(Model.) 3 Sheets—Sheet 1.

L. H. PIERSON.

CONVERTIBLE DRILL PRESS OR SLOTTING MACHINE.

No. 341,165. Patented May 4, 1886.

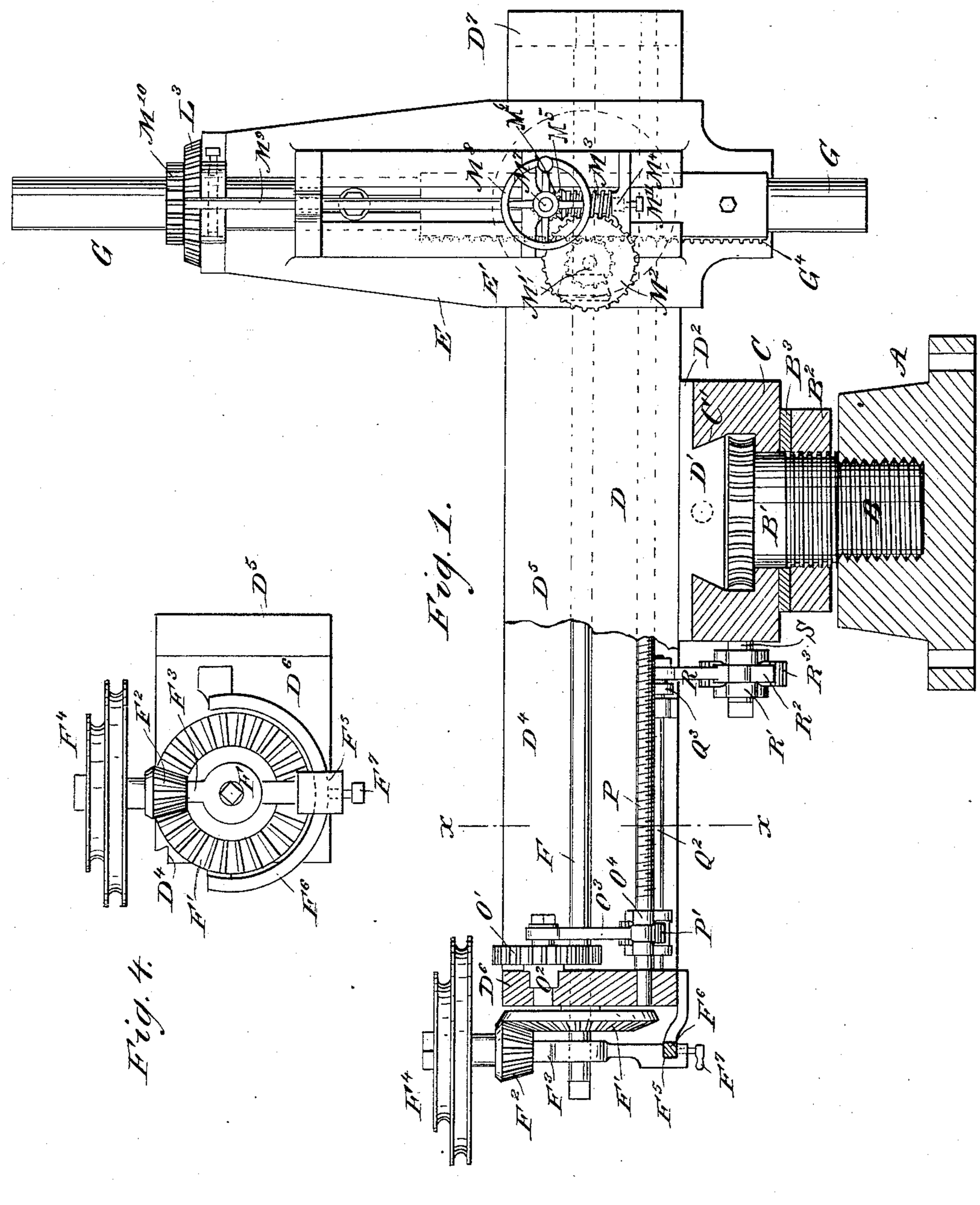

Fig. 1.

