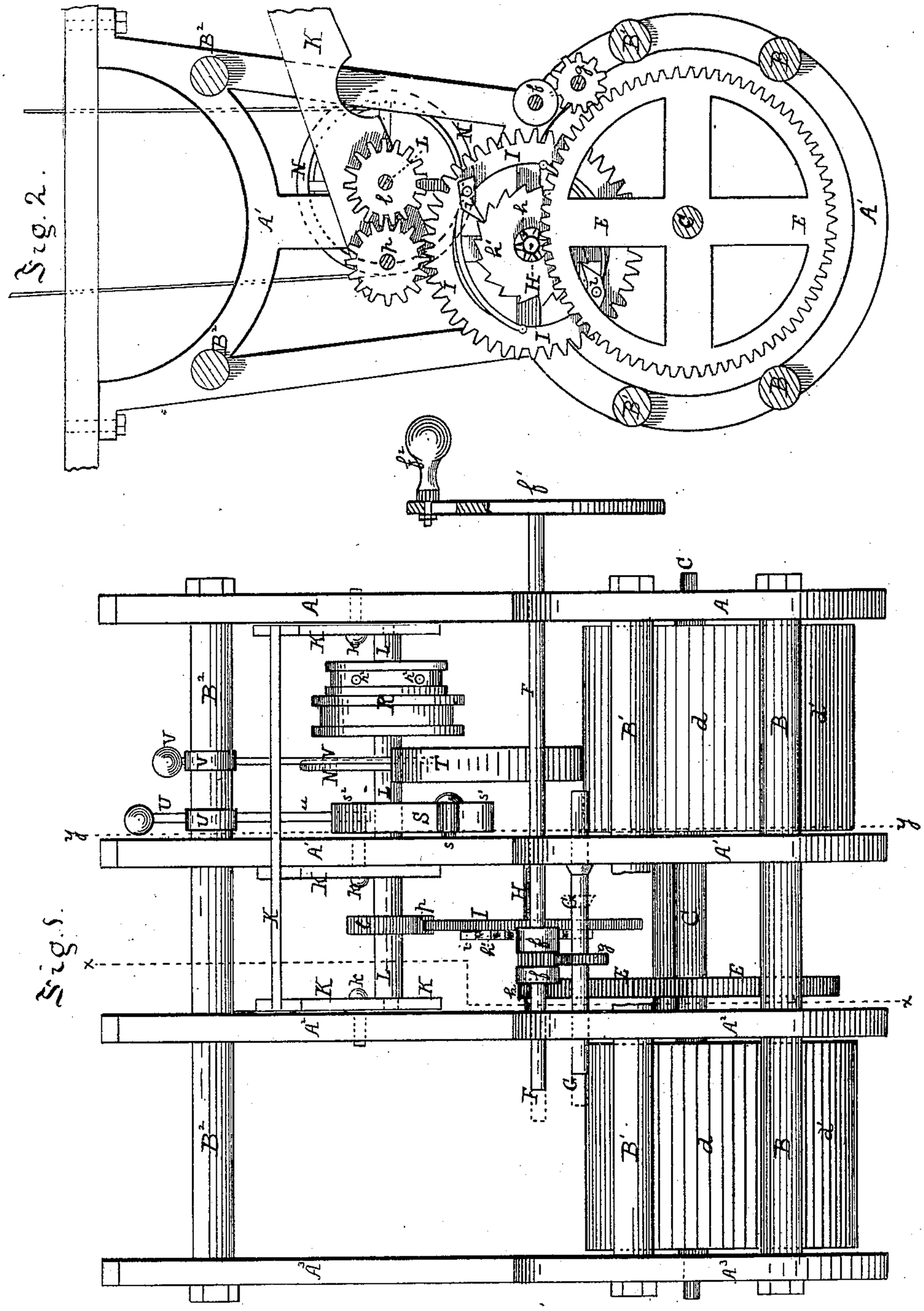
2 Sheets—Sheet 1.

E. SHIVER.

Spring-Motor.

No. 205,690. **Patented July 2, 1878.**



WITNESSES:

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Chas C. Montooth

INVENTOR

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by James D. Kay

ATTORNEY

2 Sheets—Sheet 2.

E. SHIVER.

Spring-Motor.

No. 205,690. Patented July 2, 1878.

