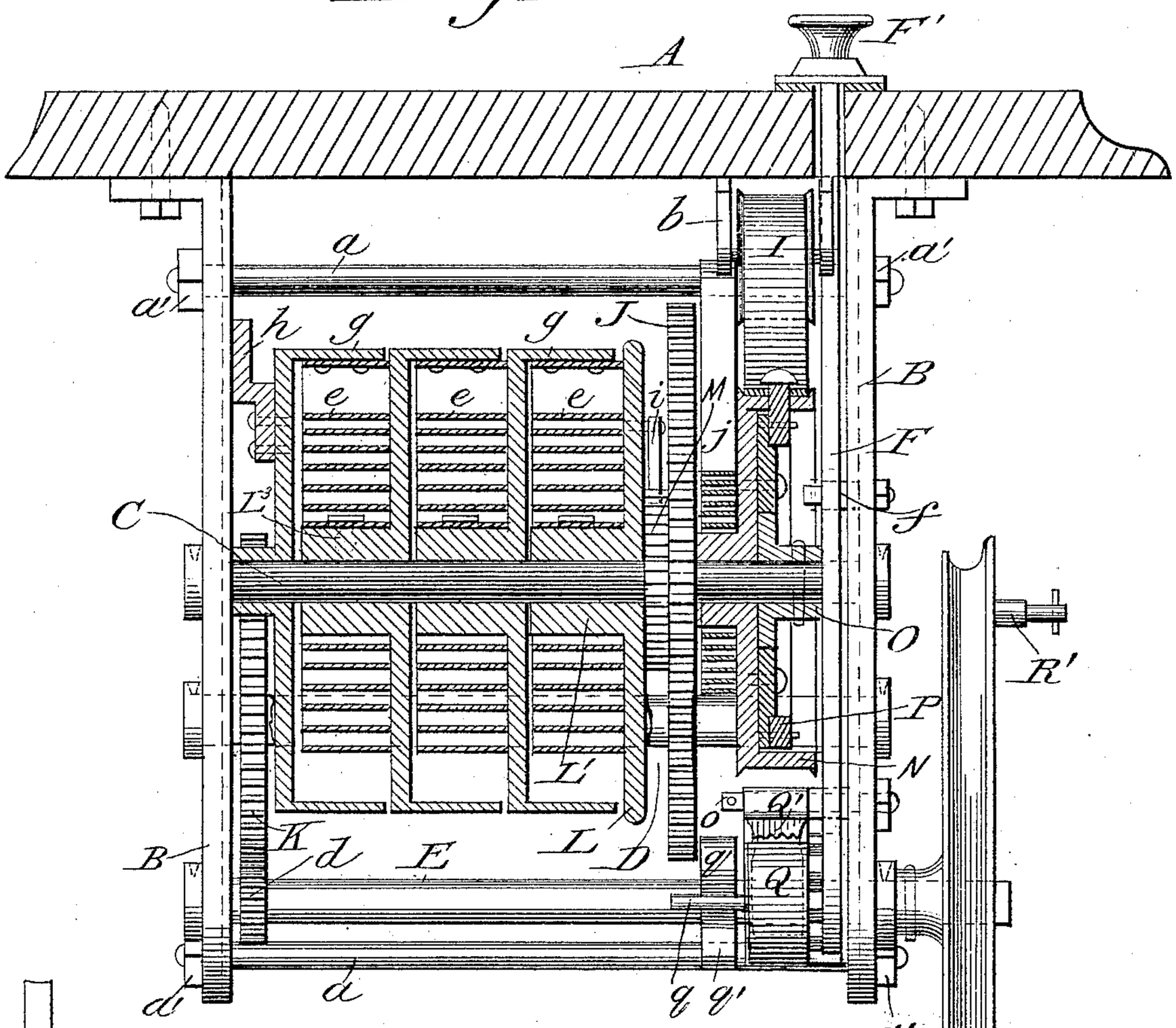
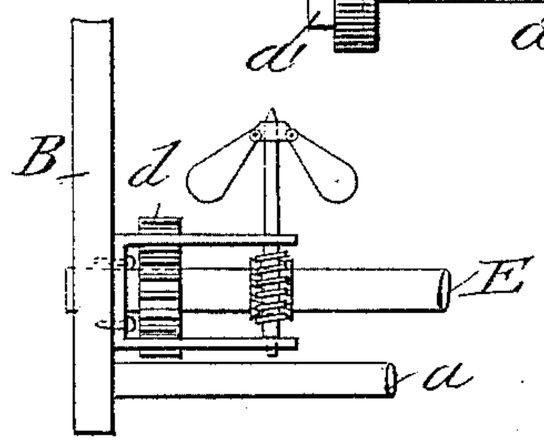