Fig. 4.

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Jno. Mathew Ritter

INVENTOR:

L. H. Pierson

BY Munn & Co

ATTORNEYS.

N. PETERS. Photo-Lithographer. Washington, D. C.

(Model.)

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L. H. PIERSON.

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Fig. 5.

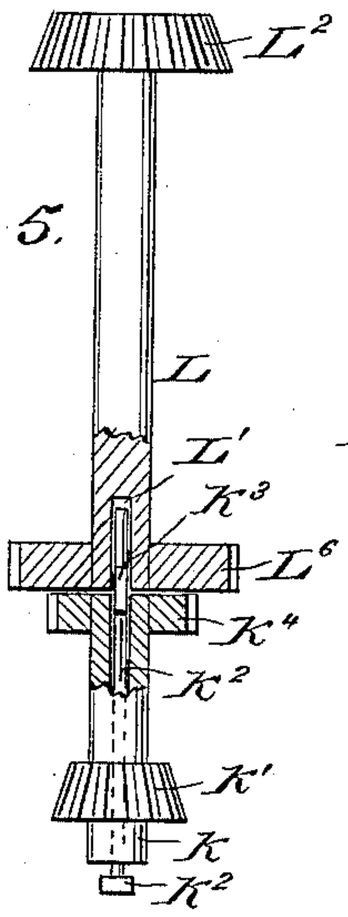


Fig. 7.

Fig. 8.

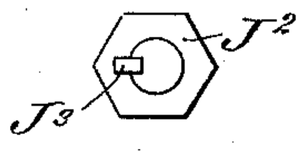


Fig. 9.

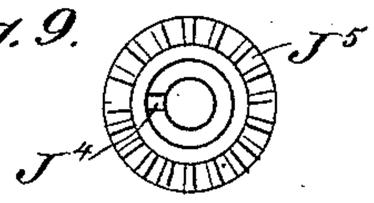
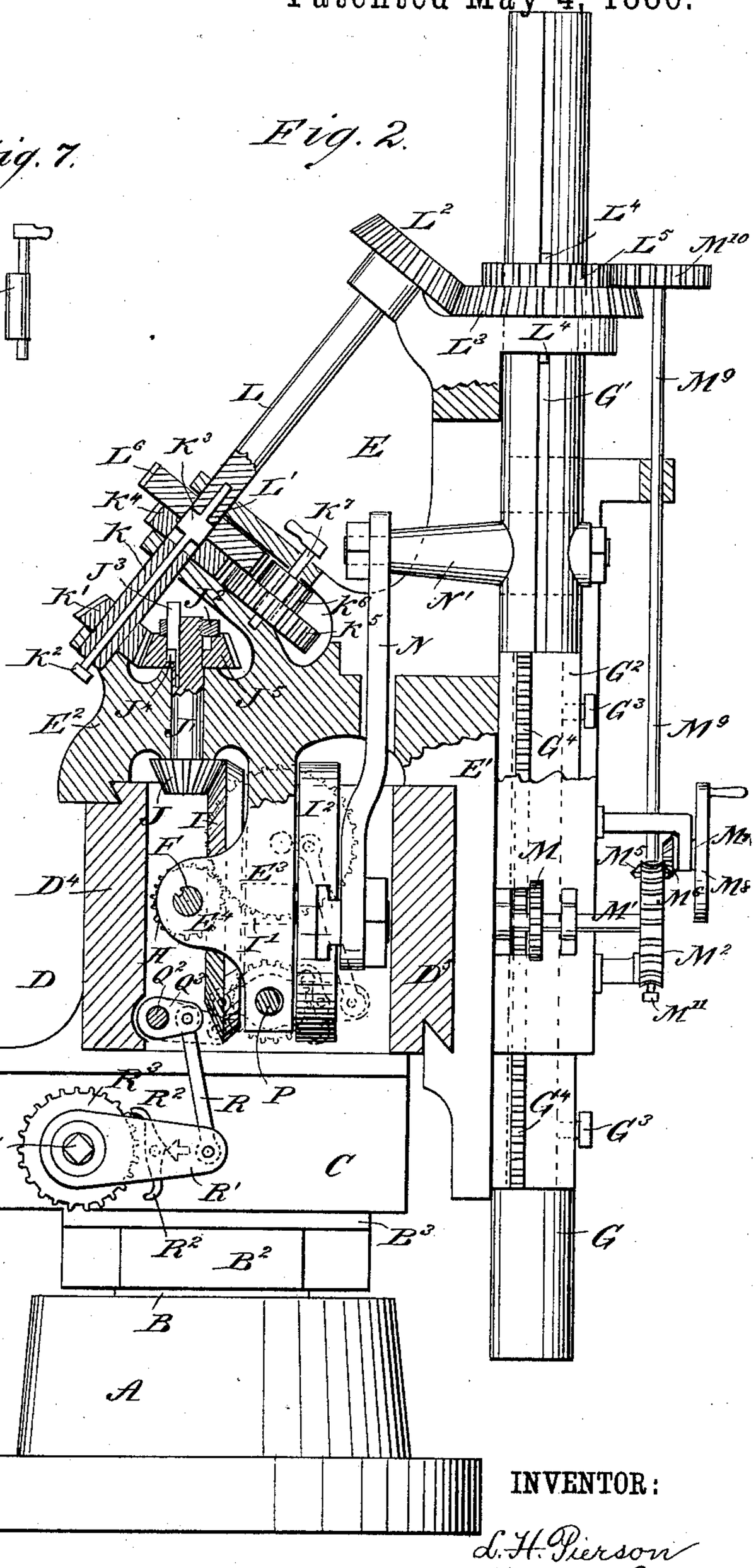