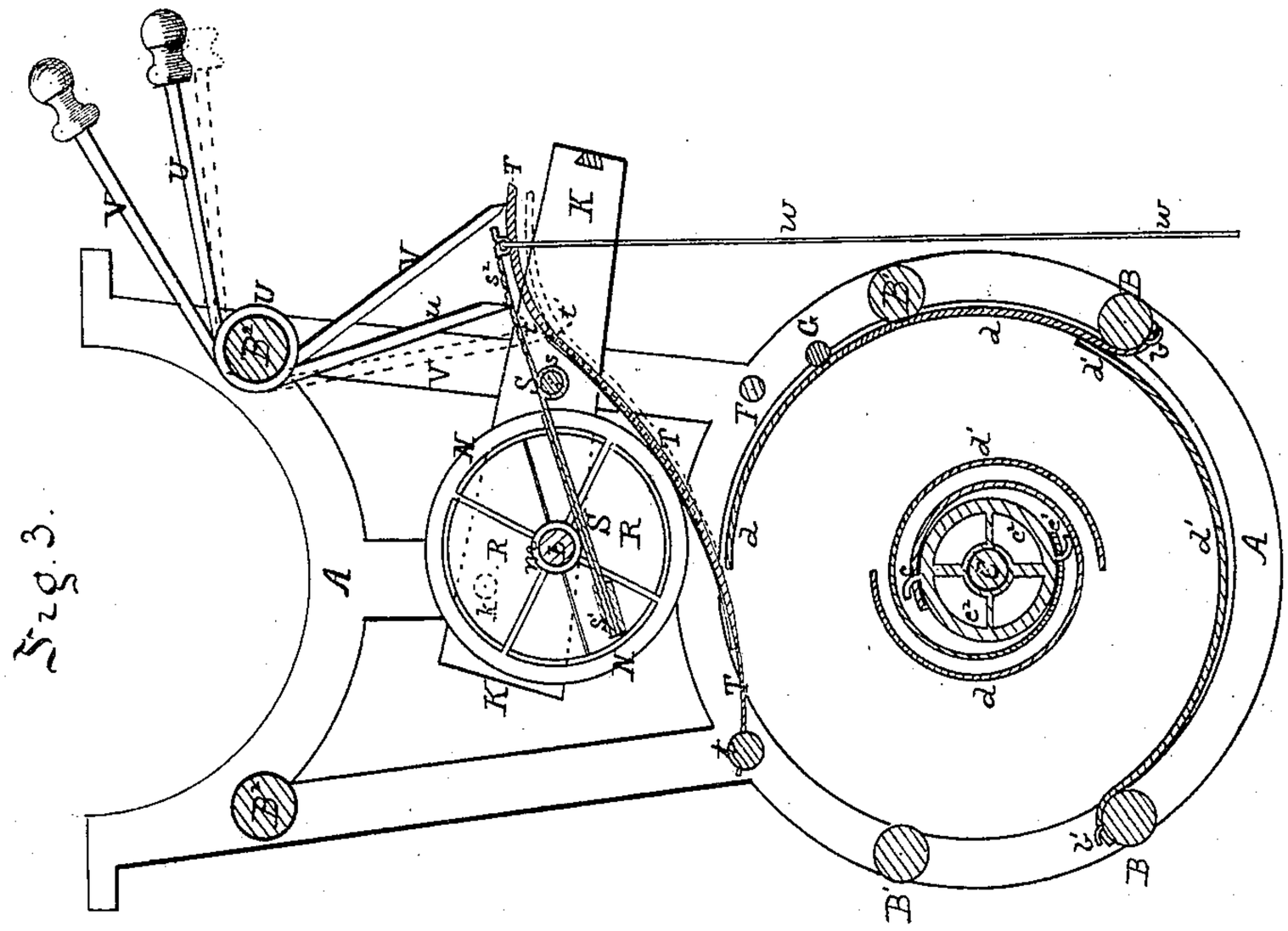

Fig. 3.

