No. 679,568. Patented July 30, 1901.

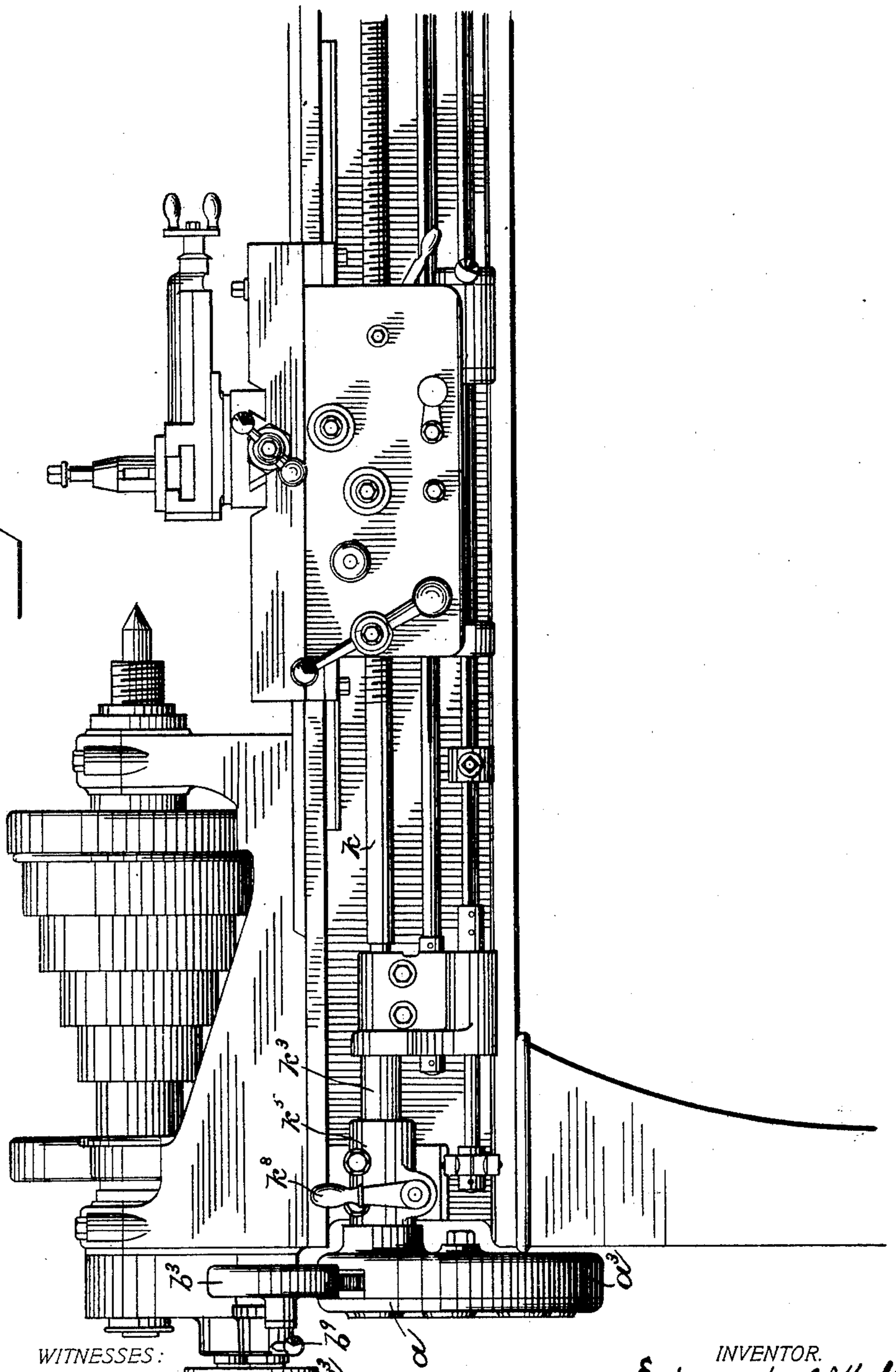
E. A. MULLER.

ENGINE LATHE.

(Application filed Jan. 31, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig 1



