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C. C. CLEVERDON.

SPEED CHANGING MECHANISM.

(Application filed July 12, 1900.)

(No Model.)

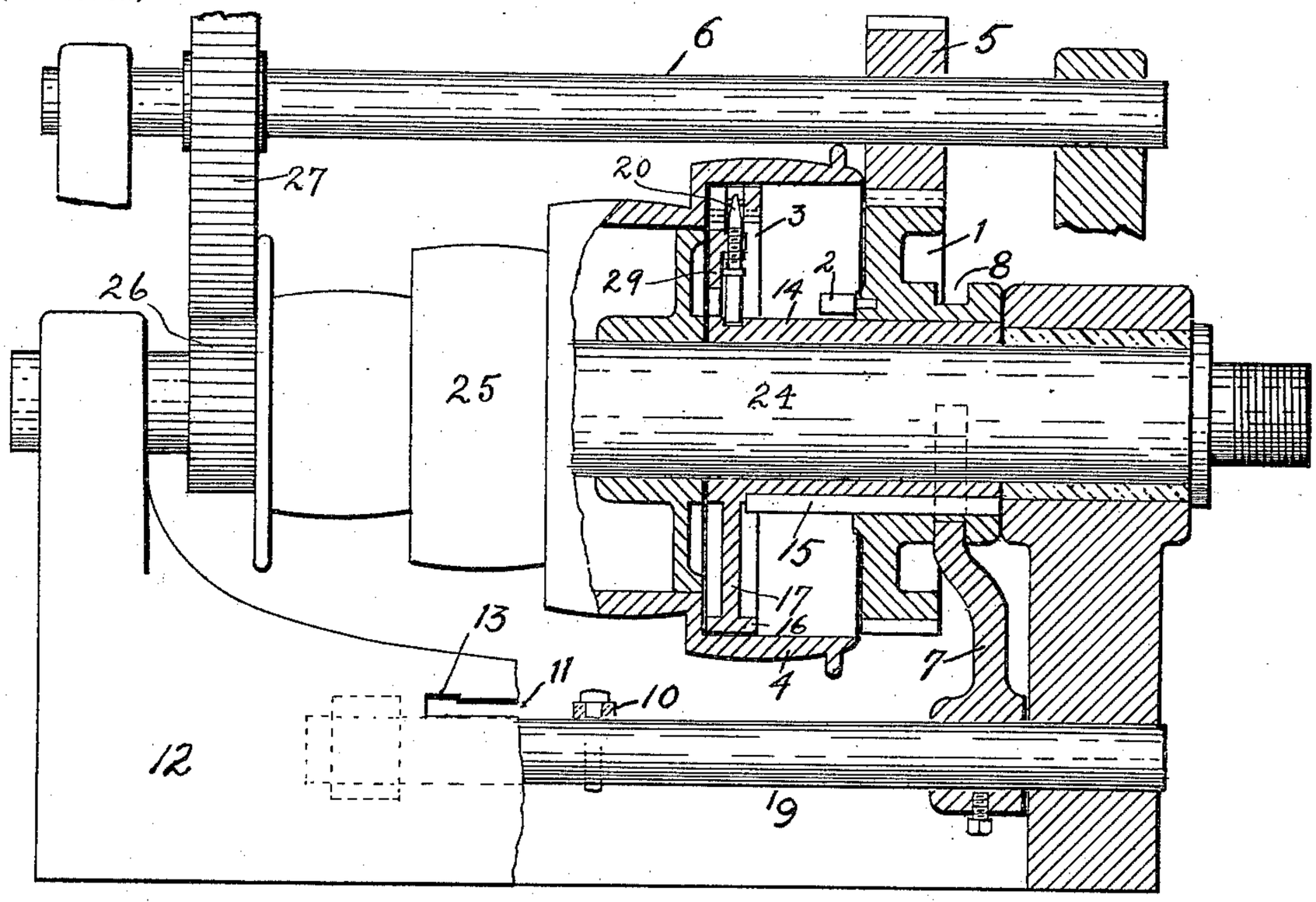

Fig. 1

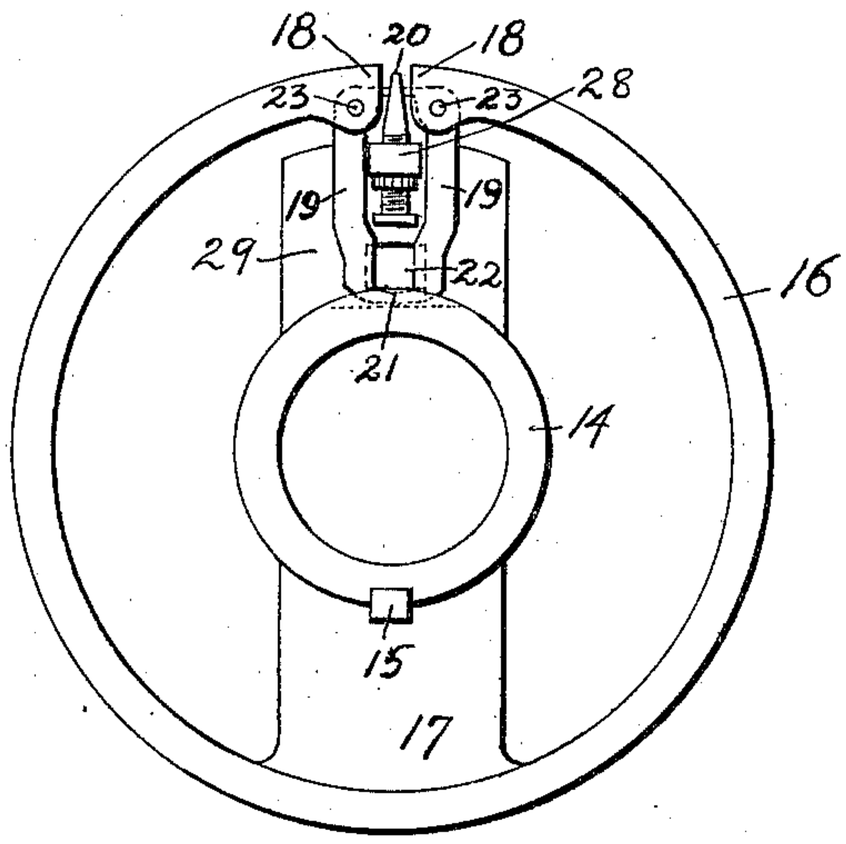

Fig. 2

WITNESSES

George E. Haley

Robert N. Holt.

INVENTOR

Carl C. Cleverdon

By Samuel N. Pond.

his Attorney.

UNITED STATES PATENT OFFICE.

CARL C. CLEVERDON, OF AUSTIN, ILLINOIS.

SPEED-CHANGING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 662,710, dated November 27, 1900.

Application filed July 12, 1900. Serial No. 23,317. (No model.)

To all whom it may concern:

Be it known that I, CARL C. CLEVERDON, a citizen of the United States, residing at Austin, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Speed-Changing Mechanisms, of which the following is a specification.

My invention relates, broadly, to a novel and effective means for changing at will the speed of a rotating shaft or spindle, in whatever relation or class of machines the latter may be employed; but the principal application of my invention contemplated by me is in connection with that class of machine-tools of the lathe variety, and more especially with those that are provided with back gears or equivalent mechanism for reducing the speed and increasing the torque of the driving-spindle.

The object of my invention is to render it possible to change the speed of the rotating shaft, as in a lathe, for example, the speed of the head-stock spindle from fast to slow, or vice versa, by a single movement of a lever and without stopping the machine. I am aware that this change is now effected on a large number of turret-lathes, &c., by means of friction-heads, most of which operate by clutching the live-spindle to either the rapidly-rotating belt-cone or to a slow-running gear, both loosely mounted upon the live-spindle.

