(No Model.) 3 Sheets—Sheet 1.

B. HOLMES.

VARIABLE SPEED COUNTER SHAFT.

No. 571,879. Patented Nov. 24, 1896.

Fig.1

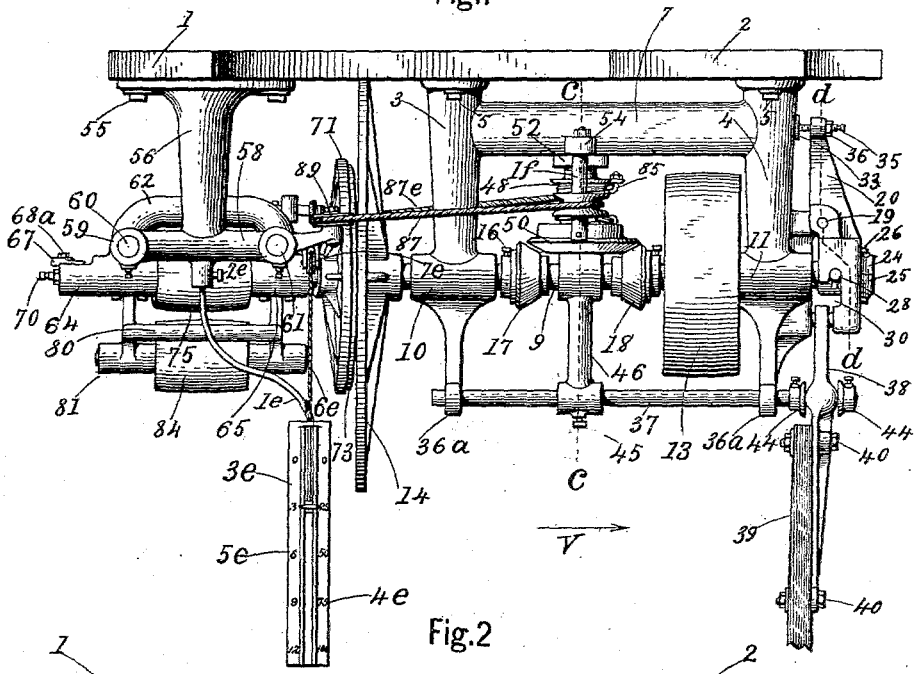
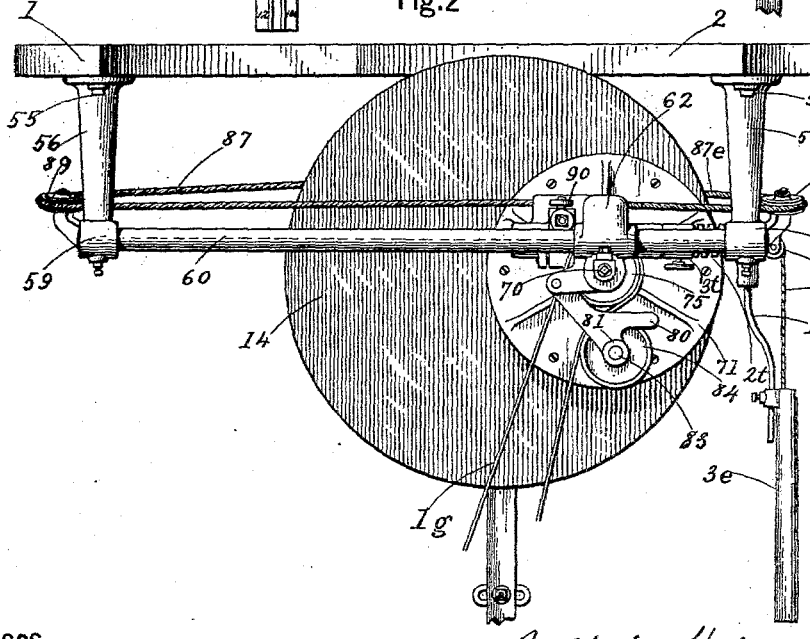


Fig.2



Witnesses.
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Attorney.

(No Model.) 3 Sheets—Sheet 2.

B. HOLMES.

VARIABLE SPEED COUNTER SHAFT.

No. 571,879. Patented Nov. 24, 1896.