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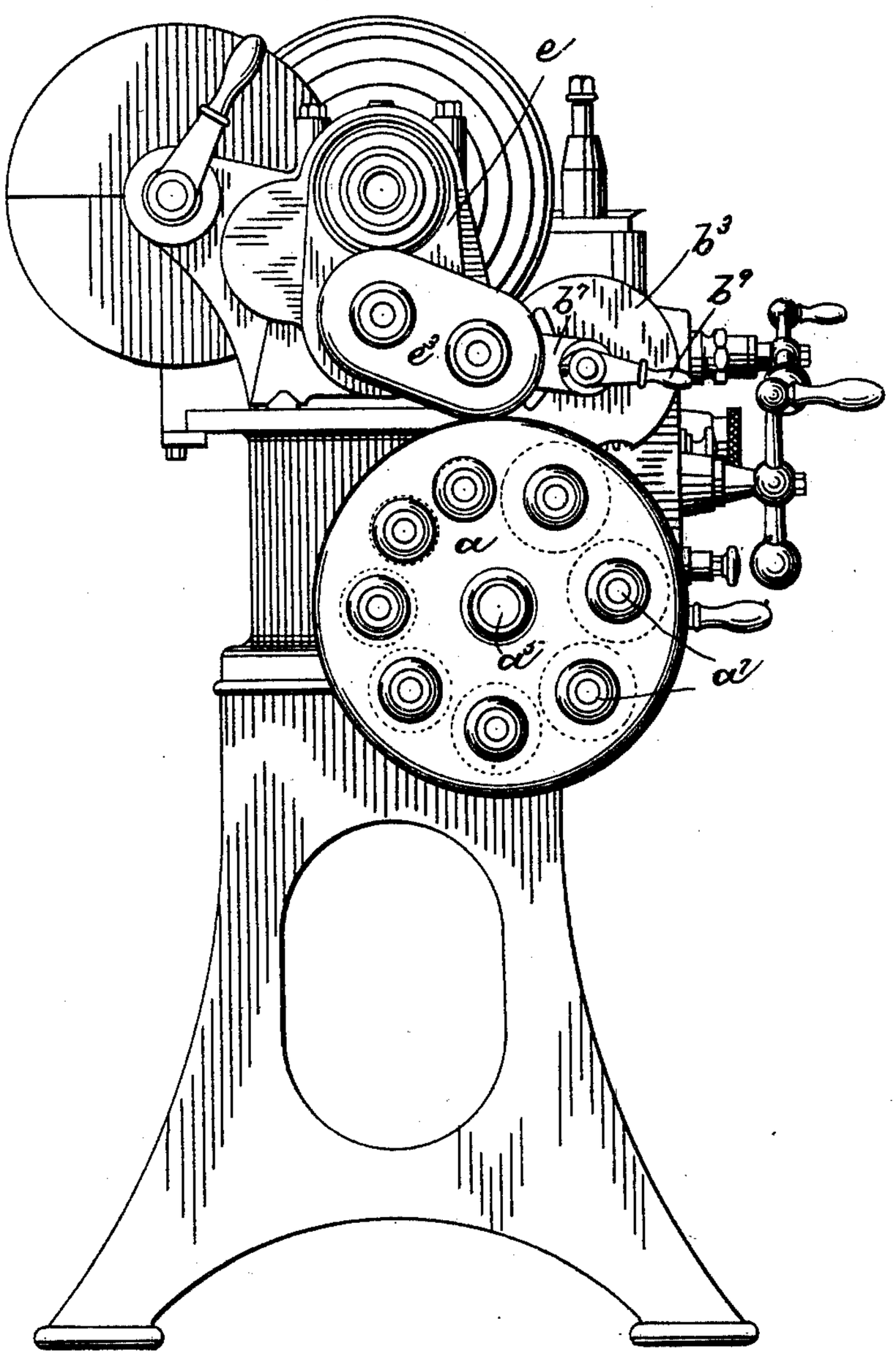
(No Model.) 4 Sheets—Sheet 2.

Fig. 2



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(No Model.) 4 Sheets—Sheet 3.

