No. 690,884. Patented Jan. 7, 1902.

G. SILVESTRI.

FRICTIONAL GEARING.

(Application filed Feb. 10, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

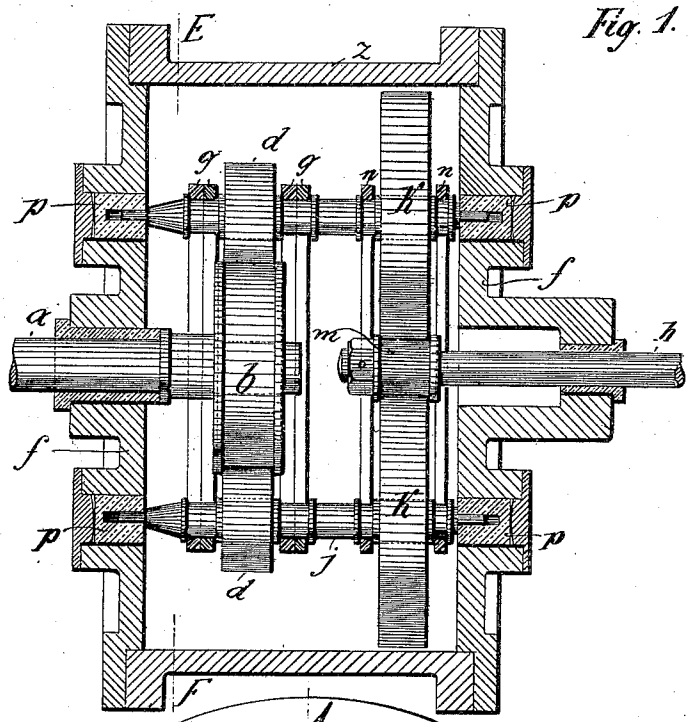
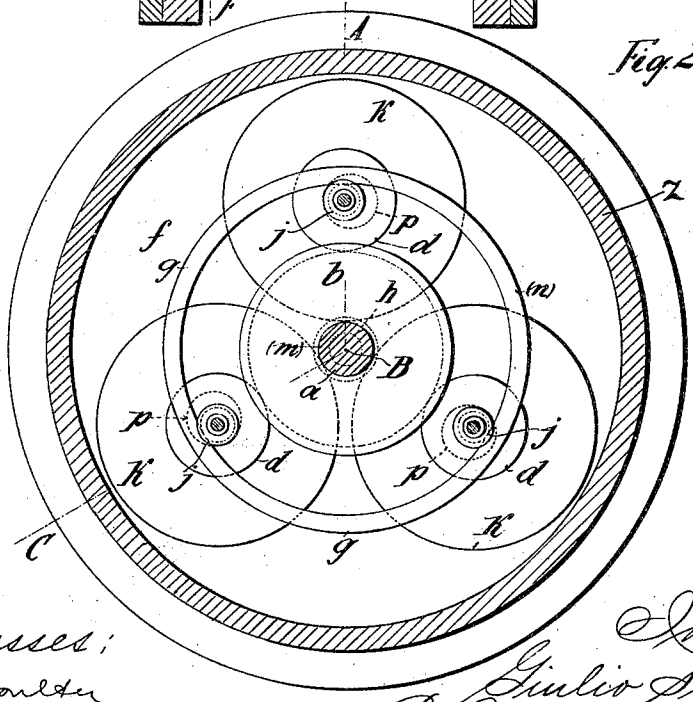


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 4.

