No. 671,806. Patented Apr. 9, 1901

W. ROBINSON.

LATHE.

(Application filed Dec. 13, 1900.)

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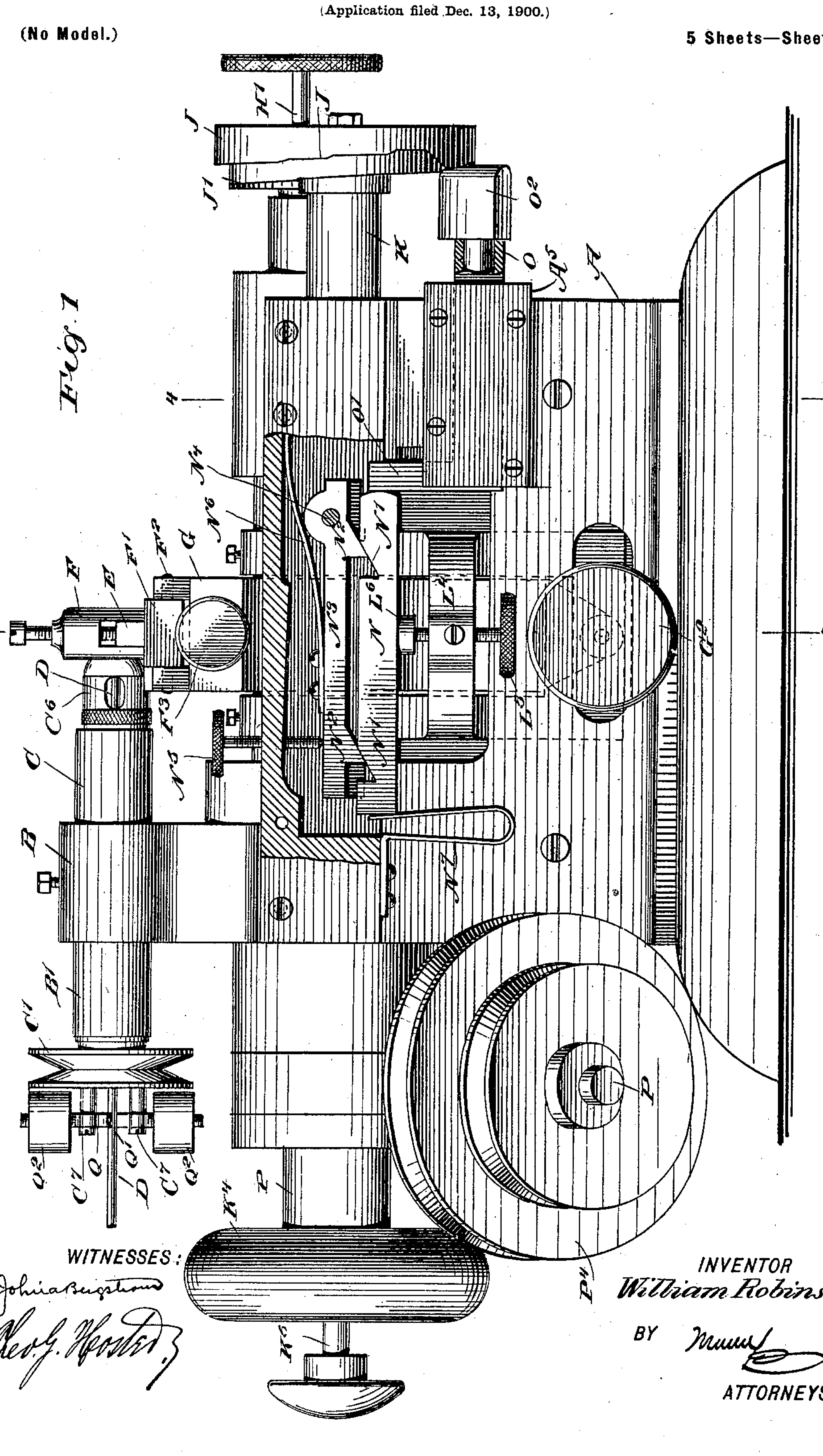

Fig. 1

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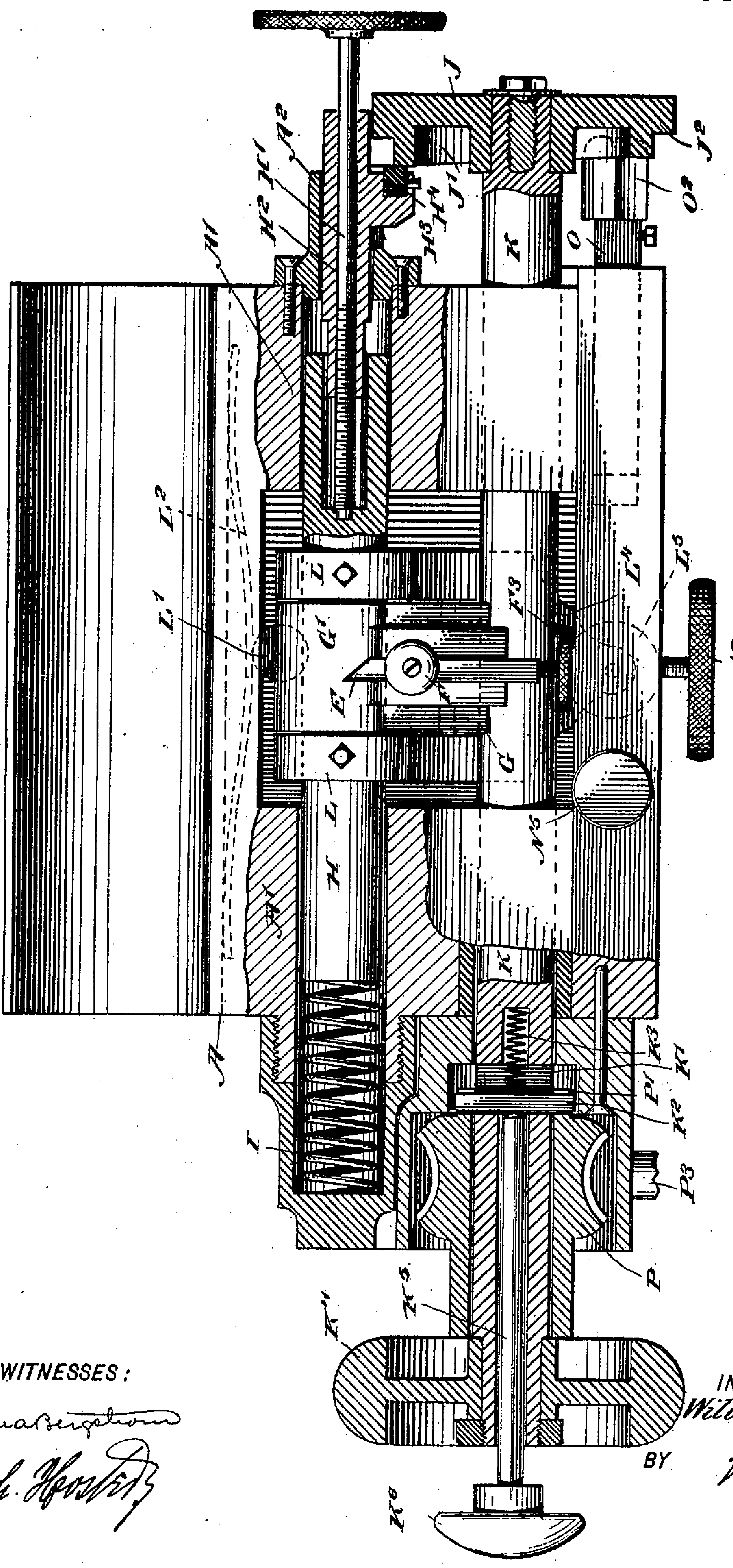

