No. 672,742.

Patented Apr. 23, 1901.

J. C. POTTER & J. JOHNSTON.

TURRET LATHE.

(No Model.)

(Application filed Oct. 7, 1899.)

5 Sheets—Sheet 1.

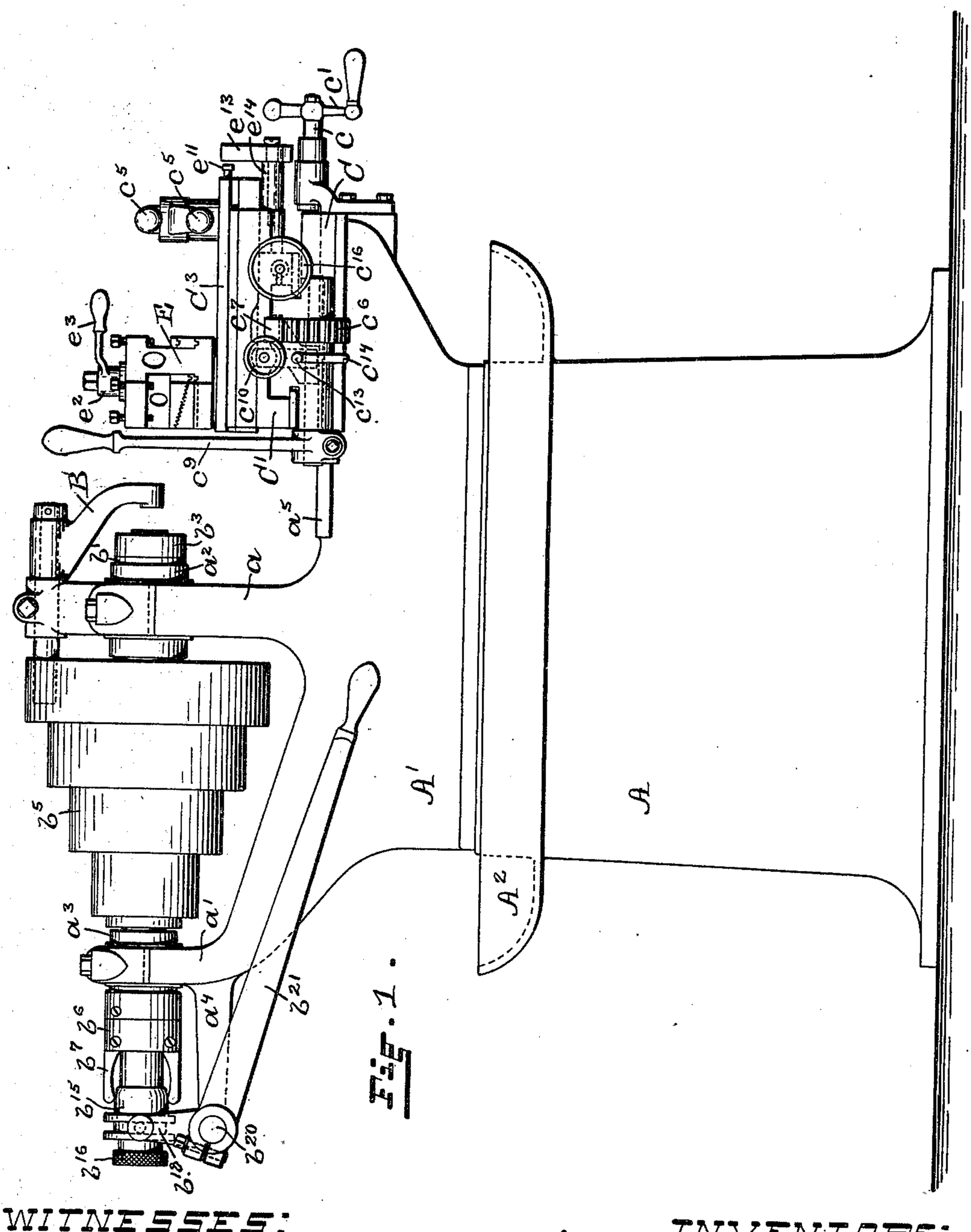

Fig. 1.

