(No Model.) 5 Sheets—Sheet 1.

F. M. POWELL.

PULLEY.

No. 424,687. Patented Apr. 1, 1890.

Fig. 2.

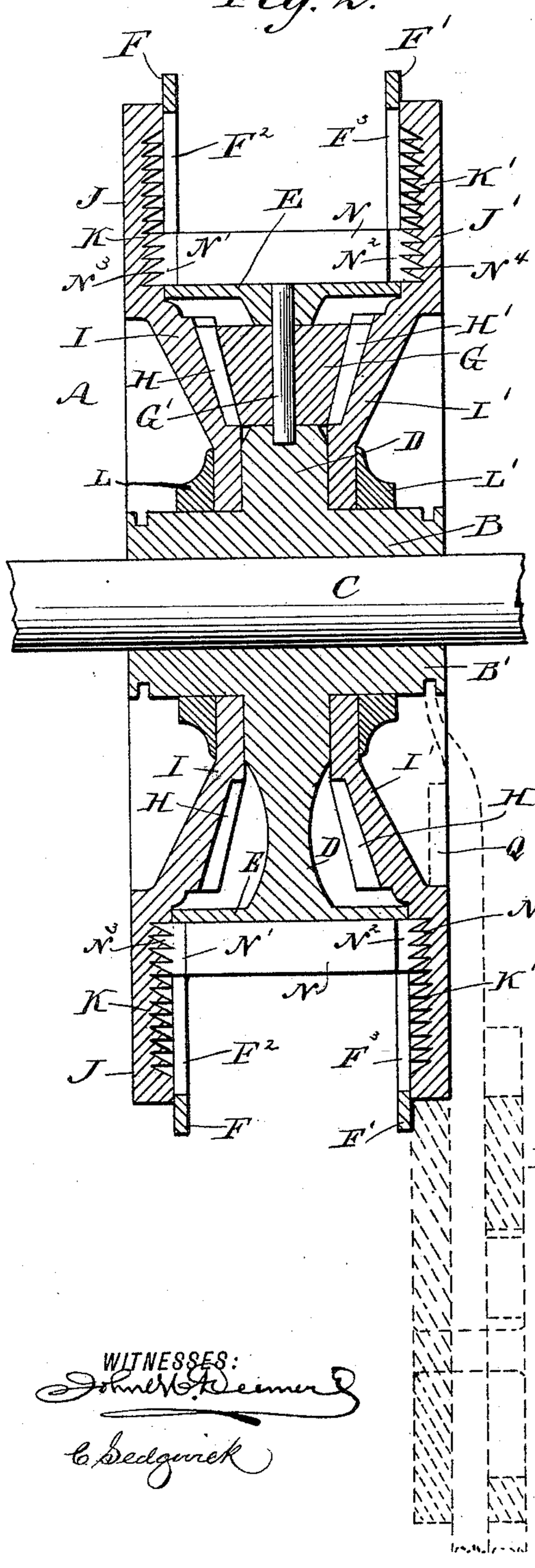
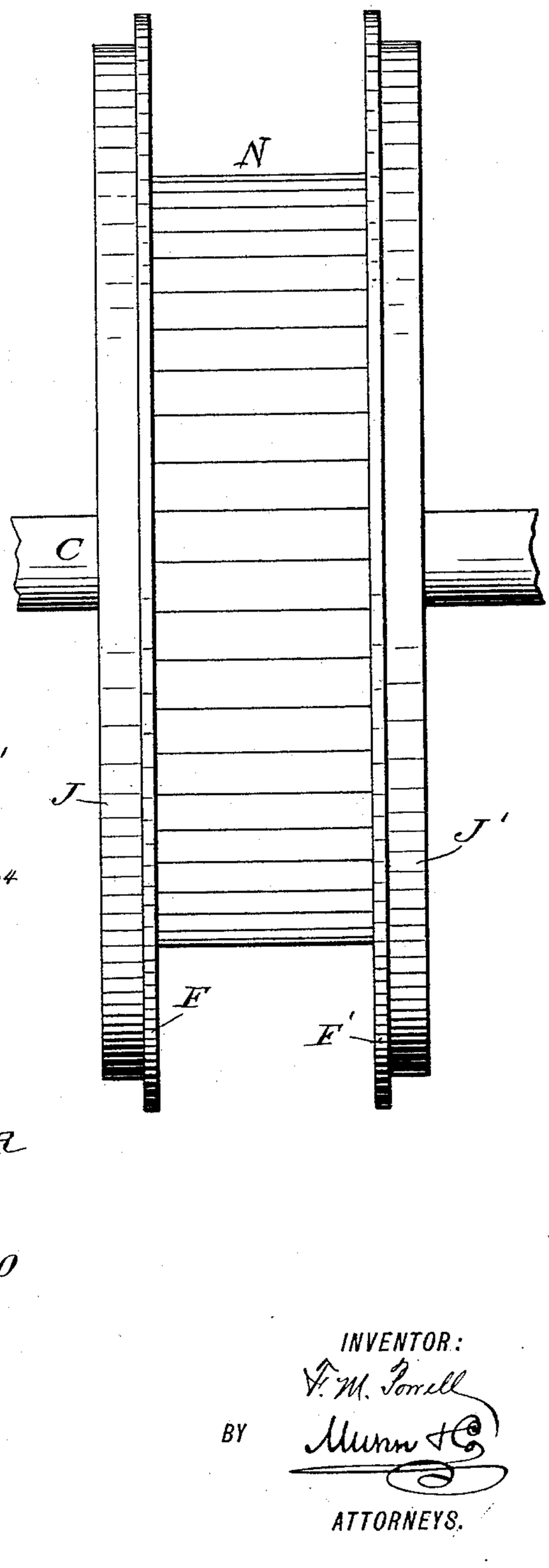


