(No Model.) 3 Sheets—Sheet 1.

A. C. STEBBINS.

FEEDING APPLIANCE FOR RADIAL DRILLS.

No. 392,169. Patented Oct. 30, 1888.

FIG. 2.

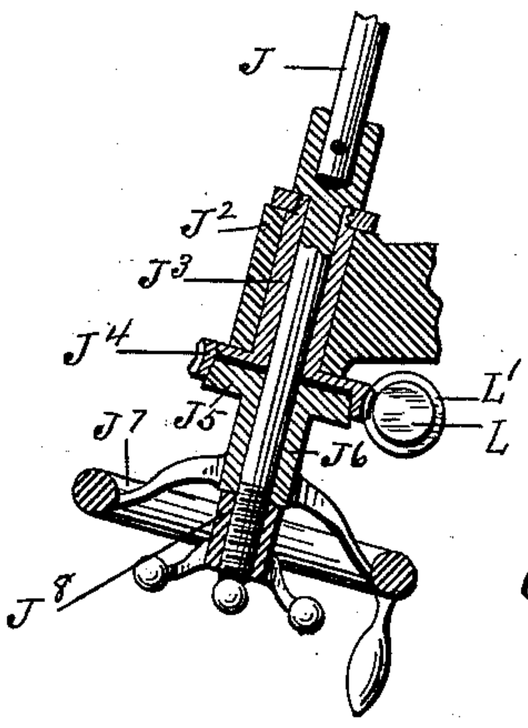

FIG. 3.

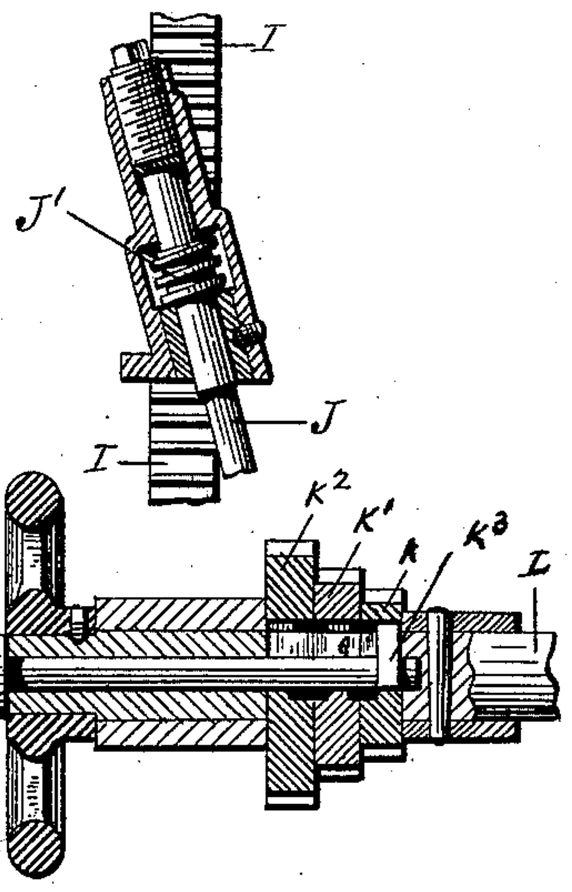

FIG. 4.

FIG. 1.

Witnesses.
Thos. F. Schmelz.
Rufus B. Fowler.

Inventor.
Albert C. Stebbins.

(No Model.) 3 Sheets—Sheet 2.

A. C. STEBBINS.

FEEDING APPLIANCE FOR RADIAL DRILLS.

No. 392,169. Patented Oct. 30, 1888.

