No. 698,854. Patented Apr. 29, 1902.

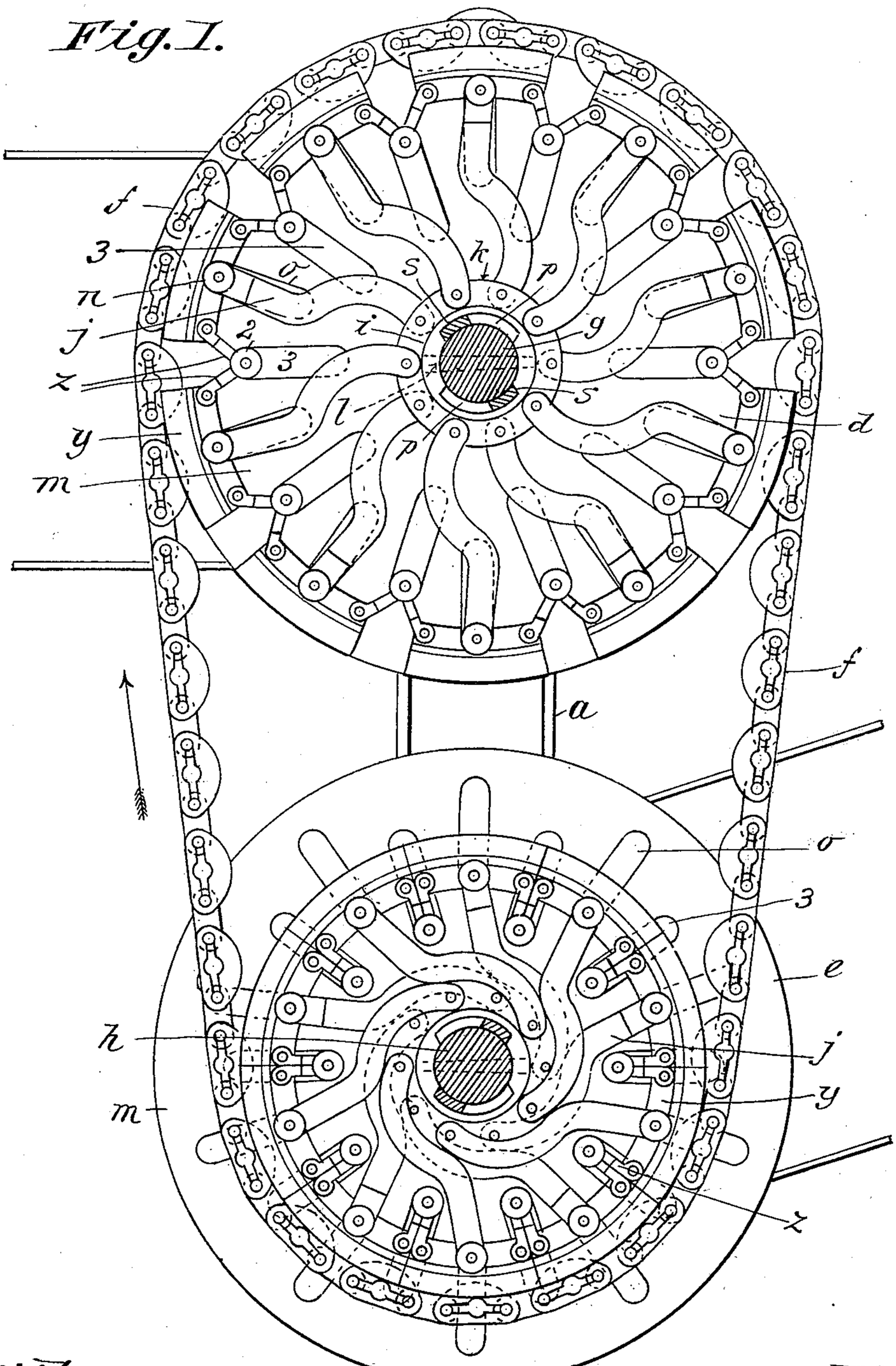
J. C. PRATT.

EXPANSIBLE PULLEY.

(Application filed Mar. 15, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



Witnesses:
J. R. Garfield
K. I. Clemons

Inventor:
John C. Pratt
by Chapin & Co
Attorneys.

