No. 775,471. PATENTED NOV. 22, 1904.

W. T. S. JOHNSON.

CHANGE GEAR MECHANISM FOR MACHINE TOOLS.

APPLICATION FILED JUNE 24, 1904.

NO MODEL. 3 SHEETS—SHEET 1.

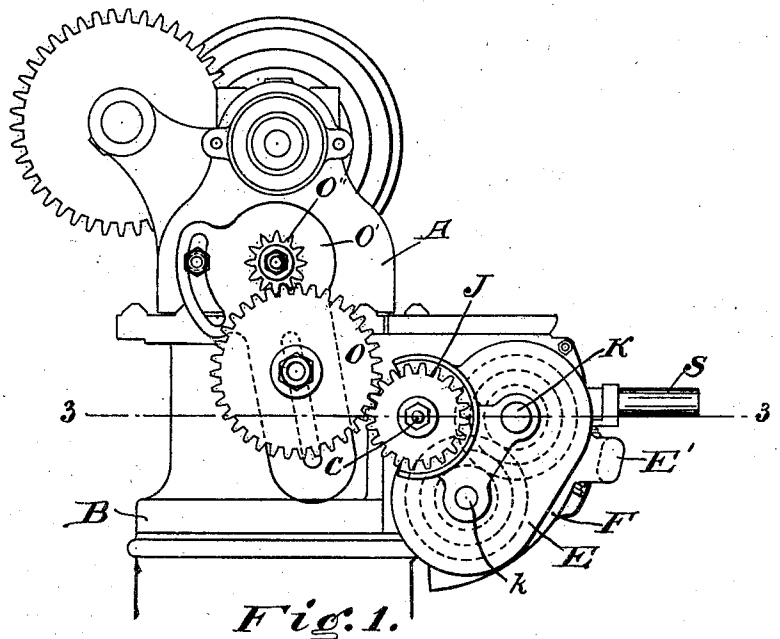


Fig. 1.

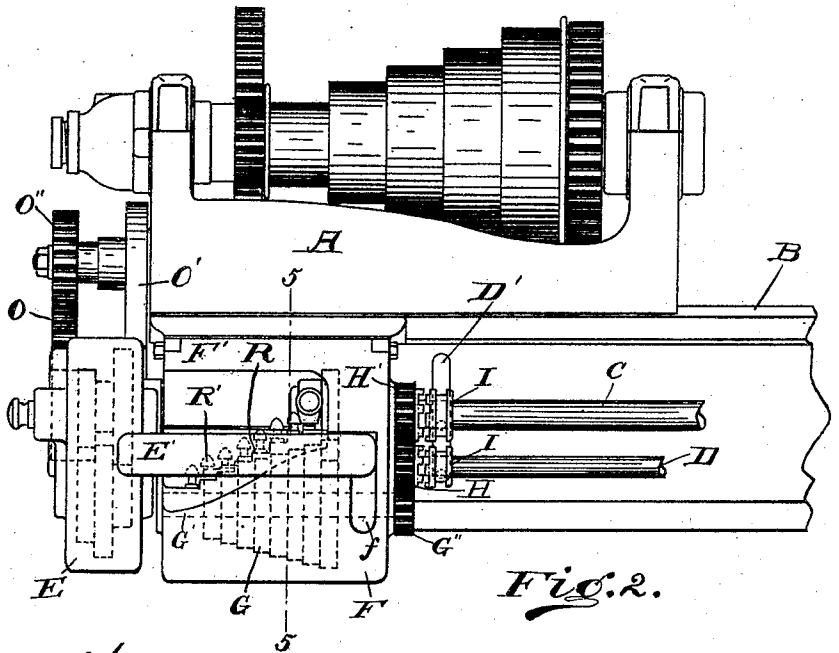


Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 2.