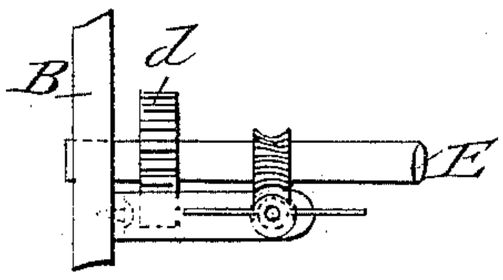
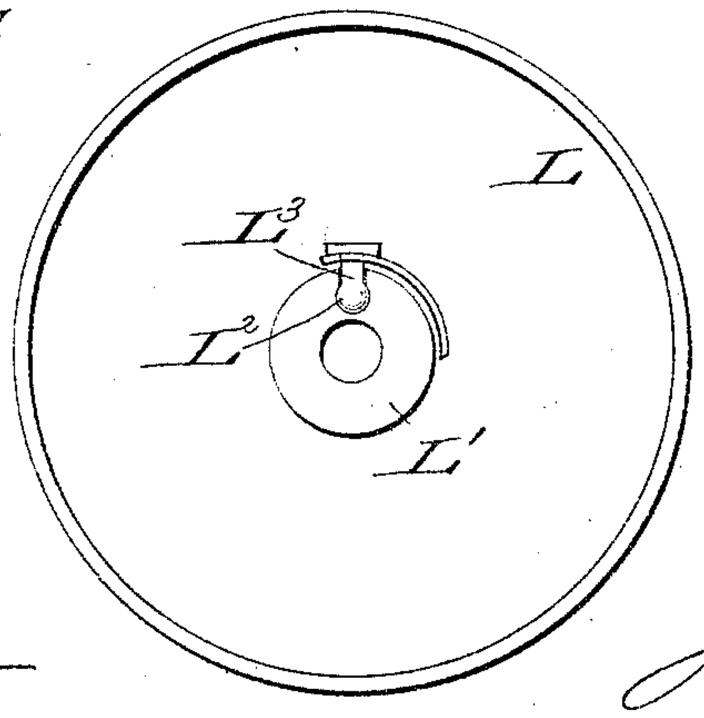