My invention is intended to overcome some of the principal objections usual in this form of driving mechanism. Among these may be mentioned the cost, complexity, the danger of slipping under heavy duty, the increased length of spindle, and in a lathe the consequent increased length of head-stock frame and lathe-bed.

My invention is also designed to reduce the number of gears running idle when the back gears are not in use.

To these ends my invention consists in the parts and combinations of parts constituting my improved speed-changing mechanism as hereinafter described, and pointed out in the claims.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, partly in central vertical section, broken away, of a lathe-head embodying my invention. Fig. 2 is an end elevation in detail of a friction-clutch having improved adjusting means which I prefer to use in connection with my invention.

For convenience and clearness the device will be described as applied to a lathe-head, similar numerals of reference referring to the same parts throughout both views.

The general arrangement of the head-stock, including the back gearing, is the same as that of the standard form used on most engine-lathes, but differs therefrom in construction and mode of operation in the following important particulars: First, the back shaft is not provided with the usual eccentric bearings for throwing the gears in or out of mesh, but always revolves when the machine is running, unless such disengagement of the back shaft is desired, as when a high speed only is required for a considerable length of time; second, the large gear on the live-spindle, which is usually rigidly connected thereto, is in my arrangement longitudinally free for a certain distance upon said spindle, although rotatively engaged thereto, and is of such a size that it may be slid under the largest step of the cone-pulley, said pulley being so formed and supported as to allow this movement of the gear, and, third, close to the web which connects the largest step of the cone-pulley to the next smaller step and inside the large step is a friction-clutch rigidly connected to the driving-spindle, and when this clutch is operative it frictionally engages the cone-pulley with the driving-spindle. This clutch is adapted to be operated by the movement of the large gear.

When running at a high speed, the large gear on the driving-spindle is inside the largest step of the cone-pulley, and in this position of the large gear the friction-clutch is made operative. To change from fast to slow speed, the large gear is slid from inside the cone-pulley into mesh with the small gear on the back shaft, the friction-clutch being released from the cone-pulley just before the gears mesh.

Proceeding now to a specific description of the mechanism illustrated in the drawings, 12 designates the housing-frame of the lathe-

head, in which is rotatably mounted in suitable bearings the live-spindle 24 of the lathe. On this spindle is loosely mounted the usual stepped cone-pulley 25, which carries at one end a small gear 26, the latter engaging a large gear 27, fast on the usual back shaft 6.

Fixedly secured on the spindle 24, adjacent the cone-pulley 25, is a hub or sleeve 14, carrying at one end a friction-clutch 3, which is housed within the largest step of the cone-pulley, (designated by 4,) as shown. Splined on said hub 14, as by means of a feather 15, is a large gear 1, carrying on one of its faces a wedge-shaped projection 2 and adapted to be slid back and forth on the hub 14 to alternately engage the friction-clutch 3 and a small gear 5, which latter is fast on the back shaft 6. The means for sliding said gear 1 comprise a fork 7, which fits into an annular groove 8 on the hub of gear 1 and is attached to a rod 9, lying parallel with the live-spindle 24, which rod 9 may be moved to the right or left of its central position by means of a lever 10. This lever 10 may be pivoted in the housing-frame 12, back of the rod 9, and projects through a slot 11 in the front of the housing-frame and terminates in a handle. (Not shown.) The rod 9, and consequently the gear 1, is locked in position at the opposite extremes of its movement by the springing of the lever 10 into depressions 13 at the opposite ends of slot 11.