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(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

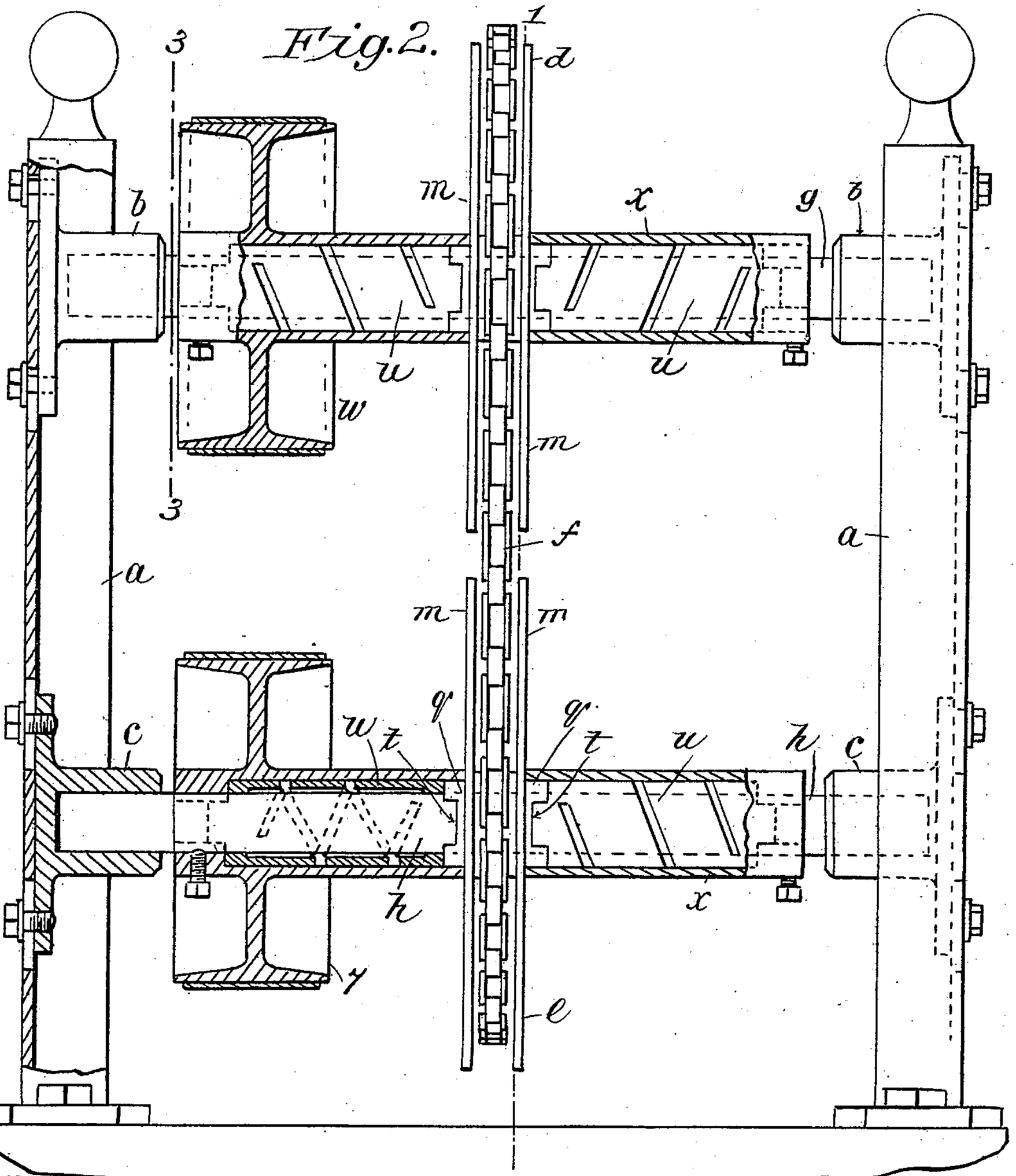


Fig. 4.

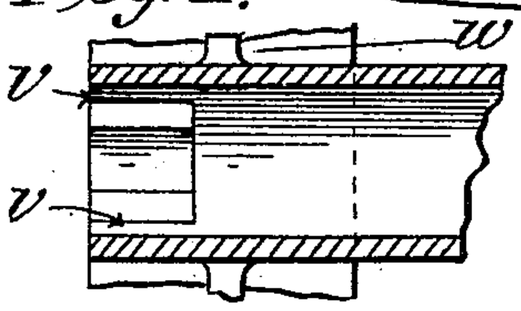


Fig. 3.