Fig. 3

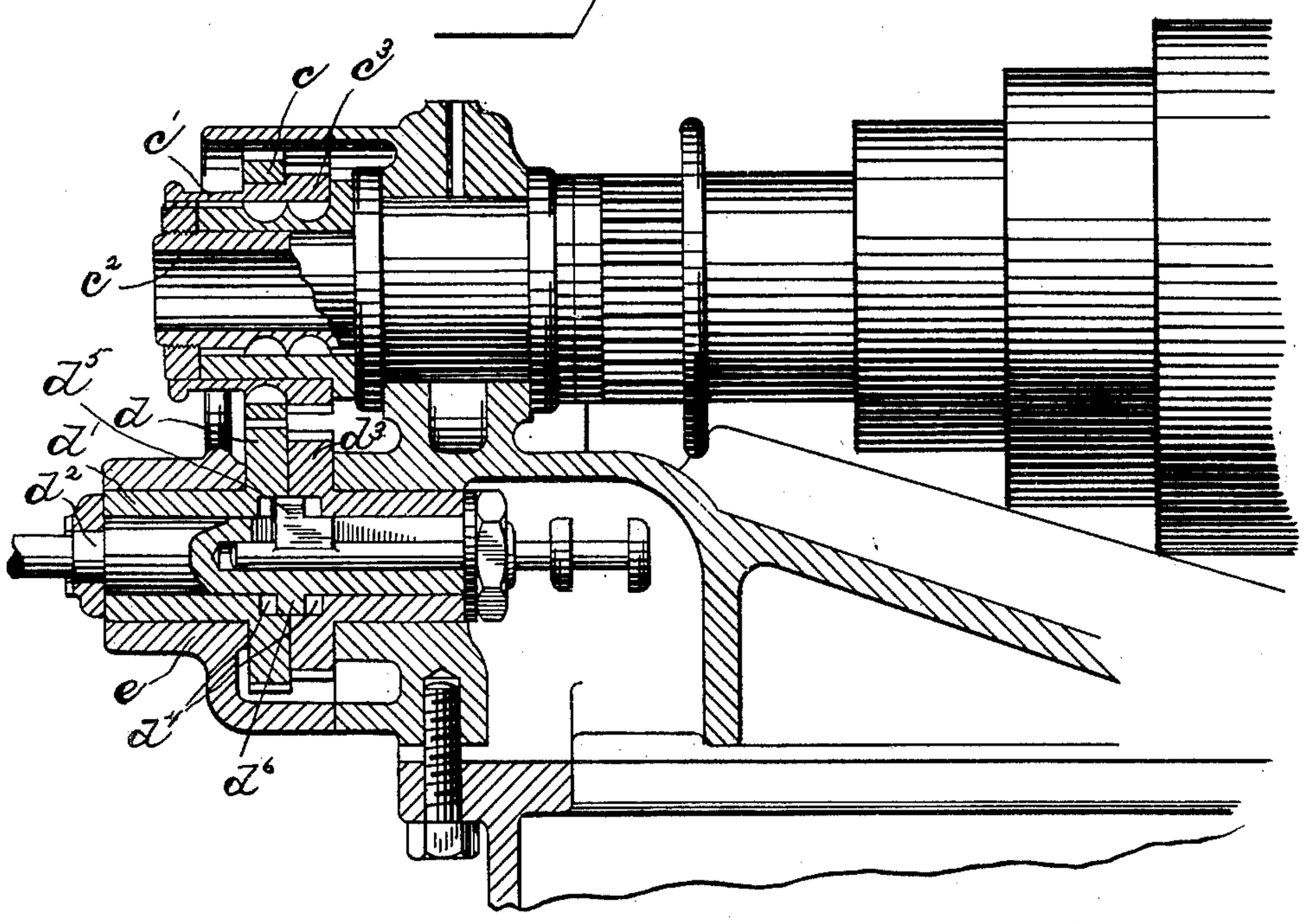


Fig. 5

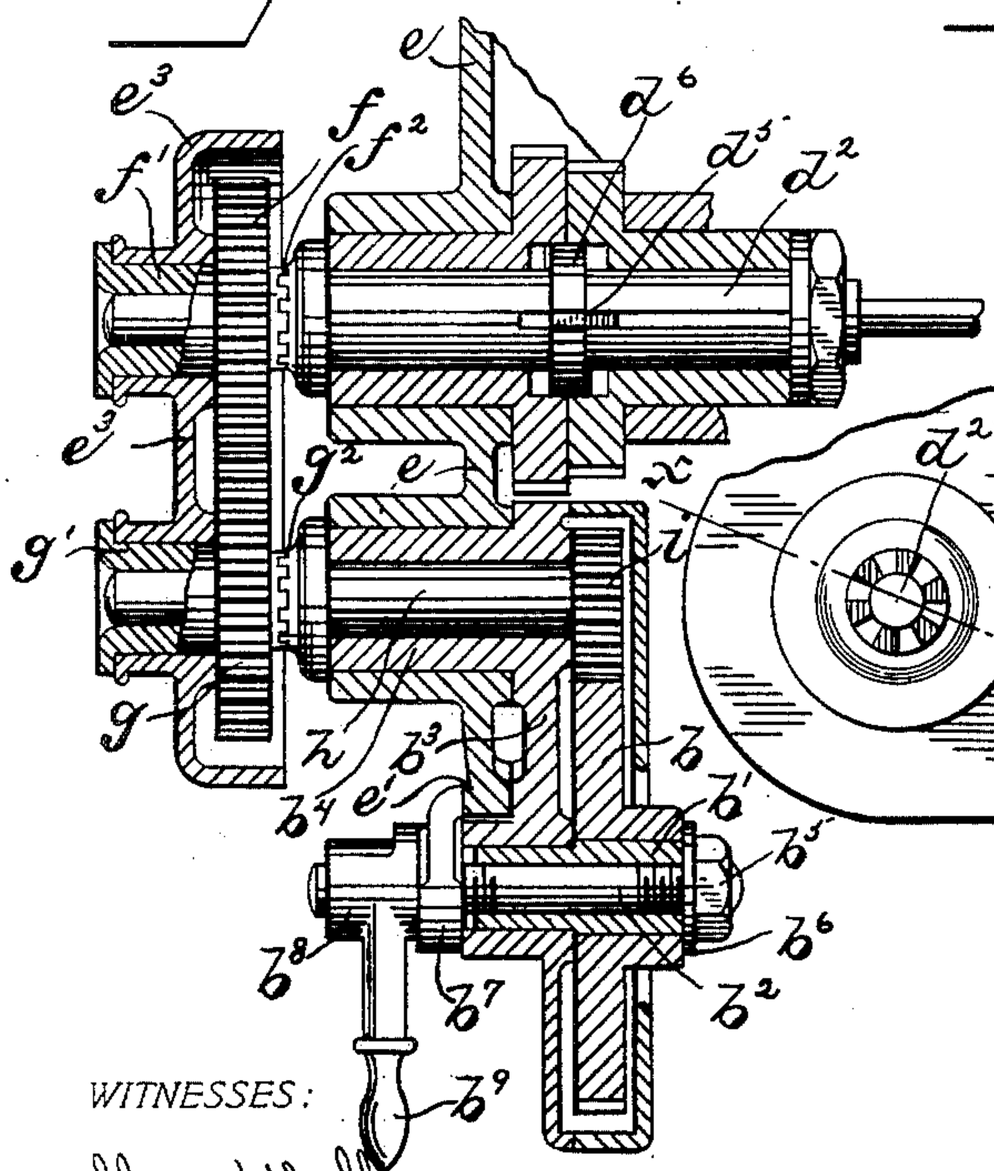


Fig. 6

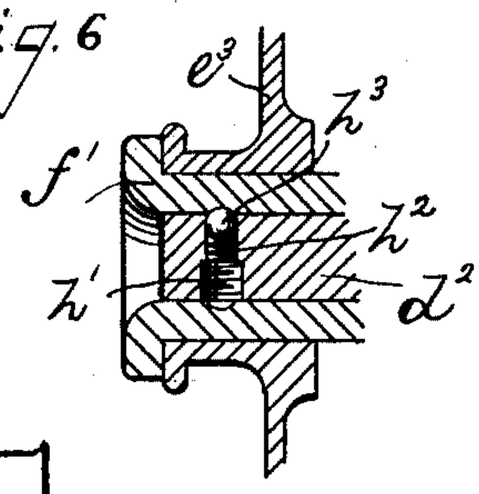
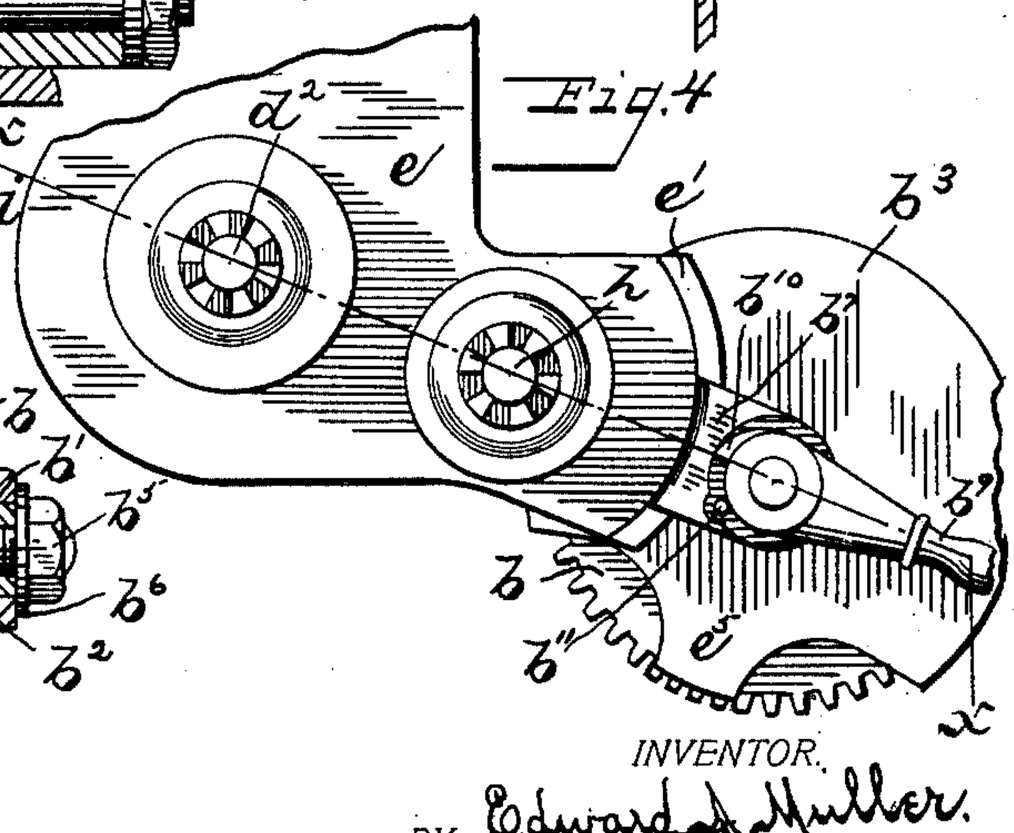


Fig. 4



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(Application filed Jan. 31, 1901.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 7