Fig. 2.







Attest:
F. H. Schott
Wm. L. Boyden.

Inventor
John A. Lee Sr.
Eli S. Reed
per Reed & Parker Attys

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

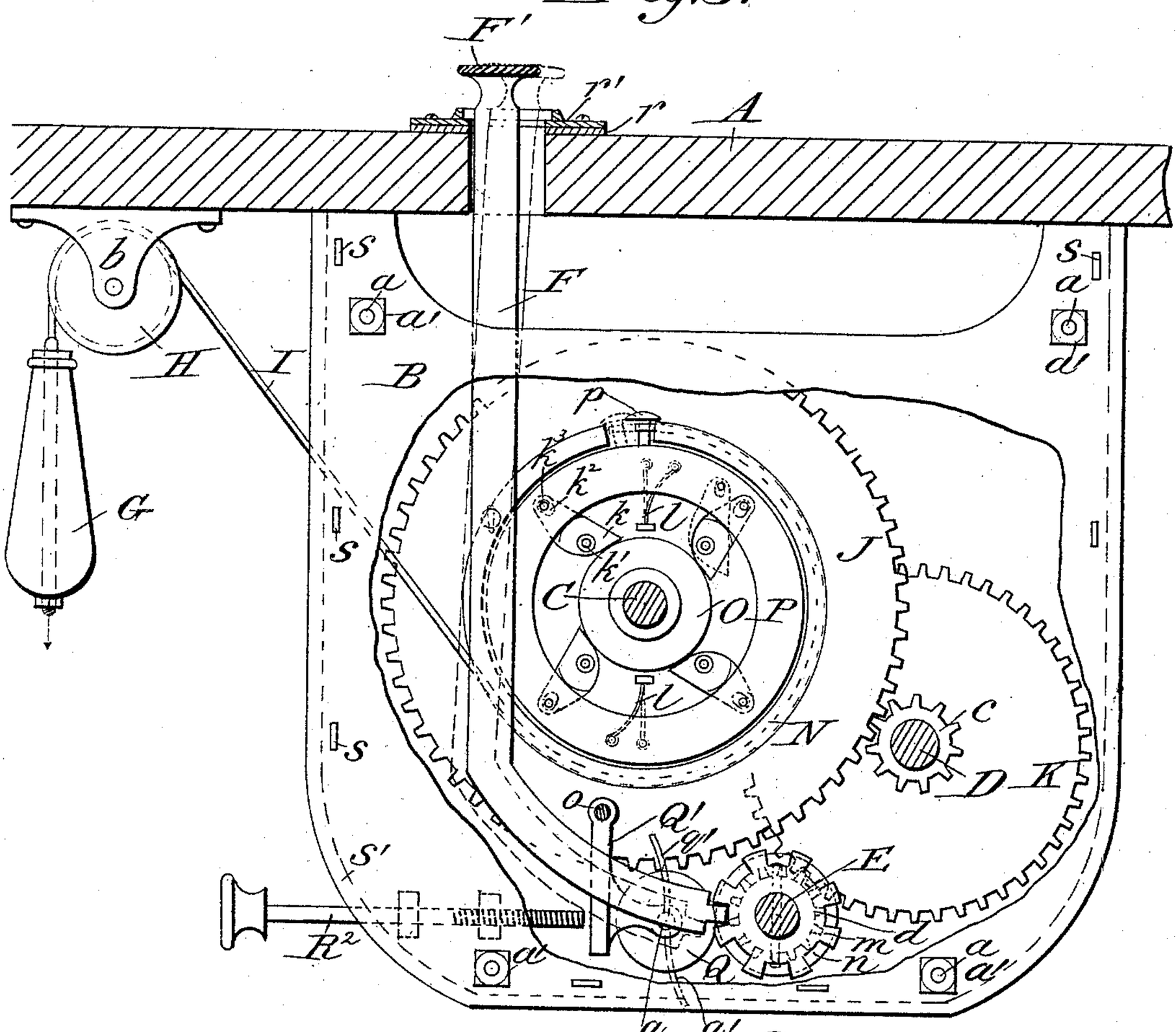


Fig. 4.

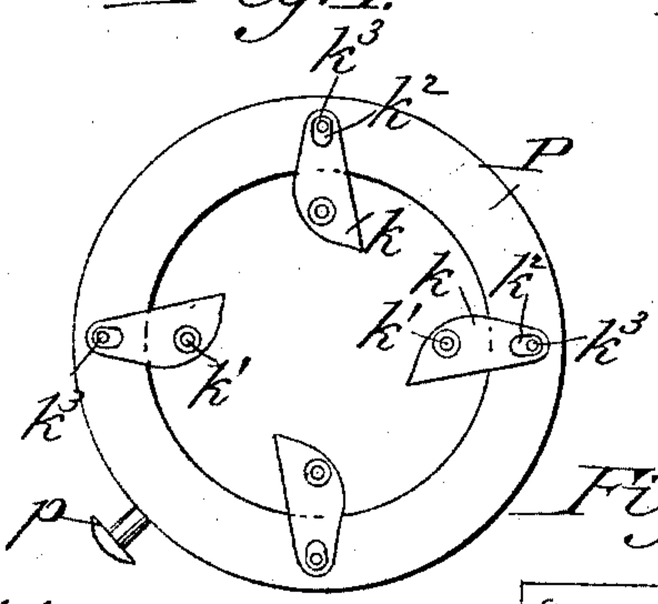


Fig. 5.

