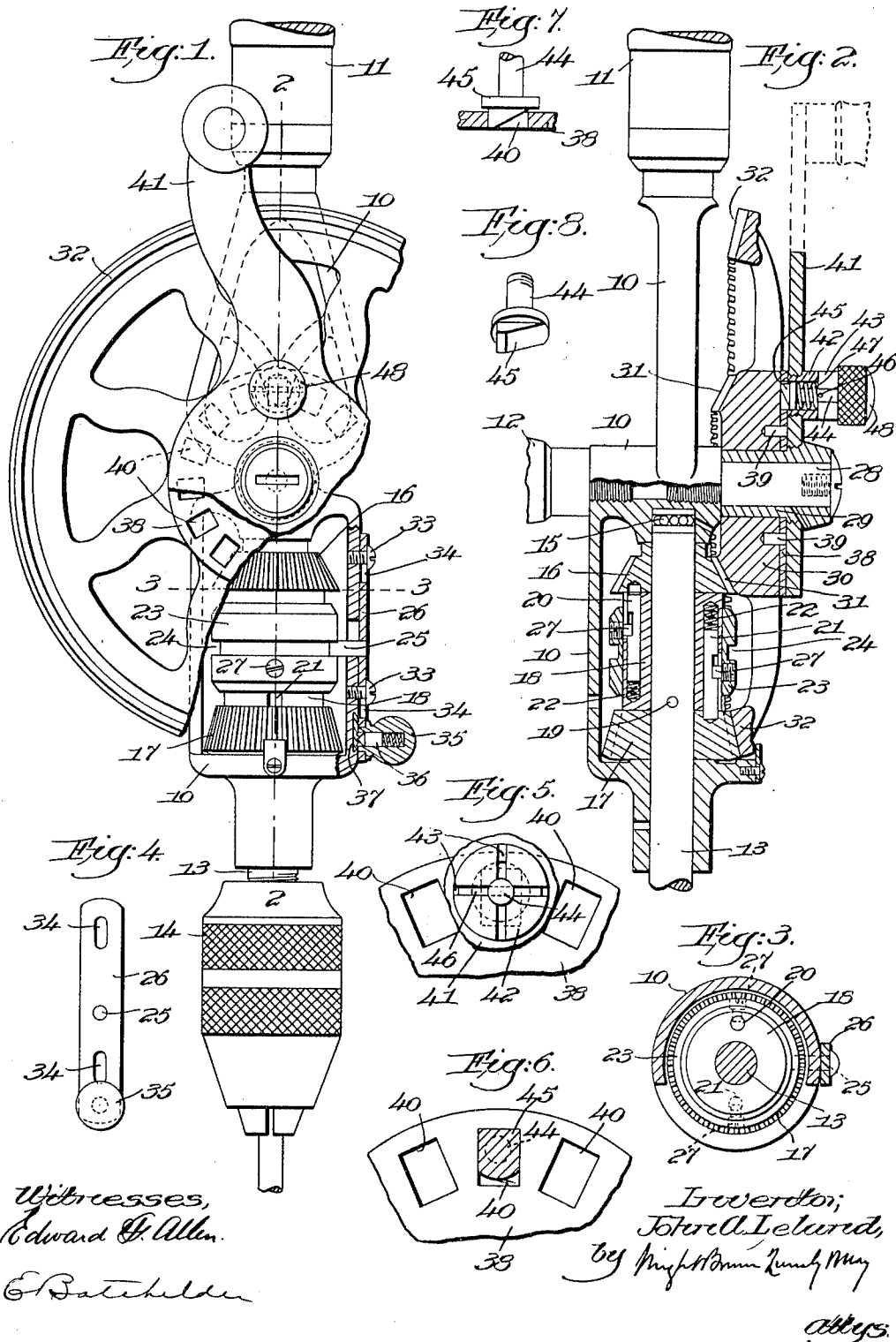


J. A. LELAND.
CHANGE SPEED GEARING.
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Patented June 10, 1913.



UNITED STATES PATENT OFFICE.