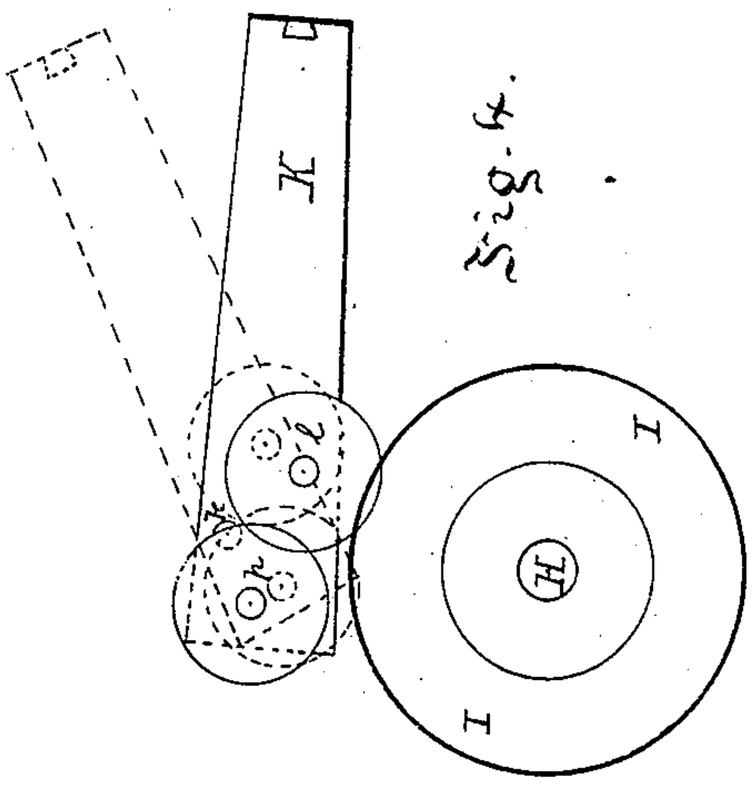

Fig. 4.

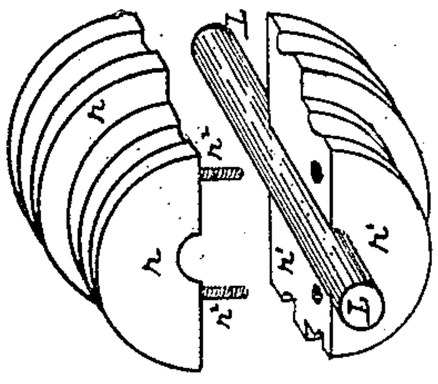

Fig. 5.

WITNESSES:

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UNITED STATES PATENT OFFICE.

ELISHA SHIVER, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN SPRING MOTORS.

Specification forming part of Letters Patent No. **205,690**, dated July 2, 1878; application filed May 20, 1878.

To all whom it may concern:

Be it known that I, ELISHA SHIVER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Spring Motors; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming a part of this specification, in which—

Figure 1 is front elevation of my improved spring motor. Fig. 2 is a vertical section through the line *x x*, Fig. 1. Fig. 3 is a vertical section through the line *y y*, Fig. 1. Fig. 4 is a diagram, illustrating the method of reversing the direction of revolution of the pulley-shaft; and Fig. 5 is a view of the wood pulley, the upper half being raised to show its construction.

Like letters indicate like parts in each.

My invention relates to motors for operating sewing-machines, watch-makers' lathes, and other light machinery, wherein the motive power is obtained from coiled elastic springs wound around a central shaft; and it consists in certain improvements in the winding mechanism, mechanism for reversing the motion of the apparatus, the brake apparatus, and, finally, in other improvements hereinafter specifically set forth.

To enable others skilled in the art to make and use my invention, I will describe its construction and mode of operation.

In the drawing referred to, A A^1 A^2 A^3 represent the standards or vertical frame-work, which are held at suitable distances apart by the cross-braces B B^1 at the base and the cross-braces B^2 at the top of the motor. At the base of the motor, extending entirely through the same, is the spring-shaft C, which is mounted in suitable bearings in the standards. Between each of the standards A A^1 and A^2 A^3, attached to hubs or arbors c^2 on the shaft C and to the motor-frame, are the coiled springs from which the power is obtained.