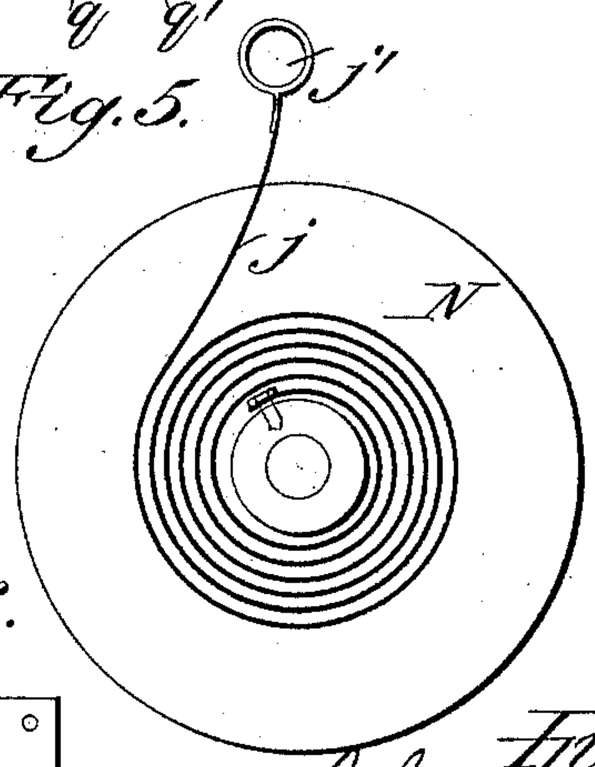
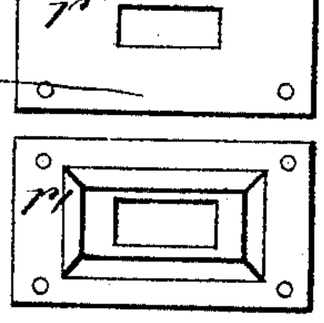


Fig. 6.



Attest:

H. H. Schott

Wm. L. Boyden

Inventors

John A. Lee Sr.

Eli S. Reed

per Fred. G. Dasher Atty

UNITED STATES PATENT OFFICE.

JOHN A. LEE, SR., AND ELI S. REED, OF CHATTANOOGA, TENNESSEE, ASSIGNORS OF ONE-HALF TO ALEXANDER M. WILLINGHAM AND JAMES W. ROPER, BOTH OF CARTERSVILLE, GEORGIA.

SPRING-MOTOR.

SPECIFICATION forming part of Letters Patent No. 440,482, dated November 11, 1890.

Application filed February 12, 1890. Serial No. 340,098. (No model.)

To all whom it may concern:

Be it known that we, JOHN A. LEE, Sr., and ELI S. REED, citizens of the United States, residing at Chattanooga, in the county of Hamilton and State of Tennessee, have invented certain new and useful Improvements in Spring-Motors; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to certain improvements in spring-motors constructed and adapted for operating sewing-machines, organs, small lathes, job-printing presses, light water-crafts, and other light and easily-operating machinery, the invention being more especially and particularly useful as a motor attachment to sewing-machines.

The object of the invention is to provide a motor which may be cheap, simple, and effective in its operation, one that can be instantly wound while it is in motion, and which when once wound is capable for running several hours and imparting motion to the machinery with which it is connected. The motor attachment is compact in its construction, so that it occupies but little space and may be placed on the machinery which it is to operate so as to be entirely out of the way of the operator. It is readily attached to or detached from the machinery with which it is to be used, whether that machinery be a sewing-machine or some other kind of a machine, and if a sewing-machine whether it be of the kind that runs by wheel or crank. The motor may be readily stopped or started at the will of the operator, and its speed can be regulated to a uniformity, and may be increased or diminished, as desired.

The invention therefore consists, essentially, in the novel form of winding attachment, and, furthermore, in certain details and peculiarities in the construction, arrangement, and combination of the several mechanical parts which constitute the invention, all substantially as will be hereinafter fully described and claimed.

In the accompanying drawings, illustrating our invention, Figure 1 is a vertical section of our improved spring-motor, certain parts being shown in elevation. Fig. 2 is a detail view of the disk and its hub, to which the actuating coiled spring is connected, and shows the mode of connecting the spring to the hub, and also shows details of the governor. Fig. 3 is a side view of our improved spring-motor, a portion of the casing being broken away to expose the interior mechanism. Fig. 4 is a detail view of the annular ring and its pawls which form a portion of the clutch mechanism used in operating the device. Fig. 5 is a detail view of the spring which serves to reverse the winding attachment after each pull upon the pull-cord during the operation of winding the motor, and shows the manner in which each end of said spring is secured in place. Fig. 6 shows the plates arranged on the table and within which the handle end of the stop-lever is located.