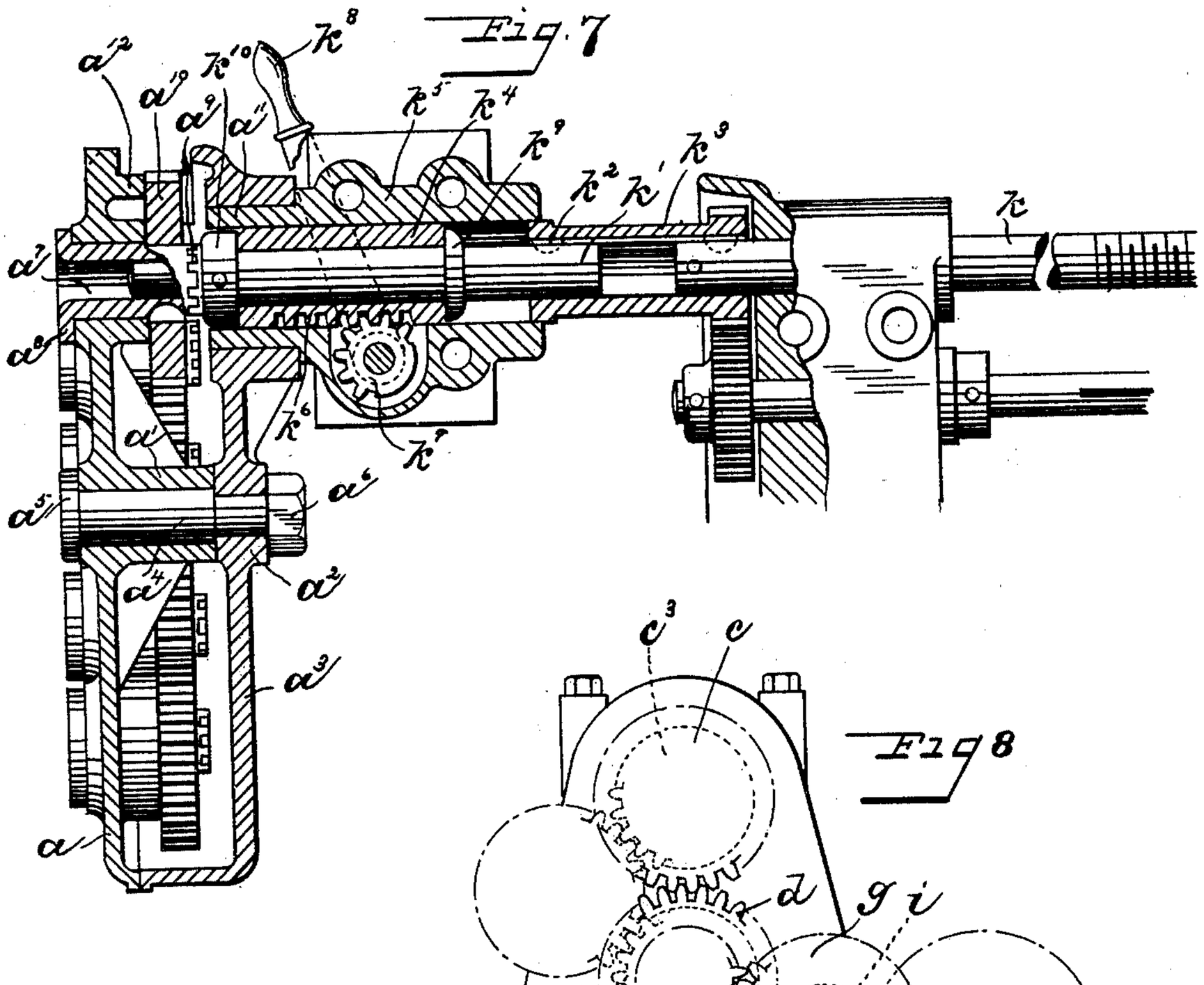
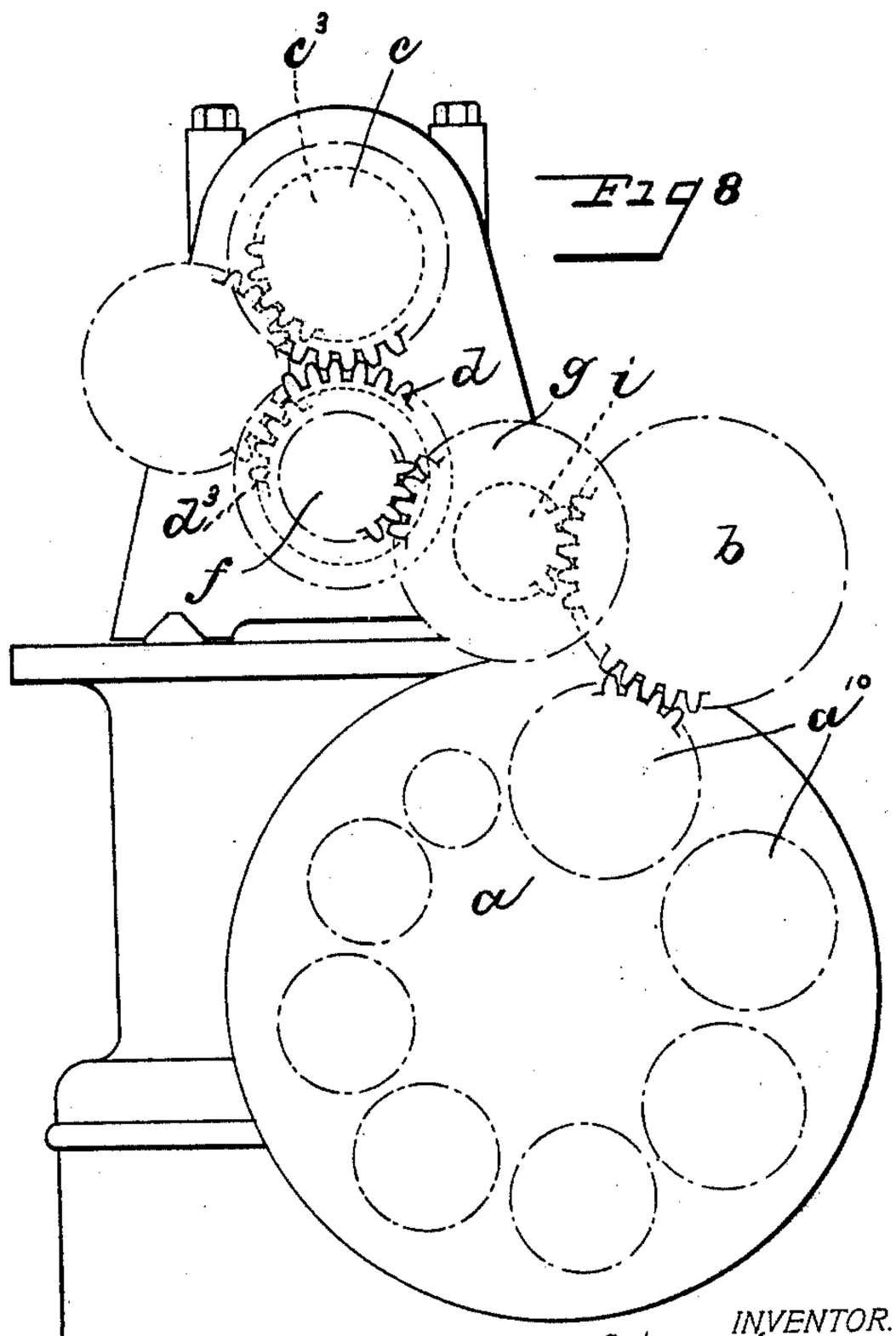