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B. M. Simms.

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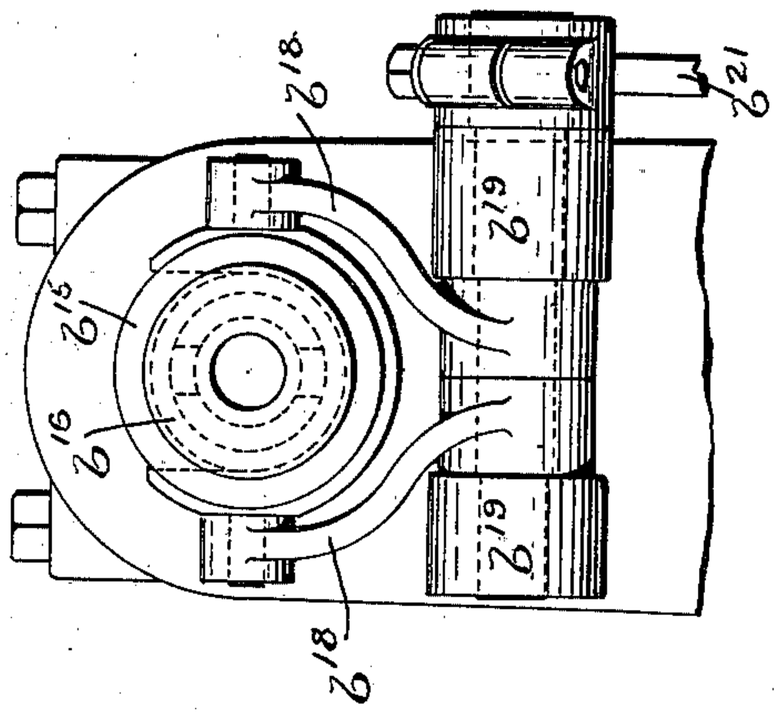

Fig. 3.

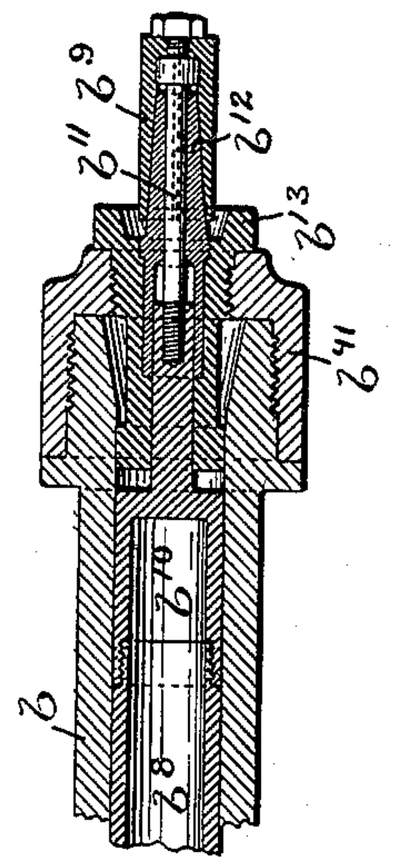

Fig. 4.

