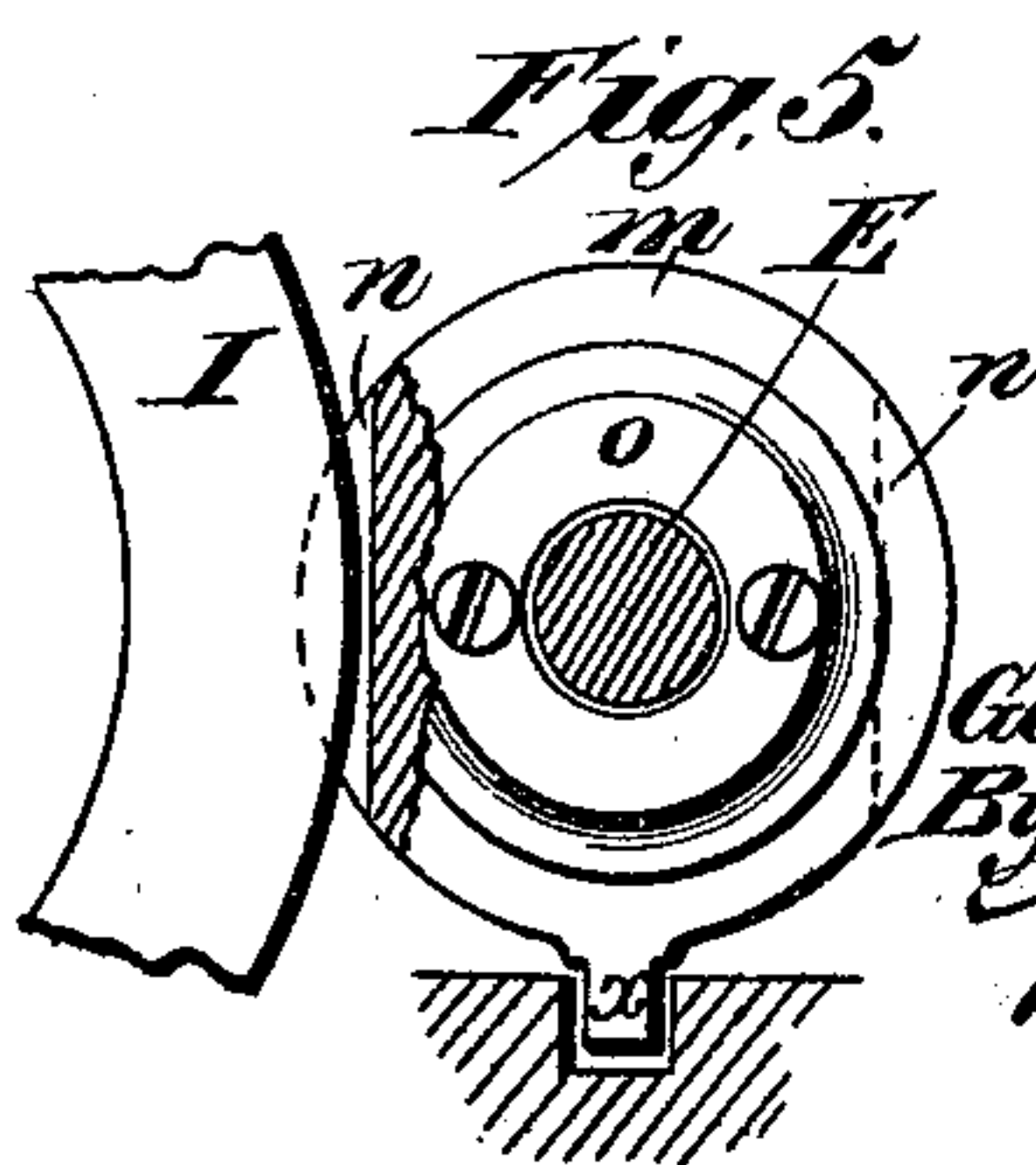