Fig. 2

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(Application filed Dec. 13, 1900.)

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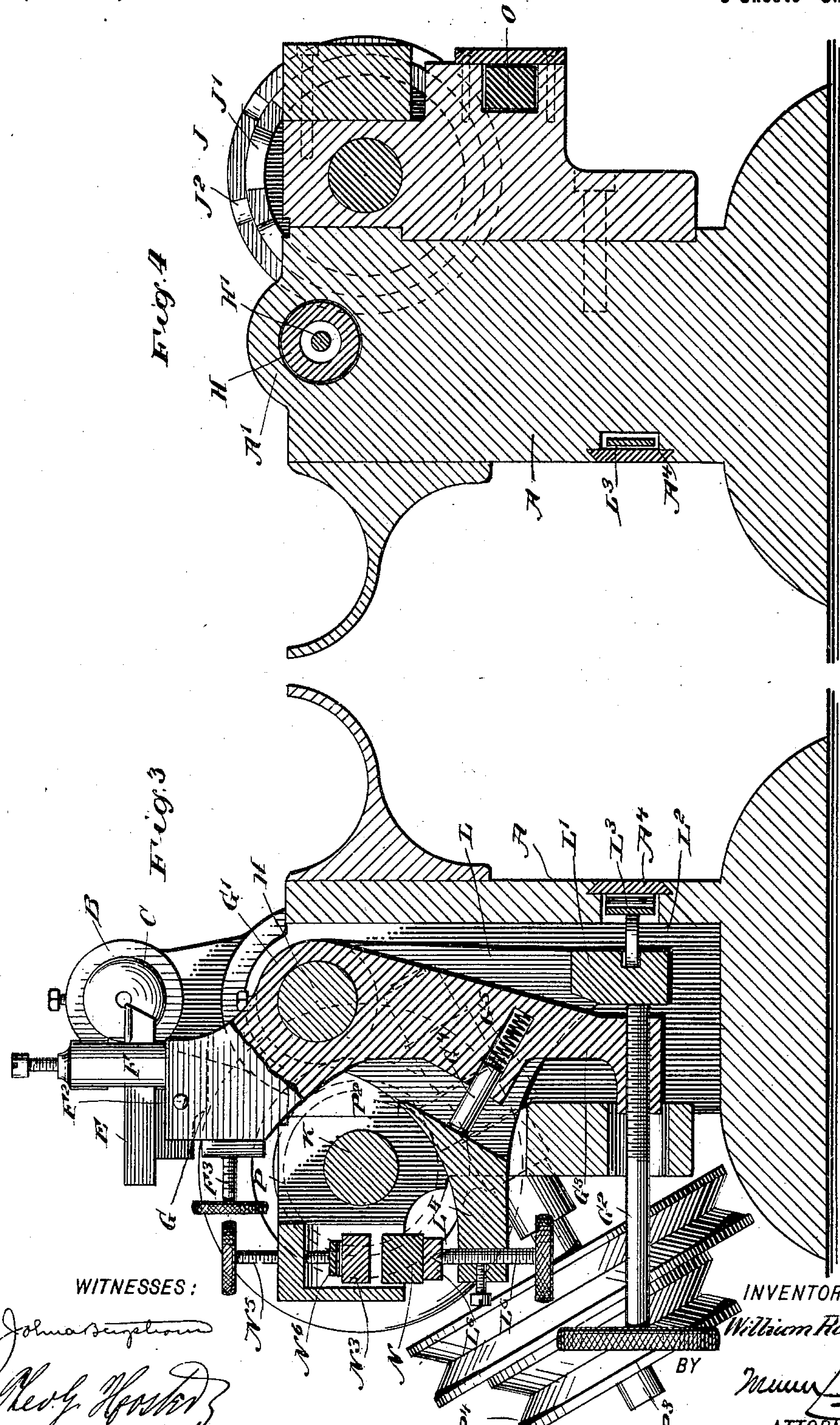