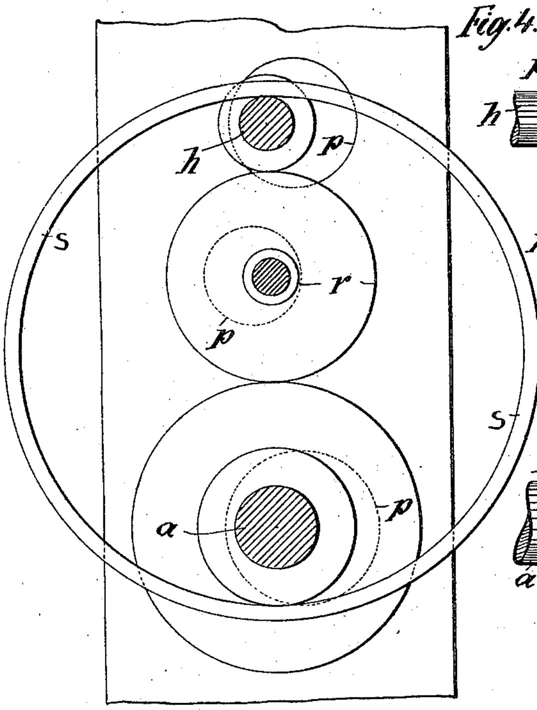


Fig. 3.

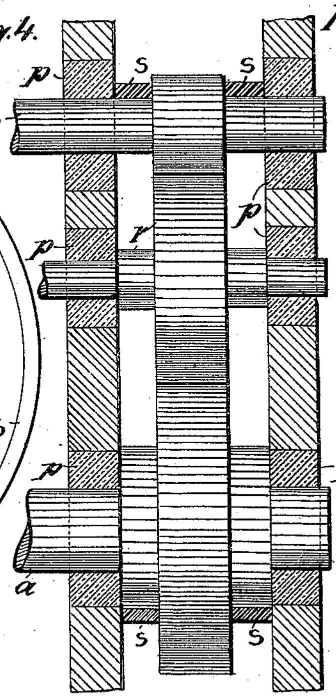
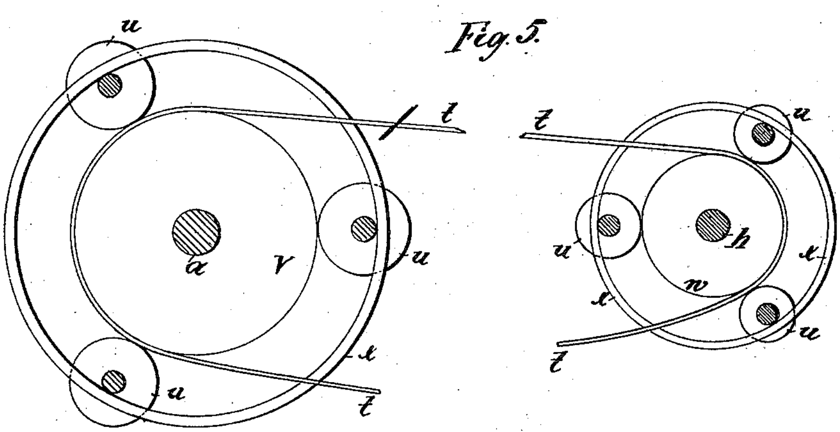


Fig. 5.



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No. 690,884. Patented Jan. 7, 1902.

G. SILVESTRI.

FRICTIONAL GEARING.

(Application filed Feb. 10, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 6.

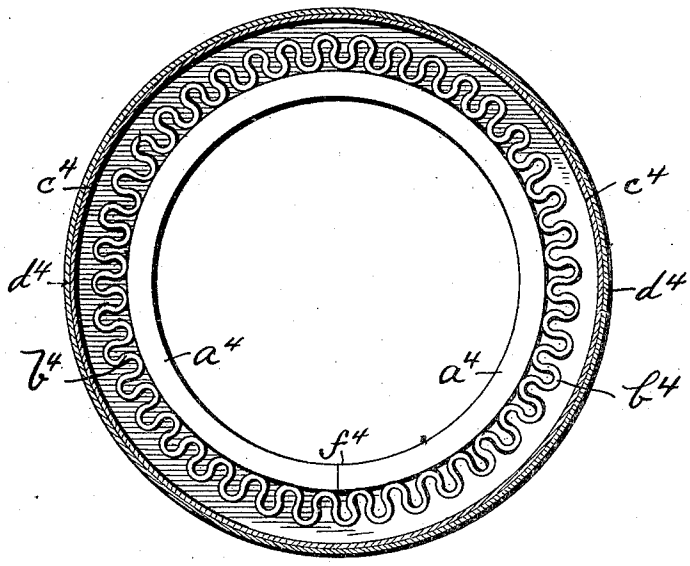
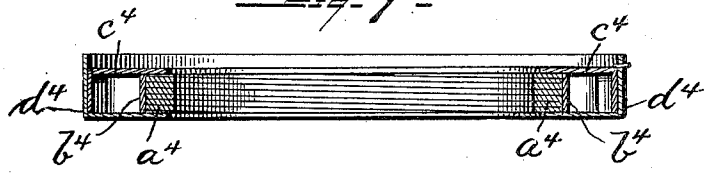


Fig. 7.