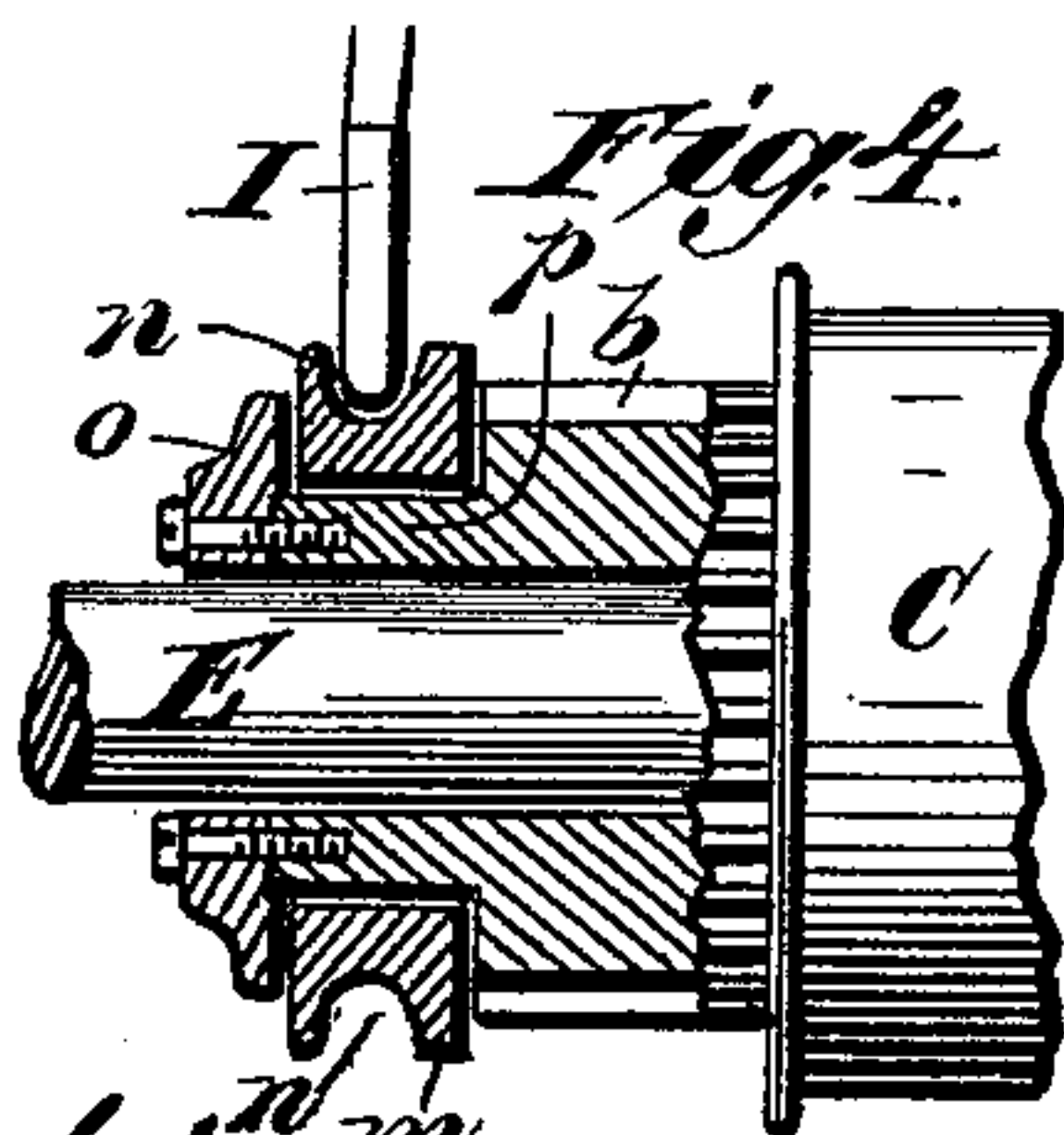