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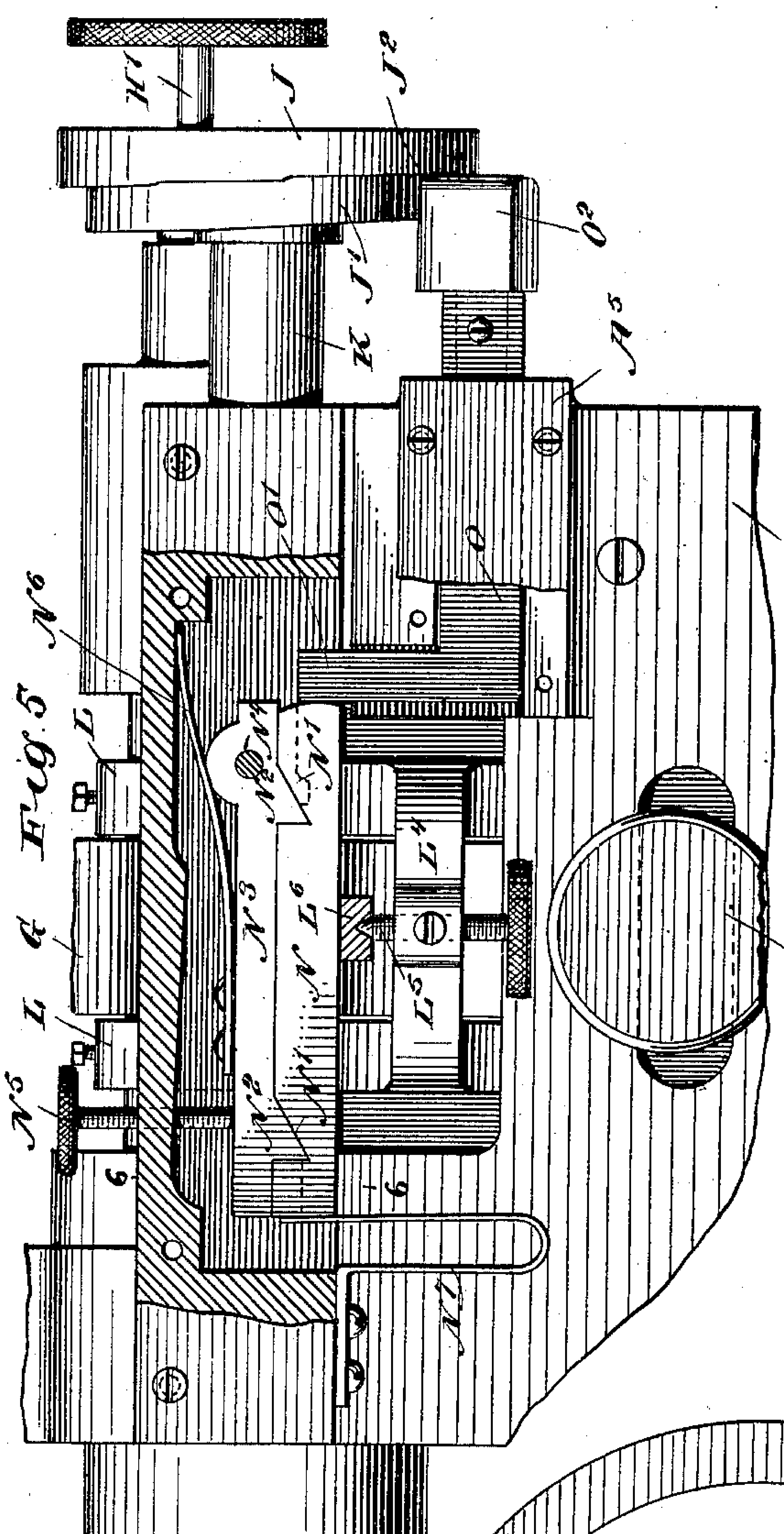