In the space between each of the standards A A^1 and A^2 A^3, I have attached two or more flexible springs, *d d'*, at different points on the periphery of the hub c^2 on the spring-shaft, and to different parts of the frame, the springs being on the same vertical plane and coiled together, but working entirely separate from or independent of each other. When so arranged one spring re-enforces any weak part of the other, but, being perfectly free, does not bind, and renders the motion more even. The spring *d* is attached at *c* to the hub, and at *b* to the cross-brace, and the spring *d'* at c^1 to the hub, and at *b'* to the cross-brace. The ends only of the coiled springs *d d'* are shown in the drawing. On the spring-shaft C, between the standards A^1 A^2, is rigidly attached the large spur-wheel E, through which the power of the springs is communicated to the motor.

In the standards A A^1 A^2, working in suitable bearings, is the winding-shaft F, provided with the pinion *f*, which engages the pinion *g* on the shaft G, said shaft being mounted in suitable bearings in the standards A^1 A^2. The teeth of the pinion *f* are sunk below its periphery, and the projecting collars hold the pinion *g* in gear therewith.

The shafts F and G are so constructed as to be capable of a common or simultaneous motion endwise in their bearings, so that when it is desired to connect the winding mechanism with the springs the shafts F G are slid over until the pinion *g* meshes into the spur-wheel E. By the use of the intermediate pinion *g* between the winding-pinion and the spur-wheel, I remove the point at which the power is applied farther from the spring-shaft, and thus make the winding of the heavy springs easier; and as the pinions are both drawn out of gear with the spur-wheel, no power is lost in running the winding mechanism during the operation of the machine.

The shaft F extends outside of the motor-case, and is provided with the winding-wheel f^1, the handle f^2 being attached in a slot in the wheel, so that it may be changed to give a short or long throw in winding. The shaft H is mounted in the standards A^1 A^2, and is provided with the pinion *h*, which meshes into the spur-wheel E and the ratchet-wheel *h'*, both being rigidly attached to the shaft. It is also provided with the spur-wheel I, which moves loosely on the shaft, but is caused to revolve in one direction by the ratchet-wheel *h'*, which engages with the pawls *i* on the spur-wheel. When the springs are being wound up by the winding mechanism above described, the pawls on the wheel I slide over

the ratchet-wheel and the wheel I remains stationary. As soon as the springs are wound up, the shafts F G, with their pinions, are drawn out of gear with the spur-wheel, and remain stationary until required again for winding.

Above the wheel I is arranged the frame K, which is pivoted to the standards A A^1 A^2 at *k*, so that it may be swung in the motor-frame. The pulley-shaft L is journaled in the swinging frame, and carries the pinion *l*, which meshes into the spur-wheel I. The swinging frame has also the pinion *p*, mounted thereon in suitable bearings, and meshing into the pinion *l*, and in such position that by raising or swinging the frame K the pinion *l* will be freed from the spur-wheel I and the pinion *p* engage therewith, and the power will be imparted from the spur-wheel through the pinion *p* to the pinion *l*, as shown in Fig. 2, thus reversing the direction of revolution of the pulley-shaft. When the pinion *l* engages directly with the spur-wheel the pinion *p* performs no particular function. The swinging frame may be secured in either desired position by a bolt passing through one of the standards.

The pulley-shaft L carries the friction-drum *m*, against which the rubber bar of the brake apparatus is pressed, and the fly-wheel N, which imparts an even and regular motion to the apparatus. Pivoted to the frame A^1 at *s* is the rubber bar S, which passes under the shaft L and works against the drum *m*, for regulating the speed of the motor. The rubber bar is faced with leather or other suitable material, against which the friction-drum *m* rubs, and carries the weight s^1 at its lower end to free it from contact with the drum when not in use. It has also a spring-extension, s^2, extending to the front of the motor, in the upper surface of which are formed notches or ratchet-teeth, in which the end of the pressure-lever catches. The rubber bar is pressed up against the drum by the pressure-lever U, which is pivoted to the cross-brace B^2 of the motor-frame, and by means of the arm *u* engages in the notches or serrations of the spring-extension s^2. The force with which the bar S presses against the drum is regulated by the notch in which the lever catches. The rubber bar S has a treadle-bar, *w*, attached to it at the end of the spring-extension s^2, by means of which the speed of the machine can be regulated by the foot of the operator. The spring T, for stopping and starting the motor, is attached to an arm, *t*, extending from the standard A^1, and passes under the fly-wheel N, and is provided with a suitable rubber, which presses against the periphery of the fly-wheel. It is thrown out of contact with the wheel by means of the trip-arm V, pivoted on the cross-brace B^2 and pressing against the free end of the spring. When the trip-arm is drawn down until it catches in the stop *k'* on the spring, as shown in dotted lines, it presses the spring down from the wheel and permits its revolution. The handles of the pressure-lever U and trip-arm V extend to the front of the motor, so as to be within sight and easy reach, thus bringing the motor under perfect control of the operator of the machine.