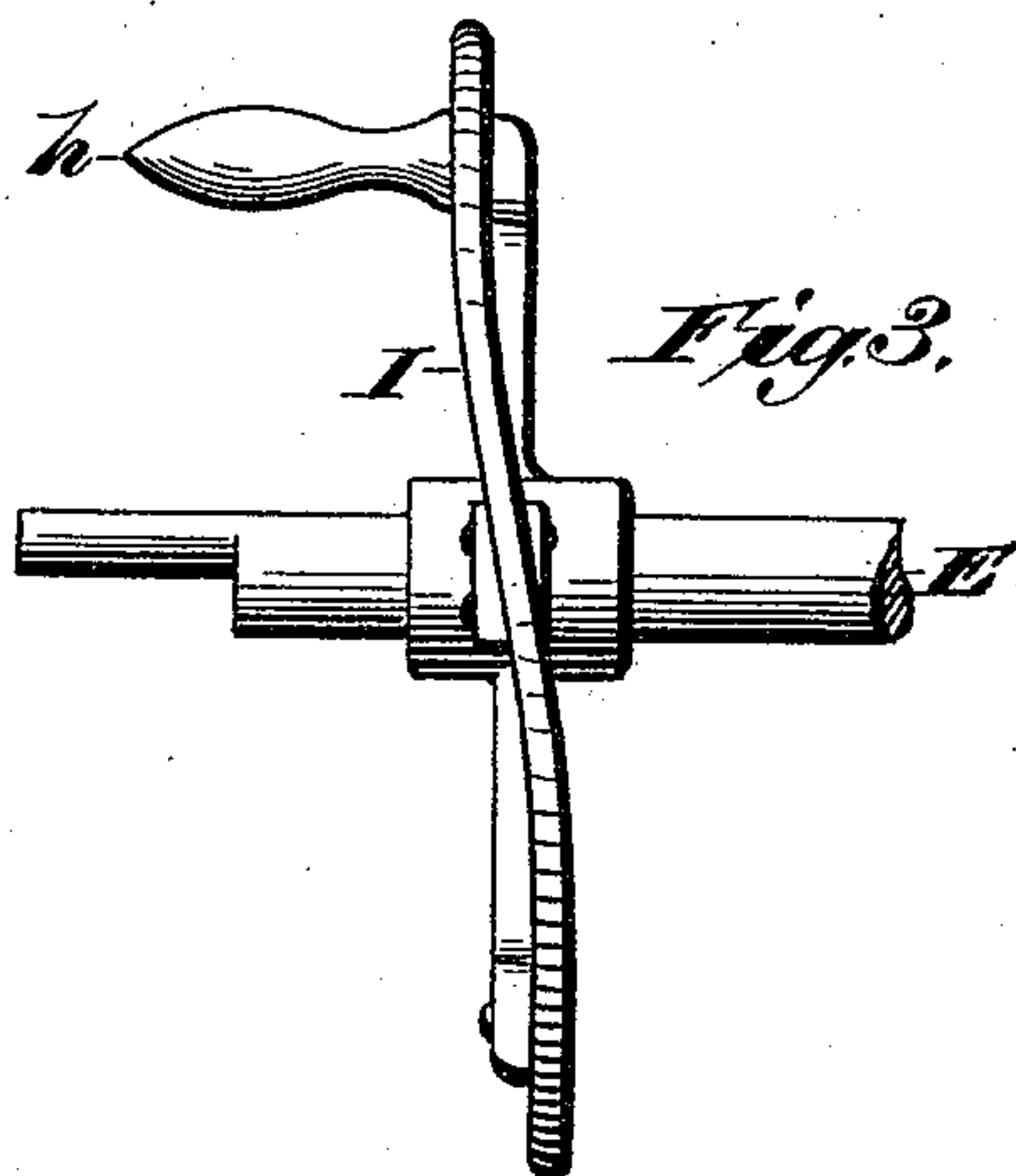