Fig. 5

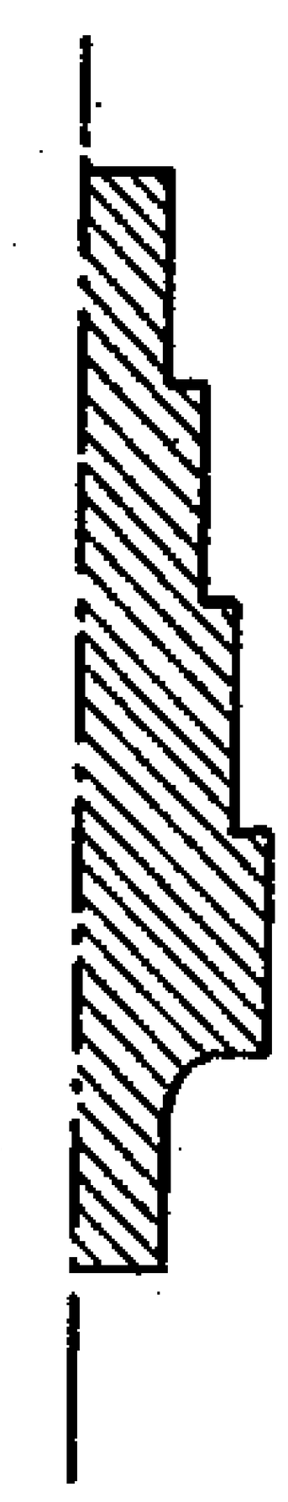

Fig. 9

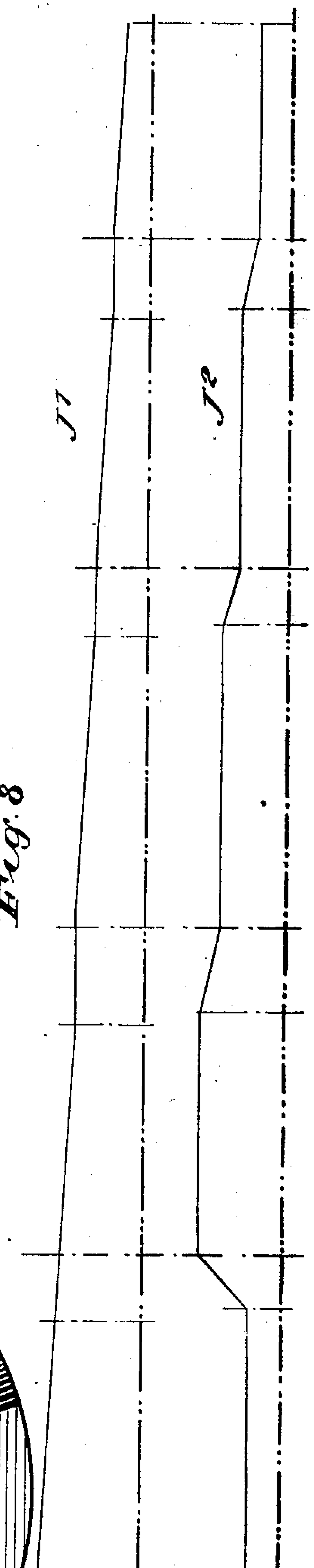

Fig. 8

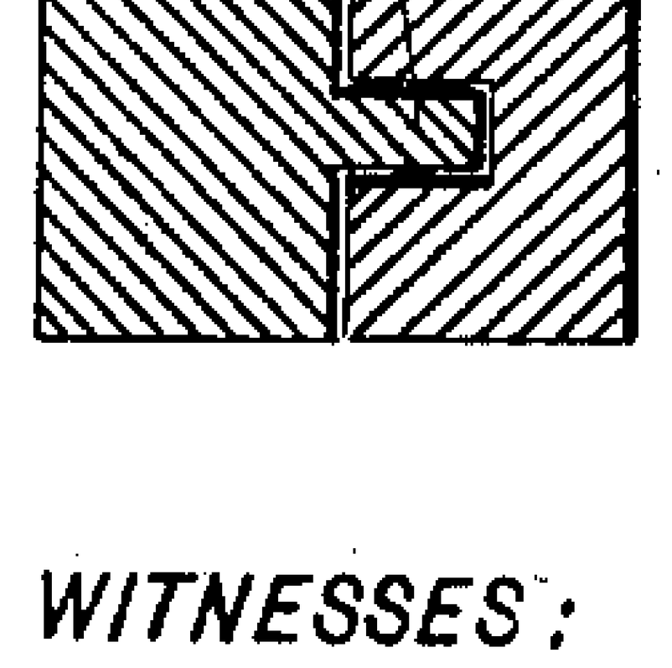

Fig. 6

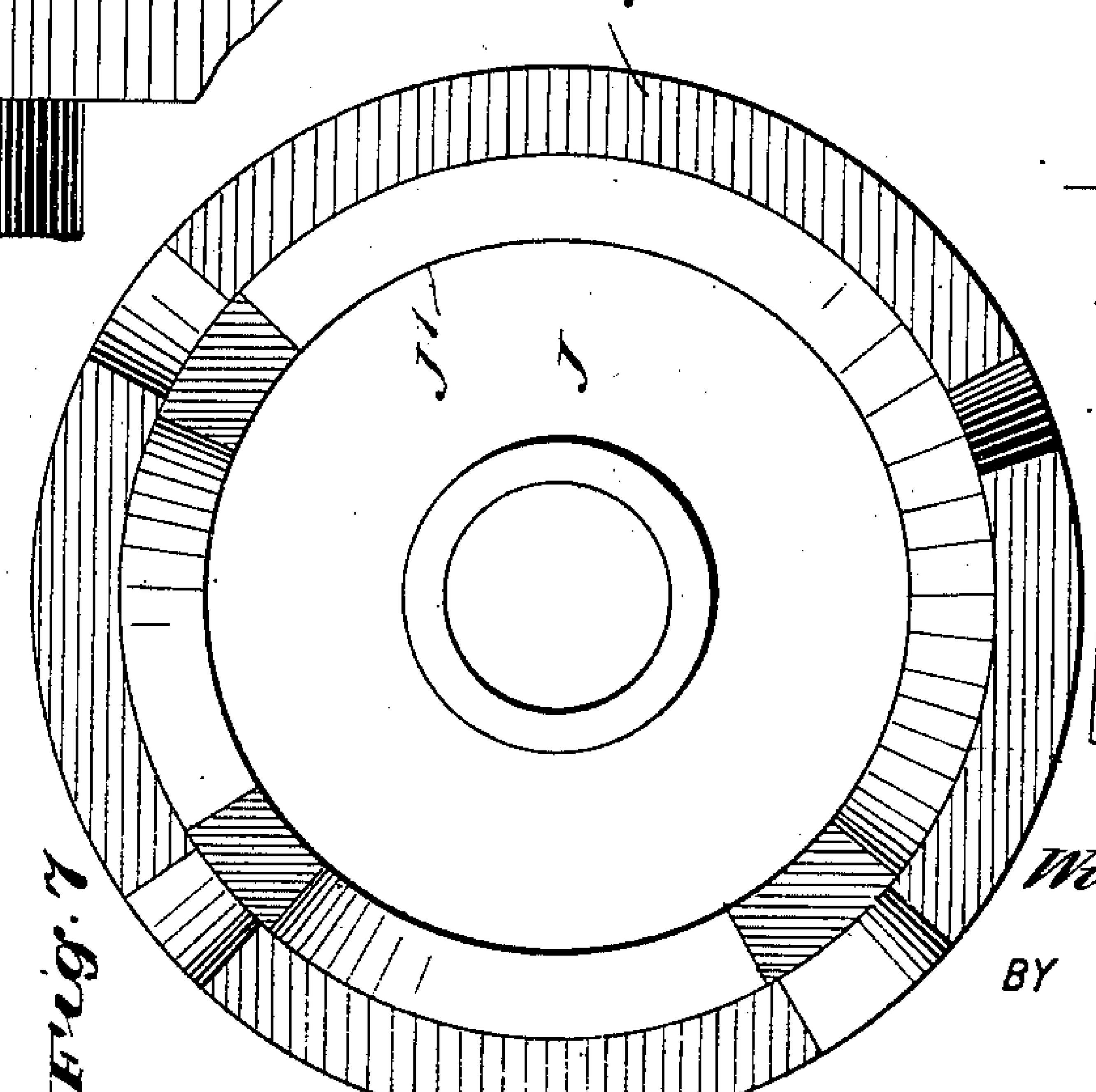

Fig. 7

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(Application filed Dec. 13, 1900.)

(No Model.) 5 Sheets—Sheet 5.