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CHANGE-SPEED GEARING.

1,063,984.

Specification of Letters Patent.

Patented June 10, 1913.

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To all whom it may concern:

Be it known that I, JOHN A. LELAND, a citizen of the United States, and a resident of Montague, in the county of Franklin and State of Massachusetts, have invented certain new and useful Improvements in Change-Speed Gearing, of which the following is a specification.

This invention relates to tools of the type known as hand drills, or breast drills, and the invention refers particularly to the structure of the gearing which is employed for changing the speed, although my invention is not limited to this particular type of implement.

Obviously the gearing may be employed for driving or rotating a tool other than a drill.

One of the objects of the present invention is to provide an improved speed change mechanism which will enable the speed to be shifted at any time without withdrawing the tool from the work.

Another object of the invention is to provide an improved mechanism of this type which will enable the gears to be locked whereby the driven spindle or shaft can have a tool more conveniently connected thereto.

Another object of the invention is to provide improved mechanism for enabling the gearing to be operated by either a right hand ratchet motion or a left hand ratchet motion or positively.

To these ends the invention consists in the construction and combination of parts substantially as hereinafter described and claimed.

Of the accompanying drawings,—Figure 1 is a side elevation of sufficient parts of a breast drill embodiment of the invention to illustrate my improvements, parts being broken out and the other parts in section. Fig. 2 is a view looking from the left of Fig. 1 with the gearing members in section, and the chuck omitted. Fig. 3 represents a section on line 3—3 of Fig. 1. Fig. 4 is a detail elevation of the slide by means of which the change of speed is primarily effected. Fig. 5 is a detail view on an enlarged scale of a portion of the crank ratchet mechanism. Fig. 6 is a view similar to Fig. 5, but omitting the head of the ratchet controlling stud, and showing the ratcheting pawl in section. Fig. 7 is a detail side elevation of the ratch-

eting pawl, a portion of the recessed disk for operating therewith being shown in section. Fig. 8 is a detail perspective of the ratcheting pawl and its stud.

Similar reference characters indicate the same or similar parts in all of the views.

The frame 10, which may be a single casting, is provided with handles, portions of which are indicated at 11 and 12. Rotatably mounted in said frame is a spindle 13, which, when the implement is what is known as a breast drill or hand drill, is provided with a suitable chuck 14 at its outer end. The inner end of the spindle is supplied with a roller bearing 15, to sustain end thrust.

Loosely mounted on the spindle 13, and within a semi-circular or shell like portion of the frame, are two pinions 16 and 17. A clutch hub 18 is secured to the spindle as by means of the transverse pin 19, between the two pinions 16 and 17. The hub 18 is provided with longitudinal sockets or borings for bolts 20, 21, each bolt having a spring 22 between its inner end and the bottom of the socket to normally project it so as to engage a recess or keeper in a pinion when the bolt is released and permitted to be projected by its spring as presently described. Mounted on the hub 18 and slidable longitudinally thereof is a sleeve 23 having an external annular groove 24 which receives a pin 25 projecting from a controlling slide 26. The sleeve 23 is provided with a pin or screw 27 for each of the bolts, the inner end of such pin passing through a longitudinal slot in the slide of the hub 18 and into an elongated recess in its bolt.

The frame of the implement is provided with a stud 28 on which is mounted a sleeve 29. On the latter is mounted the hub 30 of a compound gear having an inner circular series of teeth 31 and an outer circular series of teeth 32. These two series of teeth will be hereinafter referred to respectively as the small gear and the large gear. They are constantly in mesh with the two pinions 16, 17 as presently described and the crank hereinafter described rotates both of the gears 31, 32.

Projecting from one side of the semi-cylindrical portion of the frame are two pins or screws 33 which pass through slots 34 in the slide 26, thereby serving to guide the latter. One end of the slide is provided with a knob or handle 35 containing a spring

pressed detent 36, the inner end of which is suitably pointed and adapted to engage a plate 37 in the side of the frame 10, said plate 37 being preferably roughened or

5 notched as indicated in Fig. 1.