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UNITED STATES PATENT OFFICE.

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FRICTIONAL GEARING.

SPECIFICATION forming part of Letters Patent No. 690,884, dated January 7, 1902.

Application filed February 10, 1900. Serial No. 4,748. (No model.)

To all whom it may concern:

Be it known that I, GIULIO SILVESTRI, engineer, a citizen of the Empire of Austria-Hungary, residing at IV Allegassee 28, Vienna, Austria-Hungary, have invented certain new and useful Improvements in Frictional Gearing; and I do 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.

The present invention relates to improvements in frictional gearing wherein the necessary pressure for producing the adhesion of the several parts is obtained from an elastic ring of novel construction which rotates in contact with and is continuously distorted by the axles of the said parts, and in consequence of their symmetrical positions the pressure is not borne by their bearings, but by the rotating parts.

The accompanying drawings show various methods of carrying out my invention.

Figure 1 is a longitudinal section on the line A B C of Fig. 2. Fig. 2 is a section on the line E F of Fig. 1, showing the invention applied to shafts having the same axis—that is, in alinement. Figs. 3 and 4 are sections corresponding to Figs. 1 and 2, but showing the invention applied to parallel shafts a short distance apart from each other. Fig. 5 shows the invention applied to two parallel shafts situated at some distance from each other. Fig. 6 is a sectional plan view showing more clearly the construction of the pressure device, and Fig. 7 is a vertical sectional view of Fig. 6.

Fast on the end of the driving-shaft *a*, Figs. 1 and 2, is a disk *b*, of any desired diameter, around which are symmetrically arranged at least two gearings *d* K, which have their bearings in and are prevented from circular movement around the shaft *a* by the frame-plate *f*. These rollers *d* are held in frictional contact with the driving-disk *b* of the driving-axle *a* by pressure devices, such as spring-rings *g*, which are sprung over the shafts of the rollers *d*, so as to cause them to press upon the disk *b*. When employing spring-rings, the internal diameter of the same is such that a slight distortion, producing the spring-pressure, occurs when they are in position over the axles *j* of the rollers *d*, and the other dimensions of the rings must be such that while on the one hand they press with sufficient force on the axles of the rollers *d* and cause them to rotate by the friction so set up between this latter and the disk *b* when this latter rotates on the other hand they do not undergo any permanent distortion. As the axles *j j* are prevented from moving in a circular path around the axle *a*, it follows that the rings *g* are caused to rotate by friction around the axle *a* in a direction opposite to the direction of rotation of this latter. Should it be desired to drive a shaft *h*, situated in alinement with the driving-shaft *a*—that is, a shaft situated in the position which an extension of the driving-shaft would occupy, as shown in the drawings, Figs. 1 and 2—power can either be taken from the ring *g* and transmitted to the driving-shaft *h* by suitable coupling means or in an analogous manner to the means for driving the rollers *d* the axles *j* of the rollers *d* are provided with disks *k*, which grip between them either the simple end of the driven axle *h* or a roller or disk *m*, fast thereon. The spring-rings *n n*, one on each side of the disks K, fast on the axles of the rollers *d d*, cause the disks K to press on the end of the axle *h*. The arrangement may be such that the rings *g* and *n*, respectively, work from the center—*i. e.*, with an expanding tendency—in which case the rollers *d* and disks K would roll or be in frictional contact with the internal surface of hollow driving and driven disks, respectively.

