(No Model.) 3 Sheets—Sheet 1.

G. F. GODLEY.

SPRING MOTOR.

No. 299,979. Patented June 10, 1884.

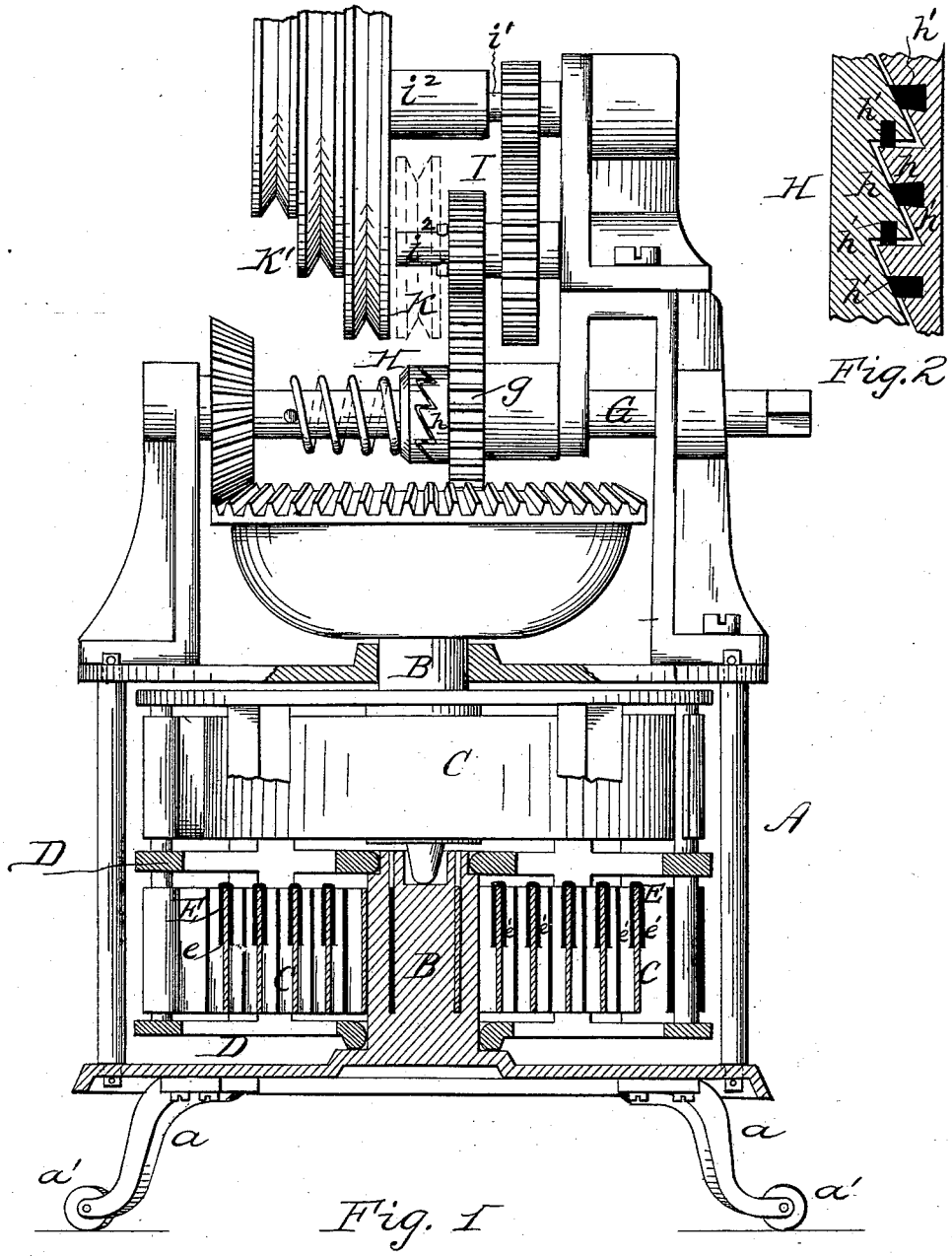

Fig. 2

Fig. 1

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(No Model.) 3 Sheets—Sheet 2.