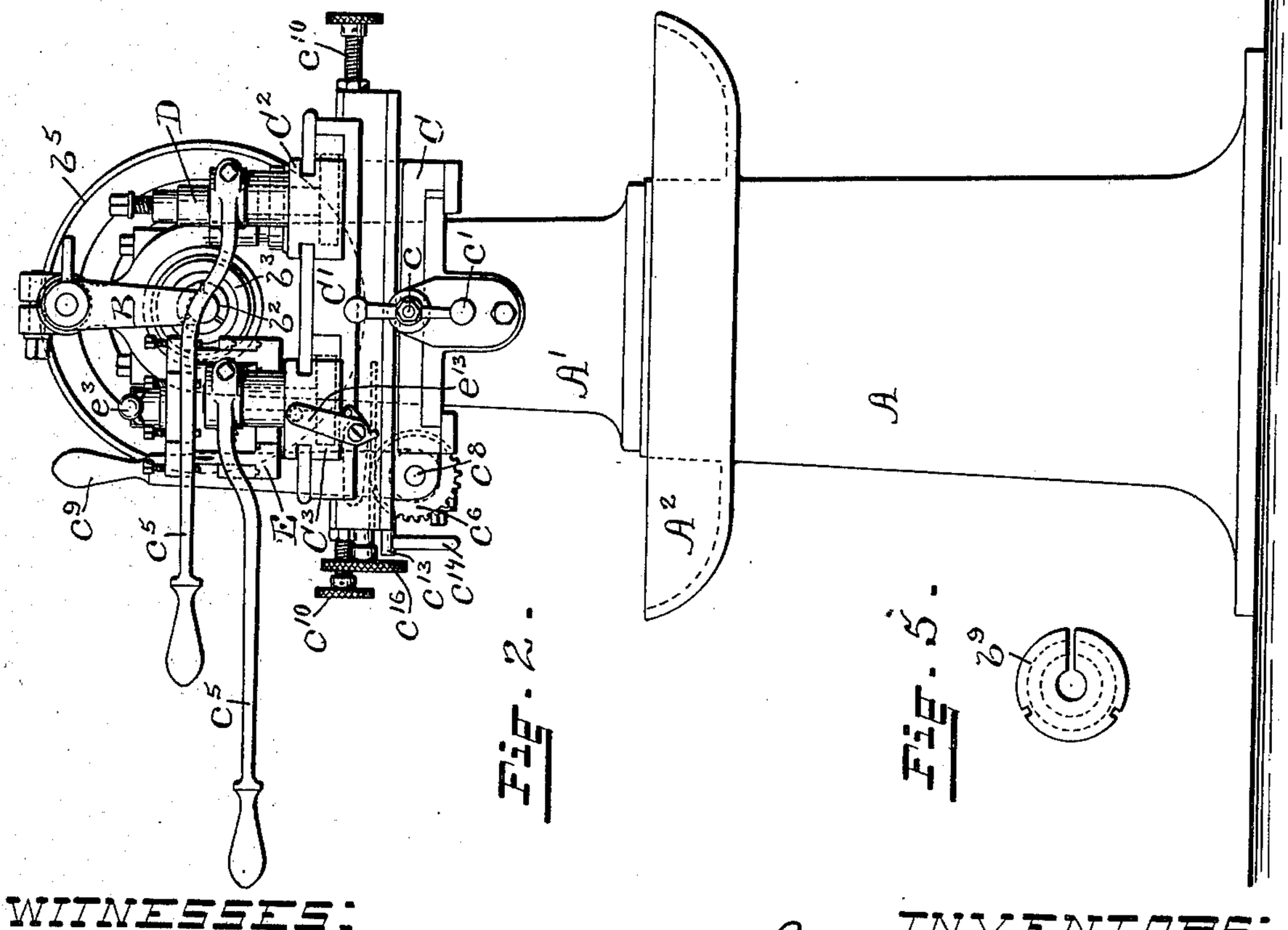

Fig. 2.

Fig. 5.

