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BELT SHIFTER FOR STEPPED CONE PULLEYS.

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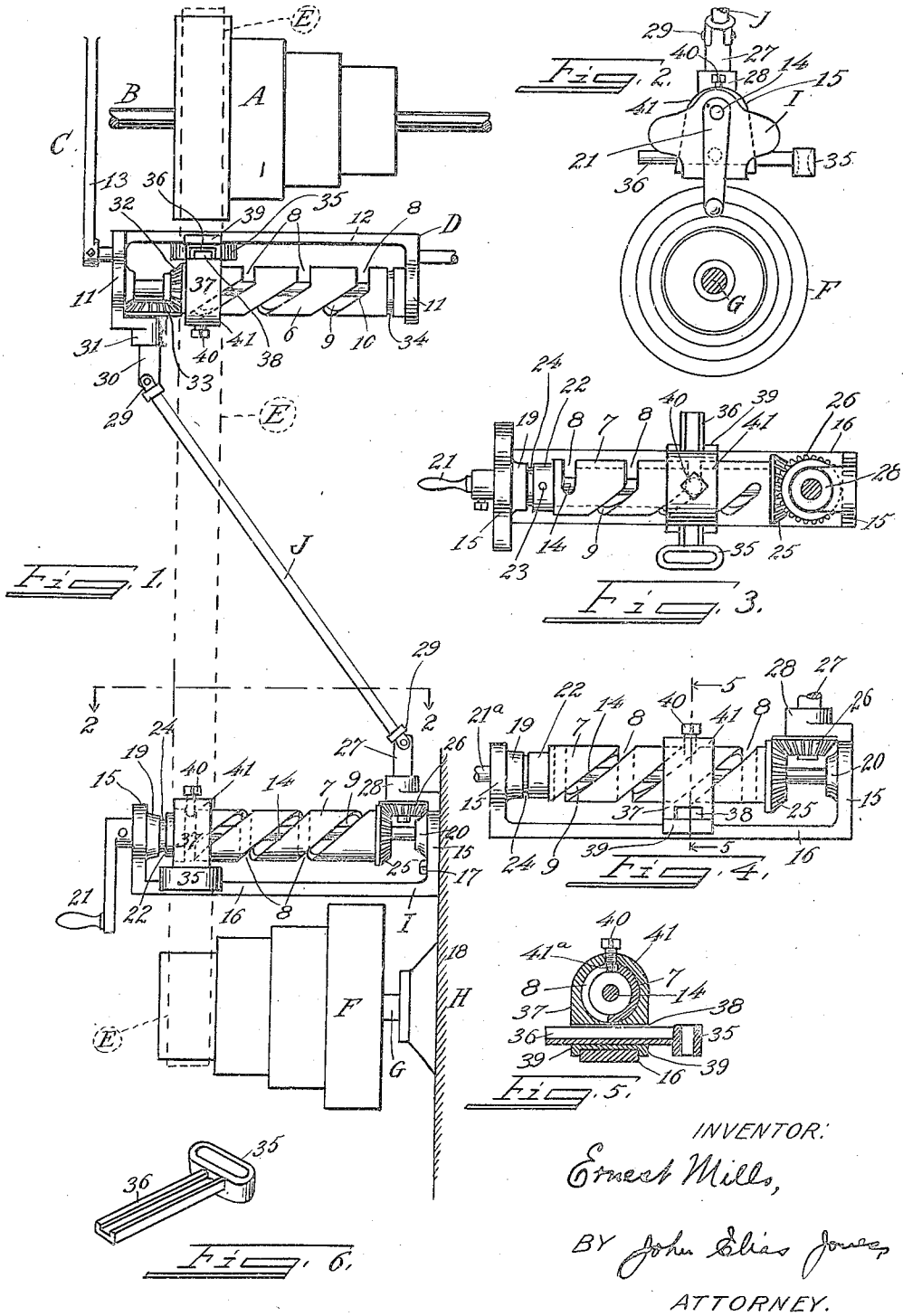

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

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BELT SHIFTER FOR STEPPED CONE PULLEYS.