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SPRING MOTOR.

No. 299,979. Patented June 10, 1884.

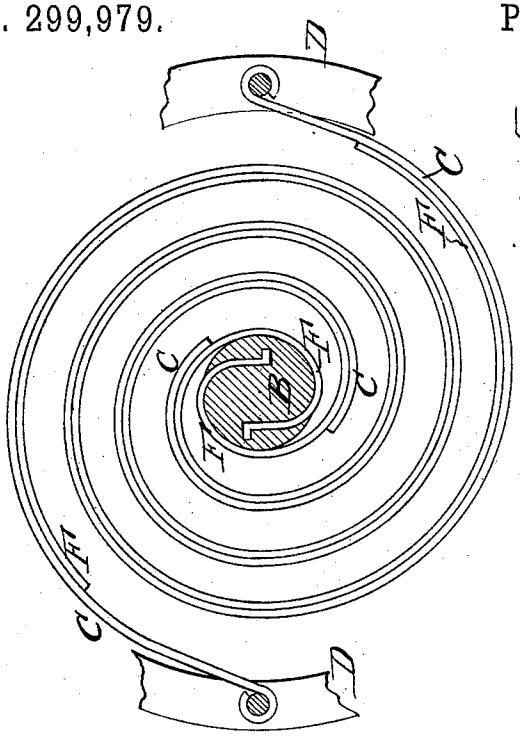

Fig. 5

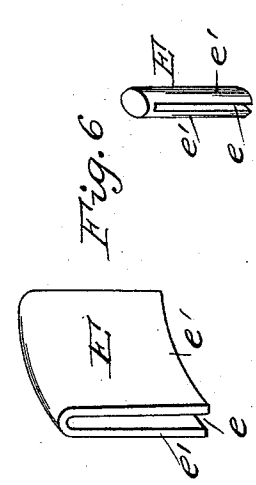

Fig. 6

Fig. 7

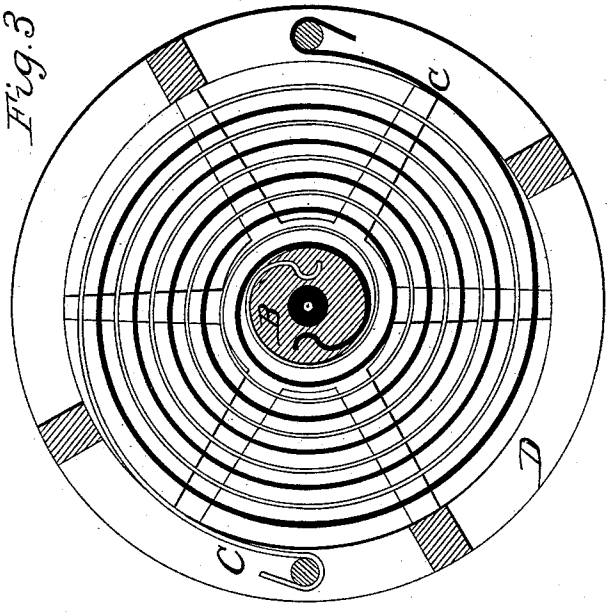

Fig. 3

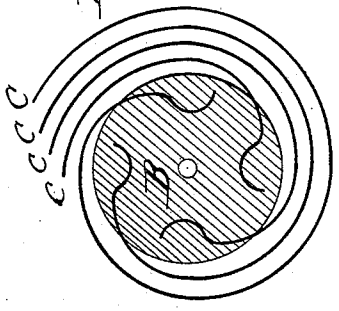

Fig. 4

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SPRING MOTOR.

No. 299,979. Patented June 10, 1884.