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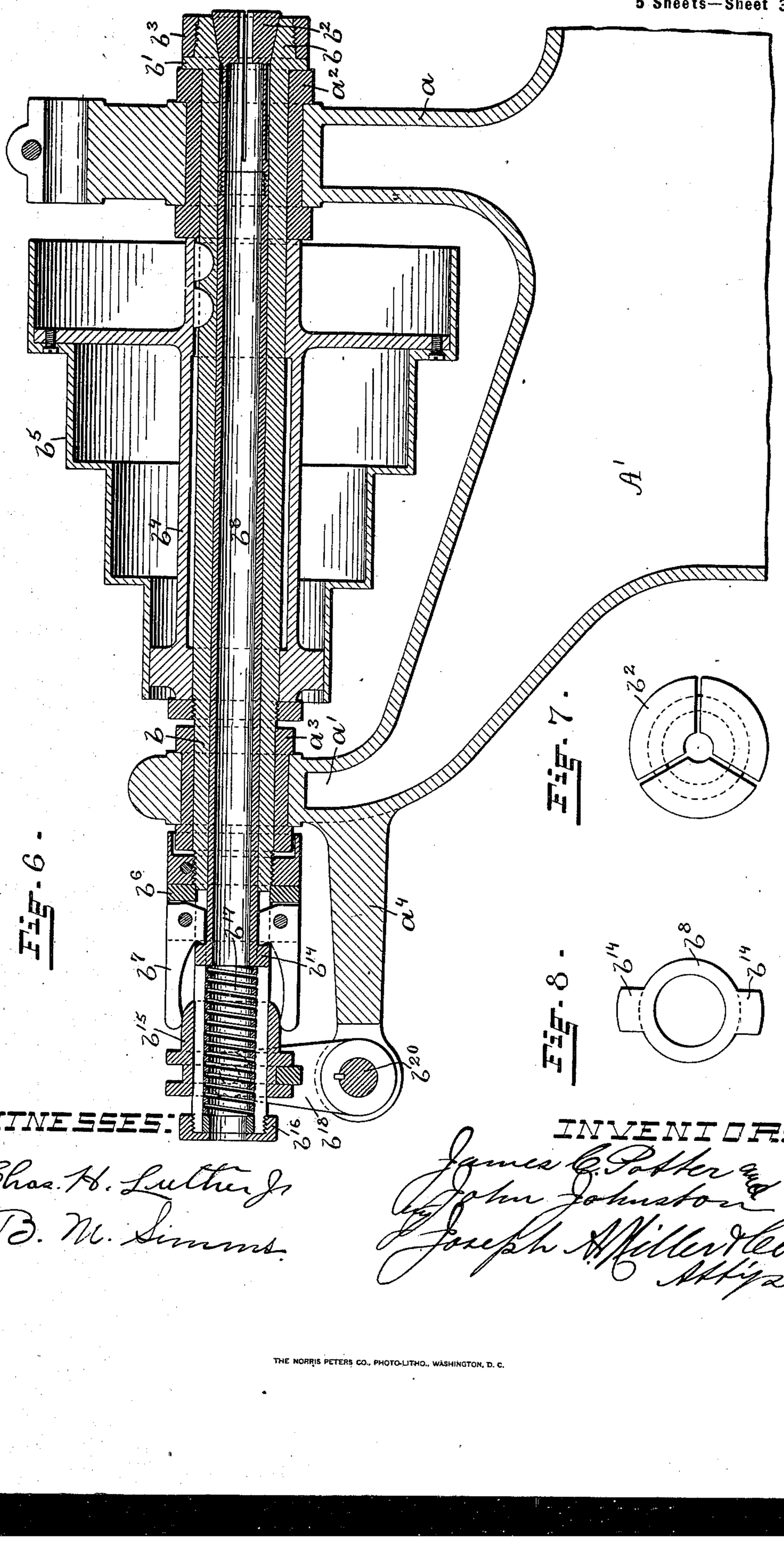

Fig. 6.

Fig. 7.

Fig. 8.

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Fig. 9.