Fig. 1.



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(No Model.) 5 Sheets—Sheet 2.

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Fig. 3.

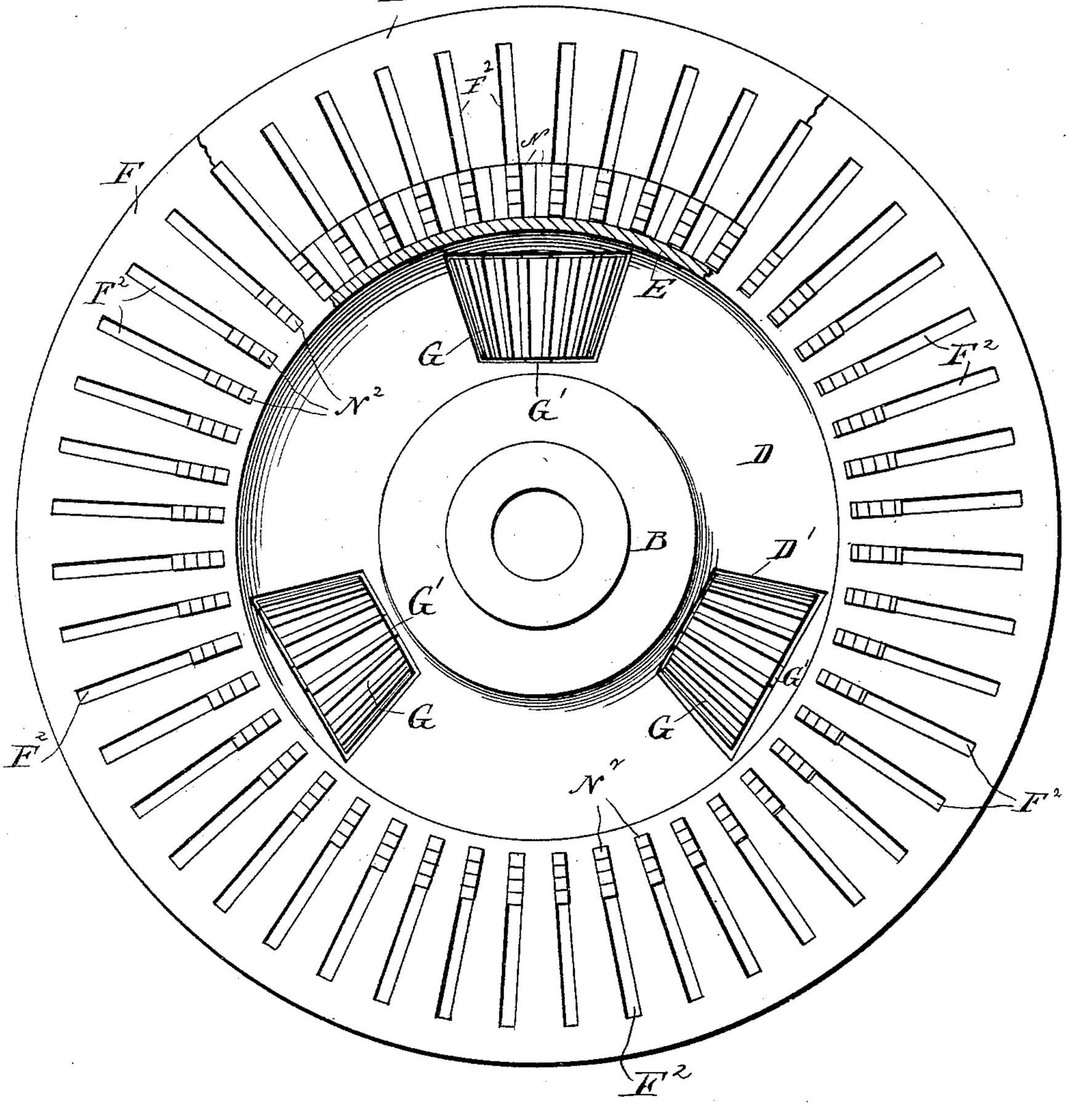

Fig. 6.

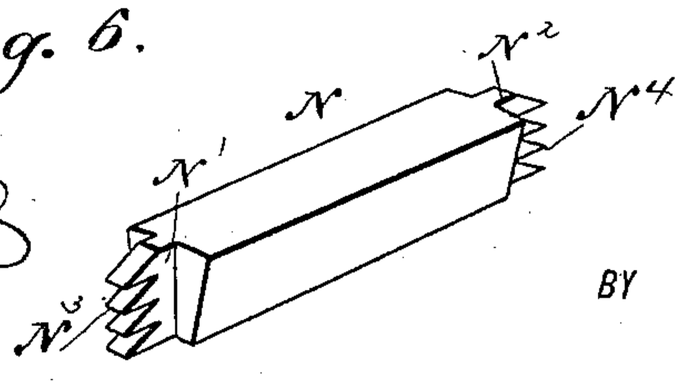

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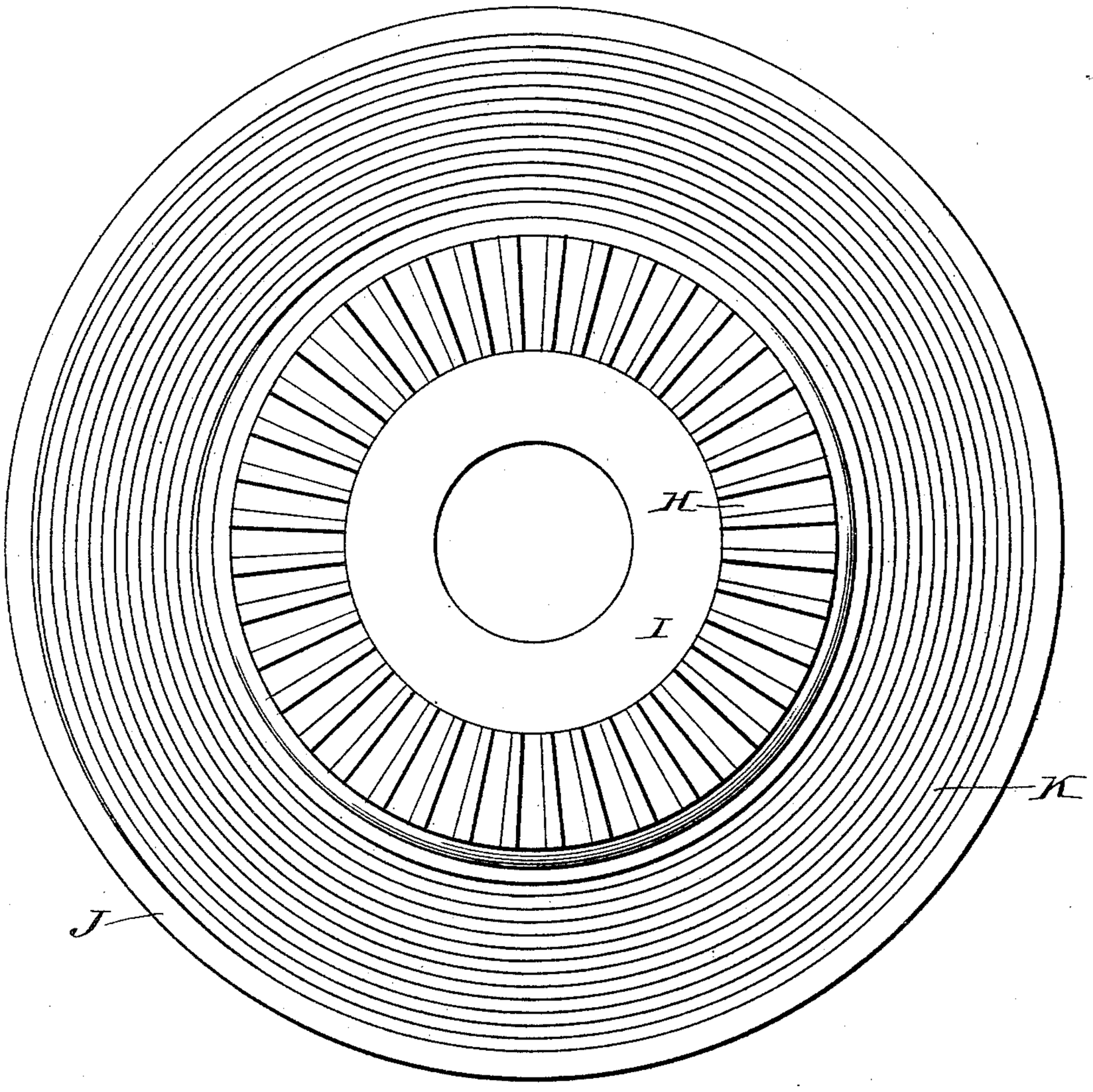
Fig. 4.