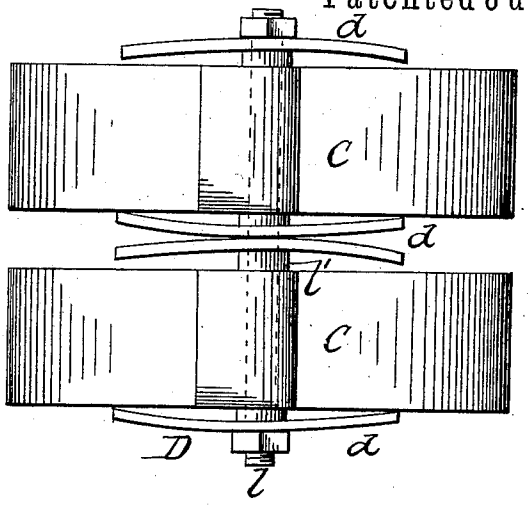

Fig. 8

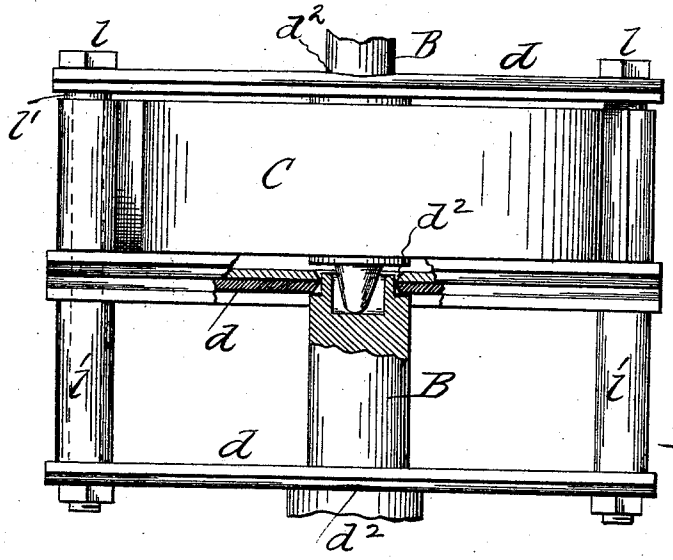

Fig. 9

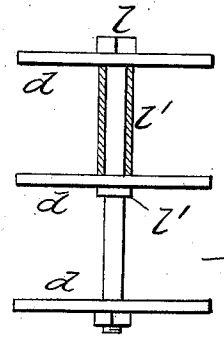

Fig. 10

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UNITED STATES PATENT OFFICE.

GEORGE F. GODLEY, OF PHILADELPHIA, PENNSYLVANIA.

SPRING-MOTOR.

SPECIFICATION forming part of Letters Patent No. 299,979, dated June 10, 1884.

Application filed March 24, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. GODLEY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Spring-Motors, of which the following is a specification, reference being had therein to the accompanying drawings, wherein—

Figure 1 is a side elevation, partly sectional, of a spring-motor embodying my invention. Fig. 2 is a detail broken section of noiselessly-operating clutch mechanism for the driving and winding shaft. Fig. 3 is a horizontal section through one of the spring-cage apartments, showing the arrangement of a nest of intercoiled springs and their end connections. Fig. 4 is a similar broken section illustrating the inner end or mandrel connection of the springs when more than two are used. Fig. 5 is a like view showing re-enforcing springs and modified end connections. Figs. 6 and 7 are detail perspectives of different forms of anti-friction blocks for the coils of the springs. Fig. 8 is an end elevation of preferable form of cage for the springs. Fig. 9 is a side elevation, partly sectional, of the same; and Fig. 10 is an end elevation, partly sectional, of a modification of the cage.

My invention has relation to spring-motors having band or volute springs, more particularly to that form of the same having sectional mandrels. It is well known that in these motors the coils of the springs, in unwinding, open more upon one side of the mandrel or spring than upon the other, that this irregular unwinding of the coils causes them to bind against each other and against the mandrel upon one side of the latter, and that this binding action generates excessive friction between the coils and mandrel and produces a side draft on the latter, which makes it bind in its bearings. It is also well known that a large portion of the power of the springs of the motor is expended or wasted in overcoming this resultant friction, to proportionately reduce the power or capacity of the motor, and that this binding action not only consumes the spring-power, but also necessitates a greater exertion of force to effect a winding of the springs.