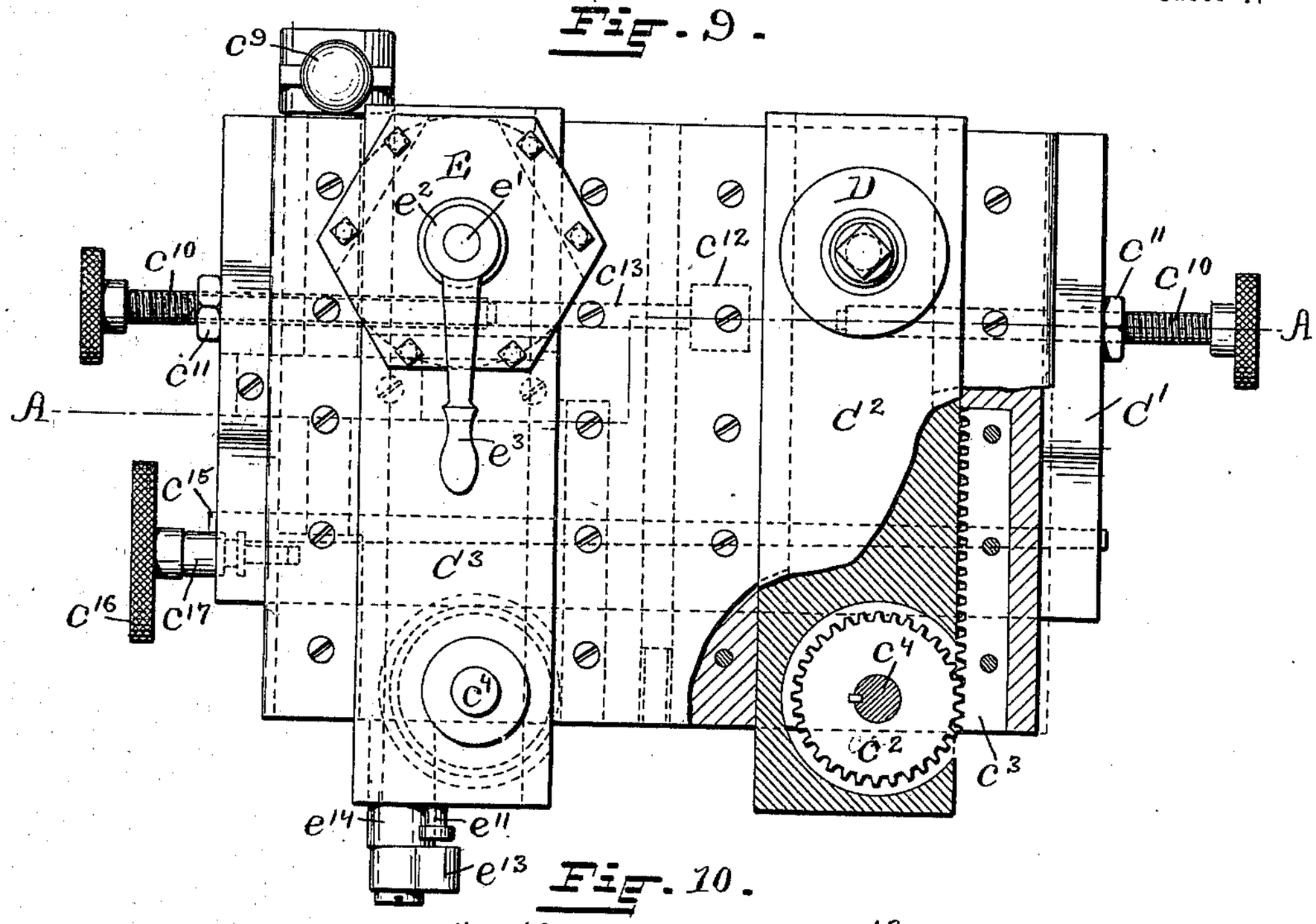


Fig. 10.

