(No Model.)

2 Sheets—Sheet 1.

E. S. REED.

SPRING MOTOR.

No. 444,906. Patented Jan. 20, 1891.

Fig. 1.

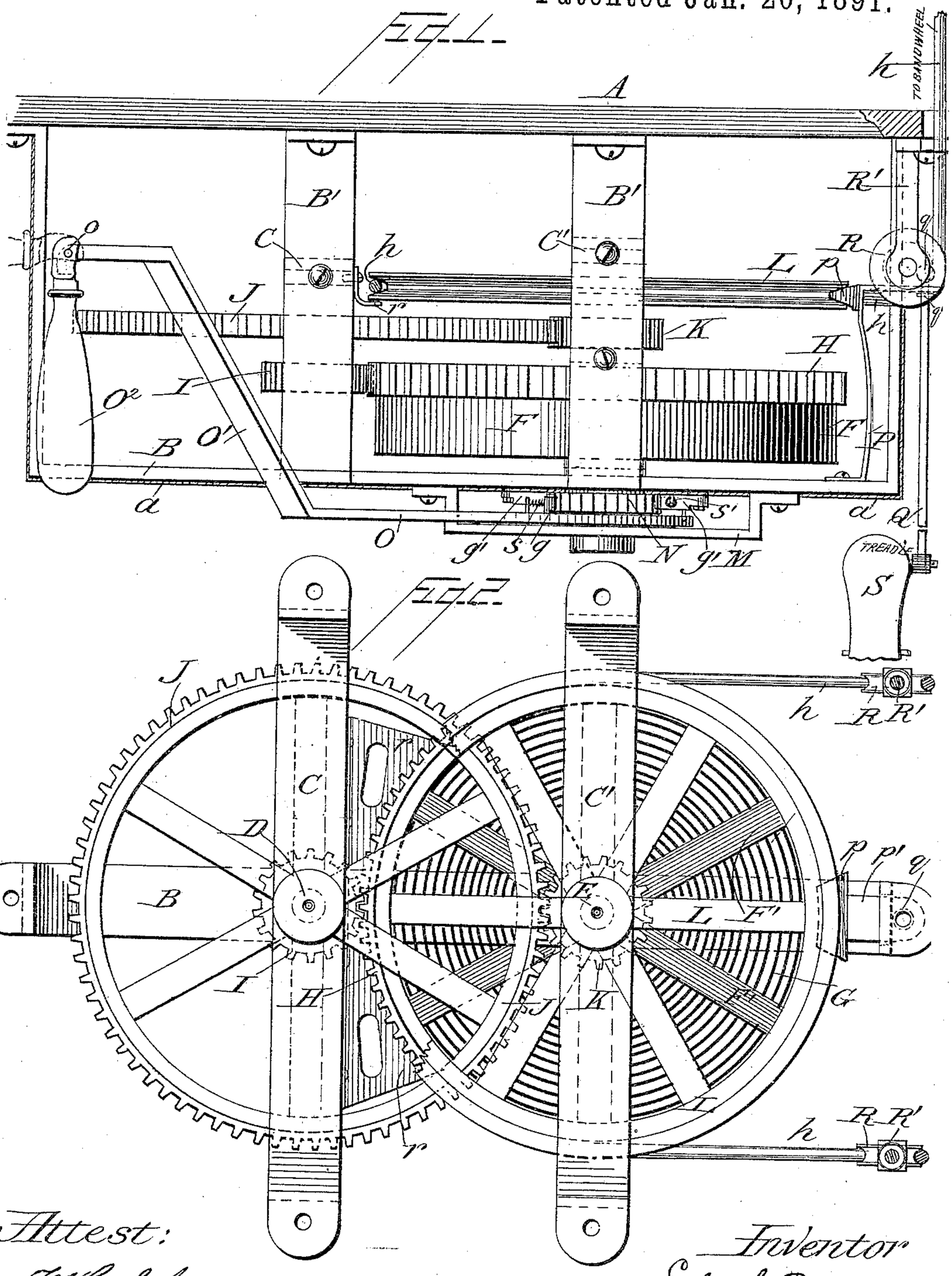

Fig. 2.