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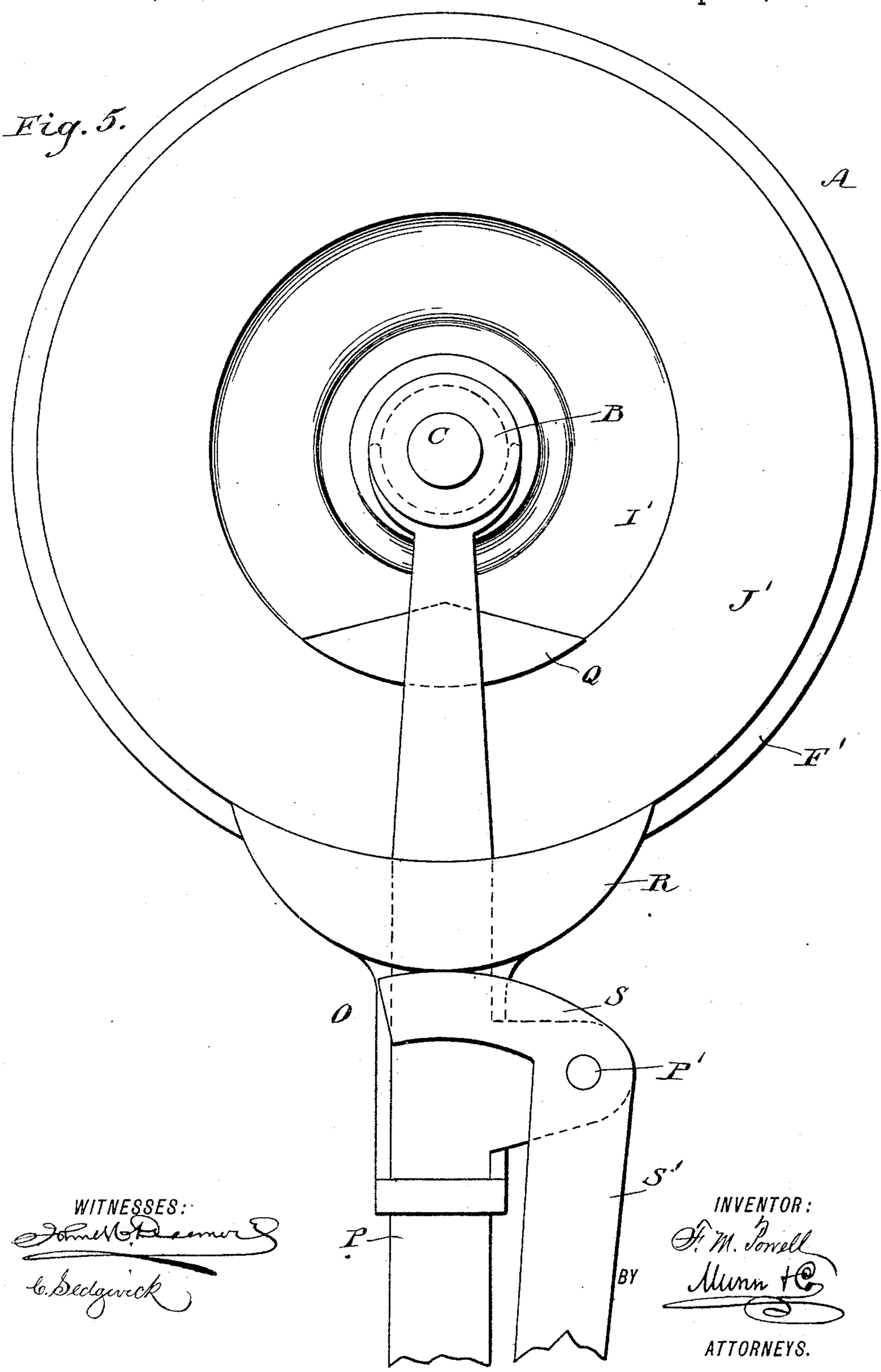
PULLEY.