My invention has for its primary object to avoid the above-described irregular opening or unwinding of the coils of the motor-springs and the consequent friction and waste of spring-power by intercoiling or placing within the coils of one another two or more band or volute springs to form a nest of such springs, all of which are in the same plane, and each having opposite detachable end connections with the mandrel and cage.

My invention has for its further object to interpose elastic blocks between the coils of the springs, to prevent the coils closing upon each other, and which serve to increase the power or capacity of the springs; to provide a noiselessly-acting clutch mechanism for the driving or winding shaft of the motor; to furnish its end shaft with a cone-pulley for effecting a variation in the speed or force of the transmitted power; to provide a light, strong, inexpensive, and durable spring-cage; and, finally, to produce an easily-constructed, powerful, and durable spring-motor.

In the drawings, A represents the motor-frame, having legs or supports *a a*, provided with rollers or casters *a' a'*, for making the motor portable; B, the sectional mandrel; C, the springs, and D the cage therefor, only one of which is shown, but the number of the cages and appurtenances therefor may be multiplied, as desired, and constructed and arranged either as shown in Fig. 1 or as indicated in Figs. 8 and 9, the latter being the more preferable form and will be hereinafter described.

The springs C are each composed of a nest of two band or volute springs, as shown in Fig. 3, or more than two, as represented in Fig. 4. The springs of a nest are intercoiled, as illustrated. They are all in the same plane or placed in one apartment of the cage or barrel D, and the ends of each spring have separate and independent connection with the cage and mandrel. These end connections are so made that every spring comprising the nest has its inner end secured to the mandrel on a side opposite to that to which its outer end is attached to the cage. It follows, therefore, that each spring of any two springs of a nest having aligning end connections has opposing end connections both with the mandrel and the cage, as indicated in Fig. 3, and as the draft

or strain of unwinding of these springs is in opposite directions or on both sides of the mandrel they equalize each other, the result whereof is that their coils unwind or open regularly or to the same extent on all sides of the mandrel, and all side draft on the latter, binding in its bearings, and like action between said coils and the mandrel, and consequent friction, are avoided. The full capacity or power of the springs can therefore be obtained for working purposes and the winding of the springs performed with less labor or exertion. The ends of the springs may be secured to the cage and mandrel, as shown, or any other suitable or desired form of attachment may employed. To prevent the coils of the springs closing upon each other when wound up I interpose the elastic blocks E between the coils. Any number of the blocks may be used. (See Fig. 1.) They are composed of rubber bent or bifurcated to have a slot, *e*, and sides *e' e'*, so that they can readily be attached to or placed upon the spring-coils to automatically hold themselves in position thereon. They may have any suitable configuration; but I prefer the form shown in Fig. 7. These blocks not only prevent the coils closing upon each other when wound up, but also keep them from rubbing against each other to produce friction as they unwind. When the springs are wound the blocks E, being elastic, are compressed, and as they react or expand during the unwinding of the coils their expansive force proportionately increases the power of the springs, and consequently the capacity of the motor.

To further increase the power of the springs C C, I provide them with re-enforcing springs F F, (see Fig. 5,) in which case the inner ends of the springs C C and the outer ends of the springs F F are free or unconnected, to permit them to yield lengthwise both during their winding and unwinding.

The driving and winding shaft G is constructed as shown, having loose wheel *g*, provided with clutch H, the engaging-teeth *h* of which are faced with leather, rubber, or other suitable similar material for producing a noiselessly-acting clutch mechanism for shaft G. The leather facings *h'* consist of cylindrical or other shaped blocks inserted, as shown, in openings formed in the faces of the teeth *h*. (See Fig. 2.) The shafts *i* and *i'* of the multiplying-gearing I are extended at *i²* for attachment of various sizes of pulleys K, which may be grooved, as shown, or otherwise configured, as desired. A number of these pulleys may be joined together to form a cone-pulley, K', which may be applied to the last shaft, *i'*, or to the shaft *i*, for varying the speed or force of the transmitted power.