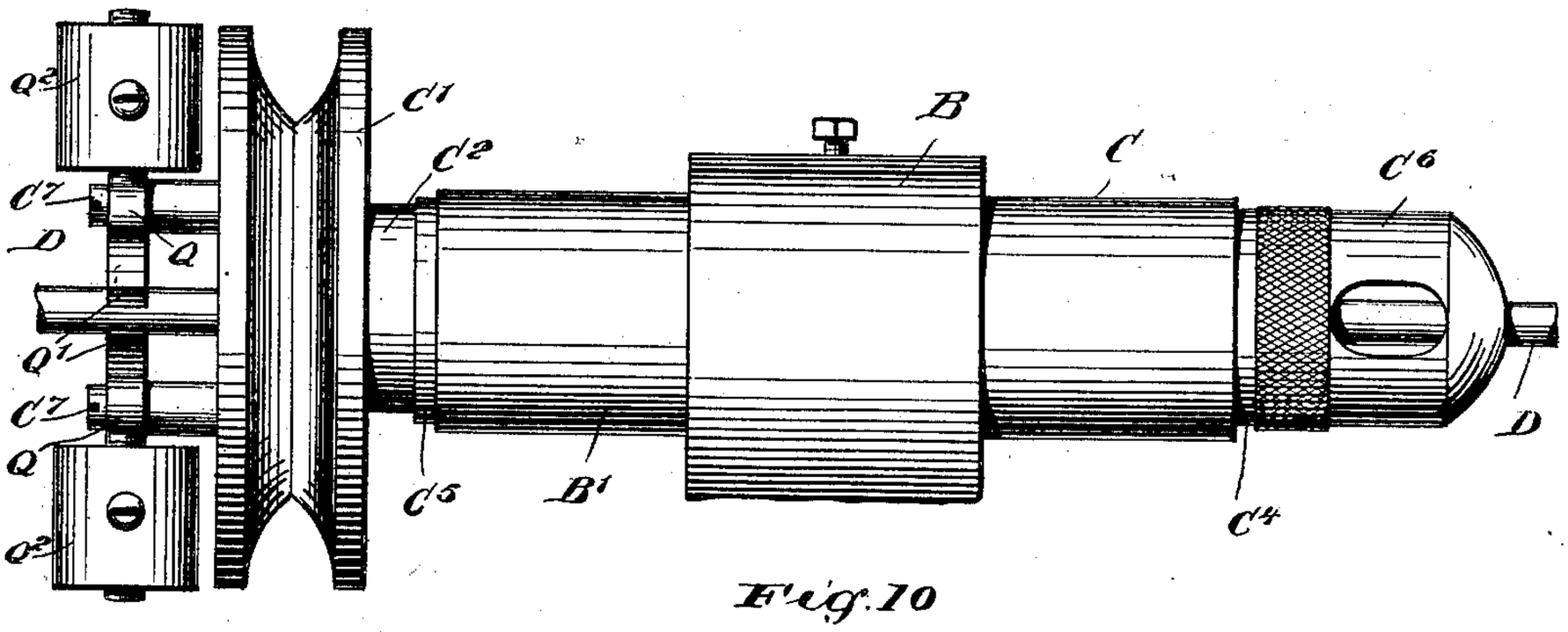

Fig. 10

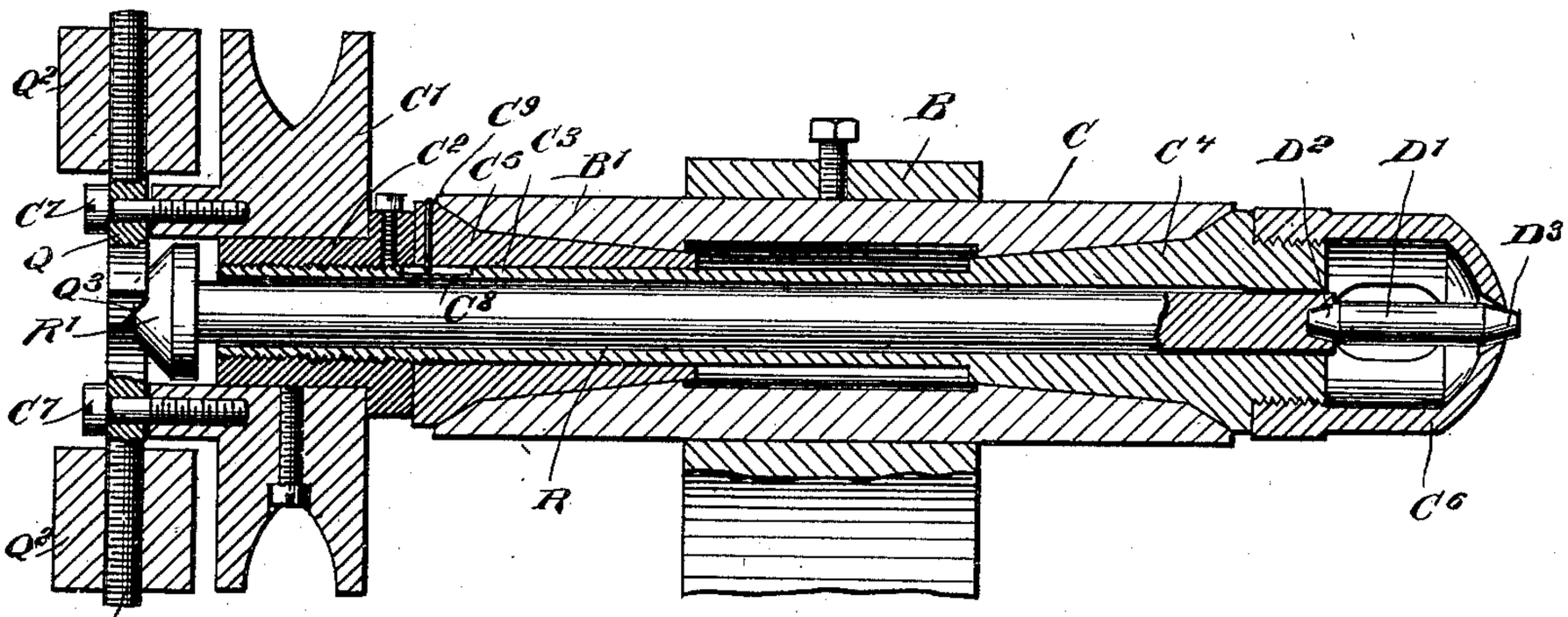

Fig. 12

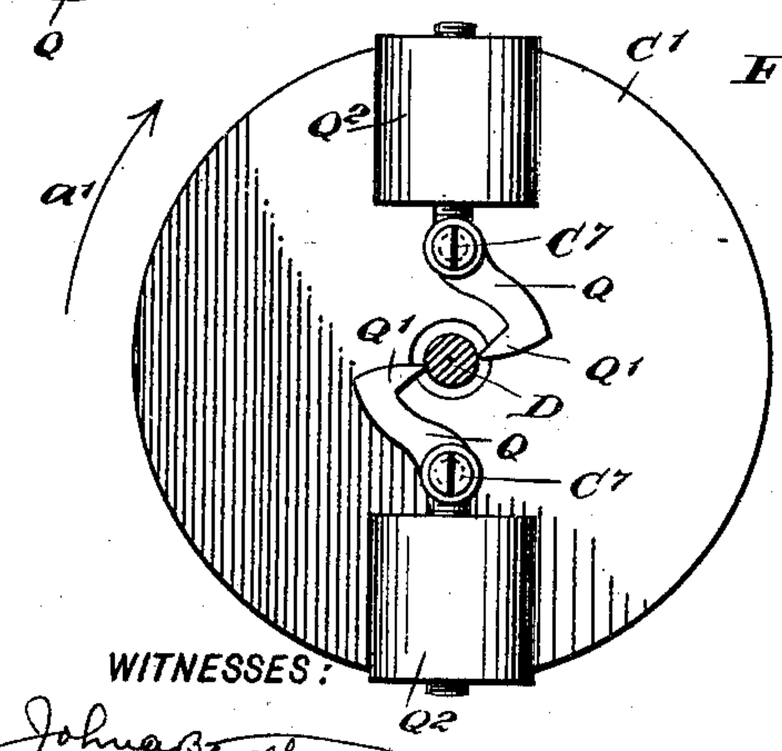

Fig. 11

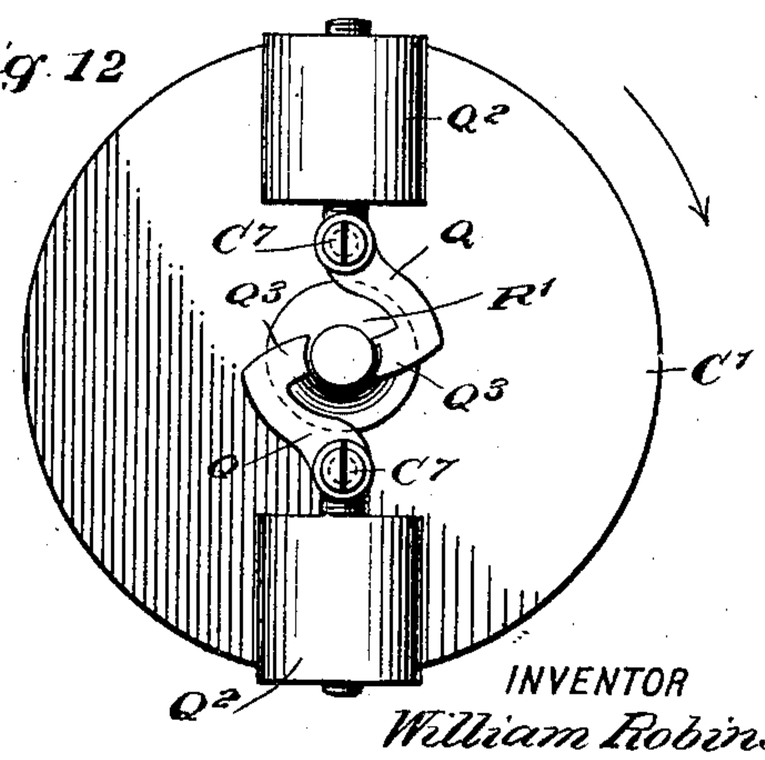

Fig. 13

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UNITED STATES PATENT OFFICE.

WILLIAM ROBINSON, OF AURORA, ILLINOIS.

LATHE.

SPECIFICATION forming part of Letters Patent No. 671,806, dated April 9, 1901.

Application filed December 13, 1900. Serial No. 39,642. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ROBINSON, a citizen of the United States, and a resident of Aurora, in the county of Kane and State of Illinois, have invented a new and Improved Lathe, of which the following is a full, clear, and exact description.

The invention relates to watchmakers' lathes; and its object is to provide a new and improved lathe more especially designed for automatically and accurately turning articles having more than one diameter—mainly balance-staffs, barrel-arbors, center-staffs, cannon-pinions, third and fourth escapement-pinions, pallet-arbors, type-bar pins for type-writing machines, &c.

The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a front elevation of the improvement with parts broken out. Fig. 2 is a plan view of the same with part in section. Fig. 3 is a transverse section of the same on the line 3 3 in Fig. 1. Fig. 4 is a like view of the same on the line 4 4 in Fig. 1. Fig. 5 is a front elevation of the improvement with parts in section and parts in a different position from the one shown in Fig. 1. Fig. 6 is a transverse section of the wedge-shaped shifting-bar, the section being on the line 6 6 in Fig. 5. Fig. 7 is an enlarged face view of the cam-wheel with the two cams. Fig. 8 is a diagrammatic view of the cams unrolled. Fig. 9 is an enlarged sectional side elevation of a staff. Fig. 10 is an enlarged side elevation of the work-holder as arranged for holding the blank for making staffs and the like. Fig. 11 is an end view of the same. Fig. 12 is a sectional side elevation of the work-holder as arranged for holding the type-bar pins of a type-writing machine, and Fig. 13 is an end view of the same.