No. 424,687. Patented Apr. 1, 1890.

Fig. 5.



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(No Model.) 5 Sheets—Sheet 5.

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Fig. 8.

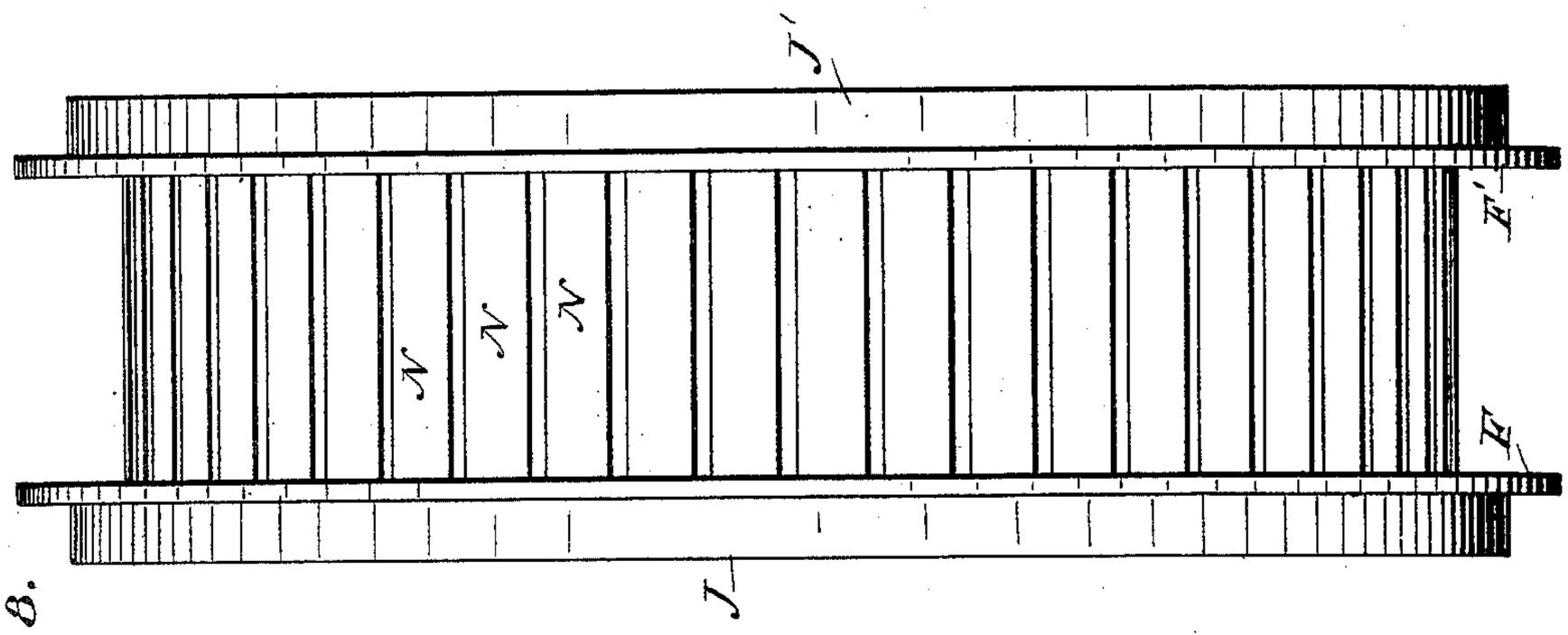
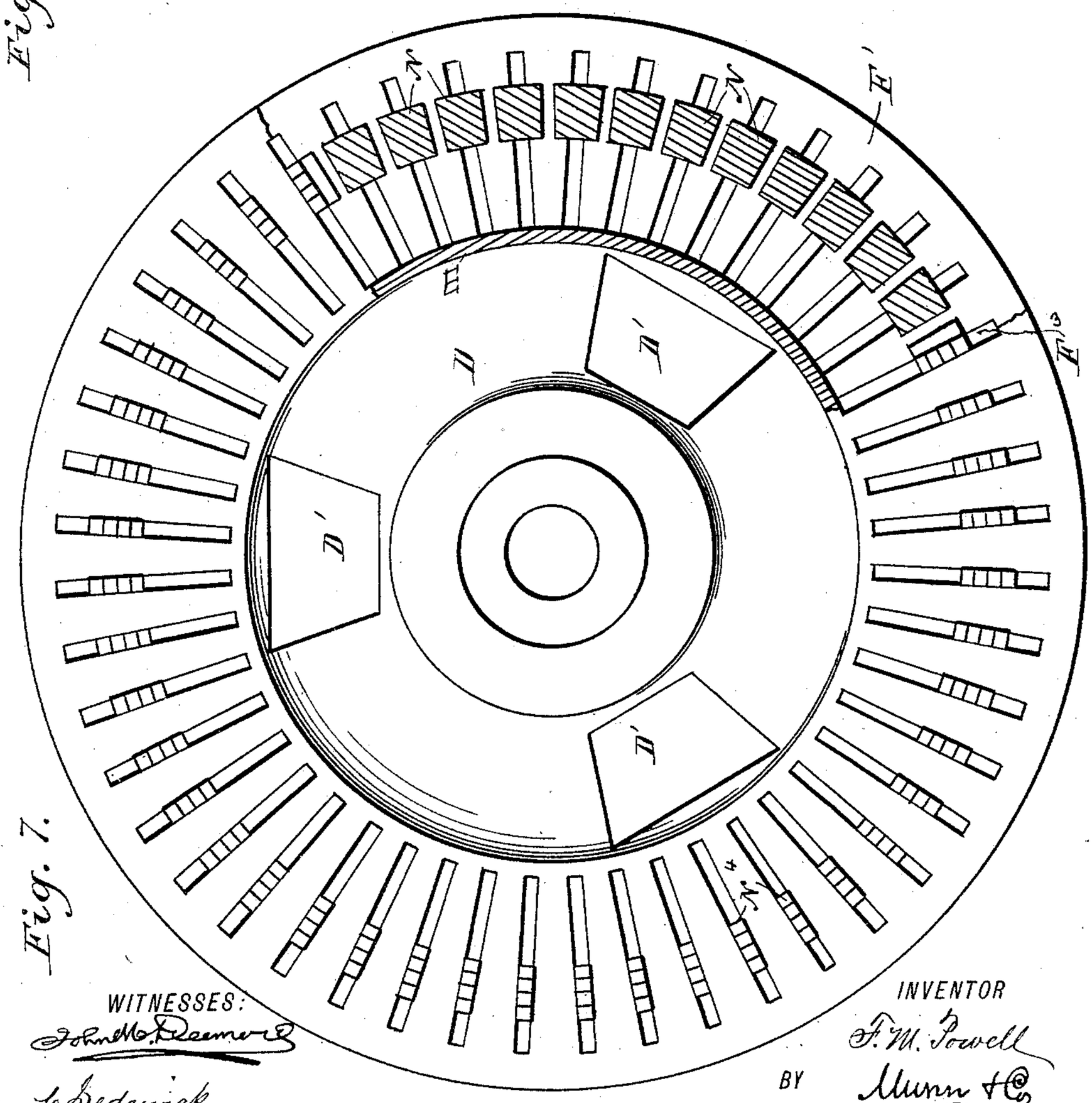