Fig. 8



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UNITED STATES PATENT OFFICE.

EDWARD A. MULLER, OF SPRINGFIELD, OHIO, ASSIGNOR TO THE SPRINGFIELD MACHINE TOOL COMPANY, OF SAME PLACE.

ENGINE-LATHE.

SPECIFICATION forming part of Letters Patent No. 679,568, dated July 30, 1901.

Application filed January 31, 1901. Serial No. 45,435. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. MULLER, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Engine-Lathes, of which the following is a specification.

My invention relates to improvements in engine-lathes, and more especially to devices for changing the speed of the lead-screw and feed-rod.

The object of my invention is to provide a quick and certain means embodied in the structure of the machine whereby the changes can be made. I attain this object by the construction shown in the accompanying drawings, in which—

Figure 1 is a front elevation of a lathe embodying my invention. Fig. 2 is an end elevation of same. Fig. 3 is a vertical sectional view of the lathe-head. Fig. 4 is an end elevation of gear-casing, partly broken away, showing one of the gears. Fig. 5 is a sectional view taken on the line X X of Fig. 4. Fig. 6 is a detail of Fig. 5, showing the manner of holding the gears and their casing in place. Fig. 7 is a vertical sectional view of the disk, its gears, casing, and connection with lead-screw. Fig. 8 is an end view in outline, showing the relative position of the disk, its gears, and the driving-gears for same.

Like parts are represented by similar letters of reference in the several views.

In constructing my device I employ a disk a, having a hub a', which extends at one side thereof and bears against an enlargement a^2 in the side of the casing a^3 and is journaled on the stud a^4. Said stud is preferably formed at one end with a head a^5, which bears against the disk to hold it in place on said stud, and at the other end is reduced and extends through the casing a^3, is screw-threaded at its outer end, and provided with the nut a^6 to firmly attach the stud to said casing. The casing a^3 is provided with an opening having an extended hub a^{11}, engaging with and rigidly attached to an extension of the box k^5, and the disk and casing are so formed as to provide a chamber for the gears, hereinafter mentioned. Said disk is provided with a series of openings around the same near its periphery, in each of which the sleeves a^7 are journaled and have projecting flanges a^8 formed on one end to engage the outside of said disk and a clutch at the other end forming one half of the coupling a^9. Upon each of said sleeves a gear a^{10} is keyed, said gears a^{10} being of different diameters to vary the speed, as hereinafter described. The gear on one end and the flange on the other end of said sleeves serve to hold the same in position. Any one of these gears is driven by the gear b independent of the others, said gear b receiving its motion through a train of gears, of which the initial gear c is mounted on the sleeve c' on the main shaft or spindle c^2 of the lathe. Said gear c drives the gear d, preferably formed with the extended hub d' on the shaft d^2, journaled in the casing e. Adjacent to the gear c and mounted on the shaft c^2 is the gear c^3, and adjacent to the gear d and mounted in like manner is the gear d^3, and motion is transmitted in the usual manner from the gear c^3 to the gear d^3 through an intermediate gear mounted in the rear of said gear and meshing with each of same, as shown in outline in Fig. 8. The hubs of the gears d and d^3 are each provided with a clutch at d^4, and the shaft d^2 is bored out and slotted to permit a sliding key d^5 to engage with either one of said gears. The collar d^6 is also provided on said shaft to engage said key upon each side to strengthen the same. Upon the reduced and extended portion of the shaft d^2 the gear f is carried by the bushing f', mounted in the frame e^3, one half of the clutch-coupling f^2 being formed with or attached to said bushing f' and the other half to the shaft d^2. The gear g, driven by the gear f, is carried by the bushing g', mounted in the frame e^3, one half of the clutch-coupling g^2 being formed with or attached to the bushing g' and the other half to the shaft h, said shaft h carrying at its other end the gear i, which meshes in the gear b. This gear b is mounted on the bushing b', surrounding the bolt b^2, and is carried by the swinging frame b^3, which is journaled in the frame e at b^4 and forms a bearing for the shaft h. It will be seen that as the axes of the shaft h and the swinging frame b^3 are the same the gear b will always mesh with the gear i and that by reason of