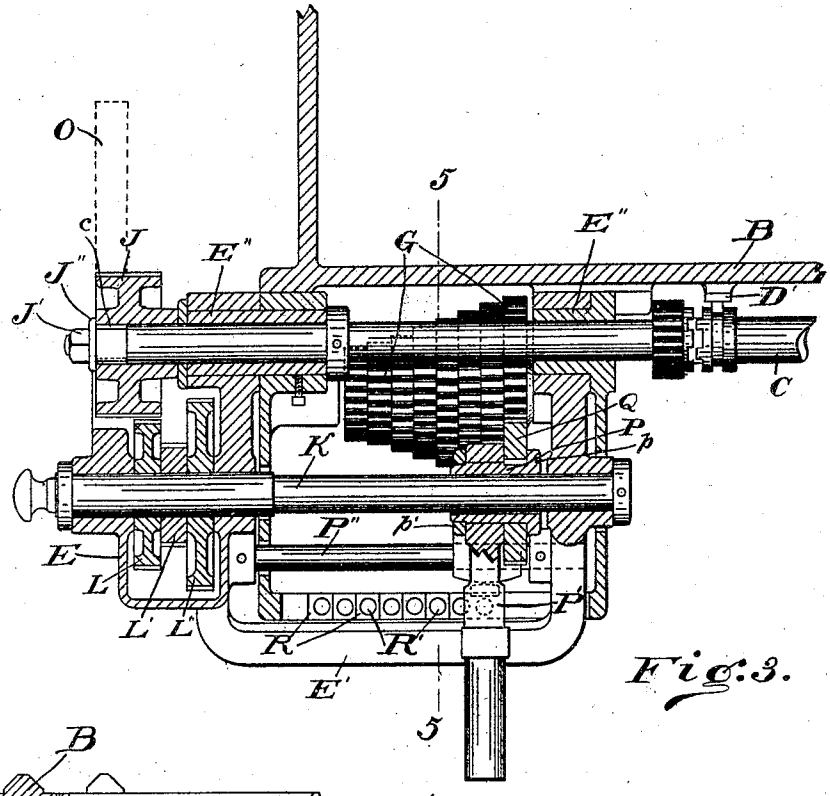


Fig. 3.

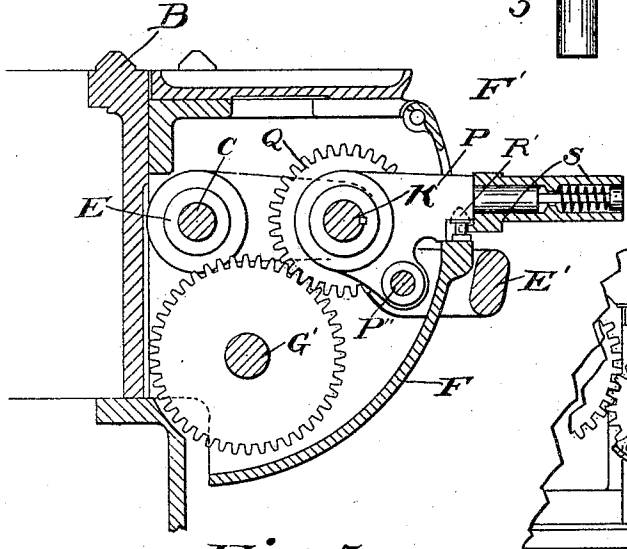


Fig. 5.

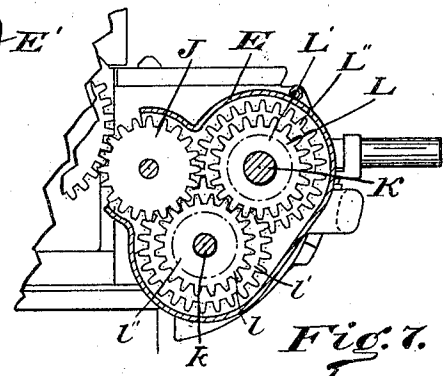


Fig. 7.

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NO MODEL. 3 SHEETS—SHEET 3.