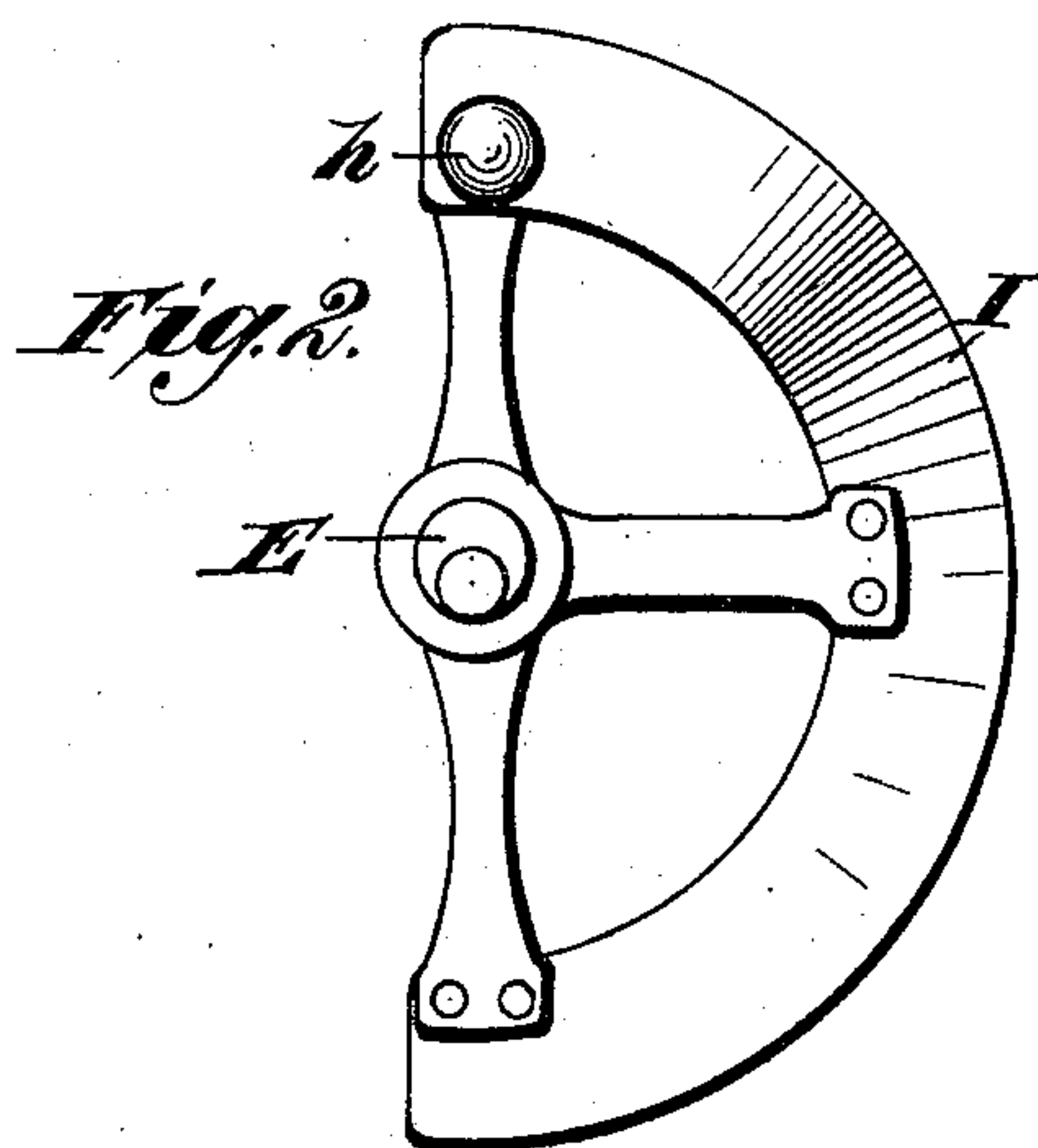