Attest:

F. H. Schott

Wm. L. Boyden

Inventor

Eli S. Reed

per Fred. P. Fisher

Atty

(No Model.)

2 Sheets—Sheet 2.

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FIG. 3.

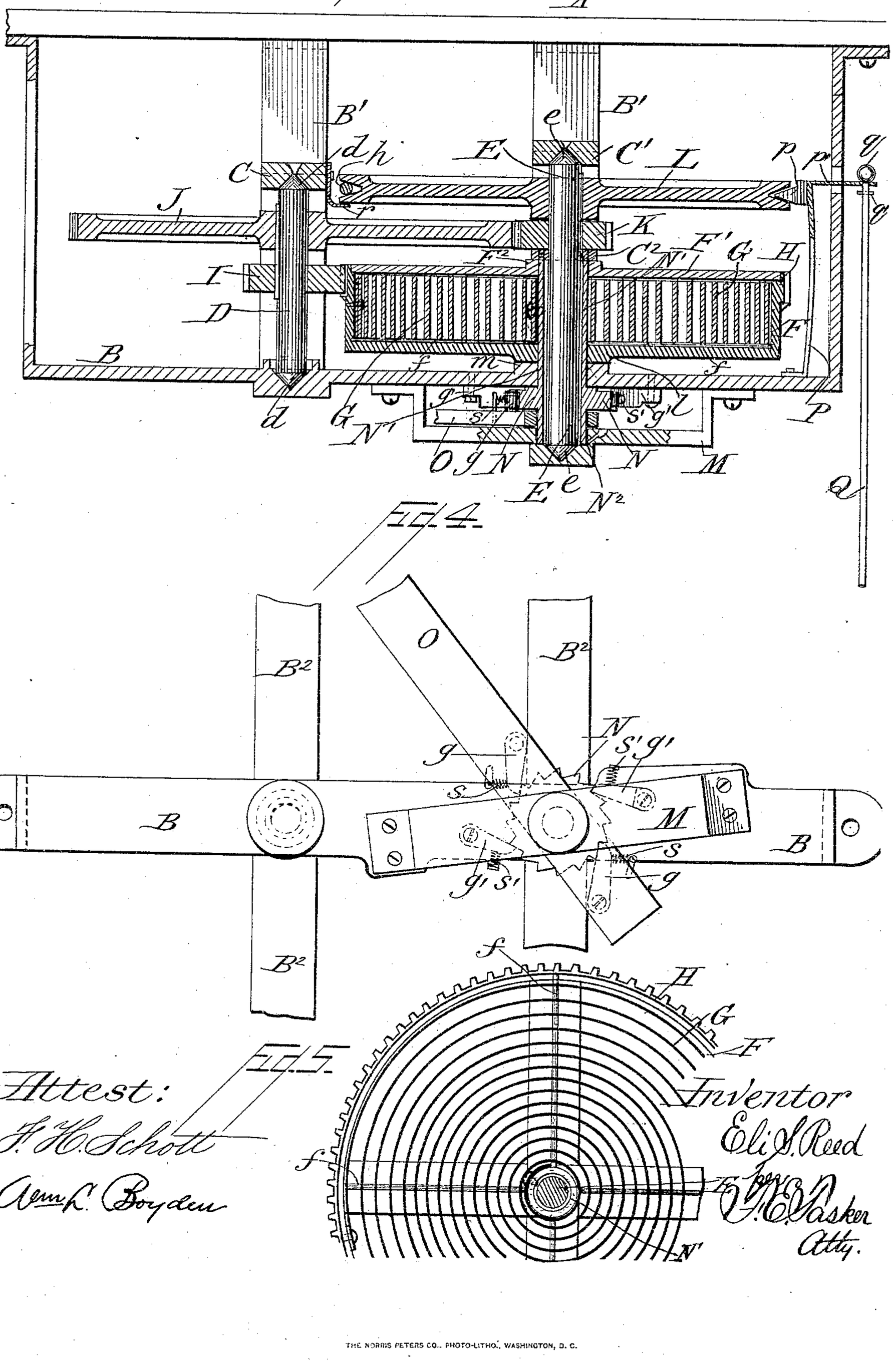

FIG. 4.