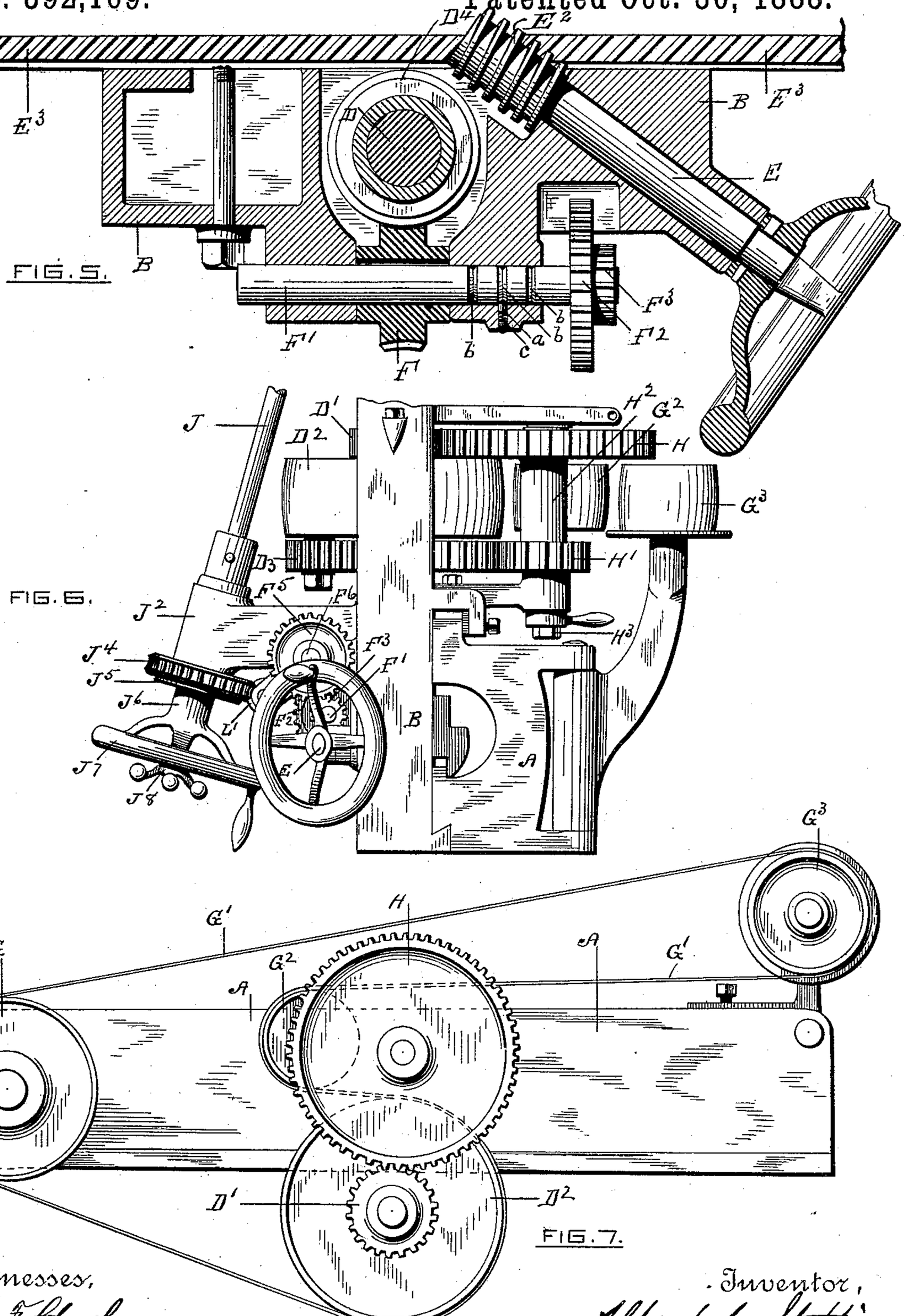

FIG. 5.

FIG. 6.

FIG. 7.

Witnesses,
Chas. F. Schmeck
Rufus B. Fowler

Inventor,
Albert C. Stebbins

(No Model.) 3 Sheets—Sheet 3.

A. C. STEBBINS.

FEEDING APPLIANCE FOR RADIAL DRILLS.

No. 392,169. Patented Oct. 30, 1888.