Similar letters of reference designate corresponding parts throughout all the different figures of the drawings.

A designates the table, platform, or surface in connection with which the motor is arranged. This table may obviously be of any suitable and desirable pattern and form belonging to any of the various kinds of machinery which our improved motor is adapted and designed to operate. Beneath this table or platform A, and securely fastened thereto by means of bolts or other suitable attaching means, is the supporting-frame B, within which the several mechanical parts of our improved motor are located. This frame is preferably furnished with a casing, (not shown in the drawings,) which casing is made of sheet metal and designed to cover the working parts of the machine. By referring to Fig. 3 it will be seen that the said frame B is provided with lugs *s*, which act in the place of grooves to allow the metal casing to be fitted to the frame, and in Fig. 3 the dotted lines at *s'* represent a rim outside of the lugs *s*, the purpose of which rim is to permit the metal casing when it is being fastened in place to pass between it and the aforesa-

lugs *s*. The sides of the supporting-frame B are connected and securely braced and fastened together by means of the horizontal tie-rods *a a*, located at top and bottom of the frame-work and projecting through the sides thereof, the projecting ends of said tie-rods being furnished with nuts *a' a'*, which are screwed up tightly against the outer side of the frame. There may obviously be any number of these tie-rods. In Fig. 3 we have shown four of them—two at the top and two at the bottom of the frame. Four may perhaps be a preferable number, but obviously we can use all that may be needful to securely fasten the frame together.

Within the frame B are journaled three principal horizontal shafts C, D, and E, said shafts passing through bearings in the sides of the frame and having their projecting ends furnished with suitable oil-cups, as shown in Fig. 1, which cups may be fastened rigidly to the supporting-frame or may be cast integral therewith, whichever plan may be found better.

We term the shaft C the "winding-shaft." It is located at about the middle part of the frame. On this shaft are arranged many of the rotating parts of the motor mechanism, as we shall now proceed to specify. The main actuating-spring consists of several coils *e e e*, which are arranged within suitable barrels *g g g*, said barrels being provided with hubs, which are nicely bored to fit upon the shaft C. There may obviously be any number of the coils, so that the spring may have greater or less power, according to the number of coils. We preferably employ three coils and as many inclosing-barrels. At one end of these barrels is a disk L, which has a hub similar to the hubs of the barrels, said hub being located upon the winding-shaft C and firmly secured thereto. In Fig. 2 we have shown this disk L with its hub L', said hub having an opening or hole L^2, which receives a button L^3 on the end of the first coil *e*. The first coil *e* is thus connected at one end to the disk-hub L', while at its other end it will be connected to the first barrel *g*. The hub of the first barrel projects within the interior of the second barrel, and the second coil *e* is firmly secured to said hub and likewise to the inner surface of the second barrel *g*, and so on. The last barrel is rigidly held in place by the connection *h*, by means of which it is securely fastened to the frame B, said connection *h* being an angle-iron or similar structure, which is firmly bolted to the frame and likewise to the barrel *g*. The intermediate barrel permits the shaft C to turn loosely within its hub. Thus it will be seen that as the shaft C is rotated by some suitable means applied thereto the actuating-spring will be wound up more or less as may be desired, and that when it unwinds it will actuate the shaft and rotate it in the reverse direction, thereby setting in motion the train of gearing, which we shall proceed to describe hereinafter, and thus transmitting motion to the machinery with which the motor may be connected.

On the shaft C, near the disk L, is a large gear-wheel J, loosely mounted on the shaft. Connected rigidly to the hub of this gear, and likewise loose on the shaft between the large gear J and the disk L, is a ratchet-wheel M, which is engaged by a series of one or more pawls *i*, that are pivoted to the disk L and engage the teeth of the ratchet. Thus it will be seen that when the coiled spring, after having been wound up to a sufficient tension, begins to unwind, the pawl or pawls *i* will rotate the ratchet, and thus revolve the gear J. It may be here stated that when the coiled spring is being wound up the pawl or pawls will slip loosely over the ratchet. The revolution of the gear-wheel J is transmitted to the shaft D, on which is a pinion *c*, which is engaged by the gear-wheel J. The shaft D also has thereon a gear-wheel K, which meshes with the pinion *d* on the shaft E, which shaft is provided with a large pulley or wheel R, furnished with a crank-pin R', to which pulley a belt may be applied for the application of the power of the spring-motor to any machinery with which the device may be arranged. The pulley R may be of any convenient size and form to permit the power to be easily transmitted from the motor. Thus it will be seen that the train of gearing just described will multiply to a high degree the speed furnished by the actuating-spring, since the gear J on the shaft C is very large, while the pinion engaging it on shaft D is small, &c. Hence the uncoiling of the spring will serve through this train of gearing to impart a very rapid motion to the shaft E and its pulley R.