FIG. 5.

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

Inventor
Eli S. Reed
per
W. E. Baker
Atty.

UNITED STATES PATENT OFFICE.

ELI S. REED, OF CHATTANOOGA, TENNESSEE, ASSIGNOR TO THE UNIVERSAL SEWING MACHINE MOTOR ATTACHMENT COMPANY, OF SAME PLACE.

SPRING-MOTOR.

SPECIFICATION forming part of Letters Patent No. 444,906, dated January 20, 1891.

Application filed May 29, 1890. Serial No. 353,622. (No model.)

To all whom it may concern:

Be it known that I, ELI S. REED, a citizen 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 I 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.

This invention relates to an improvement in spring-motors adapted especially for the purpose of driving sewing-machines, but also useful for actuating other kinds of machinery, the object of the invention being to provide a simple, cheap, light, and efficient spring-motor which will consist of few parts, may be easily wound up, may be readily and speedily applied to any kind of a sewing or other machine, may be quickly stopped or started, and which will conform in as great a degree as is possible to the multitude of requirements exacted of a motor of this kind; and the invention therefore consists in the construction, arrangement, and combination of parts, substantially as will be hereinafter described and claimed.

In the annexed drawings, illustrating my invention, Figure 1 is a side elevation of my improved spring-motor, shown in operative position beneath a machine-table, the casing being removed to show the mechanical parts. Fig. 2 is a top plan view of the motor without the machine-table. Fig. 3 is a longitudinal vertical section with certain parts in elevation. Fig. 4 is an enlarged detail view of a part of the winding-lever, ratchet, pawls, and adjacent parts. Fig. 5 is an enlarged partial plan view of the drum that contains the spring, and the spring therein, and shows the interior bottom of the drum with its ribs.

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

A denotes the horizontal table of a sewing or other machine with which it is desired to use the motor. This may be any kind of a table belonging to any kind of a machine. My purpose is to locate my motor directly beneath the table, securing it thereto, so that it may be out of the way and may occupy as small a space as possible. Further, it is so placed that its gearing is horizontal, thus permitting the casing of the motor to be flat and of a short vertical width. Motors when arranged beneath machine-tables commonly project and are often inconveniently placed, and generally the gearing is vertical, which requires that the motor occupy considerable space, thus presenting a clumsy and awkward appearance, as well as being disadvantageous in various ways. I aim at compactness, neatness, and simplicity, and believe that I achieve the same by having the motor-gearing horizontal and the motor located as I have just described. The main frame of the motor is preferably of a skeleton form, having the horizontal bottom bar B, which is longitudinal, together with the transverse bottom bars B^2 and the upright side bars B′, whose upper ends are secured by means of screws or otherwise to the under surface of the sewing-machine table. This frame is inclosed, if desired, within an external casing *a* of thin sheet-iron or other metal.

F indicates a drum of suitable width and diameter, having a cover F′, which fits neatly into a rabbet around the upper edge of the drum. The under side of the drum is formed with a central boss or enlargement *l*, which is seated upon a corresponding boss or enlargement *m* on the bottom bar B. Passing centrally through the drum and likewise through the bar B is a tube or sleeve N′, formed integral with a ratchet-wheel N, located below the bar B, said ratchet having also integral therewith the downwardly-extending tube-section N^2, which has a bearing in a circular recess in the rectangular strap M, which is securely fastened by means of screws or other means to the under side of the bar B. Within the ratchet tube or sleeve which loosely surrounds it is the vertical shaft E, having bearings at its upper and lower ends in the cross-piece C′ and the strap M, respectively. The drum F has formed on the outer surface thereof a series of gear-teeth, making a gear-wheel H integral with the drum, the teeth being of suitable size. Within the drum and coiled around the ratchet-tube is a spring G. One end of this

spring is connected to the wall of the drum and the other end to the ratchet-tube N′. The spring G may be of greater or less size and power. Obviously the rotation of the ratchet-wheel N in one direction will cause the spring to wind up and become closely coiled, so that when it unwinds it will drive the gearing of the motor, the drum F during the unwinding of the spring revolving upon the ratchet-tube, which serves as a journal.