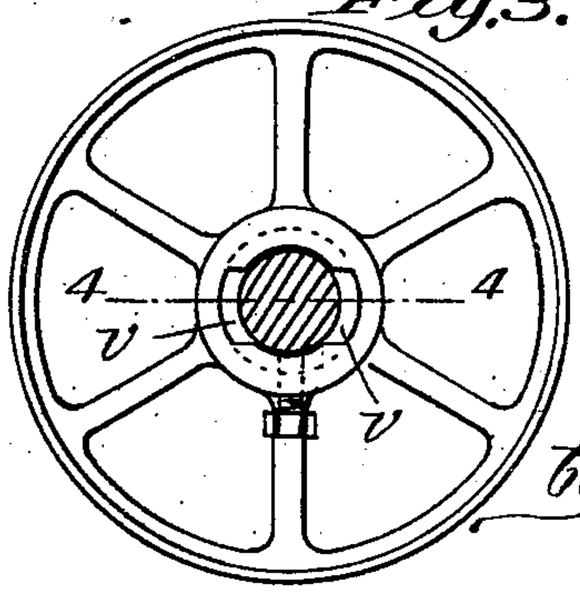
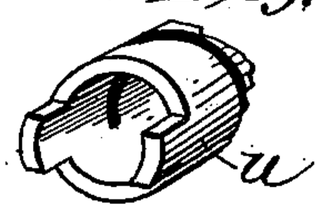


Fig. 5.



Witnesses:
J. D. Garfield
K. I. Clemons

Inventor:
John C. Pratt.
by Chapin & Co
Attorneys

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(No Model.) 4 Sheets—Sheet 3.

Fig. 6.

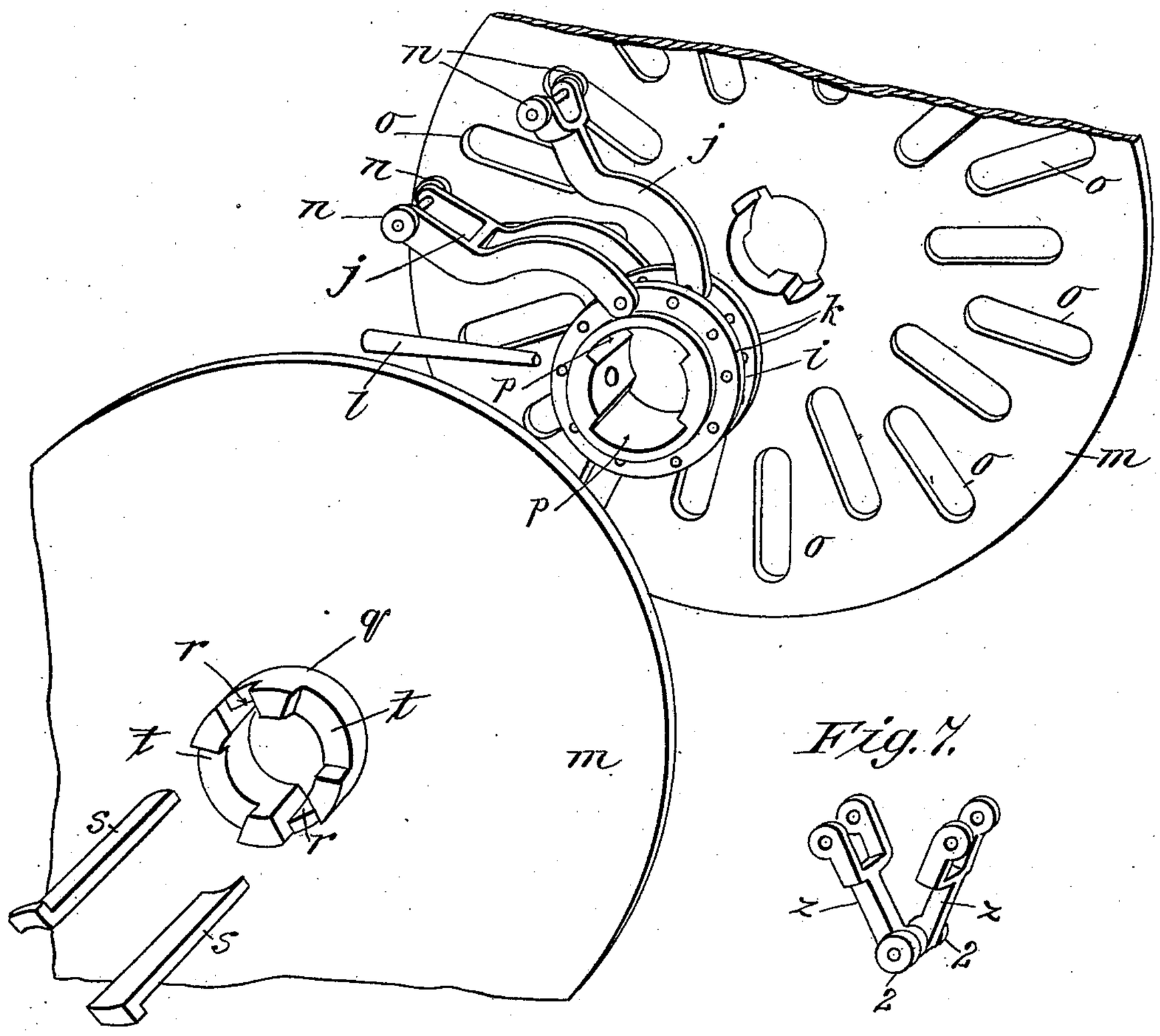


Fig. 7.