The improved lathe is mounted on a suitably-constructed bed A, supporting a head-stock B, carrying a work-holder C, supporting and rotating a rod D, from which the articles are turned by the use of a single pointed tool E, held in the usual manner in a tool-post F, the work being rotated in the holder C by a pulley C', connected by belt with other machinery for imparting a rotary motion to the pulley and the work, as hereinafter more fully described. The tool-post F has its base F' fulcrumed at F^2 on a carriage G, and the said base F' can be readily adjusted by the operator turning a screw F^3 to bring the point of the tool in proper position relatively to the work.

The carriage G is formed with a hub G', engaging a spindle H, mounted to turn and to slide longitudinally in bearings A', formed on the bed A, as is plainly indicated in Fig. 2, and one end of said spindle is pressed on by a spring I to normally hold the spindle and the carriage G in a right-hand position. The right-hand end of the spindle H engages a screw-rod H', screwing in a sleeve H^2, mounted to slide longitudinally in a bearing A^2, secured to the bed A. On the sleeve H^2 is formed a transverse offset H^3, supporting a wear-block H^4, engaging a circular cam J' on the face of a cam-wheel J, secured to and rotating with a driven shaft K, extending longitudinally in suitable bearings arranged on the bed A. When the shaft K is rotated, the rotary motion given to the cam-wheel J causes the cam J' thereof to impart a sliding motion to the wear-block H^4, the sleeve H^2, the screw-rod H', and the spindle H, so that the latter moves against the tension of the spring I and at the same time moves the carriage G from the right to the left to feed the tool E along the work.