The drum or barrel F connects with the shaft E, which, we have seen, is loosely within the ratchet-tube, through a novel system of gearing, which I will now proceed to describe. Parallel to shaft E is a vertical shaft D, having a bearing at its upper and lower ends in the cross-bar C and bottom bar B, respectively. A pinion I is keyed or otherwise rigidly secured on this shaft, which pinion engages the drum-gear H. A large gear-wheel J is also keyed on shaft D above the pinion. This gear J will preferably be considerably larger than the pinion—say six times as large, for example—since the function of this gearing is not only to transmit motion to shaft E, but also to multiply and greatly increase the number of its revolutions. The gear-wheel J engages a pinion K, keyed to shaft E above drum F, said pinion K being considerably smaller than gear J—say one-sixth as large—*i. e.*, about the size of pinion I.

Between the pinion K and the drum-cover F′ is a cross-bar C^2, similar to cross-bars C and C′, and fastened at each end to one of the side uprights B′. The drum-cover F preferably has a central boss F^2, which rests beneath cross-bar C^2, and the ratchet-tube N′ finds a bearing at its upper end in said bar C^2. On the shaft E, above pinion K, and keyed firmly to said shaft, or, if desired, integral with pinion K, is the main driving-wheel L, having a grooved periphery which receives the drive belt or cord *h*. The cord *h* runs horizontally from the drive-wheel L and then passes around vertical pulleys R R, carried by brackets R′ R′, which give to the belt a vertical direction and permit it to be easily applied to the band-wheel of the sewing or other machine with which the motor may be used. (See Figs. 1 and 2.)

Certain structural details which contribute to make the machine more perfect and facilitate its easy operation will now be referred to. The interior bottom surface of the spring-drum F, on which surface the spring G rests, is provided with a series of radial ribs *f*, or slightly-raised projections, of which there may be any suitable number. They are found of great advantage in diminishing the friction of the spring on the drum-bottom in winding or unwinding and render the movements thereof much easier than is the case when the spring rests bodily upon the bottom of the drum in contact with the whole thereof, instead of simply touching it at a few points. The bearing ends of the shafts D and E are pointed at *d d* and *e e*, respectively, and these pointed ends enter correspondingly-shaped bearings. This arrangement enables the shafts to operate easily with little friction. Suitable perforations or openings are also provided at each of these bearing-points to permit easy lubrication. Further, it is found of advantage to arrange a plate *r* alongside of a part of the periphery of wheel L and beneath said periphery, said plate having a right-angled flange, which is secured to the cross-bar C. (See Figs. 2 and 3.) This plate keeps the belt from dropping off the wheel, when loosened.

In order that the motor may be started at any moment with promptitude, or may have its motion quickly and speedily arrested at any time, and, in fact, governed and controlled at all times with little effort on the part of the operator, it becomes necessary to provide an efficient brake device. I will therefore at this point explain the form of brake here employed, although other forms may of course be used with other forms of the motor having the same drive-gearing as herein.

P denotes a flat spring, being a flat strip of spring-steel of sufficient strength. It is secured at its bottom end to the bar B of the main frame. It is arranged vertically and carries at its upper end a shoe *p*, adapted to press upon the periphery of the drive-wheel L, and preferably shaped to enter the belt-groove in this wheel. The spring P is tensioned, so as to hold its shoe with a strong constant pressure upon the wheel, the pressure being sufficient to keep the wheel from rotating, even during and after the spring has been wound up to its highest tension. Evidently as soon as the brake is removed from the wheel it will be free to turn. Thus the brake governs the wheel L and controls its speed.