For parallel shafts the arrangement as shown in Figs. 3 and 4 is used, wherein Figs. 3 and 4 show the invention as applied to parallel shafts only a short distance apart, this being effected by the interposition between the driving-shaft *a* (or *h*, as the case may be) and the driven shaft *h* (or *a*) of a roller or disk *r*, the necessary pressure being produced by the rings *s*, which encircle the entire system.

Fig. 5 shows the invention as applied to parallel shafts some distance from each other. For this purpose an auxiliary power-transmission member is employed. This consists, preferably, of a steel band *t*, loosely passing over the disks *v* and *w* of the driving and

driven shafts a and h. This band is caused to press against the aforesaid disks v and w by means of rollers u and rings x being situated on each side of the rollers u and the edge of the band t, so that despite the looseness of fit of the band t over the disks v and w no slip can occur between them. The rollers u are preferably arranged similarly to the modification shown in Figs. 1 and 2, the inclosing cylinder z being of course provided with apertures for the passage of a transmission-band. Instead of employing closed rings, as described, continually distorted by the axles, I preferably employ a pressure device constructed according to my invention. (See Figs. 6 and 7.) By the use of this form of pressure device the distortion of same by the axles of the gearing is almost entirely obviated.

My improved pressure device essentially consists of the helical-shaped ring and a spring-ring surrounding it. The ring first described has the disadvantage of an undulating motion, because for the purpose of effecting radial pressure their inner diameter must be smaller than the diameter of the circle described by the axles over which the rings are arranged. The number of deflections of the ring and of the turning-points is double the number of inclosed axles. Therefore the arc between the two turning-points is very short, so that there results a considerable deflection. For the purpose of preventing breaking of the ring the height of the ring cross-section must be limited; but this produces low radial pressure. My improved expanding ring, on the contrary, effects very high radial pressure without altering the strength, so that great powers can be transmitted. During its rotation its form is not considerably altered and by the elasticity the inner periphery can be reduced corresponding to the wear.

The expanding ring is formed by a helical-shaped ring a^4, inclosed by the undulatory ring b^4. The inner ring a^4 is the support for the flexible undulatory ring b^4, the purpose of which is to effect a great peripheral strain without altering the elasticity. It is evident that the ring b^4 being always stationary on the inner ring cannot be altered in its shape. It is advantageous to embody the expansion-ring with a box $c^4\,d^4$ for the purpose of securing the relative position of both rings a^4 and b^4, and, on the other hand, of guiding laterally the inner ring by means of the free ends f^4, which may engage suitable openings in the wall of the box c^4.

What I claim is—

1. The combination with a driving-shaft, and a friction-disk fast thereon, of driven shafts arranged parallel with the driving-shaft, friction-disks on the driven shafts adapted to frictionally engage with the disks on the driving-shaft, and a pressure device sprung around all of the driven shafts, and comprising a helical-shaped ring and an undulatory spring-ring surrounding the said helical-shaped ring.

2. The combination with a driving-shaft, and a friction-disk fast thereon, of driven shafts arranged parallel with the driving-shaft, friction-disks on the driven shafts adapted to frictionally engage with the disks on the driving-shaft, and a pressure device sprung around all of the driven shafts, and comprising a helical-shaped ring and an undulatory spring-ring surrounding the said helical-shaped ring, a shaft adapted to receive rotation from the said driven shafts, and gearing between the latter shafts and the shaft to be driven therefrom.

3. The combination with a driving-shaft, and a friction-disk fast thereon, of driven shafts arranged parallel with the driving-shaft, friction-disks on the driven shafts adapted to frictionally engage with the disk on the driving-shaft, and a pressure device sprung around all of the driven shafts, and comprising a helical-shaped ring and an undulatory spring-ring surrounding the said helical-shaped ring, a shaft arranged in alinement with the driving-shaft, a disk on the first shaft, disks on the driven shafts adapted to frictionally engage with the said disk and spring-bands sprung around the driven shafts and exerting pressure thereon, as and for the purpose specified.

4. A device for use as described comprising a helical-shaped ring and an undulatory spring-ring surrounding the helical-shaped ring.

In witness whereof I have hereunto set my hand in presence of two witnesses.

GIULIO SILVESTRI.

Witnesses:
WILHELM BERGER,
C. B. HURST.