Fig.3

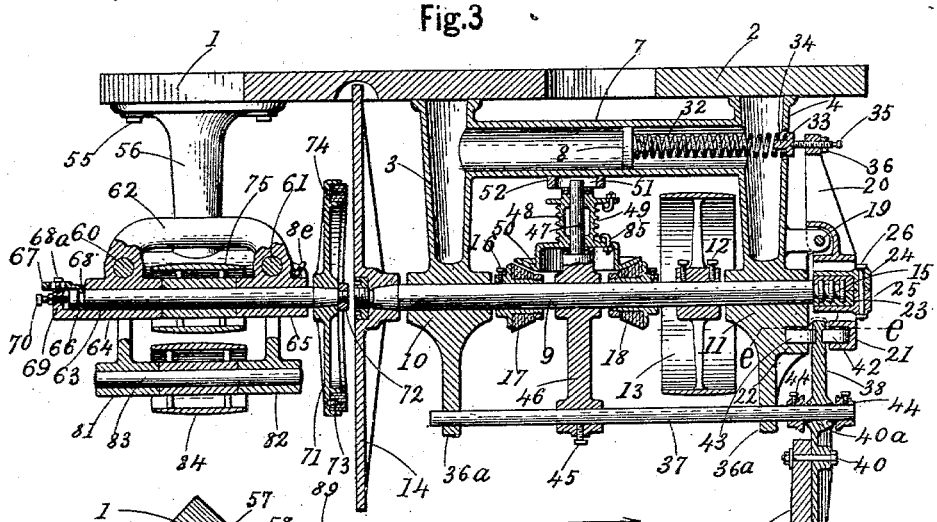
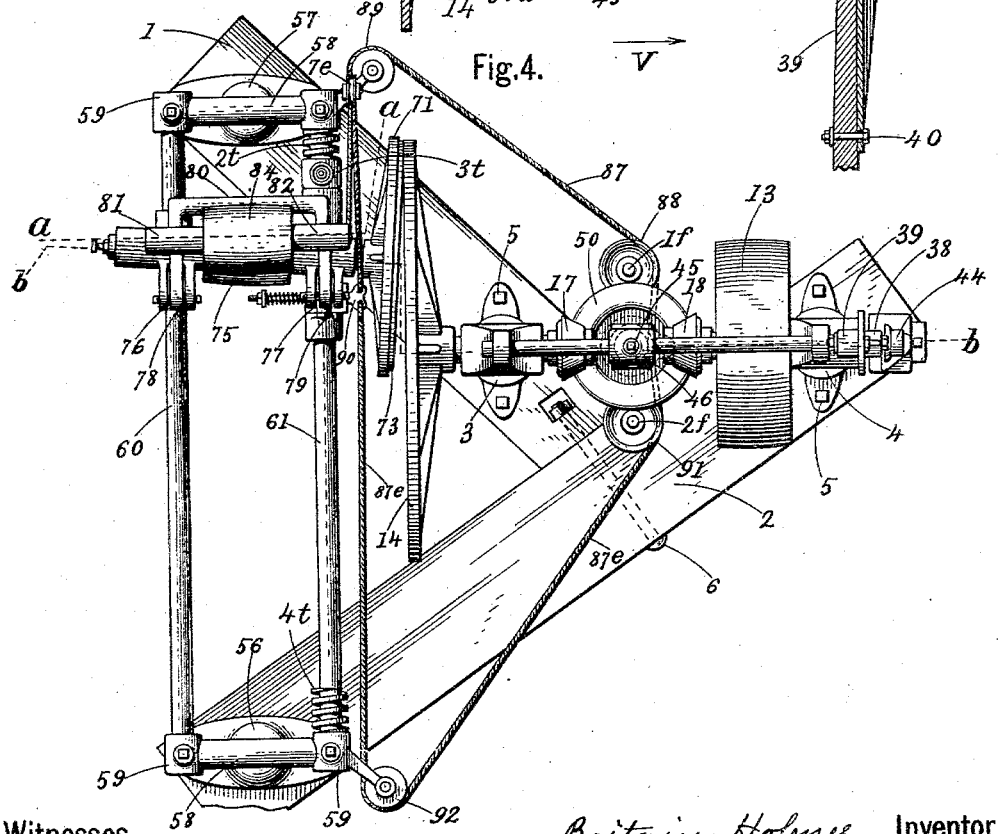


Fig.4.



Witnesses.
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(No Model.) 3 Sheets—Sheet 3.

B. HOLMES.

VARIABLE SPEED COUNTER SHAFT.

No. 571,879. Patented Nov. 24, 1896.

Fig.5.

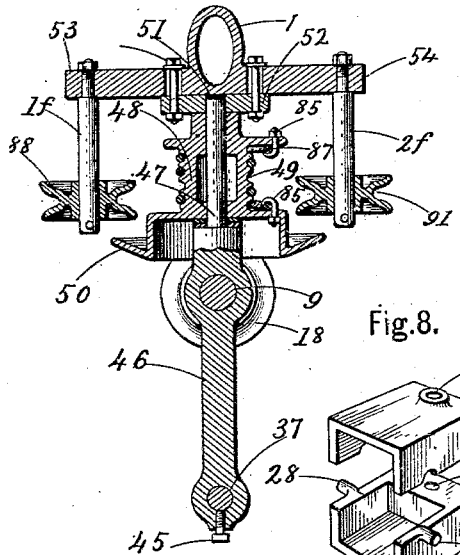


Fig.6

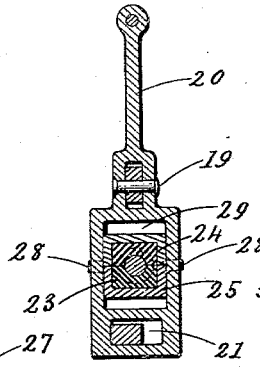


Fig.7.