Fig. 8

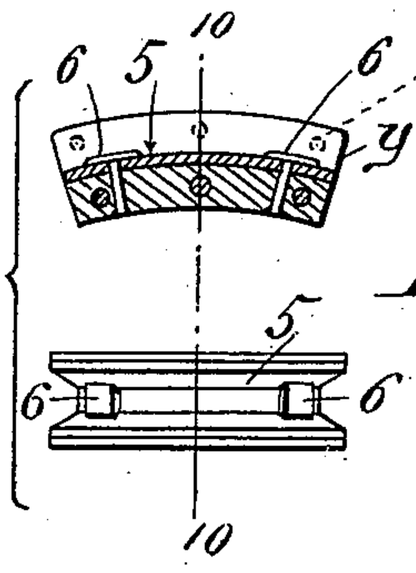


Fig. 9

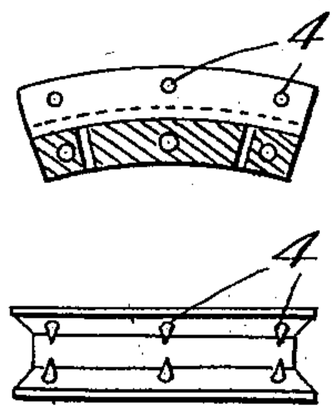
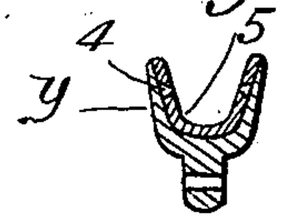


Fig. 10.



Witnesses:
J. H. Garfield
H. A. Clemons

Inventor:
John C. Pratt.
by Chapin & Co
Attorneys.

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J. C. PRATT.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 11.