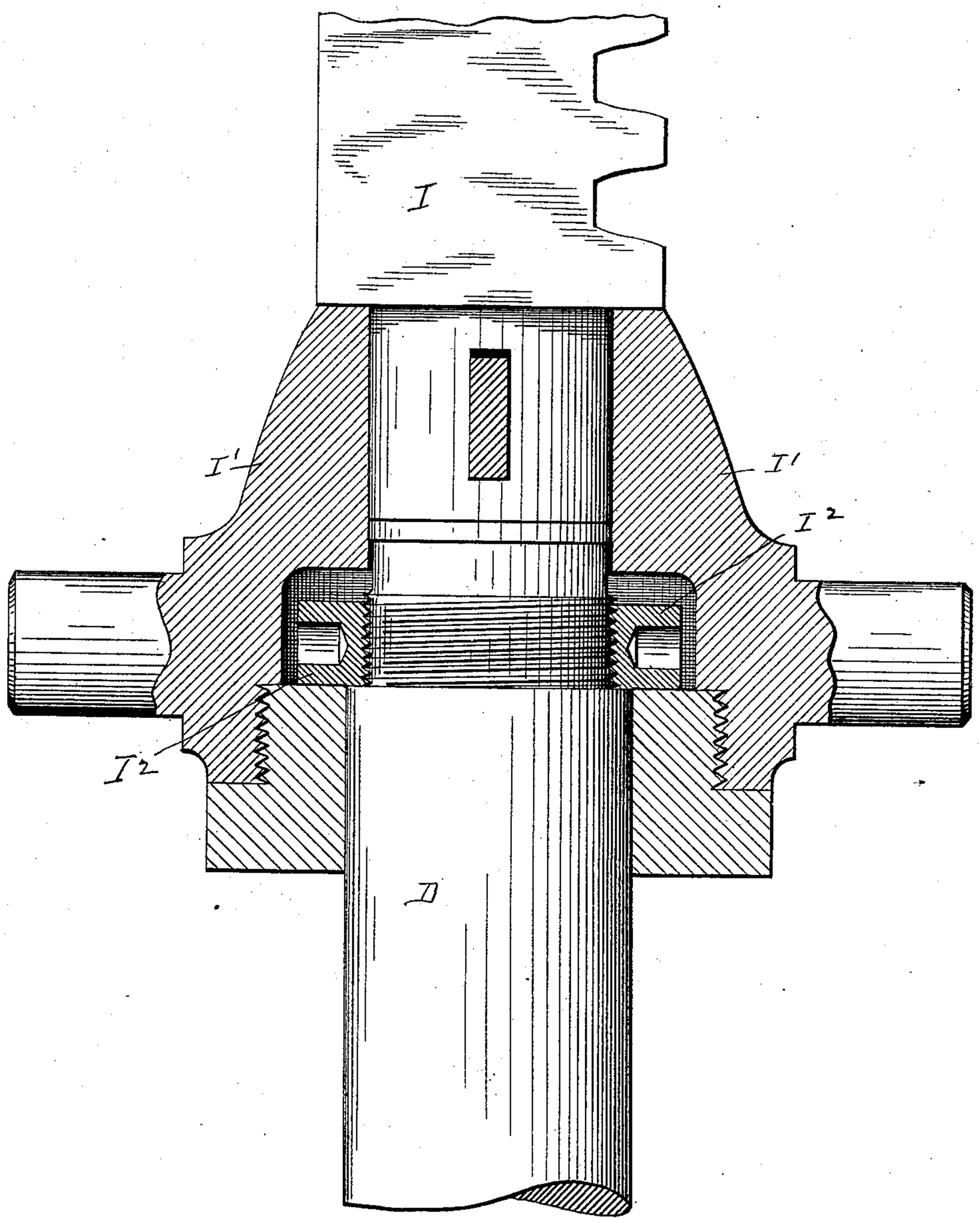

Fig. 8.

Witnesses,
Chas. F. Schmelz,
H. M. Fowler.

Inventor,
Albert C. Stebbins,
By his Attorney
Rufus P. Fowler.

UNITED STATES PATENT OFFICE.

ALBERT C. STEBBINS, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE POND MACHINE TOOL COMPANY, OF SAME PLACE.

FEEDING APPLIANCE FOR RADIAL DRILLS.

SPECIFICATION forming part of Letters Patent No. 392,169, dated October 30, 1888.

Application filed March 23, 1887. Serial No. 232,108. (No model.)

To all whom it may concern:

Be it known that I, ALBERT C. STEBBINS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Radial Drills, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a front view of the sliding head carrying the revolving drill-spindle. Figs. 2 and 3 are sectional views of portions of the mechanism for imparting a vertical feeding motion to the drill-spindle. Fig. 4 is a sectional view of a part of the connecting mechanism by which the feeding mechanism is connected with and actuated by the revolving drill-spindle. Fig. 5 is a horizontal sectional view of the sliding head. Fig. 6 is a side view of a portion of the sliding head, the upper part having been removed. Fig. 7 is a diagrammatic view illustrating the method of driving the drill-spindle and the position of the "back-gears." Fig. 8 shows a sectional view of the swiveled joint between the rack and drill-spindle, taken vertically through the center of the joint.