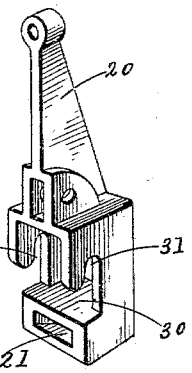


Fig.8.

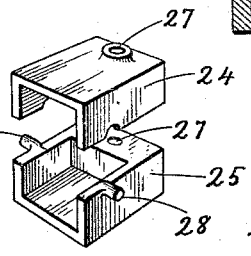


Fig.9.

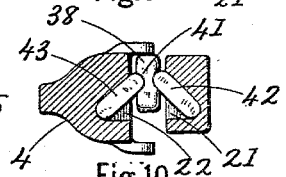


Fig.10

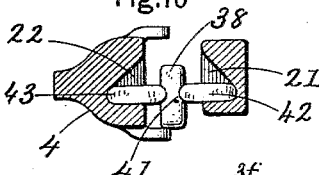


Fig.11.

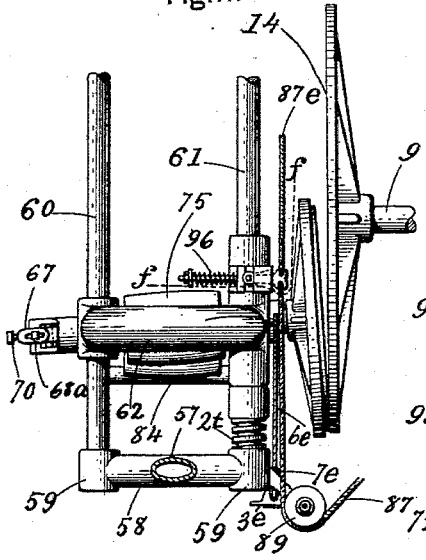


Fig.12.

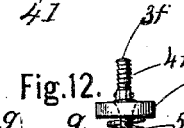
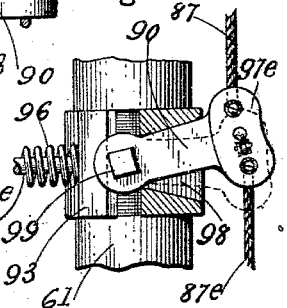


Fig.13.



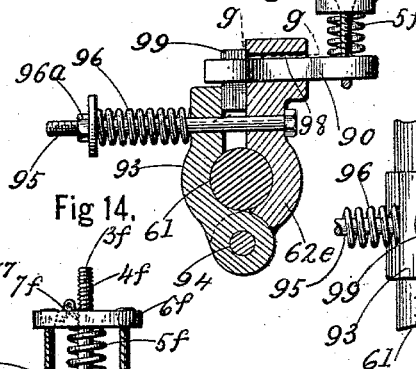


Fig 14.

Witnesses.
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UNITED STATES PATENT OFFICE.

BRITAIN HOLMES, OF BUFFALO, NEW YORK, ASSIGNOR TO JAMES SANGSTER, OF SAME PLACE.

VARIABLE-SPEED COUNTER-SHAFT.

SPECIFICATION forming part of Letters Patent No. 571,879, dated November 24, 1896.

Application filed May 20, 1895. Serial No. 549,882. (No model.)

To all whom it may concern:

Be it known that I, BRITAIN HOLMES, a citizen of the United States, residing in Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Variable-Speed Counter-Shafts, of which the following is a specification.

My invention relates to certain improvements in variable-speed counter-shafts, their starting, stopping, and reversing mechanism, and to certain details of construction, all of which will be fully and clearly hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 represents a side elevation of the device complete. Fig. 2 represents a front end elevation showing a face view of the driving friction-disk. Fig. 3 is a vertical longitudinal section on or about lines *a a* and *b b*, Fig. 4. Fig. 4 represents an inverted plan view showing the mechanism for varying the speed and the framework from which it is suspended. Fig. 5 is a vertical cross-section on or about line *c c*, Fig. 1. Fig. 6 represents a vertical section on or about line *d d*, Fig. 1. Fig. 7 is a detached perspective view of the combined toggle-case and lever. Fig. 8 represents a perspective view of the pivoted thrust-box at the end of the main shaft, showing its two parts separated. Fig. 9 is a horizontal section of the lower portion of the hanger 4 and combined toggle-case and lever on or about line *e e*, Fig. 3, showing the closed position of the toggle. Fig. 10 is a similar section showing the toggle open. Fig. 11 is a fragmentary top plan view of the carriage portion and adjacent parts, a horizontal section being cut through the hanger 57. Fig. 12 represents a section on or about line *f f*, Fig. 11. Fig. 13 is a section cutting horizontally through line *g g*, Fig. 12. Fig. 14 represents a detached front elevation showing a suitable device for taking up the slack in the cable, chain, or rope used with this device.