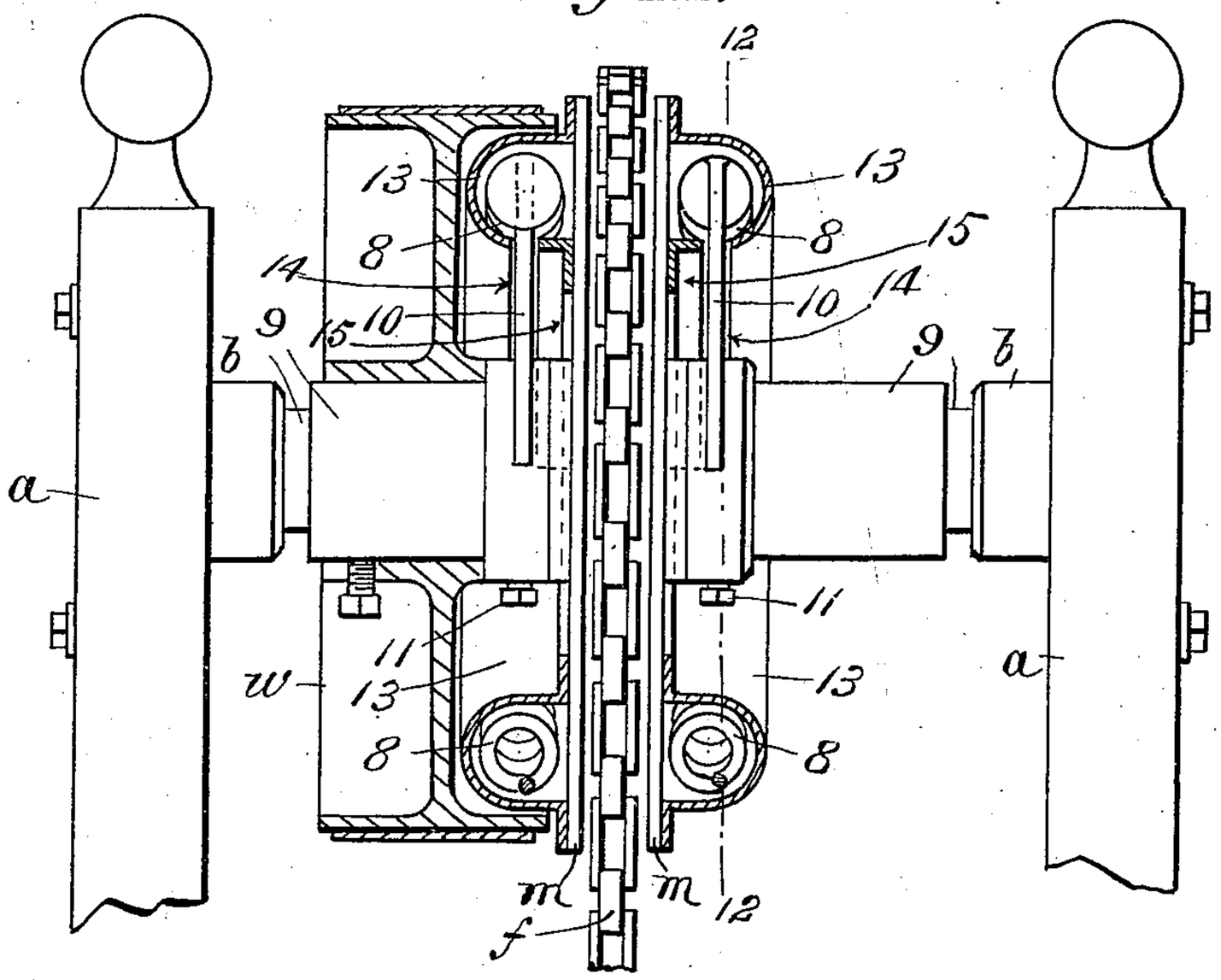
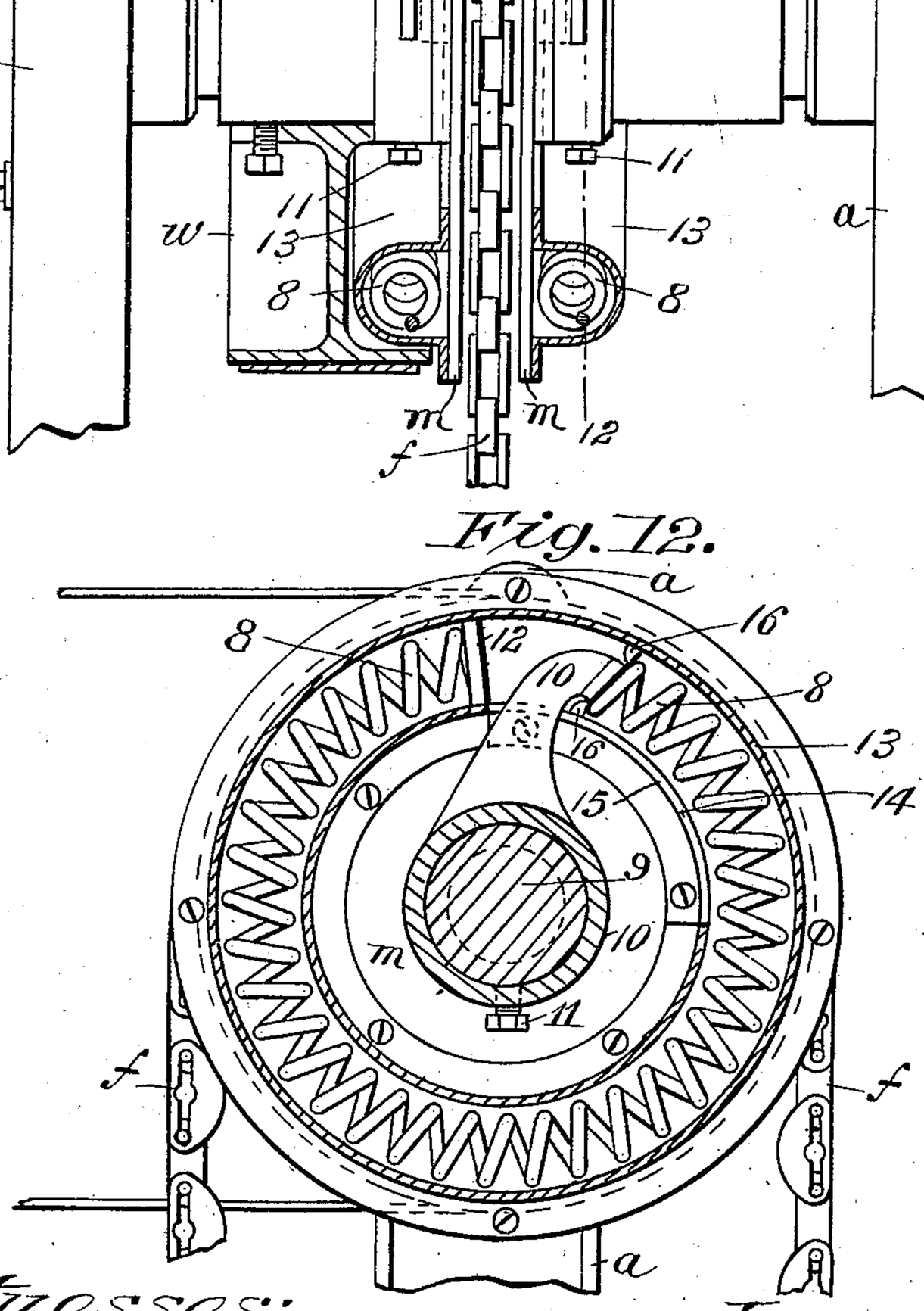