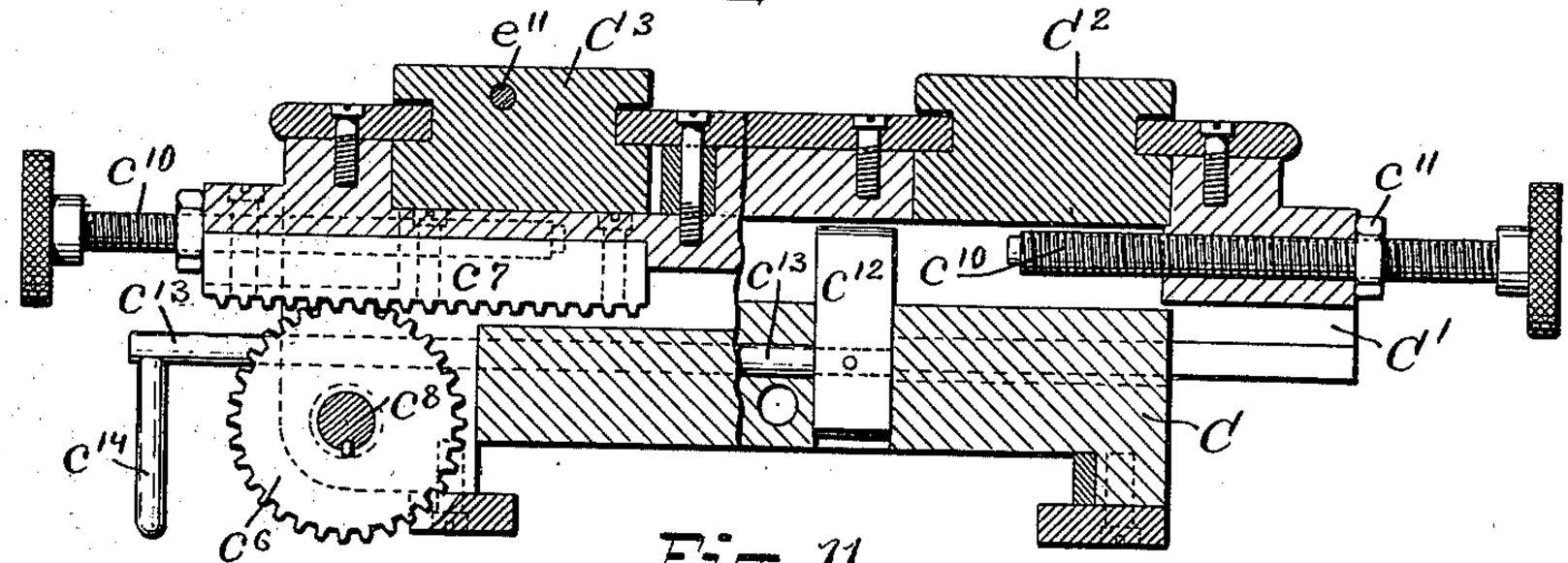
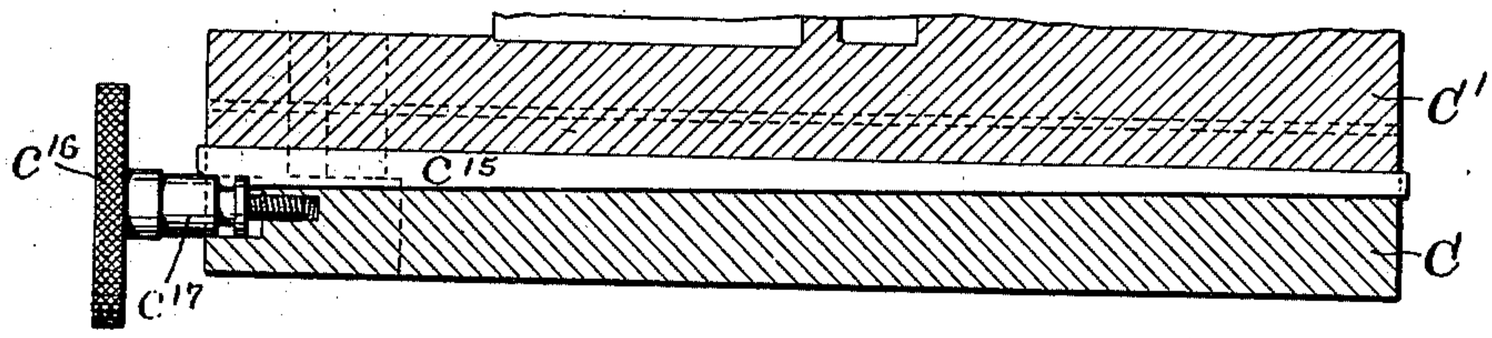


Fig. 11.