Referring to the drawings in detail, 1 and 2 represent the framework, to which the hangers 3 and 4 are suspended or secured by bolts 5. (See Fig. 4.)

The framework above referred to may be constructed of any suitable material, cast-iron or wood. If made of cast-iron, it can be cast in one piece. If constructed of wood, it is preferably made in two parts, 1 and 2, the part 1 being rigidly secured to the part 2 by means of a bolt 6, substantially as shown in Fig. 4. When the device is designed to be used as an overhead counter-shaft, it may be attached to the ceiling in any well-known way.

The hangers 3 and 4 are preferably constructed of cast metal and may be formed in one piece, the two being preferably connected by a hollow or tubular portion 7, the portion 8 (see Fig. 3) being cast in one piece with it or otherwise rigidly secured in place within the said hollow portion 7. The object of this portion 8 will appear farther on. The driving-shaft 9 is mounted in boxes 10 and 11 in the hangers 3 and 4. To the driving-shaft 9 is rigidly secured by set-screws 12 (see Fig. 3) the driving-pulley 13, and at the forward end of the driving-shaft 9 is rigidly secured a driving-disk 14, and at the rear end is a longitudinal thrust-bearing 15. (See Fig. 3, where a section through the boxes inclosing this bearing is shown with the bearing in place therein.)

On the driving-shaft 9 are rigidly secured in any well-known way, by set-screws 16, for instance, (see Fig. 3,) two bevel driving-wheels 17 and 18, their smaller sides facing each other. The working faces of these bevel driving-wheels are preferably composed of paper, but any suitable material may be used.

To a lug on the hanger 4 is pivoted, by a pin 19, the combined toggle-case and lever-arm 20. At the lower end of this lever-arm is an angular depression or recess 21, forming one half of the toggle-case, and directly opposite the recess 21 is another recess 22 below the box 11 in the lower part of the hanger 4, which is stationary and unyielding, the recess 22 forming the other half of the toggle-joint case. (See Figs. 3, 6, 7, 9, and 10, where these toggle-joint recesses are shown.) The longitudinal thrust-bearing 15 at the end of the driving-shaft is mounted in a Babbitt box 23, (see Fig. 3, also Fig. 6,) the Babbitt metal being inclosed within the two half-box portions 24 and 25, which are securely fastened together by a bolt 26, (see Figs. 1 and 3,) the bolt 26 passing through the holes 27. (Shown in Fig. 8.) On each side of the lower portion 25 of this inclosing box is a trunnion 28. (Shown in Figs. 1, 6,

and 8.) When this box is secured and provided with Babbitt metal, above described and substantially as shown in Fig. 3, the lever-arm 20 is put in place. The lever-arm 20 is provided with an opening 29 (see Fig. 6) large enough to allow it to pass over the thrust-box 24 25, the trunnions 28 passing into the openings 30. (See Figs. 1 and 7.) The arm 20 is now dropped slightly to allow the openings 31 (see Fig. 7) to receive the trunnions, which act as supporting pivotal bearings upon which the arm 20 may turn.

Within the tubular portion 7 is a spiral spring 32, (see Fig. 3,) having one end resting against or secured to the supporting portion 8, and at the opposite end is a disk 33, having a pin 34 to keep it central against the spring 32, so that it is compressed between the portion 8 and the disk 33. The end of the spring 32 and the disk 33 passes through an opening in the hanger 4. (See Figs. 1 and 3.) At the outer side of the disk 33 is a conical depression. The point of a set-screw 35, which screws through the top of the arm 20 and is secured by a jam-nut 36, fits in said depression. The object of the screw 35 is to adjust the force of the spring 32.