the gear b being mounted in said frame it can be made to engage with any one of the gears a^{10} mounted in the disk a, said disk being revolved on the stud a^4 until the desired gear is in proper position to engage with said gear b. To provide for tightening the swinging frame in any position in which it may be moved for the purpose of disengaging and engaging said gear b with any one of the gears a^{10}, the bolt b^2 is extended and screw-threaded at each end, one being provided with a nut b^5 and collar b^6, which bears against the end of the bushing b', and the other end with the extending shouldered plate b^7, bearing against the flange e' of the casing e, and a screw-threaded collar b^8, bearing against said plate and having the handle b^9 and also the offset b^{10} to contact with the pin b^{11} on the plate b^7. The offset b^{10} and the pin b' serve as a stop whereby the handle b^9 may be operated to lift or lower the gear b into position, and when in position a slight additional movement of the handle, by reason of the collar b^8 being screw-threaded on the bolt, tightens the gear in position. There are formed on the disk for each of its gears projecting segments a^{12}, (see Fig. 7,) equal to the pitch diameter of its gear, which, in connection with the frame b^3, said frame at the point e^5 being equal to the pitch diameter of the gear b, (see Fig. 4,) form a stop when the gears are in proper mesh.

To transmit the motion from any one of the gears a^{10} mounted in the disk a to the lead-screw k, I provide the shaft k' with a key k^2 in one end thereof to slidingly engage in a keyway in the sleeve k^3, the other end of said sleeve being keyed to the end of the lead-screw k. I further provide a movable sleeve or bearing k^4 in the box k^5, having a rack k^6 formed on one side thereof to engage with the pinion k^7, journaled in a recess in the box k^5, having a handle k^8 to operate the same. The collars k^9 and k^{10} are rigidly attached to the shaft k' adjacent to the ends of the movable sleeve or bearings k^4, and the collar k^{10} is provided with a clutch forming one half of the couplings a^9. The shaft k' is reduced and extended into the bushing or sleeve a^7 to support the same with its gear a^{10}, thus relieving the disk a and casing a^3 from all strain while the gear a^{10} is transmitting motion to the lead-screw. It will be seen the arrangement is such that by operating the handle k^8 the shaft k' has a longitudinal movement, so that the clutch-coupling a^9 may be thrown in and out of engagement. In Fig. 6 I have illustrated an arrangement for holding the gears f and g and their bushings in position on the shafts d^2 and h by providing a hole in said shaft and a groove in said bushings, a screw h' in one end of said hole and a spring h^2 adjacent to the same carrying a ball h^3 in the other end of said hole to engage the groove in said bearings.

It will be seen by reference to Figs. 5 and 6 that the casing e^3 can be removed and the speed varied by having the ratio-gears f and g of different diameters and reversing the position of same, placing f on the shaft h, and g on the shaft d^2, or gears of different diameters may be substituted therefor, and in this way a great variation of speed can be obtained with a less number of gears in the disk. I preferably provide separate casings with each set of gears and their bushings, and they can be readily removed and replaced in the manner stated. I have found that by making one of the shafts d^2 and h slightly shorter than the other, the gears and its casing can be more easily mounted.

The operation of my device is as follows: First by the handle k^8 disengage the coupling a^9 and then by the handle b^9 lift the gear b, so that it will not engage with any of the gears a^{10}. The disk may then be revolved on its stud a^4 until such one of the gears a^{10} as is desired is in proper position to be received on the lead-screw shaft k'. Then the gear b may be lowered by the handle b^9 until its casing e^4 at e^5 contacts the segment a^{12}, when it is in proper mesh, and a slight additional movement of the handle will cause the bolt b^2 to lock it in position. It has been a common practice to keep gears to vary the speed separate and independent of the machine, subject to the annoyance of being mislaid and when found placed in the machine; but it will be seen that I provide a means whereby they are mounted in the casing attached to the machine, so that any one of the gears without reference to the other may be thrown into mesh for the purpose of varying the speed.

While I have shown my device in connection with an engine-lathe, it is obvious that it may be applied to other machines where variable speed is required.