According to the shape of the article to be turned, a transverse swinging motion is given to the carriage G, so as to not only turn the work lengthwise, but to give it the desired shape, according to the various diameters of the article to be made. For this purpose the carriage-spindle H carries a yoke L, having a downward connecting-bar L', supporting a wheel L^2, traveling on the face of a flat spring L^3, held on a removable slide A^4, attached to the bed A. (See Figs. 2, 3, and 4.) The yoke L is also provided with a forwardly-extending arm L^4, in which screws vertically a screw-rod L^5, supporting at its upper end a wear-

block L^6, engaging the under side of a bar N, formed with a plurality of wedges N′, engaging corresponding wedges N^2 on a bar N^3, fulcrumed at N^4 to the bed A and engaged at its free end by a screw-rod N^5, screwing in the bed. A spring N^6 is secured to the top of the bar N^3 and rests with its free end on the bed A, so as to hold the bar N^3 normally in position—that is, with the wedges N^2 in engagement with the wedges N′ of the bar N. The latter is pressed at its left-hand end by a spring N^7, attached to the bed A, and the opposite end of the bar is engaged by a foot O′, projecting upward from a bar O, mounted to slide in suitable bearings A^5, attached to or formed on the bed A. The outer end of the bar O carries a removable head O^2, resting against the face of a cam J^2, formed on the cam-wheel J and concentric with the cam J′, previously mentioned. When the shaft K is rotated, the head O^2 in traveling on the face of the cam J^2 imparts a sliding motion to the bar O, so that the foot O′ thereof shifts the bar N to the left against the tension of the spring N^7, and the bar N during this movement slides, with its wedges N′, over the wedges N^2, whereby the bar N moves downward and moves the wear-block L^6 and screw-rod L^5 in a like direction, thereby giving a swinging motion to the yoke L, so that the spindle H is rocked, and consequently a swinging motion is given to the carriage G, the tool-post F, and the tool E.

The cams J′ J^2 are arranged according to the shape to be given to the article to be turned by the lathe. For instance, if a balance-staff is to be turned, such as shown in Fig. 9, then the faces of the cams J′ J^2 are arranged as illustrated in Figs. 7 and 8. When the machine is in operation, the cam J′ causes a forward feeding of the carriage G and tooth E to turn the work to a given diameter—that is, the wear-block H^4 travels on a spiral portion of the cam J′ and causes a sliding from right to left of the spindle H, carriage G, and tool E to turn the work to a given diameter, the removable head O^2 during this time traveling on a straight surface on the cam J^2, so that no movement whatever is given to the bar N. When the end of this portion of the work has been reached, the wear-block H^4 then travels on a straight portion of the cam J′, so that the carriage G and tool E remain at a standstill, while the head O^2 travels on an inclined portion of the cam J^2, and thereby imparts a swinging motion to the carriage G and the tool E to bring the latter to a different position. Soon after this has been done the wear-block H^4 again travels on a spiral portion of the cam J′, while the removable head O^2 travels on a straight or parallel portion of the cam J^2. This is repeated for turning the different diameters of the staffs, and when a curved portion is to be turned then both cams J′ J^2 are active—that is, impart sliding motion simultaneously to the wear-block H^4 and head H^2 to shift the tool E from the right to the left and also give a transverse movement to the tool to give the desired curvature to the article at a particular point.

It is evident from the foregoing that for differently-shaped articles to be turned different cam-wheels J are employed; but in each case the cams J′ J^2 coact to give the desired movement at the proper time to the carriage G, so as to turn the article according to the predetermined design without any assistance whatever on the part of the operator. When the article has been turned throughout its length, as described, then the wear-block H^4 and the head O^2 have traveled the whole length of their respective cams—that is, the wheel J has made one revolution—and then the springs I and N^7 immediately return the spindle H and the bar N and the parts connected therewith to the original first position, after which the above-described operation is repeated—that is, a second article is turned in precisely the same manner as above described, the work being fed forward the proper distance.

The desired adjustment between the carriage G and the yoke L is made by a suitable screw-rod G^2, screwing in a depending arm G^3 of the carriage G, and in said arm is also held a slidable pin G^4, pressed on by a spring G^5 and engaging the arm L^4 of the yoke L. The pin G^4 and spring G^5 form a yielding connection between the depending arm G^3 and the carriage. By this arrangement the operator can readily adjust the yoke relatively to the carriage G by turning the screw-rod G^2 accordingly.

In order to hold the bars N N^3 in proper relation to each other, I provide the same with tongue and groove N^8, as indicated in Fig. 6.

In a slot K′ in the shaft K is held a clutch-bar K^2, pressed by a spring K^3 in engagement with a clutch member P′, formed on a worm-wheel P, mounted to rotate loosely on the shaft K and in mesh with a worm P^2, (see dotted lines in Fig. 3,) secured on a shaft P^3, mounted to turn in suitable bearings on the bed A and carrying a pulley P^4, connected by belt with other machinery, so that the rotary motion given to the pulley P^4 and shaft P^3 is transmitted by the worm P^2 to the worm-wheel P and by the clutch member P′ and clutch-bar K^2 to the shaft K. A hand-wheel K^4 is secured on the outer end of the shaft K, and in this outer end is also mounted loosely a rod K^5, adapted to press the clutch-bar K^2 out of engagement with the clutch member P′ whenever it is desired to turn the hand-wheel K^4 and the shaft K by hand. In order to do this, it is necessary for the operator to press the handle K^6 of the rod K^5 in an inward direction to push the clutch-rod K^2 out of mesh with the clutch member P′ and then turn the hand-wheel K^4 to rotate the shaft K.

The work-holder C is constructed in detail

as follows, reference being had to Figs. 10, 11, 12, and 13: The pulley C′ of the work-holder is secured on a nut C^2, screwed or otherwise fastened on a sleeve C^3, having a fixed conical head C^4 and a loose conical head C^5, engaging correspondingly-shaped ends in the bearing B′ of the head-stock B. The head C^5 is held in engagement with the bearing B′ by the nut C^2, and the head C^5 is held against turning by a pin C^9 engaging a keyway C^8 in the sleeve. On the outer end of the fixed head C^5 screws a thimble C^6, through which extends the work D in the shape of a rod to be turned into staffs or pins by the tool E, as previously described.