An enlarged end elevation of the friction-clutch 3, Fig. 1, is shown in Fig. 2. Here 16 is an expansible friction-ring connected to the hub 14 by means of a web or plate 17. Inside of and near the adjacent ends 18 18 of this ring are pivoted at 23 23 two levers 19 19, which have a fulcrum on a conically-ended screw 20, which latter screws through a lug 28 on a plate 29, rising from the hub 14. The inner ends of these levers come together, so as to keep the space 22, where the wedge 2, Fig. 1, enters, practically of constant width, and the diameter of the friction-ring is adjusted by varying its circumference in the following manner: To increase the diameter of the friction-ring, the conically-ended screw 20 is screwed out, so that the distance between the outer ends of the levers 19 19, and hence of the pivot-pins 23 23, is increased, thereby increasing the circumference of the friction-ring. The diameter of the ring is decreased by moving the screw in the opposite direction. The aforesaid change in diameter of the friction-ring is intended merely for purposes of adjustment.

The operation of my improved device will readily be understood from the foregoing description. With the parts in the positions shown in Fig. 1 the spindle is rotating at slow speed, the power being transmitted from the cone-pulley 25 and gear 26 through the reducing-gears 27 and 5 on the back shaft 6 to the large gear 1. When it is desired to change from slow to high speed, the lever 10 is moved to the left. This first disengages the gears 1 and 5, and immediately thereafter the wedge-shaped projection 2 enters the recess 22, thereby spreading the levers 19 19 of the friction-clutch, which increases the diameter of the ring 16 sufficiently to make the latter frictionally engage the inner face of the cone-pulley, the shaft or spindle 24 being then driven direct from the cone-pulley by the intervention of said clutch. When the lever 10 is again thrown back to the right, the friction-clutch is first disengaged and immediately thereafter the gear 1 slides into mesh with the gear 5 and the speed is changed from fast to slow.

The mechanism of my friction-clutch, as herein shown and described, provides for an exceedingly delicate adjustment of the latter, the conically-ended screw 20 engaging the short arms of the levers 19 19, acting to spread or contract the ring 16 by very fine degrees.

In the speed-changing mechanism herein shown and described I do not limit myself to any particular form of friction-clutch, but may use any suitable clutch mechanism adapted to be operated by the movement of the gear 1. Neither is my invention limited to its use on lathes, as it is obvious that it can be advantageously applied in many other relations, as in hoisting apparatus, self-propelled vehicles, &c.

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

1. In a speed-changing mechanism the combination with a rotatable shaft and a pulley loosely mounted thereon, of a gear mounted to slide lengthwise on the shaft and rotatively engaged therewith, means for moving said gear in either direction upon the shaft, a friction-clutch adapted to be operated by a movement of said gear in one direction to connect the pulley with the said shaft, a gear carried by and rotating with said pulley, a back shaft, and speed-reducing gears thereon, including a slow-running gear adapted to mesh with the slidable gear when it is moved in the opposite direction, to transmit motion to the shaft through said speed-reducing gears, substantially as set forth.

2. The combination with the driven shaft and a pulley loosely mounted thereon, of a train of speed-reducing gears driven from said pulley, a friction-clutch fixedly mounted on the driven shaft and adapted to engage and disengage said pulley, a longitudinally-slidable gear mounted on said driven shaft and partaking of the rotation thereof, said gear at one limit of its longitudinal movement engaging one of the speed-reducing gears, and provided with a device whereby at the other limit of its movement it effects engagement of the friction-clutch with the pulley, and means for so shifting said gear longitudinally, substantially as set forth.

3. The combination with the driven shaft and a hollow stepped pulley loosely mounted

thereon, of a train of speed-reducing gears driven from said pulley, a friction-clutch fixedly mounted on the driven shaft and located within the largest step of the pulley, a gear splined on the hub of said friction-clutch and adapted to be slid into and out of said hollow pulley, said gear when out of the pulley engaging one of the train of speed-reducing gears, and when within the pulley causing the friction-clutch to engage the latter, and means for shifting said slidable gear, substantially as described.

In testimony that I claim the foregoing as my invention I have hereunto signed my name, this 7th day of July, 1900, in the presence of two witnesses.

CARL C. CLEVERDON.

Witnesses:

SAMUEL N. POND,

GEORGE E. HALEY.