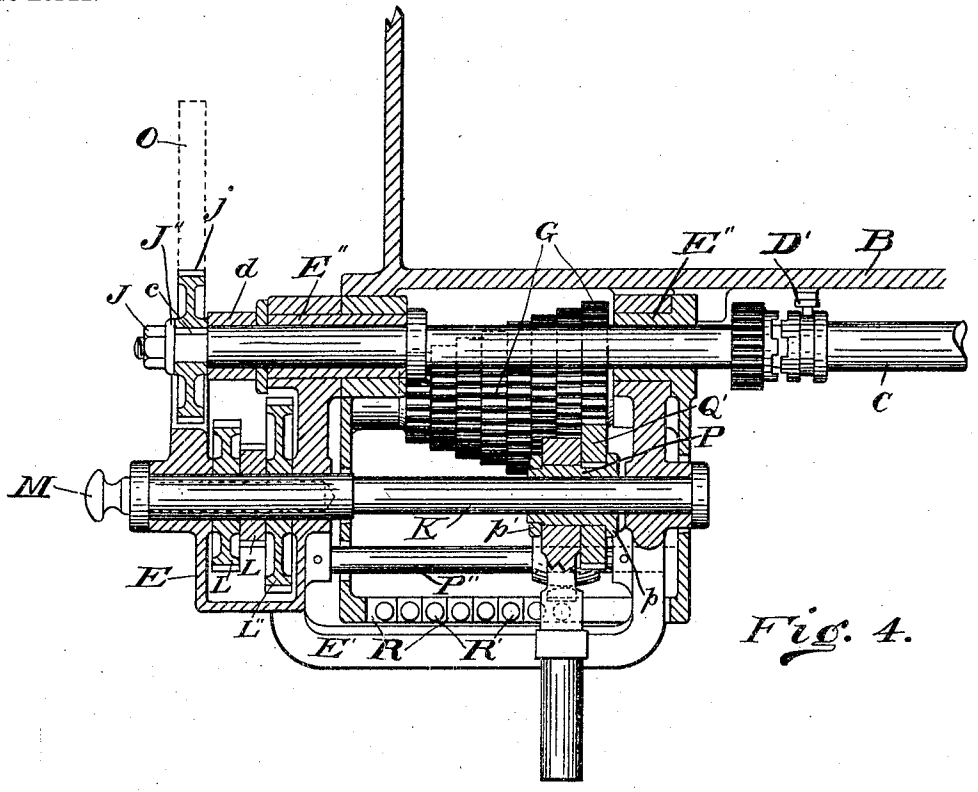


Fig. 4.

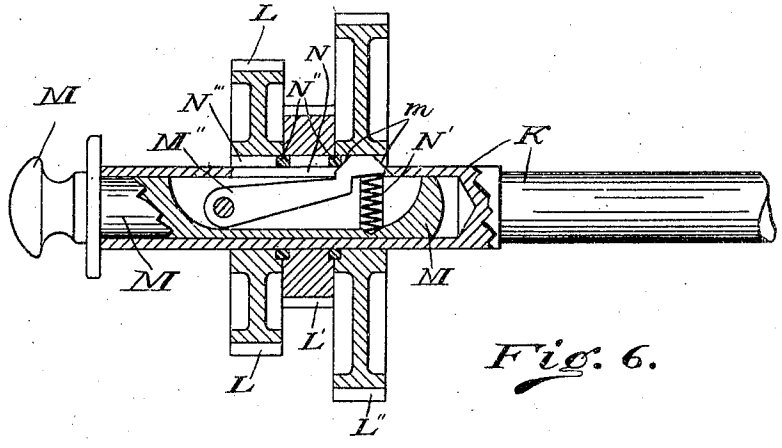


Fig. 6.

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No. 775,471. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM T. S. JOHNSON, OF CINCINNATI, OHIO.

CHANGE-GEAR MECHANISM FOR MACHINE-TOOLS.

SPECIFICATION forming part of Letters Patent No. 775,471, dated November 22, 1904.

Application filed June 24, 1904. Serial No. 214,042. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM T. S. JOHNSON, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented a certain new and useful Improvement in Change-Gear Mechanism for Machine-Tools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of my specification.

My invention relates to machine-tools or lathes, and more particularly to the mechanism by which changes in the rate of feed of the tool, or when applied to the lead-screw in screw-cutting lathes changes in the number of threads to be cut, may be produced.

The object of my invention is to produce a simple efficient change-gear mechanism, arranged to readily produce any one of a number of designed speeds, which will at the same time be readily adjustable to produce any desired feed.

The several advantages of my invention will appear as I proceed with my description.

In the drawings, Figure 1 is an end elevation of a lathe provided with my improved change-gear mechanism. Fig. 2 is a front elevation of the same. Fig. 3 is a section of Fig. 1 on the line 3 3. Fig. 4 is a similar section illustrating the arrangement when a different thread is to be cut or a different rate of feed to be produced than any of the number of threads or speeds that the machine is especially designed to produce. Fig. 5 is a section of Fig. 3 on the line 5 5 thereof. Fig. 6 is a longitudinal section, on an enlarged scale, of the shaft K. Fig. 7 is a partial end elevation of the lathe with the outside wall of the change-gear box removed.

A is the head-stock mounted on the bed B in the usual manner, C the lead-screw, and D the feed-rod, mounted in suitable bearings.

E is a swinging box, hereinafter to be called the "swinging gear-box," which contains a series of multiple gears which by means of a sliding gear swinging with the swinging gear-box may be caused to induce several speeds in a set of cone-gears which are carried in a cone-gear box F.