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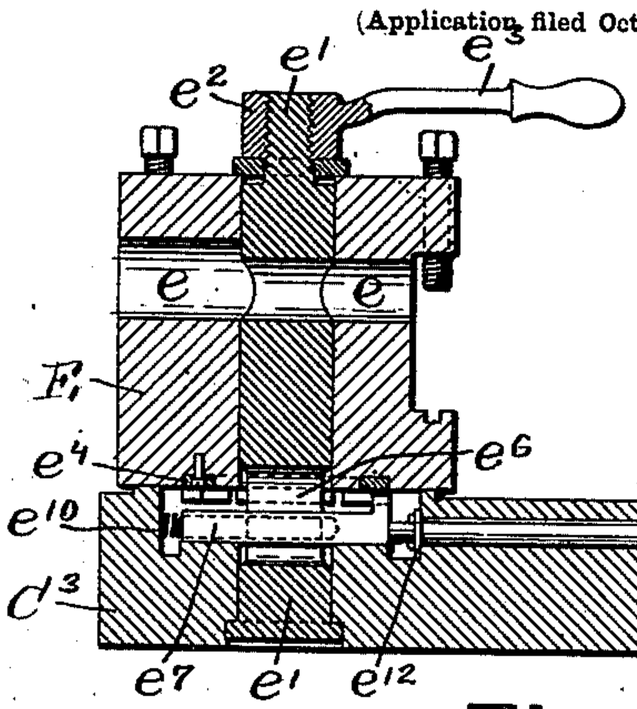


Fig. 12.

Fig. 13.

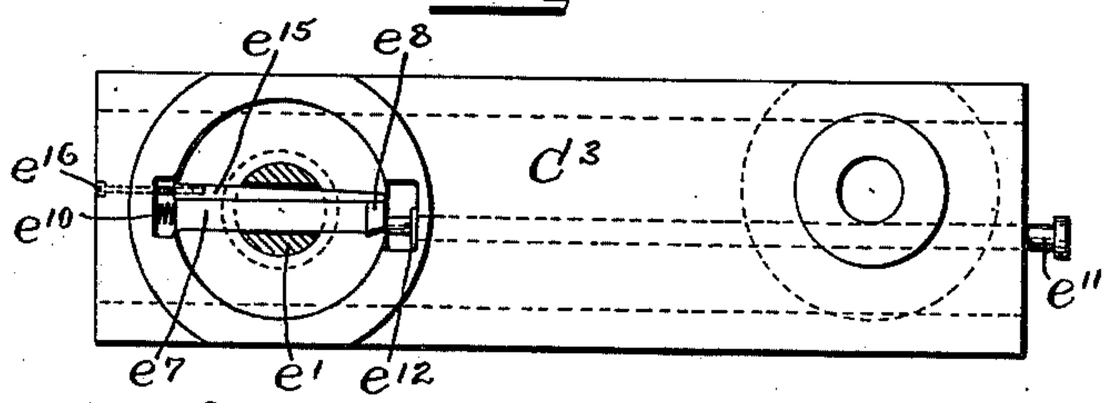


Fig. 14.