Fig. 7.



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UNITED STATES PATENT OFFICE.

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PULLEY.

SPECIFICATION forming part of Letters Patent No. 424,687, dated April 1, 1890.

Application filed February 6, 1889. Serial No. 298,877. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. POWELL, of Frederick, in the county of Brown, in the Territory of Dakota, have invented a new and Improved Pulley, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved pulley which can be easily and quickly changed so as to increase or decrease its diameter while the pulley is in motion.

The invention consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a front elevation of the improvement. Fig. 2 is a diametrical section of the same. Fig. 3 is a face view of the same with one of the disks removed and with parts in section. Fig. 4 is a face view of one of the flanges or disks. Fig. 5 is a face view of the improvement with the brake applied. Fig. 6 is a perspective view of one of the sliding blocks forming the rim of the pulley. Fig. 7 is a face view of part of the improvement with one of the disks removed and with parts in section, and Fig. 8 is a front elevation of the same.

The improved pulley A is provided with a hub B, secured by suitable means to the shaft C. The hub B supports a web D, on the periphery of which is formed a rim E, supporting the parallel and annular flanges F and F′ at its ends. The flanges F and F′ are provided with radial slots F^2 and F^3, respectively, extending from the rim E to within a short distance of the outer end of the respective flange F or F′. The slots F^2 and F^3 are arranged equal distances apart, as is plainly illustrated in Fig. 3.