The brake-spring P is provided at its upper end with a horizontal arm *p*′, which is perforated near its outer end. Through this perforation passes the upper end of a brake-rod Q, which is connected to arm *p*′, one form of connection comprising a terminal ball *q* above the arm and a pin *q*′ below the arm, the ball and pin being on rod Q. The lower end of the brake-rod may be connected, as shown in Fig. 1, to a treadle S, which has a pin entering the socket on the brake-rod, for instance. By pressing the treadle with the foot the pressure of the brake-shoe may be relaxed and the motor and machine set in operation. By removing the foot from the treadle the brake may be reset, the drive-wheel gripped, and the machine stopped. Thus by a simple easy movement of the foot the machine may be started, stopped, and controlled at all times.

O designates the winding-lever. It is located horizontally beneath the motor, its inner end passing through the strap or guard M, and being perforated to permit the passage through it of the ratchet-tube N^2, above described. The forward part of this lever is suitably bent at O′, so as to bring the outer

end nearer to the edge of the machine-table and into convenient proximity to the hand of the operator. The outer end of the lever is provided with a drop-handle O^2, pivoted thereto at *o*, which may be lifted into a position of horizontality when the lever is to be operated, but may be allowed to fall into a depending position out of the way, as shown in Fig. 1, after the winding has been finished. As will be readily perceived, the inner end of the lever O lies directly beneath the ratchet-wheel N. Lever O carries two oppositely-located spring-actuated pawls which engage the ratchet-wheel. *g g* denote these lever-pawls, and *s s* their springs, which tend to press them into engagement with the teeth of the ratchet. On the bottom of the bar B is another pair of oppositely-located spring-actuated pawls *g' g'* and their springs *s' s'*. Thus we find here a series of four pawls, two on the lever and two on the frame, and all acting on the ratchet. As the lever moves in one direction—say to the right (see Fig. 4)—the lever-pawls slip idly over the ratchet-teeth, engaging them successively, but producing no action thereon. When the lever moves in the reverse direction, the lever-pawls being in engagement, the ratchet will be partially rotated, and while this rotation is taking place the pawls on the frame will drop into the teeth successively, and will thus hold the ratchet in whatever position the lever O may place it. The result of rotating the ratchet will obviously be to wind up or more closely coil the spring G, one end of which we have seen to be fastened to the integral ratchet-tube which passes through the drum. One of the pawls *g*, it will be noticed, is preferably shorter than the other, and likewise one of the pawls *g'* is preferably shorter than the other. This is so that a less movement of the lever O will result in causing the shorter pawl to engage the ratchet, and a longer movement will cause the longer pawl to engage, thus lessening the extent of movement of lever O, necessary at times to accomplish a result, and similarly with the holding-pawls a less rotation of the ratchet will cause the short pawl to engage with the next tooth, and so slight movements of the ratchet may be caught and not lost through non-action of the pawl. It will be found that this winding-lever will operate easily and quickly. A few vibrations thereof will quickly and surely coil the spring to its highest tension. This winding operation may take place at any time, whether the motor is running or at rest, and as the handle is in position near the work and in proximity to the front of the machine it will be found that the winding is an extremely simple process which may be attended to at any moment with very little trouble and the expenditure of but a slight amount of strength.

The operation of my improved motor will be evident from the foregoing description of the construction and arrangement without need of additional detail. The ease with which it may be wound constitutes one great merit, and the simplicity of the combination makes it light-running and noiseless. A few vibrations of the winding-lever winds the spring. Then the drop-handle falls out of the way, and the machinery can be set in motion instantly by pressing the treadle or otherwise releasing the brake. The coiled spring will thus cause the drum to rotate, thus actuating the train of multiplying-gears and driving the shaft which carries the driving-pulley, which, we have seen, is belted to the band-wheel of the driven machine. When it is desired to stop the machine, the operator will again set the brake. It will be observed that the motor may be wound while in motion without interfering therewith in the least.