The cone-gear box F is of any ordinary type, secured to the frame B, and is open in front and provided near its top with a hinged lid F′ in any convenient manner. The cone-gear shaft G′ projects beyond the box and there has keyed to it the spur-gear G″, meshing with a gear H, loosely mounted on the rod D, and the gear H meshes with the spur-gear H′, loosely mounted on the screw C. By means of clutch members I I′, respectively feathered to the screw C and the rod D and operated in any convenient manner, (as, for example, by the lever D′,) the gear G″ may be made to operate either the screw or the rod. The screw-shaft C projects through the cone-box, in whose walls it is suitably journaled, and is provided at its end with a wide spur-gear J, loosely mounted upon it. (See Fig. 3.)

A substantially U-shaped frame E′ is journaled on bushings E″ E″, secured to the cone-gear box, one side of the frame being just inside one end of the cone-gear box and the other side of the frame being just outside of the opposite end of the cone-gear box, with its axis of oscillation coincident with the axis of the screw C. The swinging gear-box E is secured to the latter side of the frame E′ and carries the multiple change-gears, which will be now described.

In the frame E′ is journaled a shaft K, upon which are loosely mounted within the swinging gear-box the three gears L, L′, and L″. Said shaft is drilled out at the end to receive a slotted pin M, (see Fig. 6,) which may be pulled in or out by means of the handle M′. In the slot of this pin is pivoted a key M″, which is normally caused to project through a keyway N in the shaft K by means of a spring N′. Said keyway is of the length of the total depth of the three gears L, L′, and L″, which are mounted side by side in the change-gear box. Said gears are provided with keyways N‴, which are separated from each other by means of rings N″, mounted on the shaft K. The key M″ is beveled at *m* so as to readily slide over these rings when the pin M is pulled in or out. It is apparent that by means of this pin and pivoted key M″ any one of the three gears L L′ L″ may be keyed to the shaft K, the other two turning loosely thereon.

Three gears l, l', and l'' (see Fig. 7) are keyed to a short shaft k, which is journaled in the change-gear box below and back of the shaft K, the three gears meshing with the gears L, L′, and L″ in the order mentioned. The shaft k is driven by means of the wide gear J, which meshes with the gear l. The gear J is in turn driven by the gear O, which is adjustably mounted on the swinging arm O′, which may be adjusted in various angular positions. The gear O is driven from the gear O″, which gets its power from the driving-shaft in the usual manner.

The rotation of the shaft K is communicated to any one of the set of cone-gears G in the following manner, (see Figs. 3 and 5:) A sleeve P is feathered to the shaft K and its movement along the shaft K is controlled by means of a bracket P′, which is held in a fixed position with reference to the frame E′ by means of a rod P″, which passes through an opening in said bracket P′. The sleeve P turns loosely in the bracket P′ and has keyed to it a spur-gear Q, which is adapted to engage any one of the set of cone-gears G. The gear Q and the bracket P′ are held in position by means of a collar p on the sleeve P and a washer p'. It is apparent that the bracket P′ may be slid from side to side so as to bring the gear Q opposite any one of the set of cone-gears G. It is also apparent from the fact that the frame E′ swings about the screw-shaft C, and with it the gears l, l', and l'' and L, L′, and L″ about the gear J, that if the gear Q is moved along the shaft K so as to be brought opposite any particular one of the set of cone-gears by properly swinging the frame E′ by means of the bracket P′ the gear Q may be brought into mesh with any one of said set of cone-gears.

The cone-gear box F has suitable slots in its side and front walls to permit of the swinging up and down of the shafts K and the rod P″ and the frame E′.

In order to lock the bracket P′ in position when the gear Q is engaging the desired one of the set of cone-gears, the upper edge of the front face of the cone-gear box is stepped, as at R, (see Fig. 2,) there being a step for each one of the set of cone-gears. On each step is a pin R′, adapted to be engaged by a notch in the flange of an adjustable collar S, which is mounted on the bracket P′. This collar is spring-controlled, so as to normally engage one of the pins, the arrangement being apparent from Fig. 5.