On the shaft C, near gear-wheel J, is a winding-wheel N, having a suitable peripheral surface, to which is attached the strap I, which runs over the winding-spool H, whose spindle is journaled horizontally in the brackets *b b*, affixed to the under side of the table A, said strap I being furnished at the end thereof with a pull or handle G, by means of which it is manipulated during the operation of winding up the motor. The operator by pulling downward in the direction of the arrow shown in Fig. 3 upon the pull G will partially rotate the winding-wheel N. Said winding-wheel has a hub, about which is coiled a spring *j*, its end being connected by a pin or other device to the wheel-hub. The other end of said spring *j* is provided with a ring *j'*, which passes around one of the upper tie-rods *a*. It will thus be seen that when the operator pulls upon the pull G and rotates the winding-wheel in one direction, this operation will serve to coil the spring *j* more or less tightly, so that when the operator lets go of the pull said spring in uncoiling will return the winding-wheel to its former position.

The winding-wheel N is broken or cut away at one point in its periphery. (See Fig. 3.) Within the winding-wheel is an annular ring P.

k k k denote a series of four pawls or dogs, which are pivoted by means of pivots *k' k' k'* to the vertical face of the winding-wheel N, said pawls or dogs having their outer ends slotted at k^2 k^2 k^2, which slots are entered by horizontal pins k^3 k^3 k^3 on the ring P. The inner ends of these pawls or dogs are curved properly to adapt them to bear upon the hub O, which is located upon the shaft C and is securely bolted or otherwise fastened thereto. Thus it will be seen that the series of pawls constitute a clutch mechanism adapted to grip the hub O, when desired. Although we have shown four of these pawls, yet we do not intend to be confined to this number. The series may contain any number, either four or less, or more, as may be preferred. The annular ring P is provided at one point in its periphery with a projection or pin *p*, which lies within the slot or cut-away portion of the periphery of the winding-wheel N, and is connected, as shown in Fig. 3, to the end of the strap I, which passes around the winding-wheel.

l l designate springs, which are secured to the winding-wheel and also to the annular ring P, their function being to reverse the motion of the annular ring P sufficiently to remove the dogs *k* from contact with the hub O at the proper time. It will thus be clearly seen that the operator by pulling upon the pull G and revolving the winding-wheel N will cause the annular ring P to be rotated, since said ring is connected by the projection *p* with the strap I, which rotation of the ring P oscillates each pawl of the series upon its pivot *k'*, the slot in the other end aiding and assisting in the free movement of the pawl and ring in this manner, and the result of this movement of the pawls being to clasp or grip their inner ends tightly upon the hub O, which will cause said hub to rotate, carrying with it the shaft C, and hence winding up the coiled springs. When the operator lets go the pull G or relaxes his hold thereon, so that the spring *j*, to which we have above referred, may act to restore the winding-wheel to its former position, it is clearly evident that the reversing-spring *l* will operate to move the ring P sufficiently to disengage the pawls from contact with the hub. When the operator pulls again upon the pull G, the same operation will take place as before, and the shaft C will be given another rotation and the coiled springs wound up a little more. Thus the operator by successive downward pulls upon the handle G will in a very short time wind up the coiled spring to its fullest tension, it being held in this position by means of the pawl *i* engaging the ratchet, as we have already seen.