Fig. 12.



Witnesses:
J. W. Garfield
E. D. Clemons

Inventor
John C. Pratt
by Chapin & Lee
Attorneys

UNITED STATES PATENT OFFICE.

JOHN C. PRATT, OF HARTFORD, CONNECTICUT, ASSIGNOR OF ONE-HALF TO ARTHUR L. FOSTER, OF HARTFORD, CONNECTICUT.

EXPANSIBLE PULLEY.

SPECIFICATION forming part of Letters Patent No. 698,854, dated April 29, 1902.

Application filed March 15, 1901. Serial No. 51,368. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. PRATT, a citizen of the United States of America, residing at Hartford, in the county of Hartford and State of Connecticut, have invented new and useful Improvements in Expansible Pulleys, of which the following is a specification.

This invention relates to power transmission from one shaft to another by a flexible connection or belt and is in the nature of an improvement on my two prior United States Letters Patent, dated December 27, 1898, No. 616,630, and December 18, 1900, No. 663,928.

The particular object of this invention is to provide collapsible and expansible driving and driven pulleys united by a flexible belt connection to self-propelled vehicles and in certain incidental improvements in details of construction, whereby the mechanism is adapted to the purpose specified and whereby as wide a range as possible of the expansion and contraction of the pulleys may be obtained.

Referring to the drawings forming part of this specification, Figure 1 is a side elevation of the driving and driven pulleys and their driving connections between them, their shafts being shown in section taken on line 1 1, Fig. 2. Fig. 2 is a plan view of the pulleys and their supports mounted in a suitable frame, certain portions being shown in section. Fig. 3 is a sectional view through one of the shafts on line 3 3, Fig. 2. Fig. 4 is a section through Fig. 3 on line 4 4. Fig. 5 is a perspective view of one end of a spring carried on one of the pulley-shafts. Fig. 6 is a perspective view of portions of one of the pulleys, the parts being in separated relation. Fig. 7 is a perspective view of a pair of the links between two of the peripheral segments of a wheel. Fig. 8 is a plan in section of one of said peripheral segments. Fig. 9 is another plan and section of the same. Fig. 10 is a cross-section of one of said segments on line 10 10, Fig. 8. Fig. 11 is a plan view, partly in section, of a modification of the spring construction. Fig. 12 is a sectional side elevation of the same.

Referring to the drawings, the devices are shown supported in a suitable frame *a*, which may be assumed to be a part of the frame of a power-driven vehicle. On said frame part oppositely-located bearings *b* are secured, in which the shaft of the driving-wheel is supported, and also in said frame part are similar bearings *c*, in which the shaft of the driven wheel is supported. The driving-pulley is indicated by *d* and the driven pulley by *e*. Said bearings *b* and *c* are, as shown, made adjustable toward one another for the purpose of applying the proper tension to the driving connection, (indicated clearly by *f*.)

In principle of operation the expansion of the driven wheel and the contraction of the driving-wheel take place in precisely the same manner as described in my said prior patents; but the manner of mounting these wheels and their connections with the driving and driven pulleys and the application of two resistance-springs to each pulley and the fact that it has been found desirable that the pulleys should have a greater degree of expansion and contraction have necessitated certain changes in construction of the supports and in the connections between the pulleys and the component parts of their driving and transmitting mechanisms, which will now be described.

In mounting either of the wheels upon its shaft the hub *i* is located axially between the plates *m*, and said hub and the plates are provided with keyways *p* in the hub *i* and *r* in the hubs *q* on the outside of the plates. These keyways are of the same depth; but the ways in the hub *i* are of somewhat-greater width than those in the plates *m*. There are two keyways oppositely located both in the hubs *i* and the hubs *q*, and when the side plates are in proper position relative to the hub *i*, as stated, the keys having one flanged end are slipped into the keyways *r* and *p*. They fit closely in the ways *r*; but the ways *p* being considerably wider than the key the hub *i* may rotate relative to the plates *m* to an extent permitted by the excess of width of the keyways *p* over that of the ways *r*.