Fig. 2.



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(Model.) 3 Sheets—Sheet 3.

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CONVERTIBLE DRILL PRESS OR SLOTTING MACHINE.

No. 341,165. Patented May 4, 1886.

Fig. 3.

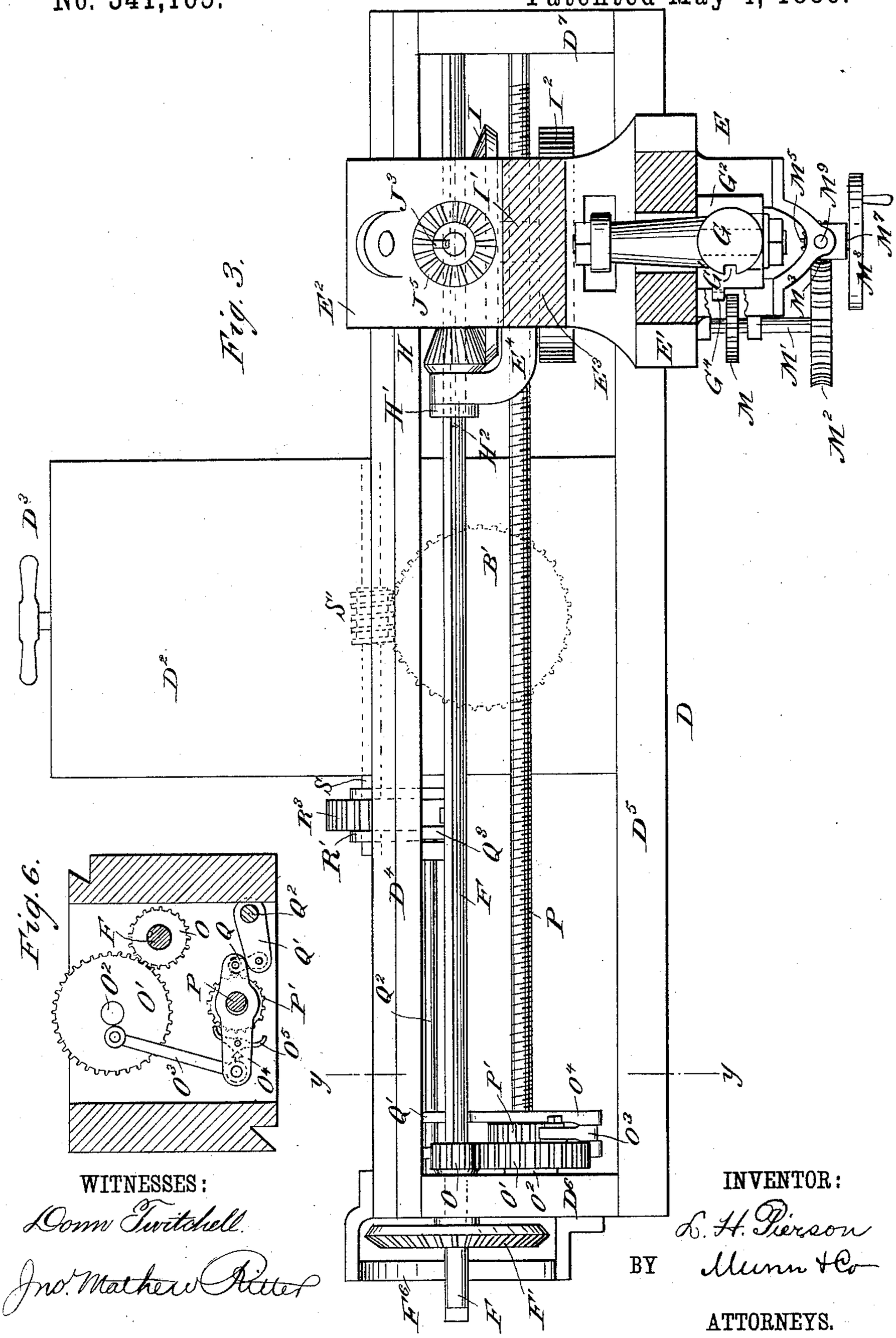

Fig. 6.

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UNITED STATES PATENT OFFICE.

LAURENCE H. PIERSON, OF SAN FRANCISCO, CALIFORNIA.

CONVERTIBLE DRILL-PRESS OR SLOTTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 341,165, dated May 4, 1886.

Application filed July 23, 1885. Serial No. 172,418. (Model.)

To all whom it may concern:

Be it known that I, LAURENCE HAIGHT PIERSON, of San Francisco, in the county of San Francisco and State of California, have invented a new and Improved Convertible Drill-Press or Slotting-Machine, of which the following is a full, clear, and exact description.

The object of my invention is to provide a new and improved machine which is convertible from a drill-press to a slotting-machine, and constructed in such a manner as to be portable and attachable to the work to be slotted or drilled, and which can be operated by hand or other power and easily changed from a drill-press to a slotting-machine, and vice versa.

The invention consists of a traveling head which carries the contrivance for converting the up-and-down motion into a rotary one; of a frame or guide on which the traveling head is adjustable; of a standard which supports the frame and is directly attachable to the work which is to be slotted or drilled, and of feeding devices, hereinafter more fully set forth.

The invention also consists in various parts and details, hereinafter more fully set forth and described.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a front elevation, partly in section, of my improvement. Fig. 2 is a cross-section of the same on the lines *x x* of Fig. 1. Fig. 3 is a plan view, partly in section, with top gears removed, showing the machine as a slotter. Fig. 4 is an end elevation of the transmitting device. Fig. 5 is a detail view of the speed-changing device. Fig. 6 is a vertical cross-section on the lines *y y* of Fig. 3, and Figs. 7, 8, and 9 are detail views of parts hereinafter more fully described.