The outer face of the hub 30 of the compound gear is provided with a circular series of recesses, said recesses being preferably formed in a disk 38 which is secured to said hub as by pins 39. The recesses are indicated at 40. The crank 41, having a suitable handle is connected to the sleeve 29, and is provided with a tubular bearing 42, the outer end of which is provided with four radial notches 43. Mounted in said tubular bearing is a stud 44 having a beveled block or pawl 45 at its inner end, and having a transverse pin 46 adapted to engage either pair of radial notches 43. A spring 47 tends to hold the pawl 45 in the position indicated in Fig. 2. The stud 44 is provided with a head or knob 48 by means of which the stud and the pawl 45 can be drawn outwardly and given more or less of a rotation.

It will now be understood that when the pawl 45 is in the position shown in Fig. 2, the compound gear can be rotated positively in either direction by manipulation of the crank 41. By grasping the knob 48 and partially withdrawing the stud 44 and then giving said stud a quarter rotation and permitting the ends of the pin 46 to return into engagement with the radial notches 43, the pawl 45 will then be set so as to permit ratcheting. This is best illustrated in Fig. 7, which illustrates the beveled side of the pawl as in such position relatively to one side of one of the recesses 40, while an abrupt side of the pawl bears against the other side of such recess as to result in movement of the crank 41 in one direction driving the disk 38 and the compound gear while movement of the crank in the other direction will result in the pawl yielding and passing the notches of the disk without transmitting motion to the compound gear. Of course by reversing the direction of the inclination of the pawl from the position shown in Fig. 7, the direction of ratcheting will be reversed.

The gears 31, 32 are in mesh with the pinion 16, 17, but if the sleeve 23 is shifted longitudinally so as to withdraw one bolt from its pinion, and permit engagement of the other bolt, then the spindle 13 will be rotated at a speed according to which one of the bolts 20 or 21 is projected. By shifting the slide 26 to an intermediate position, both of the bolts will be projected sufficiently so that both pinions are locked to the bolt-carrying hub 18 and results in locking the spindle so that the chuck can be conveniently opened and closed for substitution of tools. This locking of the spindle is due to the fact that if both pinions 16 and 17 are

locked to the spindle through the medium of the clutch hub and its bolts, the engagement of the two gears 31, 32 with the two pinions, will necessarily effect this locking, because of the different sizes of the two gears 31, 32. 70

I claim:—

1. An implement of the character described, having a shaft or spindle to be driven at either one of two speeds, a compound gear having two circular series of teeth, two pinions loosely mounted on said spindle and engaging the two series of teeth of the gear at the same side of the axis thereof, a hub directly secured to the spindle between said two pinions, independently movable spring-projected bolts carried by said hub to selectively engage the pistons, and means for selectively rendering said bolts alternately operative and inoperative in relation to said pinions. 75

2. An implement of the character described, having a shaft or spindle to be driven at either one of two speeds, two pinions loosely mounted on said spindle, a hub secured to the spindle between the pinions and bolts therein adapted to operatively engage the pinions, a compound gear engaging both pinions, and means for shifting said bolts to alternately engage them with said pinions, or to simultaneously engage them with both pinions to lock the gearing. 80

3. An implement of the character described, having a shaft or spindle to be driven at either one of two speeds, two pinions loosely mounted on said spindle, a hub secured to the spindle between the pinions and independent spring actuated bolts therein adapted to operatively engage the pinions, a compound gear engaging both pinions, and a longitudinally adjustable sleeve for shifting said bolts to alternately render them operative and inoperative in relation to said pinions. 85

4. In change speed gearing, the combination with a shaft or spindle, of two pinions loose thereon, a hub secured to the spindle and a plurality of independently movable devices therein to engage the pinions, a compound gear engaging both pinions, and a longitudinally adjustable sleeve having lost motion connection with said movable devices to shift the latter to cause the hub to be locked to either pinion. 90