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To all whom it may concern:

Be it known that I, ERNEST MILLS, a citizen of the United States of America, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented a certain new and useful Improvement in Belt Shifters for Stepped Cone Pulleys, of which the following is a specification.

This invention relates to belt-shifters of the rotary, irregularly or spirally grooved cam type for use in connection with the changeable-speed transmissions of the reversely-set stepped cone-pulley form, and its object is to simplify as well as to appreciably cheapen the cost of the structure without sacrificing the efficiency thereof, or its lasting and reliable qualities, to otherwise facilitate its operations, and to reduce, to a decided minimum, wear and noise in use.

The details of structure will be fully hereinafter described in connection with the accompanying sheet of drawings, in which—

Figure 1 is a front elevation showing the belt (in dotted lines) at its highest driving-point;

Figure 2, an end elevation of the improved device, taken below the level indicated by the dotted-line 2, 2, of Fig. 1, omitting the belt, but showing the lower end of the connecting-rod used between the pair of belt-shifter devices of the upper and lower stepped-cones;

Figure 3, a plan view of the lower spirally-grooved cam and its mounting-bracket, and showing the miter-gear driving-connection, with the upright extension shaft or pin of the latter in cross-section;

Figure 4, a longitudinal elevation of the said lower spirally-grooved cam shown in Fig. 3, including the belt-shifting carrier or traveler, but omitting its transverse slide-bar that has the guide-eye for the belt therein, and, also, omitting the hand-crank of the cam;

Figure 5, a transverse section, taken on the dotted-line 5, 5, of Fig. 4, showing the spirally-grooved cam and the belt-shifting carrier or traveler, but, also showing the transverse slide-bar and its belt guide-eye; and—

Figure 6, a perspective view of the said transverse slide-bar and its belt guide-eye.

In these views:—

A indicates the upper driving stepped-cone; B, its shaft; C, one of the hanger-arms; and D, the mounting-bracket adapted to carry the upper cam-shifter for the upper bight in the belt E (shown dotted) that is to be moved transversely in the changing of the various speeds at which it is desired to run the machine.

F indicates the lower or driven stepped-cone, reversely-set to and in alinement with that of the upper cone A; G, its shaft extending from the part H of the machine that is to be run at changeable speeds in its operation on material to be suitably shaped or otherwise dressed or prepared for use; I, the mounting-bracket adapted to carry the lower cam-shifter device for the lower bight in the said belt; and J, the connecting-rod for coupling the pair of said reversely-set upper and lower cam-shifter devices so that they shall act in alined-unison in transmitting the power from the upper driving cone to the lower driven one for imparting the desired changeable speeds to the machine.

Thus far the reversely-set stepped-cone changeable-speed devices are of ordinary form and common to numerous variable-speed operated machines. I will now take up my peculiar form of belt-shifter containing my invention herein.

6 and 7 respectively indicate the upper and lower cylinders or drums, the one, 6, being located and alined parallel to and beneath the upper stepped-cone A, and the other, 7, being located and alined parallel to and axially above the lower stepped-cone F. These drums are counterparts of each other and are set in parallel alinement, with the connecting-rod J between them, as best shown in Fig. 1. Each drum has a cam-groove made longitudinally along its periphery or circumference, such cam-groove being of irregular form and having straight circumferential parts 8 at regular parallel intervals apart, and, also, having spirally-directed parts 9 that lead to and pass from the said parallel straight parts 8 along the surface of the drums, as best shown in Fig. 1 and well shown in Figs. 3 and 4. The object of these mixed or straight-and-spiral cam-grooves is two-fold, the straight parts of the grooves being relative to or coincident with the normal set or running positions of the belt when engaged over the desired respective steps in the two reversely-set cones, and the spiral parts being those relied on in the transverse shipping or shifting movements

of the belt when transferring it along the stepped-cones from one step to the desired other one to suit the desired speed at which the machine is to be run.