To assemble the parts of either wheel, the hub *i* is first placed on the shaft and is pinned or otherwise secured thereon. The radial arms *j* are now pivotally secured to the ribs of the hub in their proper order, and the side plates *m* are then slipped onto the shaft on

each side of the hub *i*, and the rolls *n* on the arms are fitted into their proper radial grooves *o* on the inner surface of the plates *m* and connected with the segments *y*, and the links *z* being also properly located in their radial grooves in said plates *m*. The side plates being firmly held in position against the ends of the hub, the keys *s* are now passed through the keyways *p* and *r*, the head of the key lying in a recess in the end of the hub *q*, as shown in Fig. 6. Any suitable means for holding the keys *s* in their proper position may be employed, as a set-screw through the hub *q*, for example. The hubs on the outside of the plates *m* are identical in construction and are each provided with notches *t*, with which projections on the ends of the spiral springs *u* interlock, the said springs being slipped over the shaft. The outer ends of said springs are provided also with projections which may enter sockets *v* in the hub of a pulley *w*, assuming that the wheel just described is applied to the bearings *b*. Said pulley *w* is provided with a long hub within which one of the springs *u* is located and which hub extends toward and close up to the wheel. On the opposite side of the wheel the spring *u* is inclosed in a long sleeve *x*, which also extends from the outer end of the spring toward and close up to the side of the wheel. Both the pulley *w* and the sleeve *x* are rigidly attached to the shaft by set-screws located beyond the opposite extremities of the springs *u*. This description of the mounting of one wheel will answer for both, as they are both identical in construction.

From the above description it will be observed that the operation of this construction, assuming the above description to have been that of the driving-pulley *d* on the bearings *b*, will be as follows: A suitable belt running over the pulley *w* rotates it, and through the interlocking connection of the pulley with the outer end of the spiral spring *u*, whose inner end interlocks with the hub *q* on that one of the side plates *m* nearest said pulley, will rotate said side plate, and the two side plates of the wheel being by means of the keys *s* in direct connection with the hub *i*, which is pinned to the shaft, there is a positive driving connection between the pulley *w* and the driving-pulley *d*. It must be borne in mind, however, that the springs *u* tend to keep the keys *s* to the rear side of the keyways *p* in the hub *i* and that all the power transmitted from the driving to the driven pulley will be measured by the resistance of the springs *u*. By the expression "rear side" of the keyways is meant the rear side thereof as compared with the direction of movement of the pulley. Now when a draft exceeding the resistance of the spring *u* on the shaft *g* is applied to the periphery of the driving-wheel, for instance, then a movement of the arms *j* of said wheel in a direction inverse to the rotation thereof takes place, and under similar conditions the arms of the driven wheel will swing in the same direction as the direction of movement of the driving-wheel.

As described in my said prior patents, the peripheral segments *y* are pivotally supported in the outer extremities of the arms *j*, which segments are V-shaped in cross-section and receive a driving connection *f*, also V-shaped in cross-section, all as described in my previous patents. The ends of the segments *y* are united by a pair of links *z* (illustrated in detail in Fig. 7) and are provided at their united ends with rolls 2, which fit radial grooves 3, located between the grooves *o*, as shown in Figs. 1 and 6 clearly. The said arms *j*, however, are somewhat different in construction from those shown in my said prior patents. In this construction, as shown in Fig. 1, every other arm is made of two parallel pieces suitably united to move as one, the other arms being formed of a single piece, as shown. The ends of these arms are pivoted to the hub *i*, as stated, by means of a pin passing through the circular flanges *k* and through the ends of these arms. The double arms are fitted over the outside of the flanges and the single arms are fitted in between the flanges. Therefore when the arms are in the position shown in Fig. 1, on the driven pulley *e*, for instance, when it is in its most contracted position diametrically, the single arm will lie between the two sides of the double arm, all as shown, and by means of this nesting arrangement a much greater range of expansibility is attainable than by the construction shown in my prior patents.

Another improvement over the construction shown in said prior patents relates to the segments *y*, which consist in making said segments of cast metal, preferably malleable iron, having projections 4 on the inclined faces thereof for the purpose of retaining a leather shoe 5, with which it has been desirable to line said segment for the purpose of increasing the frictional contact between it and the driving connection when the latter consists of V-shaped metal links. As an additional means for retaining these leather shoes rivets 6 may be passed down through the bottom of the groove in the segments and through the bottom of the latter.