The hub B, the web D, the rim E, and the flanges F and F′ are all cast in one piece similar to a common flanged pulley.

In the web D, Fig. 7, are formed a number of apertures D′, in each of which is held a beveled gear-wheel G, Fig. 3, mounted to turn on a spindle G′, held radially in the web D and extending flush with the outside of the rim E. (See Fig. 2.) The bevel gear-wheels G are arranged in a circle and extend equally from both faces of the web D. The gear-wheels mesh at both sides into the bevel gear-wheels H and H′, respectively, formed on the inner sides of the disks I and I′, respectively, fitted on the hub B, one on each side of the web D.

On the outer ends of the disks I and I′ are formed the outwardly-extending parallel and annular flanges J and J′, respectively, fitting against the annular flanges F and F′, as is plainly shown in Fig. 2. On the inside of each annular flange J and J′ is formed a spiral groove K or K′, respectively, extending in width to about the length of the slot F^2 or F^3 in the annular flange F or F′. The disks I and I′ are held in place against the web D by collars L and L′, respectively, secured on the hub B in any suitable manner.

Between the annular flanges F and F′ are held a number of blocks N, each provided on its ends with the offsets or lugs N′ and N^2, respectively, fitting into corresponding slots F^2 and F^3 in the annular flanges F and F′, so that the said blocks can move inward or outward in the radial slots. On the outer edges of the lugs N′ and N^2 are formed teeth N^3 and N^4, respectively, fitting into the spiral grooves K and K′, respectively, formed in the annular flanges J and J′. The blocks N form a circle in the pulley A and are the rim of the pulley for the belt to pass on. When the blocks N are in their innermost position, as shown in Figs. 1, 2, and 3, said blocks fit closely one against the other to make a solid rim. In this position the pulley A has its smallest diameter. When the blocks N are moved nearly to their outermost position, as shown in Figs. 7 and 8, they are short distances apart, but arranged in a circle and form a broken rim for the pulley. The diameter of the latter has now been considerably increased over the diameter when the blocks were in the position above described and shown in Figs. 1, 2, and 3.

In order to change the diameter of the pulley, I employ a brake device O, consisting of

a rod P, fitting at its upper end into an annular groove B′, formed in the hub B. On the rod P is secured a segmental block Q, fitting on the inside of the flange J or J′, and on the said rod P is also held a segmental sliding block R, adapted to engage the periphery of the flange J or J′. The block R is held to slide on the rod P, and is moved upward or downward by means of a segmental lever S, pivoted at P′ to the rod P, and provided with a handle S′, which extends downward and serves to swing the segmental lever S on its pivot P′. The under side of the block R rests on top of the segmental lever S, as is plainly illustrated in Fig. 5, and when the rod P is in position—that is, its upper end engages the groove B′—and the block Q rests on the inside of one of the flanges J or J′, then the operator, in order to brake the respective flange J or J′, throws the handle S′ inward, so that the segmental lever S presses the block R tightly against the periphery of the respective flange J or J′, and also the block Q in firm contact with the inside of the respective flange J or J′.

When the shaft C rotates and one of the flanges J or J′ is braked, the large beveled wheel H or H′ on its inner side will cause the small pinions meshing therewith to rotate on their axes, and as these pinions are carried around with the web D and mesh into the large beveled wheel of the unbraked flange J or J′ they cause said flange to rotate with the two flanges F F′. As the unbraked flange rotates its spiral groove will cause the blocks N at that end to move in or out in the slots F^2, and as the flanges F F′ carry the blocks they will cause the opposite ends of the blocks to travel in the spiral groove of the braked flange J or J′, so that the blocks will be moved simultaneously and evenly in and out in said slots F^2 F^3. The spiral grooves K and K′ are right and left, respectively, so that both move the blocks N simultaneously inward or outward.

When the brake device O is disengaged from the pulley A and the blocks N are in their innermost position, as shown in Figs. 1, 2, and 3, the belt rests on the blocks between the flanges F and F′. When the shaft C is rotated, it also rotates the pulley A, and the belt passing over the blocks N transmits the motion of the pulley to the pulley on the counter-shaft.