In order to clamp the work in position in the holder during the time the machine is in operation, I provide a centrifugal clamping device arranged as follows: On the outer face of the pulley C′ are arranged diametrically oppositely disposed pivots C^7, on which are mounted to swing levers Q, formed with their inner ends into points Q′, adapted to engage the work D at diametrically opposite points. The levers Q′ support at their outer ends adjustable weights Q^2, which when the pulley C′ is rotated in the direction of the arrow a' fly outward, and thereby cause the points Q′ to firmly grip the work, and thereby hold the same in position during the turning operation. As soon as the article has been turned and the operator stops the lathe the weights Q^2 return to their former position and the points Q′ release the work, so that the latter can be fed forward the desired distance for forming another article. It is understood that the work D extends through the sleeve C^3; but when it is desired to face off the ends of the articles turned then such articles D′ (see Fig. 12) are held at one end in the thimble C^6 and at the other end in a recess in a rod R, extending loosely in the sleeve C^3 and formed at the outer end with a cone-shaped head R′, engaged by the beveled inner ends Q^3 of the levers Q, previously mentioned, so that when the pulley C′ is rotated the weights O^2 cause the levers to press on the head R′, and thereby push the rod R to the right and securely hold the finished article D′ in position in the thimble, the outer end of the article projecting a suitable distance beyond the thimble for the tool E to finish or face off the ends. When the lathe is stopped after one end of the article is faced off, then the rod Q releases the article and the latter can be readily removed from the thimble and replaced by another and the above operation repeated.

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

1. A lathe having a carriage, a spindle carrying said carriage, and mounted to turn and to slide, a yoke on said spindle, revoluble cams, and means actuated by said cams for imparting a sliding motion to the said spindle and a swinging motion to said yoke, the said cams being rotated to impart the desired motion to the carriage for turning the article according to a predetermined design as set forth.

2. A lathe having a carriage, a carriage-spindle mounted to turn and to slide, a yoke on said spindle, mechanism for imparting a swinging motion to the yoke to rock the spindle and carriage, and cams operating in unison, one for imparting a sliding motion to the spindle and the other actuating the said mechanism to impart a swinging motion to the yoke, as set forth.

3. A lathe having a carriage, a carriage-spindle mounted to turn and to slide, mechanism as described, for imparting a rocking motion to said spindle, and a cam-wheel having concentric face-cams, one for imparting a sliding motion to the carriage-spindle and the other for imparting a rocking motion to the spindle, as set forth.

4. A lathe having a carriage-spindle on which the carriage is secured, the spindle being mounted to turn and to slide, a spring for pressing the spindle in an axial direction, spring-pressed mechanism as described, for imparting a rocking motion to said spindle, and a cam-wheel having concentric face-cams, one for imparting a sliding motion to the carriage-spindle and the other for imparting a rocking motion to the spindle by means of said mechanism, as set forth.

5. A lathe having a carriage, a spindle carrying said carriage and mounted to slide and to rock, a yoke on said spindle, a sliding bar having inclines for operating the yoke, a fixed bar on which said sliding bar is movable and having similarly-shaped inclines, a cam for shifting said sliding bar, and a cam for shifting said spindle, as set forth.

6. A lathe having a tool-carriage, a spring-pressed spindle carrying said tool-carriage and mounted to slide and to rock, a yoke secured on said spindle, a fixed bar having inclines, a sliding bar having inclines in engagement with the inclines on the fixed bar, a spring pressing said slidable bar, and a cam-wheel having concentric face-cams, one for imparting a sliding motion to said carriage-spindle and the other for imparting a sliding motion to said sliding bar, as set forth.

7. A lathe having a tool-carriage, a spring-pressed spindle carrying said tool-carriage and mounted to slide and to rock, a yoke secured on said spindle, a fixed bar having inclines, a sliding bar having inclines in engagement with the inclines on the fixed bar, a spring pressing said slidable bar, a cam-wheel having concentric face-cams, one for imparting a sliding motion to said carriage-spindle and the other for imparting a sliding motion to said sliding bar, and a yielding connection between said yoke and said carriage, as set forth.

8. A lathe having a tool-carriage, a spring-pressed spindle carrying said tool-carriage and mounted to slide and to rock, a yoke secured on said spindle, a fixed bar having in-

clines, a sliding bar having inclines in engagement with the inclines on the fixed bar, a spring pressing said slidable bar, a cam-wheel having concentric face-cams, one for imparting a sliding motion to said carriage-spindle and the other for imparting a sliding motion to said sliding bar, and means, substantially as described, for adjusting said carriage relatively to said yoke, as set forth.

9. A lathe having a carriage, and a cam-wheel with concentric face-cams, one for imparting a sliding motion to said carriage and the other for imparting a rocking motion thereto, as set forth.

10. A lathe having a cam-wheel with concentric face-cams, one for imparting a sliding motion to the lathe-carriage and the other for imparting a rocking motion thereto, the cam-face having alternate parallel and inclined portions but in reverse relation to each other, as set forth.

11. A lathe having a mechanism for imparting a rocking motion to the carriage and comprising a fixed bar with inclines, a sliding bar with inclines engaging the inclines on the fixed bar, a spring pressing said sliding bar in one direction, a rod for pressing the sliding bar in an opposite direction, and a cam engaging said rod, as set forth.

12. A lathe having a mechanism for imparting a rocking motion to the carriage and comprising a fixed bar with inclines, a sliding bar with inclines engaging the inclines on the fixed bar, a spring pressing said sliding bar in one direction, a rod for pressing the sliding bar in an opposite direction, a cam engaging said rod, and a yoke having an adjustable connection with said sliding bar and attached to the spindle of the carriage, as set forth.

13. A lathe having a carriage, a spindle carrying said carriage and mounted to slide and to rock, a yoke on said spindle, a sliding bar having inclines for operating the yoke, a fixed bar on which said sliding bar is movable and having similarly-shaped inclines, means for actuating said sliding bar, and means for shifting said spindle, as set forth.

14. A lathe having a carriage provided with a hub, a spindle engaged by said hub and mounted to slide and to rock, a spring engaging one end of said spindle, a sleeve having longitudinal sliding movement, a screw-rod screwing in said sleeve and engaging the other end of said spindle, means for imparting a sliding motion to the said sleeve to shift the spindle against the tension of said spring, and mechanism for rocking the spindle as set forth.

15. A lathe having a tool-carriage, a spindle carrying said tool-carriage and mounted to slide and to rock, a yoke secured on said spindle and provided with a projecting arm, mechanism for moving the said arm to rock the spindle, a rod mounted to slide and arranged to actuate said mechanism, and means for operating said rod, as set forth.

16. A lathe, comprising a work-holder, a carriage, a tool-holder mounted on the carriage, a spindle carrying said carriage and mounted to turn and to slide, a yoke on said spindle, means for adjusting the yoke relatively to the carriage, mechanism for swinging the said yoke to impart a rocking motion to the spindle and carriage, and means for imparting a sliding motion to the spindle as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM ROBINSON.

Witnesses:

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THEODORE WORCESTER.