VOLUTE-SPRING MOTOR.

By W. S. SHOEMAKER, Baltimore, Md.

ONE end of the spring is connected to a shaft, by means of which the said spring is compressed or wound up, and which shaft, in the uncoiling of the said spring, is turned, and thereby transmits motion, through the medium of suitable gearing, to a second shaft, adapted to do useful work. The other end of the spring is attached to a drum or casing of the spring, which is fitted with gearing, also operating upon the working shaft, to influence it in the direction which it takes through the medium of the gearing aforesaid.

A the spring, and B its casing, to which is secured the gear wheel C, adapted to engage with the pinion C' keyed to the shaft D. The outer end of the spring A is fastened to either the casing B or to the gear-wheel C, and, through these wheels, transmits movement to the shaft D aforesaid. The inner end of the spring A is connected to the shaft E, which has the toothed wheel F running loosely thereon, but adapted to have a movement in one direction, in common with the said shaft E, by means of a ratchet-wheel, *a*, and pawl *b*. The movement of the wheel F is also transmitted to the shaft D, but through the medium of the idler-wheel G, which engages with the wheel H keyed to the shaft D.

It will be seen that, upon the spring being wound up, both ends thereof communicate motion, in a common direction, to the shaft D, which may be used as the prime mover of mechanism designed for various purposes.

Applicable to all the uses for which volute-spring motors are employed, the advantages consisting in that the entire elastic force inherent in the spring is utilized in revolving the main shaft D.

May be applied to cars, in which case the springs are wound by steam power as mentioned in SUPPLEMENT, No. 47.

SPRING MOTOR.

By CHARLES M. FRAHM and WILLIAM SCHARNWEBER, Chicago, Ill.

THIS invention is a contrivance of the arrangement of a series of coiled springs and gears, whereby a large number can be arranged in a small space, and each spring can be wound up independently of the others, and while the machine is running; and the invention also comprises a simple arrangement of regulating apparatus and stop mechanism, all as hereinafter described.

Fig. 1 is a plan view, Fig. 2 is a side elevation, Fig. 3 is a horizontal section, and Fig. 4 is a longitudinal section of the improved machine.

A represents a couple of series of spindles on opposite sides of the main driving-wheel B, and arranged around its axis C, each spindle having a pinion, D, gearing with a wheel, E, on said axis. The pinions are loose on the spindles, and clutch on pins F, by their notched hubs G, which are spirally cut, so that the spindles will turn independently of the pinions for winding up the springs H, one of which is mounted on each spindle. The spindles slide a little endwise to allow the clutch pins to pass over the notched hubs of the pinions, and the spiral spring I draws them back. The spring-spindles are arranged in the housing frames J K, which are placed far enough apart to allow the alternate arrangement of the springs of each series in two different planes, so that the spindles can be arranged closer together, and more springs can be arranged in one series around a wheel, E, of a given size than can be in one plane. The motion is transmitted to the pulley-shaft L by a suitable train of gears, to be transmitted therefrom in any approved way to the machine to be driven. From the pulley-shaft a belt, M, is run to the shaft N for working a governor, O, which is to regulate the speed by the friction-brake, Q, which it works by the levers R and S. The machine is stopped by the notched wheel T, rod *v*, and the screw V, the screw being turned, so as to press the rod *v*, which is on the brake-levers R, down into the notches of the wheel, which is geared indirectly with the main driver B, so as to stop the machine. W is a spring by which the screw V is connected to the brake-levers, to afford relief to them in case the rod *v* is screwed down on the face of the stop-wheel.

There is also a spring, X, on the rod connecting brake Q with the levers R, to afford easy action. Two or more springs may be arranged on each spindle, provided the length of the spindle is increased.

The machine is designed for operating sewing-machines, lathes, churns, and any other machines for which a light power is required, and, if desired, it can be made large and strong for heavier work, such as cars and carriages.

IMPROVED SPRING MOTOR.

By J. W. H. DOUBLER, Philadelphia, Pa.