The upper cam-drum 6 is mounted on an axial-shaft 10 that is journaled at its opposite ends in the pendent end-walls or arms 11, 11, of the horizontal suspension-frame bar 12, the latter, in turn, being mounted at the lower ends of hanger-arms 13 (one-only, of those C, being shown), and the lower cam-drum 7 is mounted on an axial-shaft 14 journaling at its opposite ends in the end-walls or upright arms 15, 15, of the horizontal base-bar 16 (of the lower bracket I) that is secured by means of bolts or the like 17 to the side-part 18 shown at H in fragmentary-section only) of the machine to be operated by the changeable-speed mechanism herein.

Suitable bosses 19 and 20 are provided on the inner faces of the upright-arms 15, 15, for more extended bearings for the shaft 14, and the same structure prevails in the upper shifter-member in connection with the pendent end-walls 11, 11.

21 indicates a hand-crank attached to the extended outer end 21^a of the lower axial-shaft 14, convenient to the reach of the operator of the machine for shifting the belt when it is desired to change the speed thereof.

In the lower cam-shifter device the drum has a protuberant hub 22 at one end thereof that is secured by means of a pin 23 or the like to the shaft, so that the drum shall turn with the shaft, and a suitable washer 24 is placed between the said hub 22 and the adjacent boss 19 to provide for any undue wear, end-thrust or otherwise. At the opposite end of the said drum of the lower shifter device is keyed a miter-gear 25 on the shaft 14 that is adapted to be engaged with a driving miter-gear 26 at the lower end of a vertical short shaft or pin 27, the latter journaling in a horizontal box 28 that extends inwardly from the upper end of the adjacent end-wall 15 of the base-bar 16. The upper end of the said short shaft 27 is pivotally-connected at 29 to the lower end of the coupling-rod J and the upper end of said coupling-rod is likewise connected at 29 to the lower end of a short shaft or pin 30 that journals in a horizontal box 31 at the lower end of the adjacent pendent arm 11 of the horizontal suspension-bar 12 of the upper cam-shifter device.

The detail parts comprising the upper drum, its cam-groove, its axial-shaft, its miter-gear 32, the miter-gear 33 at the upper end of the said short shaft 30, together with the washer 34, correspond to the like parts in connection with the lower shifter device and will now need no repeated description thereof.

In both the upper and lower shifter devices a transversely-slidable guide-eye 35 is provided at the outer end of a ribbed bar 36 together with a traveler or mounting-carrier 37, the latter being movable or slidable along the drum in each shifter device, and which I will now briefly describe in detail. The ribbed bar 36 of each of the two shifters engages a transverse slot or guideway 38 made in the base of its traveler or mounting-carrier 37, the body-portion of the latter being a cylindrical block or ring whose inner diameter or orifice is very slightly larger, for clearance, than that of the outer diameter of the drum, which it encircles and along which it is adapted to freely slide back and forth in the adjustment of the belt that passes through said guide-eye 35 of each shifter. The base or bottom of each traveler 37 has vertical side-extensions 39 that span the respective upper suspension-bar 12 and the lower base-bar 16 that form track-ways therefor, as best shown in Fig. 5 in connection with the lower-shifter device. A vertical set-screw or switch-post 40, that has a plain, tracer, inner end 41^a, engages a threaded opening made in the apex of the ring-portions 41 of the carriers 37, and its said inner, plain end 41^a is adapted to engage the irregular slot or cam-groove of the drum, so that when the belt is to be shifted or switched sidewise in either direction, the hand-crank 21 is turned so as to rotate the lower drum, which is rotably-coupled with the upper drum by means of the connecting-rod J, whereby both drums shall act in unison, with the straight portions of their cam-grooves alternately in alinement for the continuous running of the belt where placed, and with the spiral parts of the said cam-grooves used to force or feed the two travelers 37 along their several drums and simultaneously transfer or switch the said belt sidewise along the respective stepped-cones A and F, to suit the desired speed at which the machine is to be run. The guide-eye slide-bars 36 for the belt move automatically back and forth in their slots 38 as the belt shifts from step to step along the several cones, the bights in the belt at top and bottom changing or widening and narrowing, as the case might be, or duly compensating for the deflection or passage sidewise of the belt, back and forth, in the shifting operation thereof.