To produce a strong and light spring-cage, I employ oblong steel or other bars, *d d*, which are connected at their ends and maintained at a suitable distance apart by the bolts *l* and collars or pipes *l'*, and have central openings, *d²*, for the passage of the sectional mandrel B. The bars or plates *d* may be transversely bowed or curved, as shown in Fig. 8, or have turned-up edges or otherwise suitably formed to present as little contact or resting surface as possible for the springs C, so as to reduce the friction between said parts to a minimum. If desired, however, the plates *d* may be flat, as shown in Fig. 10. Any form of band, knee, or foot power brake mechanism may be applied to the motor for regulating its speed.

In connecting the ends of the springs of a nest to the mandrel and cage it is not absolutely necessary to attach the opposite ends of each spring to opposite sides of the mandrel and cage, as the inner ends of the springs can be connected to the same side of the mandrel while their outer ends remain oppositely attached to the cage, as indicated.

What I claim is—

1. A spring-motor having a mandrel or spring-shaft, provided with axial slots for connection with the inner ends of nests of intercoiled volute or band springs, substantially as and for the purpose set forth.

2. A spring-motor having a mandrel, a cage, and two or more volute springs, forming a nest of intercoiled springs arranged in the same or substantially the same plane, and having inner and outer detachable end connections with said mandrel and cage, substantially as shown and described.

3. A spring-motor having two or more volute or band springs located in or substantially in the same plane, and provided with opposite detachable end connections, substantially as shown and described.

4. A spring-motor having a sectional mandrel, a revolving cage, and two or more volute or band springs, forming a nest of intercoiled springs, substantially as shown and described.

5. A spring-motor having a sectional shaft or mandrel, a revolving cage, and nests of band or volute springs, provided with independent and opposing end connections, substantially as shown and described.

6. In a spring-motor, the elastic blocks E, substantially as and for the purpose set forth.

7. A spring-motor having the coils of its springs provided with elastic blocks E, substantially as and for the purpose set forth.

8. The method herein described of increasing the capacity of the springs of a motor and avoiding friction between the coils of the springs, which consists of interposing a compressible or a resilient body between the coils of the spring at suitable intervals throughout its length, substantially as set forth.

9. A spring-motor having on its winding or driving shaft a clutch the parts of which have noiselessly acting or working contact-faces, substantially as shown and described.

10. In a spring-motor, the combination, with shaft G, of the clutch H, having flexible teeth-facings *h'*, substantially as and for the purpose set forth.

11. A spring-motor having a series of mul-

tiplying or power-transmitting shafts, and a changeable pulley, K′, adapted to be applied to any of said shafts, substantially as and for the purpose set forth.

12. A spring-motor having multiplying-gearing I, with shafts extended at i^2, as and for the purpose set forth.

13. A spring-motor cage composed of oblong, radial, or diametrical plates, having end fastening bolts and central mandrel openings, substantially as and for the purpose set forth.

14. A cage for spring-motors, and comprising oblong bars or plates *d d*, having end supports, *l*, and central mandrel openings, substantially as shown and described.

15. The cage D, composed of curved plates *d*, having end supports, *l*, and mandrel openings, substantially as shown and described.

16. The cage D, having two apartments and end supports, *l*, and two or more springs in each apartment, and having outer end connections with said supports, substantially as shown and described.

17. In a spring-motor, the cage D, having different apartments, in combination with two or more springs in each said apartment, and having end connections with the cage, substantially as shown, and for the purpose set forth.

18. A spring-motor comprising a mandrel and a revolving cage, provided with nests of intercoiled band or volute springs, substantially as and for the purpose set forth.

19. In a spring-motor, the combination of revolving cage D, composed of plates *d* and supports *l*, and the nests of volute springs C, substantially as shown and described.

20. A spring-motor having a sectional mandrel, provided with nests of intercoiled volute springs, and located one above the other, substantially as shown and described.

21. In a spring-motor, a cage composed of plates *d* and supports *l*, for the reception of band-springs, substantially as and for the purpose set forth.

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

GEORGE F. GODLEY.

Witnesses:
CHAS. W. WILLIAM,
CHAS. F. VAN HORN.