It is obvious from the description that the cone-shaft may be given for each one of the set of cone-gears either of three speeds, depending upon which of the gears L L′ or L″ is caused to be keyed to the shaft K. It is thus apparent that in order to obtain the desired speed for the feed-rod or the screw—supposing, of course, that the desired speed is any one of the number of speeds at which the machine is designed to run—it is simply necessary to pull out the pin M by means of the handle M′, so that the key M″ engages the proper one of the gears L, L′, and L″, and then move the bracket P′ along the shaft K until it is opposite the proper one of the set of cone-gears and then swing the frame E′ until the gear Q engages that cone-gear. The spring-controlled collar S will be in such a position that the notch in its flange engages the pin R′. Of course a suitable card may be provided to indicate the proper position of the bracket P′ for each of the designed speeds. It often happens, however, that a speed or a pitch is desired for which the machine is not specially designed. My improved machine is easily adapted to such a contingency. In such case the wide gear J (see Figs. 3 and 4) is removed by taking off the nut and washer J′ J″. The end of the screw-shaft C is provided with a keyway c for a short distance from its end. After removing the gear J a collar d, which is supplied with the machine, is slipped on the end of the screw and a narrow gear j, also furnished with the machine, is keyed onto the end of the shaft and the nut and washer J′ J″ replaced. This gear j, while still engaging the gear O, does not engage the gear l, for the reason that it is beyond said gear. Its rotation will drive the screw directly, and it is apparent that by selecting a proper gear j any desired speed may be given directly to the screw, in this case the change-gear box and set of cone-gears being cut out entirely from the operation of the machine. This furnishes a very ready and simple means for cutting any desired thread outside of those for which the machine is especially designed.

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

1. A change-gear device comprising in combination, a driven gear, an oscillating frame having its axis coincident with the axis of said driven gear, a shaft journaled in said frame, a set of multiple gears journaled on said shaft with means arranged to key any one of said multiple gears to said shaft, gearing carried by said frame intermediate said set of multiple gears and said driven gear, a set of cone-gears and a pinion slidably mounted on the said shaft and adapted by the swinging of said frame to be brought into engagement with any one of said set of cone-gears.

2. A change-gear device comprising in combination, a driven gear, an oscillating frame with its axis coincident with the axis of said driven gear, a shaft journaled in said frame, multiple gears journaled on said shaft with mechanism arranged to key any one of said gears to said shaft, an equal number of other gears turning together and carried by said frame, said gears meshing each with one of said multiple gears and one of said gears mesh-

ing with said driven gear, a set of cone-gears, and a pinion slidably mounted on said shaft and adapted by the swinging of said frame to be brought into engagement with any one of said set of cone-gears.

3. A change-gear device comprising in combination, a driven gear, an oscillating frame having its axis coincident with the axis of said driven gear, a shaft journaled in said frame, a set of multiple gears journaled on said shaft with means arranged to key any one of said multiple gears to said shaft, gearing carried by said frame intermediate said set of multiple gears and said driven gear, a set of cone-gears, a pinion slidably mounted on the said shaft and adapted by the swinging of said frame to be brought into engagement with any one of said set of cone-gears, and means for locking said frame and pinion in position.

4. A change-gear device comprising in combination with a driven member, an adjustable gear, a wide removable gear loosely mounted on said driven member and meshing with said adjustable gear, a swinging frame journaled on said driven member, a shaft journaled in said swinging frame, a set of multiple gears normally turning loosely on said shaft with mechanism arranged to key any one to said shaft, a corresponding number of intermediate gears meshing with said multiple gears and carried by said frame, one of said intermediate gears engaging with said wide gear, but being within the plane of said adjustable gear, a set of cone-gears, a pinion slidably mounted on said shaft and adapted by the swinging of said frame to be brought into engagement with any one of said sets of cone-gears, means for locking said pinion and frame in position, and gearing and a clutch mechanism intermediate said cone-gear shaft and said driven member, substantially as and for the purpose described.

5. A change-gear device comprising in combination with the driven shaft and the spindle, a wide removable gear loosely mounted on said driven shaft, an adjustable gear driven from the spindle meshing with said wide gear, a swinging frame journaled on said driven shaft, a shaft journaled in said swinging frame, a set of multiple gears normally turning loosely on said shaft with mechanism arranged to key any one to said shaft, a corresponding number of intermediate gears carried by said frame turning together and meshing with said multiple gears, the outside of one of said intermediate gears engaging said wide gear, but being within the plane of said adjustable gear, a set of cone-gears, a pinion slidably mounted on said shaft and adapted by the swinging of said frame to be brought into engagement with any one of said set of cone-gears, means for locking said pinion and frame in position, and gearing and a clutch mechanism intermediate said cone-gear shaft and said driven shaft, substantially as and for the purpose described.

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