In boxes 36^a, at the lower ends of the hangers 3 and 4, is mounted a shaft 37, capable of a longitudinal movement in said boxes. To or near one end of the shaft 37 is pivoted the metallic portion 38 of a wooden shifting bar 39, the wooden portion 39 being secured to it by bolts 40. This shifting-bar portion 38 is provided with a hole which is enlarged slightly from the center outward each way, substantially as shown at 40^a in Fig. 3, so that the lower end of the shifting bar is capable of a lateral as well as a forward-and-back movement. The upper end of the bar 38 projects up between the recess 21 in the lower end of the arm 20 and the recess 22 below the box 11 in the hanger 4, and is provided with a recess 41 on each side. (See Figs. 9 and 10, also Fig. 3.) The toggle-bars 42 43 are placed so that one end of the bar 42 fits in the recesses in the bar 38, and its opposite end rests in the bottom of the opening 21 in the arm 20, while one end of the toggle-bar 43 rests in the depression on the opposite side of the bar 38 and its opposite end rests in the depression 22 in the lower part of the hanger 4. (See Figs. 3, 9, and 10.) On each opposite side of the bar 38 is rigidly secured to the shaft 37, by set-screws, a collar 44. (See Figs. 1, 3, and 4.)

To the horizontal shaft 37 is rigidly secured, by a set-screw 45 or other well-known means, an upright standard 46, through which the shaft 9 slips easily. (See Figs. 1, 3, and 5.) At the top of the standard 46 is a vertical shaft 47, upon which is a winding-drum 48, having a spiral groove 49 and a bevel driven wheel 50. I have shown the spirally-grooved drum and bevel driven wheel in one integral piece, the preferred form, but they may be made in parts and secured together, if desired. The upper end of the vertical shaft 47 projects into a slot 51 in a plate 52, which is secured by bolts 52^a (see Fig. 5) to the transverse bars 53 and 54, which project out horizontally from the hollow portion 7. It will be noticed I have shown this hollow portion 7 as oval in cross-section, (see Fig. 5,) but any other suitable form will answer. A longitudinal view of the slot 51 is shown in section in Fig. 3, and a transverse section is shown in Fig. 5.

The object of the slot 51 is to steady the top of the vertical shaft 47 as it is moved lengthwise of the slot, as will more clearly hereinafter appear.

Secured to the end of the frame-piece 1 by bolts 55 is a hanger 56, and directly opposite it at the end of the frame-piece 2 is another hanger 57, also secured by bolts 55. At the lower ends of each of the hangers 56 and 57 are rigidly secured two parallel shafts 60 and 61. These shafts are preferably made round in cross-section and are arranged transversely to the shafts 9 and 37, or parallel with the driving-disk 14. On the shafts 60 and 61 is mounted a sliding carriage 62, in which is mounted a shaft 63 in boxes 64 and 65. (See Fig. 3.) At the outer end of the shaft 63 is a surrounding groove 66. (See Fig. 3.) A slotted plate 67, having a downward-projecting portion 68, which fits into the groove 66, is secured by a set-screw 68^a to the portion 69 at the end of the box 64, in which are an adjusting-screw 70 and the usual jam-nut. (See Fig. 3.) To the opposite end of the shaft 63 is rigidly secured in any well-known way the driven disk 71. I have shown it attached to the tapered end of the shaft by a nut 72, which answers the purpose very well. The driving-disk 14 is also secured to the driving-shaft 9 in a similar manner, as will be seen by reference to Fig. 3.

In the working face of the driven disk 71, near the periphery, is a ring of paper 73, which forms the frictional contact with the driving-disk 14 when in operation. This paper ring is inserted in a groove made in the metal disk, and is secured by screws 74, substantially as shown in Fig. 3.

Between the boxes 64 and 65 is firmly secured to the shaft 63 a driving-pulley 75. Projecting out from one side of the boxes 64 and 65 are two pairs of lugs or ears 76 and 77, between which are pivoted the two arms 78 79 of a tightening-pulley frame. The cross-piece 80, connecting with the arms 78 and 79, is located so as to act as a counterweight. (See Figs. 1, 2, and 4.) The lower portions of the arms 78 and 79 are provided with boxes 81 and 82, in which is mounted a shaft 83, carrying a tightening-pulley 84. (See Fig. 3, also Figs. 1, 2, and 4.)

The carriage 62, carrying the driven disk 71, is adapted to be moved back and forth on the bars or shafts 60 and 61, and thereby move the driven disk across the face of the driving-disk. This movement is obtained by

means of the power that operates the driving-pulley 13. One end of a rope or cord 87, or chain, or the equivalent thereof, is secured to the drum 48, near its upper end, by a suitable holding device 85. (See Figs. 1, 3, and 5.) The opposite end is then passed around the pulleys 88 and 89. (See Fig. 4.) From thence it passes to and is secured to one side of the carriage-releasing device 90, which will be described farther on. Another rope or chain 87^e or the equivalent thereof is secured at one end to the lower part of the drum 48 by a similar fastening device 85. The opposite end is then passed over or around the grooved pulleys 91 and 92, and from thence it passes to and is secured to the other side of the carriage-releasing device. (See Fig. 4.)

The carriage-releasing device consists of a jaw 93, pivoted to one side of the carriage by a pin 94. (See Fig. 12.) It is fitted so as to slide back and forth along the shaft or bar 61 with the carriage of which it forms a part, and is clamped tightly to the shaft or bar 61 by a bolt 95 and a spring 96, the force of which may be adjusted by the nut 96^a.