Having thus described my invention, I claim—

1. In an engine-lathe, the combination of a train of gearing from the spindle to the lead-screw having a swinging gear, with a disk having auxiliary gears of different diameters thereon, any one of said auxiliary gears adapted to be journaled on and attached to the lead-screw, and means for connecting said swinging gear with said auxiliary gears in a manner so that any one of said auxiliary gears, when journaled on and attached to the lead-screw, can be driven independently of the other auxiliary gears and independently of the disk, substantially as specified.

2. In an engine-lathe, the combination with a train of gears leading from the spindle to operate the lead-screw, of a disk having gears of different diameters thereon, a shaft, a gear of said train and a swinging frame on said shaft, a gear in said frame engaging with the gear on said shaft and adapted to mesh with and operate any one of the gears on said disk independently of the other disk-gears and independently of the disk, substantially as specified.

3. In an engine-lathe, the combination with a train of gears leading from the spindle to op-

erate the lead-screw of said lathe, of a casing carrying a disk with a plurality of gears journaled therein and having for each of said gears a projecting segment equal to the pitch diameter of its gear and a swinging gear of said train having a casing with a projection equal to its pitch diameter to contact the segments of the disk-gear to form a stop when said swinging gear is in proper mesh with any one of said disk-gears, substantially as specified.

4. In an engine-lathe, the combination of a train of gearing from the spindle to the lead-screw having a swinging gear, with a disk having auxiliary gears of different diameters thereon, any one of said auxiliary gears adapted to be journaled on the lead-screw, and means for connecting said swinging gear with said auxiliary gears in a manner so that any one of said auxiliary gears, when journaled on the lead-screw, can be driven independently of the other auxiliary gears and independently of the disk, and means for attaching said driven gear to the lead-screw, substantially as specified.

5. In an engine-lathe, the combination with a train of gears leading from the spindle to operate the lead-screw of said lathe, of a disk having gears of different diameters journaled therein, and an extension of the lead-screw adapted to engage with and form a bearing for any one of said disk-gears, substantially as specified.

6. In an engine-lathe, the combination with a disk having gears of different diameter, independent of each other journaled therein, said gears each being provided with clutches on one side thereof, of a lead-screw, a shaft slidingly attached to said screw, a clutch on said shaft to engage the clutch on any one of said gears means to throw said clutches in and out of engagement, substantially as specified.

7. In an engine-lathe, the combination with a disk having gears of different diameters, independent of each other journaled therein, said gears each being provided with clutches on one side thereof, of a shaft, a gear and a swinging frame, a gear in said frame engaging with the gear on said shaft and adapted to engage and operate any one of the gears in said disk, a lead-screw, an extension slidingly attached to said screw, a clutch on said extension to engage with the clutch on any one of said disk-gears which may be engaged with said swinging gear and means to throw said clutch in and out of engagement, substantially as specified.

8. In an engine-lathe, the combination with a casing carrying a train of gears leading from the spindle to operate the lead-screw, of a removable auxiliary casing adapted to carry two ratio-gears of the same or different diameters detachably connected in said train whereby the substitution of gears of different diameters will vary the speed, substantially as specified.

9. In an engine-lathe, the combination with a casing carrying a train of gears leading from the spindle to operate the lead-screw, of a removable auxiliary casing adapted to carry two ratio-gears of different diameters detachably connected in said train and a disk having gears of different diameters journaled therein, a swinging gear in said train adapted to engage and operate any one of the gears in said disk, independent of the others, and means for connecting and disconnecting the disk-gear so engaged with the lead-screw, substantially as specified.

10. In an engine-lathe, the combination with a casing carrying a train of gears leading from the spindle to operate the lead-screw, of a removable auxiliary casing adapted to carry two ratio-gears of the same or different diameters detachably engaging said train, and a disk having gears of different diameters journaled therein, a clutch attached to one side of each of said disk-gears, a swinging gear in said train adapted to engage and operate any one of the gears in said disk independent of the others and a clutch slidingly connected with said lead-screw to engage the clutch of any one of the gears in said disk that is engaged with said swinging gear, substantially as specified.

11. In an engine-lathe, the combination with a train of gears leading from the spindle to operate the lead-screw, of a shaft slidingly attached at one end to said screw and reduced and extended at its other end to carry the adjacent gear of said train, a clutch attached to said gear, a movable bearing to carry said shaft and a clutch on said shaft adapted to move longitudinally with said shaft and bearing to engage with the clutch on said gear, to connect and disconnect said gear and shaft, substantially as specified.

12. In an engine-lathe, the combination with a train of gears, leading from the spindle to operate the lead-screw, of a sleeve keyed to the end of said screw, a shaft slidingly mounted in said sleeve by a key and a keyway in said shaft, a journal-box, a movable bearing in said box to carry said shaft, a rack formed on one side of said bearing, a gear journaled in a recess in said box and having a handle to operate said rack, collars rigidly attached to said shaft at each end of said bearing and a clutch formed on one of said collars to engage a corresponding clutch on the adjacent gear of said train, the outer end of said shaft being reduced and extended to form a bearing for said gear, substantially as specified.

In testimony whereof I have hereunto set my hand this 24th day of January, A. D. 1901.

EDWARD A. MULLER.

Witnesses:

PERCY NORTON,

CHAS. I. WELCH.