The standard A is directly attached to the work to be slotted or drilled by suitable bolts or clamps or other devices. A pin, B, screwed into the standard A, connects the latter with the frame C, in which slides the guide D, carrying the traveling head E. The pin B is made as heavy as possible, as all the strain in slotting and drilling acts upon it. The head of the pin B is formed into a worm-wheel, B′, which meshes into the worm S′, formed on the shaft S, which has its bearings in the frame C, and on being turned gives a circular motion to the frame C, the guide D, and the traveling head E.

Between the standard A and the frame C are placed the nut B^2 and the washer B^3 on the pin B, so that when slotting on a straight line the nut B^2 can be tightened, thereby preventing the frame C from moving; but when slotting on a curve this nut B^2 is loosened enough to allow the frame C to be turned, and yet not have any lost motion. The frame C has a dovetailed recess, C′, in its upper face, to receive a dovetailed tongue, D′, formed on the under side of the guide D, and extends at right angles from the latter, forming the cross-slide D^2, which is provided on its outer end with a handle, D^3, to slide the guide D forward or backward on the frame C.

The guide D consists of the guideways D^4 and D^5, provided with dovetails and carrying the traveling head E, and of the end cross-pieces, D^6 and D^7, in which is mounted the main shaft F.

The traveling head E consists of the front plate, E′, which slides on the guideway D^5, and is provided with suitable bearings, which carry the tool-spindle G and attachments, of the rear arm, E^2, sliding on the guideway D^4 and carrying part of the transmitting and speed-changing device, and of the center arm, E^3, which projects downward between the guideways D^4 and D^5 and forms a bearing for the main shaft F and part of the gear-wheels for imparting a rotary motion to the spindle G, and also carrying the device for imparting the up-and-down sliding motion to the tool holder or spindle G when the machine is used as a slotter. The main shaft F extends beyond the cross-end D^6 of the guide D, and is provided with the beveled gear-wheel F′, which is driven from the beveled pinion F^2, journaled on the movable shaft F^3, and which pinion is provided or made integral with the graded driving-pulley F^4. The shaft F^3 is mounted on the shaft F, and in its lower end is provided with a groove, F^5, which slides on the segment F^6,

secured to the cross-end D^6, and having its center in the center of the shaft F. The shaft F^3 can be secured at any angle and at any point on the segment F^6 by the set-screw F^7, so that the graded pulley F^4 can be always kept in line with the pulley from which the driving-power is derived. The extreme pulley carrying end of the shaft F is square, so that a hand-wheel can be attached to it to turn the shaft F by hand-power.

The shaft F is slotted its entire length between the cross-ends D^6 and D^7, so that the beveled pinion H, provided with a hub, H′, and a key, H^2, which engages the slot in the shaft F, is rotated by the latter at any point on the same. The hub H′ has its bearing in and is held to an extension, E^4, of the center arm, E^3, of the traveling head E. The pinion H meshes into the beveled gear-wheel I, secured to the shaft I′, which has its bearing in the center arm, E^3, of the traveling head E, and is provided with the slotted disk I^2, which imparts an up-and-down motion to the tool-holder G by devices hereinafter more fully described.

The tool holder or spindle G is placed in suitable bearings on the front plate, E′, of the traveling head E, and receives a rotary motion or an up-and-down sliding motion by devices which belong either to the drill-press or the slotting-machine; and in order to clearly understand both devices it will be necessary to describe each device separately, and therefore I will commence with the parts belonging to the drill-press proper, and then describe the changing to a slotting-machine.

The beveled gear-wheel I meshes into the beveled pinion J, secured on the lower end of the vertical shaft J′, which has its bearings in the arm E^2 of the traveling head E. The upper end of the shaft J′ is provided with a nut, J^2, and with a key, J^3, which, when depressed in a corresponding keyway, J^4, on the beveled gear-wheel J^5, secures the latter to the shaft J′ and rotates it with the same; but when in the position as shown in Fig. 2 the shaft J′ revolves without rotating the beveled gear-wheel J^5. The nut J^2 holds the gear-wheel J^5 in place.