90 represents a link which fits loosely in the laterally-flaring opening 98 (see Figs. 12 and 13) and is provided with a square pin or substantially square pin 99, which projects down between the jaw 93 and the portion 62^c of the carriage-frame.

When the link 90 is in its normal position, it is the position shown by the dotted lines 97^e, (see Fig. 13,) but when it is moved to either side by a pull on the rope 87 or 87^e, for instance the rope 87, as shown in Fig. 13, the two corners of the square bolt, as the link 97 is turned to one side, cause the jaw 93 to open and thereby release the carriage, so it can be easily moved along the bars 61 and 62, and the moment it is released the spring 96 acts and brings the link 90 again to its normal position, and the driven-disk carriage is clamped fast by the jaw 93 and held securely in the position to which it may have been adjusted.

To the under side of the hanger 56 I have shown a curved rod 1^e, secured by a set-screw 2^e, to the lower end of which is attached a speed-indicator 3^e, having on its face a double series of figures 4^e and 5^e for indicating the speed. When this device is used on an engine-lathe, the figures 4^e will indicate the normal speed of the lathe, and when the back gear of the lathe is brought into action the figures 5^e will indicate the reduced speed. (See Figs. 1, 2, and 11.) An indicator-pointer is suspended so as to operate in a slideway in the speed-indicator 3^e. It is suspended by a cord 6^e, which extends up and over a grooved roller 7^e. (See Figs. 1, 2, 4, and 11.) From thence it passes horizontally, or substantially so, and is secured to a convenient point in the driven-disk carriage or frame—for instance at the point 8^e. (Shown in Figs. 3 and 11.)

In Fig. 14 I have shown a suitable means for taking up the slack in the rope or chain and holding it when thus taken up. It is located on the carriage-releasing-device link 90 and consists of an upright bar 3^f, either having a screw-threaded portion 4^f or a series of ratchet-teeth. Over this upright bar 3^f is a spiral spring 5^f, and supported on the spring is a perforated plate 6^f, to which the ends of the rope (which passes up through holes in the link 90) are secured in any well-known way. Referring to Fig. 14, the dotted lines 7^f represent a pivoted pawl which engages with the teeth in the upright bar 3^f by means of a spring 8^f. The operation of this device is as follows: If at any time the ropes 87 87^e should become slack, the spiral spring 5^f will force the plate 6^f upward and thereby draw up the slack rope. The pawl 7^f, as it is also moved up at the same time, will engage with the teeth in the upright bar 3^f and prevent the slack thus taken up from being drawn back again.

The operation of the variable-speed counter-shaft is as follows: When it is desired to bring the driven disk into action, the lower end of the shifting bar is moved forward by the operator. The toggle-joint is brought into the position shown in Fig. 9, which operation allows the spring 32 (see Fig. 3) to come into action and force the top of the arm 20 outward and that portion below the pin 19 inward, thereby causing the rotating driving-disk to be forced against the face of the driven disk and give it a rotating motion, which motion may be varied to any speed desired. When the shifting bar is moved backward or away from the operator, the toggle is in the position shown in Fig. 10, and the driving-disk is drawn away from the driven disk and its motion ceases. When it is desired to vary the speed, the shifting bar is moved sidewise either way or at right angles to the movement for starting or stopping the driven disk. When this movement of the shifting bar is made, the toggle-bars act as a fulcrum. A movement of the lower end of the shifting bar in the direction of the arrow V (see Figs. 1 and 3) will cause the shaft 37 to be moved in the same direction, thereby bringing the face of the bevel friction-wheel 50 in contact with the bevel friction-wheel 18, causing it to rotate, which operation will rotate the winding-drum 48 and wind up, for instance, the rope or chain 87 while it is unwinding the rope or chain 87^e, thereby moving the driven disk across the face of the driving-disk in one direction and varying the speed of its rotation. A movement of the lower end of the shifting bar in an opposite direction will bring the face of the bevel-wheel 50 in frictional contact with the bevel-wheel 17 and away from the wheel 18, thereby reversing the action and moving the driven disk in an opposite direction across the face of the driving-disk, thereby reversing the motion of the driven disk or varying its speed. During this operation of varying or reversing the motion of the driven disk the ropes or chains 87 and 87^e are wound and unwound in the spiral groove 49,

and the grooved wheels 88 and 91 rise and fall on their shafts 1^f and 2^f, as the rope or chain does while thus being wound or unwound on said drum. It will be noticed that the driven friction-disk is set at a very slight incline to the face of the driving-disk, so that a portion of one side only will be in frictional contact with the driving-disk. It will be also noticed that the driven friction-disk is not moved by hand across the face of the driving-disk, but it is actuated or moved by the power that operates the driving-shaft through the bevel driving-wheels, the power being brought into action by means of the shifting bar, the shifting bar 39 only (which requires but little power to operate it) being moved by hand to cause the engagement or disengagement of the driving and driven friction-gearing above described, which engagement is maintained only long enough to allow the driven disk to be moved to the point desired, which movement stops the instant the shifting bar is returned to a vertical or normal position. This construction is very important in a device of this kind because the power required to move the driven disk over the face of the driving-disk would in many instances be too great to be operated by hand.

