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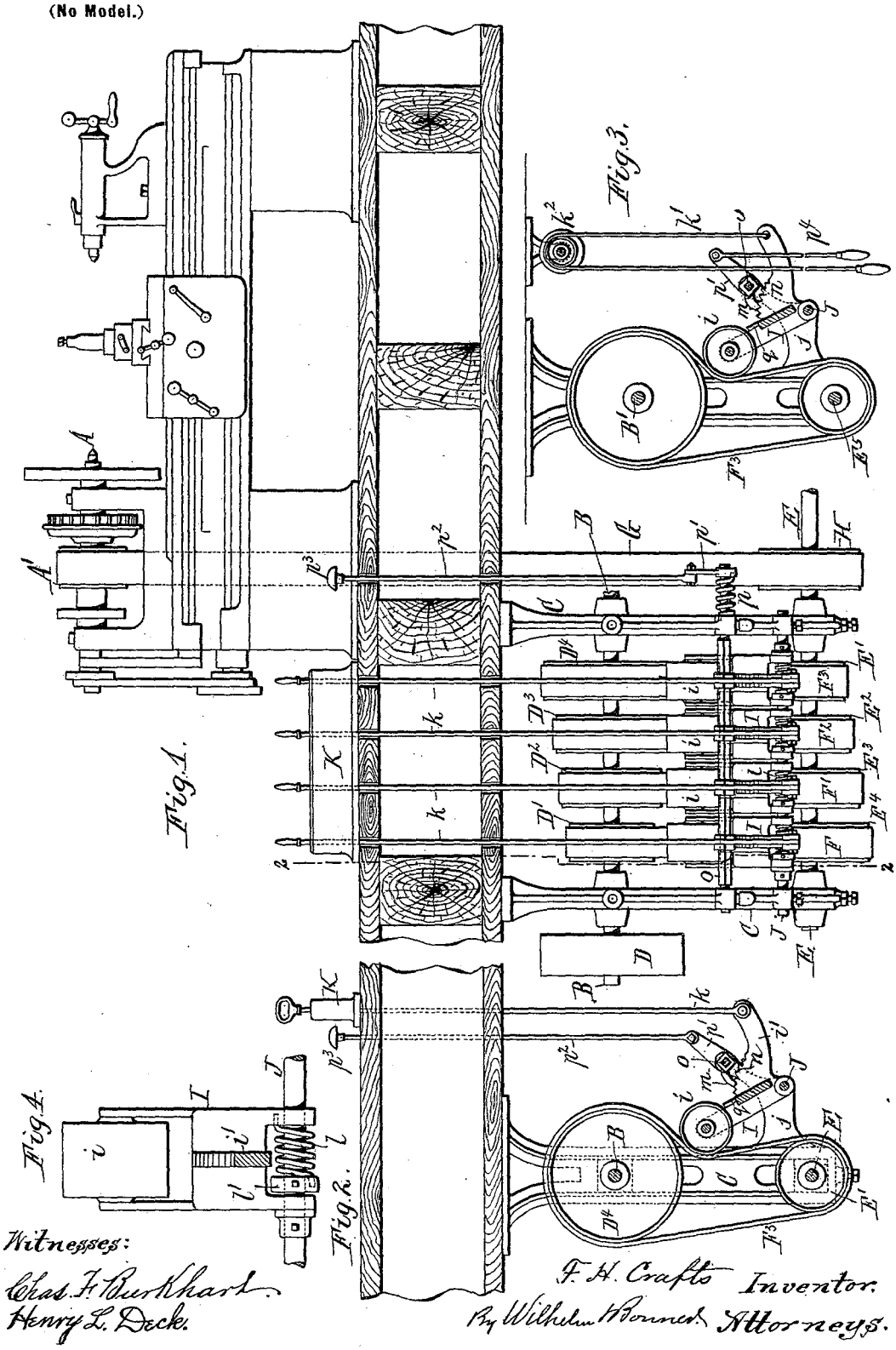
F. H. CRAFTS.

SPEED CHANGING DRIVING MECHANISM FOR LATHES.

(Application filed May 5, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SPEED-CHANGING DRIVING MECHANISM FOR LATHES.

SPECIFICATION forming part of Letters Patent No. 622,329, dated April 4, 1899.

Application filed May 5, 1898. Serial No. 679,748. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. CRAFTS, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Speed-Changing Driving Mechanism for Lathes, &c., of which the following is a specification.