An inclined shaft, K, which has its bearing in a projecting arm of the arm E^2, is provided with the beveled gear-wheel K′, which meshes into the gear-wheel J^5. In the center of the shaft K is placed a rod, K^2, provided with a square offset, K^3, which projects into a corresponding recess, L′, of the shaft L, and imparts to the latter the rotary motion of the shaft K. The shaft L forms a continuation of the shaft K, and has its bearing in a projecting arm of the arm E^2, and is provided on its extreme upper end with the beveled gear-wheel L^2, which meshes into the beveled gear-wheel L^3, placed on the tool-holder G. This gear-wheel L^3 is provided with a key, L^4, which fits loosely in a keyway, G′, on the tool-holder G, so that the latter has a free up-and-down motion when the machine is changed into a slotter, and, in drilling, the gear-wheel L^3, by means of the key L^4, rotates the tool holder or spindle G.

The tool holder or spindle G is provided with an annular recess, in which is placed the sleeve G^2, held on the spindle G by means of the set-screws G^3. This sleeve G^2 is provided with a toothed rack, G^4, into which meshes a gear-wheel, M, placed on the shaft M′, which has its bearings on projections of the front plate, E′, of the traveling head E. The gear-wheel M is provided with a key, which fits loosely in a keyway on the shaft M′, so that the gear-wheel M can be thrown in or out of gear with the rack G^4 by moving it on the shaft M′.

To the outer end of the shaft M′ is secured a worm-wheel, M^2, which engages with the worm M^3, formed on the shaft M^4. This shaft M^4 receives a rotary motion through its beveled gear-wheel M^5, meshing into the beveled gear-wheel M^6, placed on the shaft M^7, which is revolved by turning the hand-wheel M^8, secured to the shaft M^7. An automatic feed motion is obtained by connecting, the same as shafts K and L, the shaft M^4, by means of the rod M^{11}, with the vertical shaft M^9, which is provided on its upper end with a gear-wheel, M^{10}, which meshes into the gear-wheel L^5, attached to the beveled gear-wheel L^3.

The operation of the drill-press is as follows: The main shaft F rotates the pinion H, which revolves the beveled gear-wheel I, which rotates the shaft J′ by means of the beveled pinion J. The key J^3 is depressed into the recess J^4 on the beveled gear-wheel J^5, so that the latter rotates with the shaft J′ and causes the shafts K and L to rotate by means of the gear-wheel K′. The beveled gear-wheel L^2 on the shaft L rotates the beveled gear-wheel L^3, which revolves the spindle G, and the gear-wheel L^5, rotating the gear-wheel M^{10}, supplies an automatic feed to the spindle G when the gear-wheel M is moved in gear with the rack G^4. If the drill used is of a large caliber, the speed of the spindle G has to be diminished, which is accomplished by disconnecting the shafts K and L by withdrawing the rod K^2, with its square offset K^3, from the recess L′ in the shaft L, and by throwing the gear-wheels K^5 and K^6, placed on the eccentric-shaft K^7, in gear with the gear-wheels K^4 and L^6 on the shafts K and L, respectively, by turning the eccentric-shaft K^7.

In using the machine as a slotter the gear-wheel J^5 is disconnected from the shaft J′, the gear-wheel M is thrown out of gear with the rack G^4, and the spindle G is prevented from turning by screwing up the bolts G^3. An up-and-down motion of the spindle G is attained by attaching to the crank-disk I^2 in any suitable manner the pitman N, the upper end of which is pivotally secured to a detachable lug or pin, N′, placed on the spindle G. The rotary motion of the crank-disk I^2 is converted into a reciprocating motion imparted to the spindle G.