On the shaft E is located a ratchet-wheel *m* and also a rough wheel *n*. The ratchet-wheel *m* we term the "stop-ratchet." It is adapted to be engaged by the lower end of the stop-lever F, which projects upward through a slot in the table A, its upper end being furnished with a knob or handle which may be easily grasped, and which in the drawings is lettered F'. The other side of the table A is provided with a couple of plates *r* and *r'*, superposed one on the other, as shown in Fig. 3, said plates being illustrated in detail plan in Fig. 6. Through these plates projects the handle F' and within them it works nicely, being moved from the position shown in full lines in Fig. 3 into the position indicated in dotted lines in the same figure, and vice versa, for the purpose of causing the lower end of this stop-lever to engage or be disengaged from the ratchet-wheel *m*, which movement, of course, as will be obvious, stops the motion of the machine or permits the mechanism to operate, whichever may be desired. The stop-lever F is pivoted to the main frame B by means of the pivot *f*, (see Fig. 1,) fixed as a stud on the frame, one end having a pin passing through it, while the other end has a nut thereon. This stop-lever has its handle in convenient position to be readily grasped by the operator, so that he may at any time stop or start the motor. He therefore has the motor completely under his control at all times and can operate it at pleasure.

Q designates a drum-brake or governor-wheel, which may be of rubber, if desired, which works in contact with the rough wheel *n*. This brake-wheel Q is carried on a shaft *q*, which shaft is provided with a governor consisting of the blades *q' q'*. The shaft *q* is journaled in a frame Q', hung upon a horizontal shaft *o*, which is affixed horizontally to the main frame B, near the base thereof, the outer end of said shaft *o* being provided with a suitable nut, whereby it is fixed in place. Thus it will be seen that the frame Q' swings upon the shaft *o*, so that the brake-wheel Q may be brought into as close contact as desired with the rough wheel *n* on the driving-shaft E.

R^2 indicates a thumb-screw, which passes through suitable lugs on the main frame, said thumb-screw having its inner end bearing against the swinging frame Q'. This thumb-screw can be adjusted as desired, and its adjustment will cause the wheel Q to bear with a less or stronger pressure upon the wheel *n*. This brake-wheel regulates the speed of the motor and enables the operator to readily and accurately govern its speed. The rough wheel *n* is simply a wheel which has not been turned up perfectly smooth on its face. By having the wheel rough in this way a better contact is secured between it and the rubber wheel Q, which presses against it. It will be noted that the wheel Q is fastened rigidly to the shaft, which carries the governor. This governor serves an important purpose in making the movements of the motor steady and uniform.

At the left hand of Fig. 2 is shown a modification in the construction of the governor mechanism. Here it will be seen there is a worm on the governor-shaft, which shaft is

held in a separate frame bolted to the main frame B. This worm engages a gear on the shaft E. The governor-shaft carries two arms hinged at the outer end thereof, which arms are movable. In this way the speed is regulated. When the spring of the motor is very strong, the arms will be forced upward, and as the springs gradually run down and become weaker in their power the arms will drop, thus giving the band-wheel a steady motion. The movable arms of this governor are simple sheets of brass hinged edgewise, so that their flat surfaces will resist the air, thus causing the arms to be lifted when running at a high speed and to be dropped when running at a low speed.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a spring-motor, the combination of the main shaft, the main actuating-spring, the driving-gear on said shaft, the multiplying-gearing driven by said gear, and the winding devices for the spring, consisting, essentially, of a winding-wheel, a hub rigid on the driving-shaft, a clutch consisting of pivoted pawls, a reversing-spring, and a pull-strap, substantially as described.

2. In a spring-motor, the combination, with a winding-shaft, of the winding devices consisting of the winding-wheel, the hub rigid on the shaft, the annular ring, the series of pivoted pawls adapted to clutch the hub, the pull-strap connected to the annular ring, the reversing-spring secured to the ring and the winding-wheel, and the return-spring for the winding-wheel, substantially as described.

3. In a spring-motor, the combination of the winding-shaft, the actuating-spring thereon, the driving-gear on said shaft, having a connected ratchet-wheel, the pawl on the spring-disk engaging said ratchet, the multiplying-gearing, and the winding devices consisting, essentially, of the winding-wheel, the rigid hub on the winding-shaft, the returning-spring for the winding-wheel, the annular ring within said wheel, the series of pivoted clutch-dogs, and the winding-strap connected to the winding-wheel and the annular ring, substantially as described.