When the operator desires to increase the diameter of the pulley A, he applies the brake O, as above described, so that the corresponding flange J or J′ is braked, whereby the beveled wheels G turn, and, being in mesh with the corresponding bevel gear-wheels H and H′, respectively, the opposite flange J or J′ is revolved, as before described. The shaft C carries around its hub B and web D the rim E and the flanges F and F′, which support the blocks N; but as the flange J or J′ is braked and travels at a lower rate of speed, or is at a complete standstill, the blocks N, on account of their teeth N^3 and N^4, engage the spiral grooves K and K′, which cause them to travel outward in their respective slots F^2 and F^3. The blocks are moved simultaneously, and consequently the rim of the pulley is expanded. When the operator removes the brake device O, then the gear-wheel G again carries around the flanges J and J′ with the flanges F and F′, so that the blocks N remain in whatever position they are in.

When the operator desires to decrease the diameter of the pulley A, he brakes the other flange J or J′, so that the movement of the blocks N in the spiral grooves K or K′ is reversed and they are moved inward simultaneously and the diameter of the pulley decreases until the blocks N again rest on the rim E of the web D. It is understood that the blocks N can be stopped at any position by removing the brake.

It will be seen that this pulley can to very great advantage be used for changing the speed of rolls, drums, pulleys, shafts, &c., in mills or other machinery. For instance, of two parallel shafts: Both are provided with a differential pulley of the character described and a belt passes over both pulleys, of which one is the driver and the other the driven. If the pulley on the driver and the driven shaft is constructed as above described, then by moving the blocks N inward simultaneously on the driver-pulley and the blocks N on the driven pulley outward simultaneously the speed of the driven shaft is correspondingly decreased, and when the driver-pulley is expanded and the driven pulley contracted the speed of the driven shaft is increased. Thus the differential speed of two or more driven shafts is under the full control of the operator, who can change the diameter of any one of the differential pulleys whenever desired and while the shafts are in motion.

A swing idler can be used between the shafts to take up slack of belt when the driven pulley is contracted, so the belt will not slip on driver-pulley and the driven shaft stop. If one of the pulleys is a common pulley an idler will also be necessary, but by using two differential pulleys the range of differential speed is greater.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A pulley comprising a hub, a rim connected therewith and provided with parallel radially-slotted flanges, and a series of separate and independent blocks forming the expansible working-face of the pulley and projecting at their ends through said slots, and disks mounted on the hub inclosing the outer sides of its slotted flanges and provided on their inner sides with spiral grooves engaging the ends of the blocks, substantially as set forth.

2. A pulley comprising blocks forming the rim and provided at each end with a toothed

projection, annular flanges having radial slots into which fit the said projections, and a second set of annular flanges provided with spiral grooves into which fit the teeth of the said projections, substantially as shown and described.

3. A pulley comprising a hub, a web secured on the said hub and supporting a rim, annular flanges held on the said rim and provided with radial slots, blocks fitted between the said flanges and provided with toothed projections extending through the said radial slots, and a second set of annular flanges held to turn on the said hub and provided with spiral grooves engaged by the said toothed projections, substantially as shown and described.

4. A pulley comprising a hub, a web secured on the said hub and supporting a rim, annular flanges held on the said rim and provided with radial slots, blocks fitted between the said flanges and provided with toothed projections extending through the said radial slots, and a second set of annular flanges held to turn on the said hub and provided with spiral grooves engaged by the said toothed projections, and means for locking the said web to the said second set of annular flanges, as set forth.

5. A pulley comprising a hub, a web secured on the said hub and supporting a rim, annular flanges held on the said rim and provided with radial slots, blocks fitted between the said flanges and provided with toothed projections extending through the said radial slots, a second set of annular flanges held to turn on the said hub and provided with spiral grooves engaged by the said toothed projections, bevel-pinions held to turn in the said web, and bevel gear-wheels formed on the said set of annular flanges and in mesh with the said pinions, substantially as shown and described.

6. A pulley comprising blocks forming the rim and provided at each end with a toothed projection, annular flanges having radial slots into which fit the said projections, a second set of annular flanges provided with spiral grooves into which fit the teeth of the said projections, and a brake mechanism for braking either of the outer annular flanges, substantially as shown and described.

7. A pulley comprising a hub, a web secured on the said hub and supporting a rim, annular flanges held on the said rim and provided with radial slots, blocks fitted between the said flanges and provided with toothed projections extending through the said radial slots, a second set of annular flanges held to turn on the said hub and provided with spiral grooves engaged by the said toothed projections, bevel-pinions held to turn in the said web, bevel gear-wheels formed on the said set of annular flanges and in mesh with the said pinions, and a brake mechanism for braking either of the annular flanges, substantially as shown and described.

FRANCIS M. POWELL.

Witnesses:
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