The feed arrangement for the slotting-machine is derived from the main shaft F in the following manner: Near the inside of the cross-end D^6 of the guide D is secured to the shaft F the spur-wheel O, which meshes into the gear-wheel O', revolving on a stud, O^2, secured in the cross-end D^6. The gear wheel O' is connected by the rod O^3 with the forked lever O^4, which has its fulcrum on the feed-shaft P. The latter has its bearings in the cross-ends D^6 and D^7 of the guide D, and passes through a nut secured in the lower end of the center arm, E^3, of the traveling head E, so that when the screw-shaft P is turned in either direction it causes the traveling head E to slide on the guideways D^4 and D^5 of the guide D. To the feed-shaft P is secured a ratchet-wheel, P', placed between the forked end of the lever O^4, and on the latter is pivoted the double-ended spring-pawl O^5, which can be engaged with the ratchet-wheel P' on either side, by which a right or left hand motion is given to the feed-shaft P. The gear-wheels O and O' are in the same proportion as the driving beveled gear-wheels H and I, so that the feed will work at every stroke of the slotter. The outer end of the lever O^4 is connected by the short link Q to the crank-arm Q'. secured to the shaft Q^2, which is provided with the crank-arm Q^3. A rod, R, connects the crank-arm Q^3 with the crank-arm R', fulcrumed on the shaft S, which is provided with the worm S', driving the worm-wheel B' on the stud B, previously described. The crank-arm R' is provided with the double-ended pawl R^2, which can be placed in contact with either side of the ratchet-wheel R^3, secured to the shaft S. This arrangement gives a circular feed motion to the slotting-machine when the pawl O^5 is thrown out of contact with the ratchet-wheel P' and the pawl R^2 is thrown in contact with the ratchet-wheel R^3 on the shaft S. The lever O^4 acts then simply as a walking-beam to transmit the motion of the shaft F to the shaft S, by means of the connections before described, while the feed-screw P is at rest.

It will be seen that by the few changes before described the machine can be changed from a slotting-machine into a drill press, and vice versa.

Each machine is complete in all its details and workings, but both derive their respective motions and feed from the main shaft and its attachments. The entire construction is very simple and effective.

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

1. The standard A, the pin B, the frame C, the guide D, the traveling head E, and the tool-holder G, in combination with the main shaft F, the beveled gear-wheels H and I, the disk I^2, and the pitman N N', actuating said tool-holder, substantially as shown and described.

2. The standard A, the pin B, the frame C, the guide D, the traveling head E, and the tool-holder G, in combination with the main shaft F, the beveled gear-wheels H and I, the disk I^2, pitman N N', and the feed-screw P, actuated by pawl-and-ratchet mechanism and actuating the tool-holder, carriage, or head, substantially as shown and described.

3. The standard A, the pin B, the worm-wheel B', the frame C, the guide D, the traveling head E, the tool-holder G, and the main shaft F, in combination with the shaft S and the worm S', substantially as shown and described.

4. The main shaft F, the driving beveled gear-wheels H and I, the shaft I', and the crank-disk I^2, in combination with a connecting-rod, N, the stud N', and the tool-holder G, substantially as shown and described.

5. The main shaft F, the gear-wheels O and O', the connecting-rod O^3, the lever O^4, and the double-ended spring-pawl O^5, in combination with the feed-screw P, the ratchet-wheel P', and the traveling head E, substantially as shown and described.

6. The main shaft F, the gear-wheels O and O', the connecting-rod O^3, the lever O^4, the link Q, the crank-arm Q', the shaft Q^2, the crank-arm Q^3, the connecting-rod R, the crank-arm R', and the double-ended spring-pawl R^2, in combination with the ratchet-wheel R^3, the shaft S, the worm S', and the worm-wheel B', formed on the stud B, substantially as shown and described.

7. The combination, with the standard A, frame C, and the pin B, of the nut B^2 and washer B^3, substantially as shown and described.

8. The standard, the supporting-pin, the frame, the guide, and mechanism, as described, for operating the slotter and its feed jointly with the gear I J J^5 K' L^2 L^3 and shafts J' and L, substantially as described.

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Witnesses:
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SAM H. RYENSBURGER.