Toothed gearing or other forms of gearing may possibly be used instead of the friction-wheels above set forth and would be an equivalent thereto, but I prefer the mechanism hereinbefore mentioned, because its engagement and disengagement are quiet, certain, and easy, while the ready engagement of toothed gearing is not certain, and when engagement does take place it is sudden, jarring, and noisy, and often injurious in its action.

It will be noticed by reference to Fig. 2 that as the driving-pulley 75 on the driven-disk shaft is connected by a belt 1^g to a pulley of some kind below it for driving a lathe or other machine a line connecting the two pulleys must be a line radiating from the movable center of the driving-pulley 75 to the substantially stationary center of the pulley it is intended to drive. Consequently the traveling movement of the pulley 75 would be in the line of a circle of which the driven pulley would be the center, whereas the movement of the carriage, its driven friction-disk, and the driving-pulley 75 is in a substantially straight line across the face of the driving-disk. The object of the weighted portion 80 is therefore to operate automatically and take up the slack above mentioned every time the speed of the driven disk is required to be varied, and thereby keep the belt 1^g taut at all points of the movements of the driven friction-disk.

It will be readily seen that it is very important in this construction to have a suitable means acting automatically, as above described, for taking up the slack at every portion of the movements of the driven friction-disk. It is necessary that every time the driven disk is adjusted to a given speed to have it locked in position, and it is equally as necessary that the belt on the driven-disk pulley be taut at every such adjustment.

I claim as my invention—

1. In a frictional gearing, the combination, with a longitudinally-movable rotatable shaft having a disk at one end thereof, of a carriage adjacent to and movable in a plane parallel with the face of the disk, a rotatable shaft journaled in said carriage having a disk at one end, the face of which is at an angle to said first-mentioned disk, mechanism intermediate the carriage and the longitudinally-movable shaft for automatically moving the carriage when the first-mentioned shaft is moved longitudinally, and means for moving the shaft so as to place the disk into or out of contact, substantially as set forth.

2. In frictional gearing, a rotatable shaft having a disk mounted thereon at one end thereof, slideways at right angles to said shaft, a carriage reciprocably movable on said slideways, a rotatable shaft journaled in said carriage and having a disk secured thereto and adapted to contact with said first-mentioned disk, two bevel-wheels mounted on said first-mentioned shaft, a bevel-wheel adapted to gear with either of said two bevel-wheels and having secured to its shaft a drum with a spiral grooved periphery, and cords connected with said drum and said carriage, said bevel-wheel shaft having its bearing movable on said first-mentioned shaft, said parts being combined substantially as described.

3. In a frictional gearing, the combination, with a driven disk and a slideway adjacent thereto and parallel therewith, of a movable carriage upon the slideways, a driven disk upon the carriage at a slight angle to the other disk and adapted to be moved entirely across its face, a lever for moving the disks into and out of engagement, and automatic means for moving the one disk across the face of the other when the lever is operated, substantially as set forth.

4. In a frictional gearing, the combination, with two disks, one of which is movable entirely across the face of the other, of a shifting bar capable of movement in two directions, at substantially right angles to each other, and means for connecting the bar with the disks, whereby the movement of the bar in one direction will place the disks into or out of contact, and a movement in the other direction will vary the direction and rate of speed of the disks relatively to each other, substantially as set forth.

5. A variable-speed counter-shaft, consisting of a supporting-frame, a driving-shaft mounted therein, a driving-disk at its forward end, an arm or lever pivoted to the rear hanger, a yielding spring engaging with said arm, means for adjusting the force of said spring, a pivoted box, a thrust-bearing connecting the lower end of said arm with the rear end of the driving-shaft, a shifting bar

and connecting mechanism for moving the driving-disk away from the driven disk, or allowing the spring to act and bring the driving-disk into frictional contact with the driven disk, substantially as set forth.

6. In a variable-speed counter-shaft, the combination, with supporting-hangers, of a driving-shaft mounted in suitable boxes in said hangers, a driving-disk at one end of said shaft, an arm pivoted to the rear hanger, a yielding spring engaging with said arm, a box pivoted in said arm below its pivotal center, a thrust-bearing connecting said arm with the opposite end of the driving-shaft, a toggle-joint having one end of one of its members located within a recess in the lower end of the pivoted arm, and the other member having one end located in a recess in the lower portion of the rear hanger, and a pivoted shifting bar having depressions at each side of its top end in which are located the two opposite ends of the toggle-joint bars, for moving the driving-shaft and its driving-disk away from the driven disk, substantially as described.