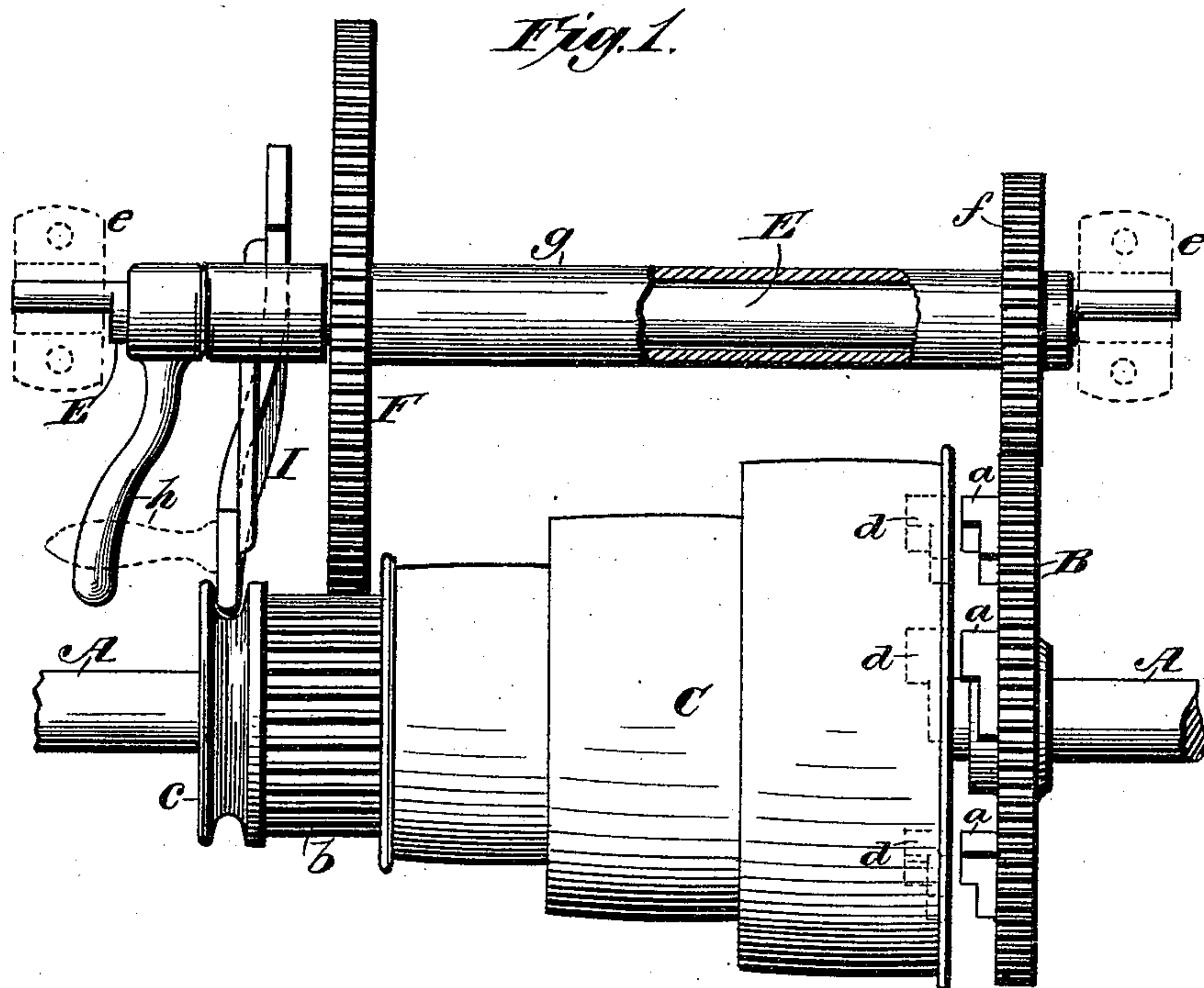