A, BOX containing the working parts of the motor. B winding-shaft, through which motion is transmitted to the power-shaft *a* by gearing *a'*. This motion is obtained from a set of spiral springs, through cord *a''*, passing around a fusee, which compensates for the variation in the tension of the springs under different degrees of contraction and expansion. From said fusee the cord passes in one direction to a drum *d*, on the winding-shaft B, and, in the other direction, is carried alternately over and under a series of pulleys *e e*, etc., attached to plates *f f*, which slide upon upright rods *g g*, around which are wound the spiral springs *h h*, etc., arranged in pairs, bearing alternately upon the upper and lower surfaces of said plates. The end of the cord is fastened to the frame of the motor.

In winding up the apparatus the springs are merely compressed in the direction of their length by the movement of the plates upon the rods, the plates travelling alternately upward and downward, or all toward a central point, in consequence of the shortening of the cord. As the springs expand the plates separate, lengthening the cord and unwinding the same from the drum on winding-shaft. The motion so imparted to the latter is communicated by the gearing to the power-shaft.

The duration of the motion resulting from the expansion of the springs depends upon their length and number. Their successive numbers and length do not, however, in any degree influence the amount of power, the latter being dependent upon the individual character, or that which is the equivalent, the number of springs taken to complete each set of the series, the same being a matter of discretion.

The completion of the contraction of the springs is externally indicated by means of a pointer *i* projecting from one of the sliding plates through a slot *i'*, in the back of the cabinet, as shown. The fusee J is of a peculiar character, diminishing toward both ends from the middle part or greatest diameter, as shown. The cord from the spring-pulleys to

the drum unwinds from one end of the fusee toward the greatest diameter, and on the other side winds from the greatest diameter toward the opposite end. Thus, according as the tension of the springs increases by their contraction, the leverage of the fusee increases so as to compensate for said increase of tension. The same compensation occurs in a reverse direction, as the springs expand the wound portion of the cord unwinding, and the balance winding upon the fusee. I designates a fly or belt wheel upon the end of the power-shaft, and I' a brake-lever, having a cushion *k* of rubber or

parallel sides *a b* of which passes a shaft B, having secured, at one of its ends, a cog-wheel C, which drives a similar cog-wheel D, into and through which pass the ends of a series of three bars or wires *c* of tempered steel, which extend through the side *a* and across the interior of the frame-work, and through the side *b*, where their opposite ends are firmly secured to a gear E, similar to those C D, both ends of the series of wires passing through their respective wheels, and having collars F slipped over them, for the reception of couplings or links 5, in order to prevent the separation of the

DOUBLER'S SPRING MOTOR.

other suitable material on its short arm, which, being pressed against the periphery of the wheel I, either regulates its speed or arrests its rotation altogether, according to the degree of pressure. A spring L, bearing against the end of the long arm of said lever, serves ordinarily to keep the cushion from contact with the wheel. M designates a winding-key, having a ratchet and pawl applied to a pivoted handle, so that the stem of the key can be turned in one direction only, thus allowing the handle to be drawn back after each half revolution. *n n* are stops to arrest the movement of the sliding plates and prevent their over-contraction.

wheels C D (intended to engage with each other), and for keeping the wheel E in gear with a similar wheel G on the extremities of a series of three wires *d* (similar to the series *c*) passing through the interior of the box or frame-work and at a short distance from the series *c*.

H is another similar gear (secured to the opposite ends of the wires of the series *d*), which meshes into a corresponding wheel I, through which pass the ends of another series of wires *e* extending across the box, the wheels H and I being kept in gear by a coupling or link 5 similar to that already described.

BACON'S TORSION-SPRING MOTOR.

TORSION-SPRING MOTIVE-POWER.

By ALBERT M. BACON, Boston, Mass.

CONSISTS in a series of torsion wires or bars, so arranged and provided with gearing that they may be twisted, to form a spring, the tension or power of which will correspond to the degree of twist given to the bars.

A box or frame-work, across the interior, and through the

The extremities of the series *e* of wires opposite to those secured to the wheel I are firmly secured to a gear K, similar to those previously described, which is coupled with and drives a corresponding gear L, on the extremities of another series *f* of wires, passing through the sides *a b*, and across the frame-work.

M is a cog-wheel, to which are secured the opposite ends of the series *f* of wires, the wheel M engaging with and driv-