Similar letters refer to like parts in the different figures.

My invention relates to that portion of a radial drill concerned in rotating the drill-spindle, in moving the sliding head along the radial bar, and in imparting a feeding motion to the drill-spindle; and it consists in the novel combination of the operating parts by which the drill-spindle is rotated, and in the peculiar mechanism by which the sliding head is moved on the bar, and also by which the feeding motion is given to the drill-spindle, as hereinafter described, and set forth in the claims.

I have herein shown and described those parts of the machine only which embody my present invention, as the general construction and operation of machines of this class will be readily understood.

Referring to the drawings, A denotes a portion of the radial bar, which is pivoted at one end to an upright stand, as is common in machines of this class.

Upon the bar A, and capable of sliding in ways on said bar, is a saddle, B, with a frame-work, C, attached thereto and carrying a revolving drill-spindle, D, and connected driving mechanism. In the saddle B, I journal a shaft, E, obliquely to the radial bar A, and having on its outer end a hand-wheel, E′, and at its inner end a spiral gear, E^2, which engages the rack E^3 on the bar A, causing by its rotation a sliding movement of the saddle B along the bar A, and enabling the position of the drill-spindle to be varied on the bar to suit the work to be bored or drilled.

On the drill-spindle D are placed the pinion D′, belt-pulley D^2, gear D^3, and within the saddle and shown in Fig. 5 the worm D^4, which engages a worm-gear, F, on the horizontal shaft F′. The drill-spindle is rotated by a revolving driving-pulley, G, which is concentric with the swinging movement of the radial arm A, through a belt, G′, passing around the belt-pulley D^2 on the drill-spindle D and around the idle-pulley G^2 and tightening-pulley G^3. The pulley D^2 and the pinion D′, attached thereto, run loosely on the drill-spindle D, and are detachably connected to the gear D^3, which is attached to the drill-spindle D.

The speed of the drill-spindle is reduced by the back-gear arrangement, consisting of the gears H H′ on a sleeve, H^2, held on a shaft, H^3, which is held in eccentric bearings in the frame-work of the machine, enabling the gears on the sleeve H^2 to be carried into gear with the pinion D′ and gear D^3, when the pulley D^2 is disconnected from the gear D^3. The detailed construction of the back-gear arrangement is not shown, as it is in common use for the purpose named upon a large variety of machines.

The drill-spindle D is capable of a rotary motion in its bearings, and also of a vertical sliding motion, and to the upper end of the drill-spindle I attach by a swiveled joint the rack I, having only a vertical sliding motion in ways in the top of the frame C.

The swiveled joint between the drill-spindle and the rack is shown in section in Fig. 8, and it consists of a shell, I′, attached to the lower end of the rack I, and inclosing a collar, I^2, attached to the upper end of the drill-spindle D, so as to maintain the axis of the drill-spindle coincident with the axis of the rack. I do not, however, confine myself to any special construction of the swiveled joint, as many known forms of construction may be applied for the purpose.

Journaled in bearings in the frame-work is an oblique shaft, J, having at its upper end a spiral gear, J′, Fig. 3, engaging the rack I, and by its rotation causing a vertical motion of the rack and attached drill-spindle. Surrounding the shaft J and held in the lower bearing, J^2, is a sleeve, J^3, having an attached worm-gear, J^4, with its under side recessed to form one half of a friction-clutch. Fitting the recessed wheel J^4 is a disk, J^5, forming the other half of the friction-clutch and attached to a sleeve, J^6, which has a spline-connection with the shaft J, and has at its lower end a hand-wheel, J^7. Extending below the sleeve J^6 the shaft J′ is screw-threaded, and is provided with a nut, J^8, by which the sleeve J^6 is carried up and the disk J^5 made to engage the recessed wheel J^4, and the shaft J thereby connected with the worm gear-wheel J^4, whose rotary motion is imparted to the shaft J, giving a downward feeding motion to the rack I and connected drill-spindle D. By disconnecting the friction-clutch the shaft J is turned by the hand-wheel J^7 and the drill-spindle given a vertical motion in either direction.