Many changes may be made in the precise structure and relative arrangement of the parts of my motor without departing from the invention, and I reserve the liberty of varying the same as experience may suggest. The cover of the drum which contains the winding-spring, instead of being a flat plate, may be simply a skeleton frame, having the series of radial bars or strips with an encircling ring adapted to fit into the rabbet in the upper edge of the drum; also, the bottom of the drum, instead of being an integral surface, may be composed of cross-bars, being thus skeleton-like, the ribs above mentioned being arranged on these cross-pieces, as shown in the drawings. All these various skeleton constructions depicted in the drawings are intended to permit lightness in the machine, and it will be noted that in many respects I have endeavored, by making the bearings of such a nature as to reduce friction and by lightening the machine and changing parts into simpler forms, to achieve lightness and ease of operation, it being essential that a spring-motor should be of light weight, adapted to be easily applied to any kind of a machine, and that it should be capable of being wound with the least possible expenditure of physical power.

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

1. In a spring-motor, the combination, with a spring-driven train of gearing, which includes a geared drum containing the drive-spring, of a winding-ratchet having an integral part thereof serving as a journal for the geared drum, one end of the spring being attached thereto, the drive-shaft with its drive-wheel, said shaft being actuated by the gearing and said wheel being belted to the driven machine, the winding-lever, a pair of spring-actuated pawls on the main frame engaging the teeth of the ratchet for the purpose of holding the same, and another pair of spring-actuated pawls on the winding-lever, likewise engaging the said ratchet, substantially as described.

2. In a spring-motor, the combination of the geared drum, the spring within the drum, the winding-ratchet having an integral tube on

which the drum revolves and to which one end of the spring is attached, the shaft within said tube carrying a drive-pulley connected to the driven machine, the second shaft carrying a pinion engaging the geared drum, a large gear-wheel engaging a small pinion on the shaft which is within the ratchet-tube, and a winding-lever having a pair of pawls thereon which engage the teeth of the ratchet, together with the pair of pawls on the main frame, which engage likewise the teeth of the ratchet for holding the latter, substantially as described.

3. In a spring-motor, the combination of a geared drum, a spring within the drum, a winding-ratchet having an integral tube, a shaft within said tube, a second shaft outside the tube carrying a pinion engaging the geared drum, and carrying also a large gear-wheel engaging a small pinion on the shaft that lies within the tube, a wheel at the upper end of the latter shaft, a brake device whose shoe is applied to the periphery of said wheel, and a winding-lever, substantially as described.

4. In a spring-motor, the combination of the sewing-machine table A, the main frame of the motor secured beneath the frame, the drum F, having the geared rim H, the spring G within the drum, one end connected to the wall thereof and the other to the ratchet-tube, the ratchet-wheel N, integral with ratchet-tube N′, the shaft E within the ratchet-tube, the shaft D, parallel to shaft E, the pinion I on shaft D, engaging the geared rim H, the large gear-wheel J on shaft D, above the pinion, and the pinion K on shaft E, meshing with gear-wheel J, substantially as described.

5. In a spring-motor, in combination with the train of gearing and the spring for actuating the same, a winding-ratchet for winding the spring, a pair of pawls for holding said ratchet, a winding-lever, and a pair of pawls thereon for engaging the ratchet, one member of each pair of pawls being shorter than the other member, so as to operate substantially as described.

6. In a spring-motor, the combination of the drive-wheel L, the flat brake-spring P, having a shoe p and a horizontal arm p', the brake-rod Q, passing through a perforation in said arm p' and provided with a terminal ball q above the arm, a pin or projection q' below the same, and a treadle S, to which the lower end of the brake-rod is connected.

7. In a spring-motor, the combination, with the geared drum, its spring, a winding-ratchet having an integral tube, a shaft within said tube, and a system of gearing connecting the geared drum with said shaft, of the brake device consisting, essentially, of the vertical spring carrying the brake-shoe which is applied to the periphery of the wheel, said spring having a perforated arm, and a depending rod connected to said arm at its upper end and at its lower end to a treadle, substantially as described.

8. In a spring-motor, the combination of a geared drum, a spring within the drum, a winding-ratchet having an integral tube, a shaft within said tube, a system of gearing connecting the geared drum with said shaft, a wheel on the upper end of the shaft that lies within the ratchet-tube, a brake device consisting of a vertical spring having a shoe applied to the periphery of said wheel, and a winding device for winding up the spring, substantially as described.

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

ELI S. REED.

Witnesses:
DOUGLAS WILSEE,
WM. L. BOYDEN.