(No Model.)

G. H. BENNETT.
LATHE.

No. 436,013.

Patented Sept. 9, 1890.



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UNITED STATES PATENT OFFICE.

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LATHE.

SPECIFICATION forming part of Letters Patent No. 436,013, dated September 9, 1890.

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To all whom it may concern:

Be it known that I, GEORGE H. BENNETT, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Speed-Changing Mechanism for Lathes, &c., of which the following is a specification.

My invention relates to mechanism for changing the speed of shafting, spindles, &c., in certain machines—such, for example, as lathes, drilling-machines, &c., in which changes of rotative speed are frequently necessary, its object being to accomplish the desired change expeditiously without shifting belts or stopping the machine, thereby saving valuable time and enabling the workman to concentrate his attention upon his work without interruption.

To this end it consists in the combination of a transfer counter-shaft gear journaled parallel with the driven shaft in eccentric rotative bearings, so as to be thrown into or out of engagement therewith, a loose driving-pulley upon the main shaft adapted to be shifted laterally into or out of engagement with its shaft, gears upon the main shaft and driving-pulley adapted to be engaged by the counter-shaft gear, and means whereby the driving-pulley is disengaged from the main shaft and the transfer-gears thrown into mesh with the driving-pulley gear and shaft-gear at the same operation.

A good illustration of the nature and advantages of my invention is seen in its application to the ordinary turning-lathe, where it is frequently necessary to change the speed of the spindle. The common device for this purpose is as follows: The spindle carries a disk spur-gear, behind which the driving-pulley (usually a "cone-pulley") rests loosely upon the spindle, and is engaged with or disengaged from the spur-gear by a bolt-connection extending through and manipulated from the outer face of the gear by hand or a wrench. When disengaged, the driving-pulley runs loose upon the spindle, but is made to again engage the spindle through the medium of a spur-pinion constituting a part of the cone at the opposite end, with which and the spur-gear of the spindle the transfer-gears are brought into mesh by rotation of the counter-

shaft in its eccentric bearings. To bring these devices into play involves considerable trouble and delay, besides the expense usually of an extra counter-shaft and belt-shifting devices by which the motion of the belting is stopped. When all is stopped, the spindle is rotated by hand to bring the bolt-head connection into position for manipulation. The cone is then disengaged from the spindle, and the transverse gear then set up into connecting position, with usually some trouble in causing the gear-teeth to mesh, and when all is ready the driving-belt is shifted back again and the lathe is again set in motion. The change back again involves the same operations in reverse with nearly the same trouble and loss of time, all of which distracts attention from the work in hand.

In my improvement either change is effected by a single simple movement, and in light work is done instantaneously without shifting the belting or stopping the motion of any part, and even when the work is heaviest the entire stoppage of the motion is unnecessary. The mechanism by which this is accomplished is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the spindle of a lathe, with the necessary attachments complete, constructed according to my invention in its preferred form; Fig. 2, a side or face view of the shifting-cam detached; Fig. 3, a front edge view of the shifting-cam detached; Fig. 4, a horizontal axial section of a modified construction and mounting of the grooved pulley with which the shifting-cam engages; Fig. 5, an end view of the same.

Referring now to the drawings, the lathe spindle A (which may represent any spindle to which a differential speed is to be given) is provided with a fixed disk spur-gear B, having at its rear side a concentric series of clutch projections *a*. Adjacent to the gear B is the driving-pulley C, (shown as a cone-pulley,) having beyond the belt-faces a slightly-elongated spur-pinion *b* and terminated by a peripherally-grooved section *c*. The driving-pulley, with its belt-sections, spur-pinion, and grooved terminal section, is integral and is loose upon the spindle and free to move laterally into or out of engagement with the clutch projections *a*, and to this end

its face is adjacent to the spur-gear B, is correspondingly recessed, as at *d*, (shown by dotted lines,) to engage the projections *a* and form a clutch-engagement with said pulley 5 when shifted into engaging position.

At the rear of and parallel with the spindle A is a counter-shaft E, having eccentric terminal journals, mounted in bearings *e*, and carrying spur-gears F, coupled by a sleeve *g* 10 loose upon the shaft. The partial rotation of the shaft E by a handle *h* places the gears F and *f* in mesh with the gears *b* and B, in pairs, respectively.