The shaft L also carries the wood pulley R, over which the belting passes to the driving-wheel of the machine to be operated. The wood pulley R is made double, the working-faces or peripheries upon which the driving-belt works being of difierent diameters, so that the speed of the machine to which it is attached may be altered by changing the belt to another part of the pulley. It is divided longitudinally into two parts or halves, *r* r^1, and attached to the shaft by means of the screws r^2, which pass from one half into the other and clamp the pulley around the shaft. It may thus be clamped on the pulley-shaft at any desired point, so that the face of the pulley needed will come directly under the driving-wheel of the machine to which it is attached, by simply unscrewing the screws r^2, adjusting the pulley in the proper place, and clamping it again on the shaft by tightening up the screws. It may also be removed altogether and clamped to another part of the pulley-shaft. If the diameter of the shaft varies, the periphery of the pulley is still held in proper relative position thereto, and the pulley is not thrown out of center, as each half will be equally affected thereby.

The operation of my improved motor is as follows: To wind the motor, the shafts F G, with their pinions, are slid endwise in their bearings until the pinion *g* meshes into the spur-wheel E, and the springs are wound by turning the winding-shaft. When the springs are wound up, the pinion *g* is drawn out of gear with the wheel E and the winding mechanism remains stationary, thus relieving the motor from any friction from the winding mechanism while running.

The motor is started by drawing down the trip-arm V and freeing the fly-wheel N from the spring T, thus permitting its revolution. The power of the springs *d d'* is imparted, through the spur-wheel E, pinion *h*, spur-wheel I, pinions *p* and *l*, to the the pulley-shaft L, and from the pulley R to the sewing or other machine. By pressing down the lever U, the rubber bar S, working against the drum *m*, will regulate the speed of the motor by its frictional contact therewith. The pressure-lever U may be fixed to confine the motor to any desired speed, and the speed further regulated by the treadle-bar *w*. The motor may be instantly stopped by raising the trip-arm V and permitting the spring T to press against the fly-wheel. The motor is thus kept in perfect control by the spring-brake T, which has great frictional contact and is adapted to stop and start it, and the rubber bar S, which has less frictional contact and is adapted to regulate the speed.

When it is desired to run the motor in the

opposite direction, the swinging frame K is drawn down until the pinion *p* is thrown out of gear with the spur-wheel I and the pinion *l* on the pulley-shaft meshes into said spur-wheel, as shown in the diagram, Fig. 4, when the power will be communicated directly from the wheel I to the shaft L, and the direction of revolution reversed. The swinging frame K, pivoted in the case, thus makes the same attachments operative in machines running in opposite directions.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The two pinions *f g*, mounted on suitable shafts, both having a simultaneous motion into and out of gear with the spur-wheel E, such motion being imparted from the winding-shaft, substantially as and for the purposes set forth.

2. The swinging frame K, carrying the pulley-shaft L and two pinions, *l p*, in combination with the spur-wheel I, whereby the same attachments may be made operative in machines running in opposite directions, substantially as set forth.

3. The spring T, thrown into and out of contact with the fly-wheel N by the trip-arm V for stopping and starting, in combination with the rubber bar S and pressure-lever U, for regulating the speed, substantianally as described.

4. The drum *m* on the shaft L, in combination with the rubber bar S, having a spring-extension provided with a series of notches or ratchet-teeth, and the pressure-lever U, the lower end of which is adapted to engage in any desired one of the notches or ratchet-teeth, and thereby regulate the speed, substantially as set forth.

5. The wood pulley R, having working-faces of different diameters, and divided longitudinally into two halves, clamped upon the shaft by the screws r^2, passing from one half into the other, sustantially as and for the purposes set forth.

In testimony whereof I, the said ELISHA SHIVER, have herento set my hand.

ELISHA SHIVER.

Witnesses:

W. P. WOOD,

JAMES I. KAY.