7. In a variable-speed counter-shaft, the combination, with a driving friction-disk, its driving-shaft and operating mechanism, of a supporting-frame, a slideway mounted thereon, at right angles to the driving-shaft, a sliding carriage mounted on said slideway, a driven disk on said carriage facing the driving-disk at a slight angle thereto so that a portion of one side only is in contact therewith, two driving bevel-wheels on the driving-shaft, a vertical shaft between said wheels, a beveled driven wheel and winding-drum mounted thereon, cords or cables connecting the winding-drum with the driven-disk carriage, and a pivoted shifting bar and its connecting mechanism, for moving the driven bevel-wheel to or in engagement with one or the other driving bevel-wheels, and thereby causing a movement of the driven disk on the face of the driving-disk, substantially as set forth.

8. A variable-speed counter-shaft, consisting of a supporting-frame, a driving-disk capable of a rotary movement in its bearings, two bevel driving-wheels and a driving friction-disk mounted on said shaft, in combination with the supporting-frame, a transverse slideway, a carriage thereon, a driven friction-disk mounted in said carriage, at a slight incline to the working face of the driving-disk, so that a portion only on one side of its center is in frictional contact therewith, a driven bevel-wheel, means connecting it with the driven friction-disks, a shifting bar, and means for bringing said driven bevel-wheel into engagement with one or the other bevel driving-wheels on the driving-shaft, and thereby causing a movement of the driven friction-disk on the face of the friction driving-disk, substantially as set forth.

9. In a variable-speed counter-shaft, the combination, with a depending supporting-frame, of a driving-shaft mounted therein, capable of a longitudinal and a rotative movement in its bearings, a driving-disk rigidly secured to the forward end of said shaft, an arm pivoted to the rear frame-piece, a spring for moving said arm on its pivotal center in one direction, means for adjusting the force of said spring, a pivoted box, a thrust-bearing connecting the lower end of said arm with the rear end of the driving-shaft, and a shifting bar and connecting mechanism for moving the pivoted arm in an opposite direction against the force of said spring, and thereby operating the driving-disk, substantially as set forth.

10. In a variable-speed counter-shaft, a depending supporting-frame, a transverse slideway mounted on said frame, a movable carriage mounted on said slideway carrying a driven disk mounted on a shaft so as to be capable of rotation, boxes on said carriage, in combination with a driving-disk rigidly secured to a driving-shaft set nearly at right angles to the driven-disk slideway and mounted in bearings in a depending frame, the driven disk being adapted for contact with a portion of its face on the driving-disk, means including bevel-gearings connected with and operated by the driving-shaft for moving the driven-disk carriage in its slideway and thereby moving the driven disk on the face of the driving-disk, a support for the shaft of one of said bevel-gears, mounted on the shaft of the driving-disk, and a shifting bar for bringing said bevel-gearing into or out of engagement, substantially as set forth.

11. In a variable-speed counter-shaft, the combination, with the driven-disk carriage and slideway on which it travels, of a clamping device, a spring for closing the same and holding the carriage to the slideway at any point to which it may be adjusted, a carriage-releasing bar and means for operating it and opening the clamp and releasing the carriage, and moving the latter, substantially as set forth.

12. In a variable-speed counter-shaft, the combination with the driven-disk carriage and a slideway upon which it slides back and forth, of a pivoted clamping-bar and a closing-spring for locking the driven-disk carriage when adjusted to the desired point, and means substantially as above described, whereby the driven-disk carriage is released just prior to being moved and instantly locked the moment the desired adjustment is made, substantially as set forth.

13. In a variable-speed counter-shaft, the combination, with a driven friction-disk, of a carriage upon which it is mounted on a rotatable shaft, and a track or slideway secured in a depending frame for said carriage to move on, a driving-shaft mounted at right angles to the carriage-slideway in boxes in a depending frame, and capable of a rotating and a longitudinal movement in its bearings, two bevel driving-pulleys mounted on the

driving-shaft, a shaft mounted below the driving-shaft in boxes and capable of a longitudinal movement only in said boxes, an upright standard mounted rigidly on said shaft, a vertical shaft journaled in said standards, a winding-drum and bevel-gears secured to said vertical shaft, ropes or cables connected with said winding-drum and with the driven-disk carriage, grooved friction-pulleys for keeping said ropes in position, and means for moving the driven bevel friction-wheel from one to the other driving bevel-wheels and thereby causing the movement of the driven friction-disk across the face of the driving-disk, substantially as set forth.

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Witnesses:
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