This invention relates to a driving mechanism for lathes and other machines in which it is necessary to change the speed of the machine in accordance with the nature of the material or the character of the work to be performed, and more especially to driving mechanism which permits the speed to be quickly changed without the necessity of shifting the belt leading to the driving-pulley of the machine. Such a variable-speed driving mechanism is shown and described in Letters Patent of the United States No. 499,159, granted to me on the 6th day of June, 1893.

The object of my present invention is to simplify the driving mechanism and to improve the construction of the belt-tighteners used in connection therewith.

In the accompanying drawings, Figure 1 is a front view of my improved driving mechanism in connection with a lathe. Fig. 2 is a transverse vertical section thereof in line 2 2, Fig. 1. Fig. 3 is a view similar to Fig. 2, showing an overhead arrangement of the speed-changing mechanism. Fig. 4 is an enlarged fragmentary view of the belt-tightener shaft.

Like letters of reference refer to like parts in the several figures.

A is the rotary spindle of a lathe, and A′ an ordinary pulley secured thereto.

B is a horizontal main or line shaft preferably arranged below the floor on which the lathe or other machine stands and supported in hangers C, secured to the joists or other supports. This main shaft may be driven by an electric motor mounted directly on the same or by a belt running around a driving-pulley D, mounted on the shaft. In addition to the pulley D the main shaft is provided with a series of different-sized pulleys D′ D^2 D^3 D^4.

E is a counter-shaft supported in the hangers C below and parallel with the main shaft B and carrying a series of different-sized pulleys E′ E^2 E^3 E^4, which correspond to the pulleys D′ D^2 D^3 D^4 of the main shaft, but are arranged in the reverse order, as shown.

F F′ F^2 F^3 are loose independent driving-belts which pass around the several pairs of corresponding pulleys on the main and counter shafts B and E, so that upon tightening any one of these belts the counter-shaft is driven from the main shaft at a speed proportionate to the relative sizes of the two active pulleys, while the other loose belts remain idle on their pulleys. The lathe-spindle is driven from the counter-shaft E by a single belt G, running around the pulley A′ of the spindle and a pulley H, secured to the counter-shaft.

Each of the loose speed-changing belts F F′ F^2 F^3 is provided with an individual or independent tightener, which is preferably constructed as shown in the drawings. This tightener consists of a roller or small pulley *i*, journaled on the inner bifurcated arm of an upright bell-crank lever I, which is pivoted upon a horizontal rod or shaft J, supported on brackets *j*, projecting forwardly from the shaft-hangers C. The outer arm *i′* of the bell-crank lever is connected with an operating or pull rod *k*, extending upwardly through the floor and through a suitable standard K, the rod terminating in a suitable handle, as shown. Upon pulling this rod upward the inner arm of the bell-crank lever is swung toward the opposing belt, forcing its roller against the belt and tightening the same, so as to transmit motion from the main shaft B to the counter-shaft E.

l is a spring, perferably a torsion-spring, which tends constantly to swing the bell-crank lever and its roller away from the belt, so as to leave the same slack. This spring is coiled about the rod J and secured at one end to a collar *l′*, fixed to the rod, and at its other end to one of the perforated eyes or ears forming the hub of the lever, as shown in Figs. 1 and 4. The several bell-crank levers are mounted side by side on the rod J, and each is provided with an individual retracting-spring *l*.

m represents detent-pawls or dogs whereby the bell-crank levers I are locked in their operative position and which are adapted to engage, respectively, with toothed or ratchet segments *n*, arranged on the bell-crank levers

between their arms. These detent-pawls are rigidly secured to a horizontal rock-shaft *o*, which turns at its ends in suitable bearings arranged on the brackets *j*. This shaft is constantly turned in the proper direction to hold the detent-pawls in engagement with the toothed segments of the bell-crank levers by a spring *p*, coiled around the rock-shaft and connected at its ends with the shaft and the adjacent shaft-bearing, respectively. This spring may be of any other suitable construction, if desired, or any equivalent device may be used in place thereof. The rock-shaft *o* is provided at one end with an actuating-arm p', with which is connected an operating-rod p^2. This rod extends upwardly through the floor and terminates in a knob or treadle p^3. When one of the bell-crank levers is locked by its corresponding detent-pawl and it is desired to release the same for slackening the belt, the operator of the lathe or other machine simply depresses the operating-rod p^2 of the rock-shaft, which causes the latter to turn in the proper direction to swing the detent upward out of engagement with the toothed segment of the bell-crank lever. As soon as the lever is unlocked it is swung away from the belt by its spring *l*, as hereinbefore described. The rock-shaft also serves as a stop for limiting the outward movement of the belt-tighteners, the levers of the latter being provided for this purpose with lugs or projections *q*, which strike against the rock-shaft when the tighteners are unlocked.