5. In change speed gearing, the combination with a shaft or spindle, of two pinions loose thereon, a hub secured to the spindle between the pinions and having a plurality of longitudinal sockets, spring actuated bolts in said sockets, a compound gear meshing with both pinions, and a longitudinally adjustable sleeve having lost motion connections with said bolts. 95

6. In change speed gearing, the combination with a shaft or spindle, of two pinions 100

loose thereon, a hub secured to the spindle between the pinions and having a plurality of longitudinal sockets, spring actuated bolts in said sockets, a compound gear meshing with both pinions, and means for controlling the positions of said bolts longitudinally of their sockets, said means comprising a sleeve having pins engaging the bolts, said sleeve being longitudinally adjustable.

7. In change speed gearing, the combination with a shaft or spindle, of two pinions loose thereon, a hub secured to the spindle between the pinions and having a plurality of longitudinal sockets, spring actuated bolts in said sockets, a compound gear meshing with both pinions, and means for controlling the positions of said bolts longitudinally of their sockets, said means comprising a sleeve longitudinally shiftable on said hub and having inwardly projecting pins, the bolts having elongated recesses into which the pins project.

8. In change speed gearing, the combination with a shaft or spindle, of two pinions loose thereon, a hub secured to the spindle between the pinions and having a plurality of longitudinal sockets, spring actuated bolts in said sockets, a compound gear meshing with both pinions, and means for controlling the positions of said bolts longitudinally of their sockets, said means comprising a sleeve longitudinally shiftable on said hub and having inwardly projecting pins, the bolts having elongated recesses into which the pins project, the sleeve having an external annular groove, a slide having a pin entering the groove of the sleeve, and means for holding said slide in either one of a plurality of positions.

9. In change speed gearing, the combination with a shaft or spindle, of two pinions loose thereon, a hub secured to the spindle and a plurality of independently movable devices therein to engage the pinions, a compound gear engaging both pinions, means for controlling said movable devices to cause the hub to be locked to either pinion, a crank, and ratcheting connections between said crank and compound gear.

10. In change speed gearing, the combination with a shaft or spindle, of two pinions loose thereon, a hub secured to the spindle and a plurality of independently movable devices therein to engage the pinions, a

compound gear engaging both pinions, means for controlling said movable devices to cause the hub to be locked to either pinion, a crank, and ratcheting connections between said crank and compound gear, said connections comprising a reversible pawl carried by the crank, the gear being provided with a circular series of recesses to cooperate with said pawl.

11. An implement of the character described, comprising a gear having a circular series of recesses, a crank having a reversible pawl to cooperate with said recesses, means for holding the pawl in an intermediate position to positively lock the crank and gear together, a spindle, and connections between the spindle and gear for rotating the spindle.

12. An implement of the character described, comprising a gear having a circular series of recesses, a crank having a tubular bearing, a rotatably adjustable spring-actuated pawl in said bearing, and operative connections between the spindle and gear.

13. An implement of the character described having a spindle, gearing including a pair of pinions loose on the spindle, a hub secured to the spindle between the pinions and having independently movable spring-projected members mounted to move longitudinally thereof toward and from the pinions, said pinions having opposing faces formed to be engaged by the ends of said longitudinally movable members, each of the members being movable to engage with but one of the two pinions, and means for selectively withholding said members from engagement with one or the other of the pinions.

14. In mechanism of the character described, the combination with a spindle of high and low speed gearing including a pair of pinions loose on the spindle, said pinions having opposing ratchet teeth, and a barrel secured to said spindle between the pinions and having longitudinally movable pawls, means being provided for selectively rendering said pawls active or inactive.

In testimony whereof I have affixed my signature, in presence of two witnesses.

JOHN A. LELAND.

Witnesses:

LIZZIE B. STRACHAN,
KATHERINE E. NICHOLS.