In operating the pair of shifters, the hand-crank 21 is turned so as to rotate the lower cam-drum, which transmits rotary movement to the miter-gears at one end thereof and thence, through the connecting-rod J, imparts motion to the upper cam-drum through the upper pair of miter-gears, whereby the upper traveler or carrier-block first starts to move along the upper cam-drum to shift the upper bight in

the belt. The said first sidewise-movement of the belt is effected by the upper switch-post whose inner end engages the beginning of the first spiral part of the cam-slot in the upper drum, and the latter is made to turn a half revolution so as to clear the said first spiral part of the cam-slot and the said upper switch-post to enter the first straight part in the cam-slot, and at which moment the second or next step in the upper cone has been fully effected or reached with the upper bight in the belt in full engagement therewith, ready for the further turning of the said upper switch-post in the first straight portion of the cam-slot, and, also, for the entrance of the lower switch-post into the first spiral part of the cam-slot of the lower drum, after passing from the straight first part of the said lower cam-slot in which the said lower switch-post has been engaged during the first half revolution of the lower drum, and then the transfer of the lower bight in the belt follows, to become taut on the second step of the lower cone, and without the use of any idlers at any time.

I claim:—

1. In a belt-shifter device for a pair of parallel, vertically-alined, reversely-stepped cone-pulleys, the combination of an upper hanger-and-track frame having journal bearing-arms at its opposite ends, a drum or cylinder having an irregularly-formed slot along its periphery, an axial-shaft for said drum, a longitudinally-movable traveler having a tracer-pin adapted to engage said slot in the drum, a transversely-slidable bar having a belt loop or guide-eye at one end thereof and reciprocally-supported by the said traveler, a vertical, obliquely-arranged rotatory connecting-rod, a lower hanger-and-track frame having journal bearing-arms at its opposite ends, a drum or cylinder having an irregularly-formed slot along its periphery and corresponding to that of the said upper drum, an axial-shaft for said lower drum, a longitudinally-movable traveler having a tracer-pin adapted to engage the said slot in the lower drum, a transversely-slidable bar having a belt loop or guide-eye at one end thereof and reciprocally-supported by the said lower traveler, miter-gears mounted on the said upper and lower hanger-and-track frames at the respective opposite ends of the said vertical oblique connecting-rod and having pivotal-connection therewith so that the upper and lower drums shall act in unison, and a hand-crank for use in rotating the said lower slotted drum and thence, through the medium of the said connecting-rod and miter-gears, rotating the upper slotted drum, both in unison, substantially as herein shown and described.

2. In a belt-shifter device for reversely-stepped cone-pulleys or variable-speed mechanism, a drum or cylinder having a longitudinal cam slot or groove constructed along its periphery or circumference, an axial-shaft for the said drum, a hanger-and-track frame, a traveler or carrier-block adapted to be moved or slid lengthwise along the track-portion of the said hanger-and-track frame, and having a transverse slot or guide-way in its lower portion or base, a belt guide-eye having an extension bar or arm adapted to engage within and slide across the said slot or guide-way in the base of said traveler or carrier-block and thereby automatically compensate for the variable widths of bights in the belt as it is slid or moved sidewise in shifting it for different speeds desired, and a vertical coupling or tracer pin in the said traveler or carrier-block adapted to freely engage the said cam-slot in the drum for moving the carrier along the track or base-bar of the said hanger-frame, substantially as herein shown and described.

ERNEST MILLS.