The machine is thrown into gear with the main driving-shaft by tightening one or another of the slack belts by raising the proper operating-rod *k*, and when it is desired to change the speed the tightener which is in use is thrown off and the proper tightener is applied, thus changing the speed almost instantly and without shifting the belt which leads to the lathe-spindle and saving the time and avoiding the danger incident to shifting the belt.

The pressure of the belt-tightener can be readily regulated according to the character of the work under treatment, the belt being tensioned less for a light cut and more for a heavy cut. The toothed segments of the bell-crank levers I and the detent-pawls *m* permit the tighteners to be locked in any position for maintaining the desired tension of the belt.

By driving the lathe or other machine from the counter-shaft by a single belt and arranging the counter-shaft and main shaft as shown the number of belts and pulleys is materially reduced and the cost of the driving mechanism correspondingly lessened.

My improved driving mechanism is especially adapted for driving a large number of machines from a continuous main shaft arranged either overhead or below the floor, in which case the machines are placed in line with each other or in a single row, and each machine is provided with its own counter-shaft and speed-changing belts, pulleys, and tighteners. When the machines are driven from below the floor, which is the preferred arrangement, the downward pull of the driving-belt counteracts the upthrust of the lathe, tool, placing the spindle nearly in balance. All strain is also removed from the top of the head-stock, thus avoiding chatter-marks and obtaining a better class of work.

In the drawings four speed-changing belts and sets of pulleys are shown, giving a corresponding number of changes in speed; but a greater or less number may be employed, as may be desired.

When the variable-speed driving mechanism is employed overhead, as shown in Fig. 3, the counter-shaft E^5 is arranged between the driven machine and the main shaft B'. The arrangement of the belt-tighteners is the same as in that first described; but the operating-rods of the first construction are replaced by cords k', which pass upwardly and downwardly around guide-pulleys k^2, journaled in hangers secured to the ceiling or joists, these cords terminating in convenient reach of the operator of the lathe or other machine. The rock-shaft carrying the detent-pawls is in this case operated by a cord p^4, depending from the arm of the rock-shaft.

I claim as my invention—

1. The combination with a main and a counter shaft each carrying a pulley, of a belt running loosely around said pulleys, a tightener-lever carrying a roller adapted to bear against said belt, an operating device for moving the lever to tighten the belt, a locking device for holding the lever in its operative position, and a spring arranged to move the lever and its roller away from the belt when the lever is released from said locking device, substantially as set forth.

2. The combination with a main and a counter shaft each carrying a pulley, of a belt running loosely around said pulleys, a tightener-lever carrying a roller adapted to bear against said belt, an operating device for moving the lever to tighten the belt, a spring tending to move the lever and its roller away from the belt, a detent for locking the lever in its operative position, and a releasing device for unlocking said detent, substantially as set forth.

3. The combination with a main and a counter shaft each carrying a pulley, of a belt running loosely around said pulleys, a tightener-lever having locking-teeth and carrying a roller adapted to bear against said belt, and a rock-shaft having a detent adapted to interlock with said teeth, substantially as set forth.

4. The combination with a main and a counter shaft each carrying a pulley, of a belt running loosely around said pulleys, a tightener-lever having locking-teeth and carrying a roller adapted to bear against said belt, a spring tending to swing said lever away from said belt, a rock-shaft having an operating-

arm and a detent-pawl adapted to interlock with said teeth, and a spring which tends to turn said rock-shaft in the proper direction to hold said detent in engagement with the teeth of the tightener-lever, substantially as set forth.

5. The combination with a main and a counter shaft each carrying a pulley, of a belt running loosely around said pulleys, a tightener-lever carrying a roller adapted to bear against said belt, an operating device for moving the lever to tighten the belt, a spring tending to move the lever and its roller away from the belt, and a rock-shaft which is arranged in rear of said tightener-lever and forms a stop for limiting the rearward swing of the lever and which carries a detent-pawl adapted to interlock with said lever, substantially as set forth.

Witness my hand this 31st day of March, 1898.

FRANCIS H. CRAFTS.

Witnesses:
CARL F. GEYER,
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