Power is applied to the shaft J from the drill-spindle by means of the worm D^4 and connecting mechanism consisting of a worm-gear, F, on a horizontal shaft, F′, having a gear, F^2, and a pinion, F^3, adapted to engage, respectively, the pinion F^4 and the gear F^5 on the horizontal shaft F^6 by sliding the shaft F′ to the right or left from the position shown in Fig. 1, in which the gear F^2 and pinion F^3 are represented as midway between and disengaged from both the gear F^5 and pinion F^4.

The shaft F′ is shown in Fig. 5, and has a spline-connection with the worm gear-wheel F. A pin, *a*, held in the frame, is made to engage one of the three grooves *b b b* by means of the spring *c*, and thereby hold the shaft F′ in either of the three positions required to bring the gear F^2 or pinion F^3 in engagement with the gears on the shaft F^6, or to hold the shaft F′ entirely disconnected with the shaft F^6, as shown in Figs. 1 and 5. It will thus be seen that two different speeds can be imparted to the shaft F^6 from the shaft F′, or the shafts can be disconnected. Upon the opposite end of the shaft F^6, I attach the cone-gear F^7, each step of the gear engaging one of the gears K K′ K^2, which run loosely on the shaft L, each of which is connected at will with the shaft L by means of a sliding spline, K^3, operated by the knob K^4. The speed of the shaft L is thereby changed relatively to that of the shaft F^6, as each of the steps of the cone-gear F^7 is made to engage a corresponding gear on the shaft L. To the shaft L, I attach a worm, L′, Figs. 1 and 2, which engages the worm-gear J^4 on the sleeve J^3.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a radial drill, the combination, with a drill-spindle capable of a vertical sliding motion, of a rack swiveled to said drill-spindle, so as to allow the drill-spindle to rotate, and a spiral gear engaging said rack and having connected actuating mechanism for rotating the same, substantially as described.

2. The combination, with the drill-spindle D, of a rack, I, spiral gear J′, oblique shaft J, and hand-wheel J^7, substantially as described.

2. In a radial drill, the combination, with the drill-spindle having a worm attached thereto, of a rack connected by a swiveled joint to said drill-spindle, a spiral gear engaging said rack and attached to a rotating shaft, a worm gear-wheel on said rotating shaft, and mechanism, substantially as described, by which said rotating shaft is connected with and rotated by the drill-spindle, as and for the purpose set forth.

4. In a radial drill, the combination, with a drill-spindle, of a rack connected by a swiveled joint with the drill-spindle, a spiral gear engaging said rack, an oblique shaft carrying said spiral gear, and a clutching device by which said oblique shaft is connected with actuating mechanism, substantially as described.

5. In a radial drill, the combination, with a rotating drill-spindle having connected mechanism for imparting a vertical feeding motion, substantially as described, of a worm attached to said drill-spindle, a worm-gear engaged by and driven by said worm, a sliding shaft capable of sliding through said worm-gear and having a spline-connection therewith, and gears of varying size on said sliding shaft, which are made by the sliding motion of said shaft to engage corresponding gears connected with said feeding mechanism, whereby a varying speed is given the feeding mechanism, substantially as described.

6. In a radial drill, the combination, with the drill-spindle having a rack connected by a swiveled joint to said drill-spindle, and a spiral gear engaging said rack, of mechanism for actuating said spiral gear from the drill-spindle, and consisting of worm D^4, worm-gear F, shaft F′, sliding in said worm-gear, and carrying a gear, F^2, and pinion F^3, shaft F^6, with pinion F^4, gear F^5, and cone-gear F^7, shaft L, with gears K′ K′ K^2, and sliding spline K^3, worm L^2, worm-gear J^4, having a clutch-connection with the shaft J, and shaft J, carrying the spiral gear J′, engaging the rack connected with the drill-spindle, substantially as described.

7. In a radial drill, the combination, with a rotating drill-spindle, of a worm attached

thereto, a worm gear driven by said worm, a shaft extending through and capable of sliding in said worm-gear, and a series of grooves extending around said sliding shaft, a pin entering one of said grooves, and a spring whose tension is applied to hold said pin in its groove, and gears on said sliding shaft, adapted to engage corresponding gears connected with and actuating the feeding mechanism of the drill-spindle, substantially as described.

ALBERT C. STEBBINS.

Witnesses:
RUFUS B. FOWLER,
H. M. FOWLER.