4. In a spring-motor, the combination of the winding-wheel and winding-shaft, the hub on said shaft, the annular ring within said wheel, the series of dogs or pawls pivoted to the winding-wheel and loosely pivoted to the annular ring, the inner ends of said pawls being adapted to bear on the hub, the reversing-springs connected to the winding-wheel and the annular ring, and the winding-strap passing around the winding-wheel and affixed to the pin on the annular ring located within a slot in the winding-wheel, substantially as described.

5. The combination of the driving-shaft, the actuating-spring thereon, with its disk, coils, and barrels, one of which is rigidly fixed to the supporting frame-work, the driving-gear and its connected ratchet engaged by the pawl on the spring-disk, the winding devices consisting, essentially, of the winding-wheel, the annular ring, the rigid hub on the winding-shaft, the series of clutch-dogs and the pull-strap, and the shafts and multiplying-gearing, together with the drive-pulley on the drive-shaft, and the reversing-spring connected with the winding-wheel and some stationary part of the frame, which serves to reverse the motion of the winding-wheel during the operation of winding, substantially as described.

6. In a spring-motor, the combination, with the driving-shaft having thereon a wheel, of a brake-wheel mounted in an adjustable frame so as to bear against the wheel on the driving-shaft, and the governor secured on the shaft of said brake-wheel, substantially as described.

7. In a spring-motor, the combination, with the driving-shaft having thereon a rough wheel, of the brake-wheel mounted in an adjustable frame, the governor secured on the shaft of said brake-wheel, and the regulating thumb-screw bearing against the brake-wheel frame, substantially as described.

8. In a spring-motor, the combination, with the drive-shaft E, having the wheel *n* thereon, of the brake-wheel Q, the swinging frame Q′, in which the shaft *q* of the brake-wheel is hung, and the governor on the shaft *q*, consisting of the plates *q′ q′*, substantially as described.

9. In a spring-motor, the combination of the winding-shaft, the spring thereon, the driving-gear, the ratchet and pawl, and the winding devices consisting, essentially, of the winding-wheel N, the hub O, rigid on the winding-shaft, the annular ring P, the series of pawls *k k k*, adapted to grip the hub O, and the reversing-spring *j*, substantially as described.

10. The combination, with the coiled springs *e e e* and their disk L, of the gear J, operated by said springs, suitable gearing connecting said gear with a motor-pulley, and the winding devices comprising the wheel N, the annular ring P, the hub O, rigid on the winding-shaft, the winding-strap I, passing around the wheel and connected to the annular ring, and the clutch-dogs, substantially as described.

11. In a spring-motor, the combination of the main supporting-frame B, the three principal shafts C, D, and E, journaled in said frame, the drive-pulley R on the drive-shaft E, the connecting-gearing between the shafts E, D, and C, the actuating-spring on the shaft C, the winding devices, and the pull G, connected to strap I and passing over the pulley H, substantially as described.

12. In a spring-motor, the combination, with the winding-shaft, of the coiled springs *e e e*, the disk L, having a hub securely fixed to the winding-shaft, the spring-barrel *g g g*, one of which is secured by angle-iron *h* rigidly to

the main supporting-frame, the gear J, having a connected ratchet engaged by a pawl on the disk L, and the winding devices consisting, essentially, of the winding-wheel, the hub, the annular ring, and the clutch-dog, substantially as described.

13. The combination of the table A, main frame B, whose sides are connected by the tie-rods *a a a*, the principal shafts C, D, and E, journaled in said frame, the connecting-gearing between said shafts, the actuating-spring on the winding-shaft, and the winding devices consisting of the winding-wheel, the hub rigid on the shaft, the annular ring, the series of pivoted pawls adapted to clutch the hub, and the pull-strap connected to the annular ring, substantially as described.

14. In a spring-motor, the herein-described winding devices, consisting of the winding-shaft, the winding-wheel N on said shaft, the hub O, rigid on said shaft, the annular ring P, having a projection *p*, located within a slot in the periphery of the winding-wheel, the winding-strap I, passing around the winding-wheel and connected to the projection *p*, the dogs *k k k*, pivoted at *k' k' k'* to the winding-wheel, said dogs having curved inner ends and slotted at k^2 k^2 k^2 at the outer ends to receive pins k^3 k^3 k^3 on the ring P, and the reversing-springs *l l*, connected to the annular ring and to the winding-wheel, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN A. LEE, SR.
ELI S. REED.

Witnesses:
W. P. MCCLATCHY,
W. R. ROWLES.