Adjacent to the gear F and fixed upon the 15 shaft E is a segmental cam-disk I, whose outer edge is formed through a portion of its circumference to a spiral, as indicated in the edge view, Fig. 3, and also slightly eccentric to compensate for its eccentric-shaft bearing. 20 The outer edge of the cam-disk engages in the grooved section *c* of the driving-pulley, and by rotation the spiral edge of cam I moves the driving-pulley C laterally. The relative direction of the spiral is such as to 25 shift the pulley C into engaging relations with the gear B when disengaging the transfer-gears F *f*, and vice versa, and the relative position radially and extent circumferentially of the spirally-formed portion are such as to 30 cause the driving-pulley to be completely detached from the gear before causing the gears F *b* and *f* B to mesh, and vice versa, to throw the gears apart before engaging the driving-pulley. The teeth of the spur-gears being 35 similarly spaced apart, they engage very readily while one set is in motion, and the change is thus effected by simply turning a handle *h*, which may be attached to the shaft E or to the side of the cam I.

40 In the modification shown in Figs. 4 and 5 I place in the grooved section *c* or upon a suitable projection *p* of the spur-gear *b* a loose collar *m*, having at one or more portions a partial peripheral groove *n*, as indicated by 45 dotted lines in Fig. 5, in which the cam-disk I engages. The collar is held against rotation by a pin *x*, projecting radially into a groove cut in the base of the head-stock, as indicated in Fig. 5, or otherwise, as may be convenient, and is secured at the end by a washer 50 *o*, screwed to the end of the projection *p*. While for illustrative purposes I have shown and described herein the application of the invention to a lathe as a convenient example, 55 it will be obvious that its range of application extends to all machines in which definite changes of speed are necessary or desirable to be given to a spindle or shaft.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. In combination with a shaft or spindle to be driven at differential speeds, a spur-gear fixed thereon, a driving-pulley running loosely thereon and shiftable laterally to engage or disengage the spindle, a spur-gear 65 upon said driving-pulley, an eccentric counter-shaft carrying coupled transfer-gears adapted to mesh with the gears of the driving-pulley and spindle, respectively, and 70 mechanism for shifting the driving-pulley laterally out of engagement with its spindle and engaging the counter-shaft gears with those of the driving-pulley and spindle, substantially as set forth.

2. In speed-changing mechanism, the combination of the following instrumentalities, 75 viz: a spur-gear upon the driven spindle, a loose driving-pulley adjacent thereto upon the spindle and adjustable laterally into or out of rotative engagement therewith, a spur-gear 80 formed with or attached to said driving-pulley, a counter-shaft carrying spur-gears coupled in such relation that by rotation of the counter-shaft they are brought into or out of mesh with the spur-gears of the driving-pulley and spindle, and a spiral cam fixed 85 upon the counter-shaft and engaging in a peripheral groove of the driving-pulley, whereby upon rotating the counter-shaft to engage or disengage the said spur-gears of the counter-shaft with those of the spindle and 90 driving pulley the driving-pulley is shifted out of engaging relations with its adjacent spur-gear, and vice versa, substantially as set forth. 95

3. In a lathe, the combination of the spindle, the spur-gear attached thereto and provided at the pulley side with interlocking lugs, the driving-pulley loose and laterally shiftable upon the spindle and provided with 100 interlocking recesses at the gear side corresponding with the lugs of the spur-gear, and means for shifting the cone-pulley into or out of engagement with the spur-gear, substantially as set forth. 105

4. In a lathe, the combination of the spindle having a spur-gear thereon provided with interlocking face-lugs, the cone-pulley provided with corresponding face-recesses and loose and laterally adjustable upon the spindle 110 into and out of engagement with the spur-gear, an elongated spur-pinion at the remote end of the cone-pulley, the back gears, the eccentric back-gears shaft, and connections between the back-gears shaft and the cone-pulley, substantially as set forth. 115

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