In the drawings, referring now to Fig. 2, *d* has been spoken of as the "driving-pulley" and *e* as the "driven pulley," *d* being driven by means of a belt running onto the pulley *w* from a source of power, such as the engine of a motor-vehicle, power being transmitted from the shaft *h* by a belt running from another pulley 7, similar to the pulley *w*, connected with the driven wheel *e*, said belt on the pulley 7 running to the driving-axle of the vehicle.

It is, of course, obvious that any connection of the driving-pulley *d* with a motor and any connection between the driven pulley *e* and the propelling-shaft of a vehicle may be substituted for the means described without departing from the spirit of the invention, the

pulleys *w* and 7 being representative merely of means of transmission of power to the driving and from the driven wheel.

In Figs. 11 and 12 a modification of the spring construction is shown. The springs shown in these figures and indicated by 8 have the same function as the springs *u*, (shown in Fig. 2,) and their operation is identical with the latter. The purpose of this modified construction is to permit a narrowing up of the construction as a whole.

In the construction shown in Fig. 2 one end of the springs 8 is connected directly to the plate *m* and the other end to the shaft. In said Figs. 11 and 12 the shaft is, preferably, solid and is indicated by 9, and there is secured thereon an arm 10 by a set-screw 11 or other means, whose outer end bears on one end of said springs 8. The latter are in the form of an open coil and may be of such length as will give the desired degree of compression. The end of the spring opposite to that which the end of the arm 10 bears against abuts against a transverse partition 12, located in or forming part of an annular trough-shaped casing 13, which is screwed or otherwise secured to the side plate *m* concentrically. This casing is provided with a slot 14 on its inner wall to permit the swing of the arm 10. The preferable way of making this slot is to cut away the inner edge of the casing for a distance equal to the degree of movement of the arm and after assembling the parts fit in a piece 15 into said cut-away part, which will close up the opening, leaving only the said slot for the arm 10. The said piece 15 may be screwed to the plate or otherwise secured thereto either after the arm has been applied to the device or before, as desired. I place one spring on each of the plates *m* and connect therewith from the shaft, as shown, by means of an arm 10. The construction is very compact, and this form of a spring gives a greater relative movement of the shaft and plates than can be obtained by the use of the spring shown in Fig. 2. If desired, the spring may be placed in the annular casing 13 before the latter is screwed to the plate *m*, and to provide for this the stops 16 are located in the casing at about that point where the arm 10 will lie when the spring is not under tension, and the spring may be slightly compressed and put into the casing, one end bearing against the partition 12 and the other against said stops and the casing then secured to the plate, it being understood that the end of the arm is of such dimension as will permit it to come to a bearing on the spring between said stops 16.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination of two shafts of a driving and a driven pulley of the class described, one on each of said shafts, and a driving connection between them; each of said pulleys comprising a hub fixed on the shaft, annular side plates one on each side of said hub, loose on the shaft, and interlocking means between the hub and the plates, whereby the latter may rotate independently of the hub and shaft; arms between the plates pivoted by their inner ends on the hub and their outer ends having a sliding engagement with the plates; peripheral segments on the outer ends of said arms, also located between the plates; spiral springs engaging by one end each of said plates, and by the opposite ends secured to the shaft; means for adjustably separating said shafts and for rotating one of them, substantially as described.

2. In an expansible and contractible pulley, a shaft, a wheel-hub fixed thereon, annular plates constituting the sides of the wheel located on said shaft, one each side of said hub, and loose on the shaft, interlocking means between said hub and plates whereby the latter may rotate relative to the shaft and hub; arms between the plates pivoted to said hub and having a sliding engagement with the plates, V-shaped peripheral segments on said arms and a lining in said segments, such as leather, and means for securing said lining; a spiral spring on each side of said pulley and engaging one plate of the latter by one end and secured to the shaft by the opposite end, and means for rotating the shaft, substantially as described.

3. In an expansible and contractible pulley or wheel, a shaft, a wheel-hub fixed thereon, annular plates constituting the sides of the wheel located on said shaft on each side of, and close to said hub and loose on said shaft, arms between said plates pivoted to said hub by one end, said latter end being curved to conform substantially to the hub, radial grooves in the inner surfaces of said plates with which the opposite ends of said arms engage, and peripheral segments on said arms, a spiral spring, one of whose ends is in engagement with one of said plates, and whose opposite end is in engagement with a member secured to said shaft, whereby the movement of said plate rotating on the shaft will compress said spring, substantially as described.

JOHN C. PRATT.

Witnesses:
WM. H. CHAPIN,
K. I. CLEMONS.