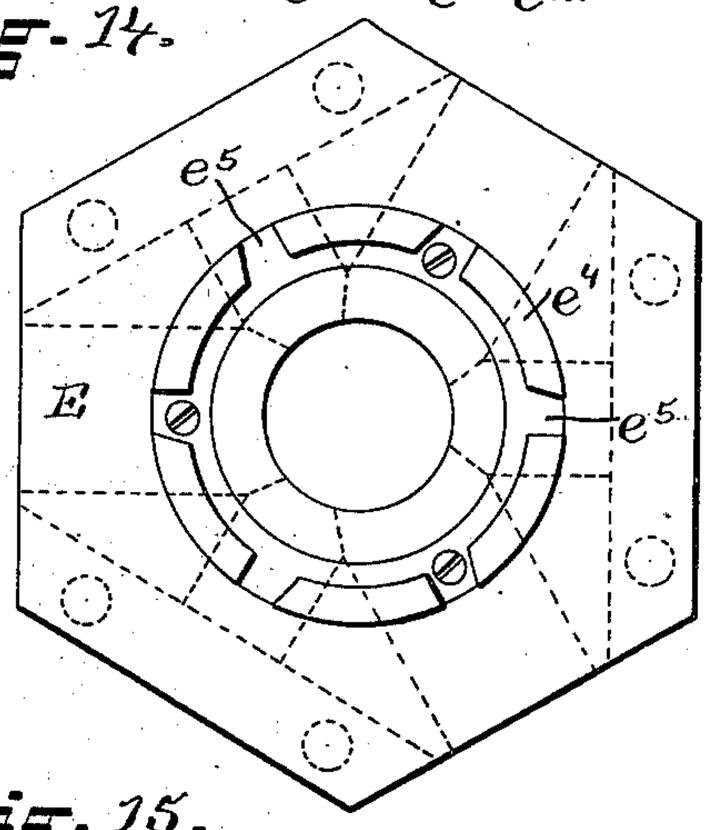


Fig. 15.

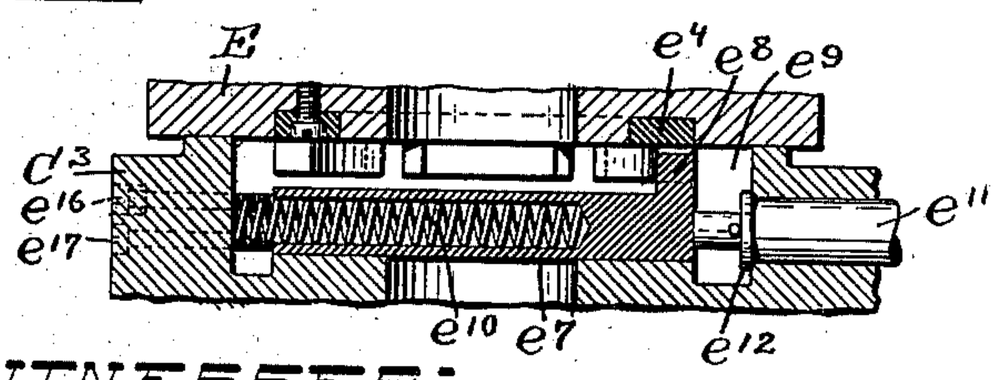


Fig. 16.

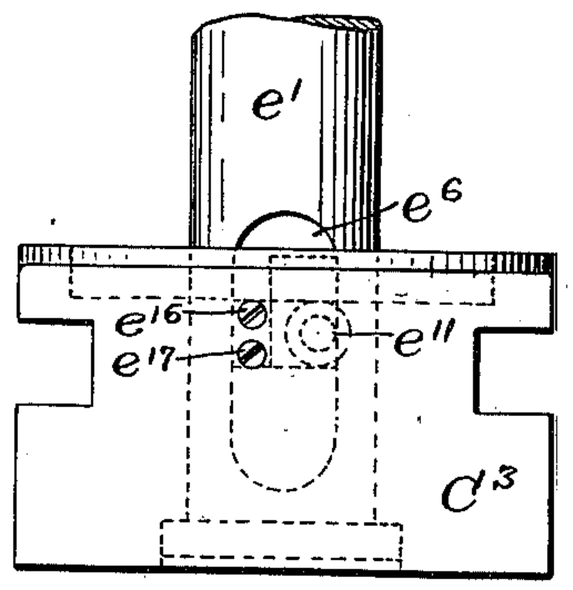
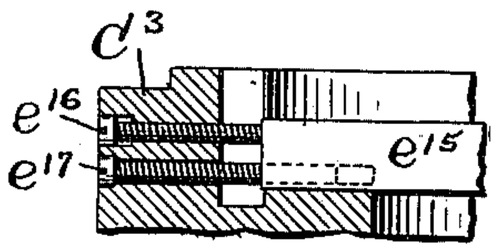


Fig. 17.



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Attys.

UNITED STATES PATENT OFFICE.

JAMES C. POTTER AND JOHN JOHNSTON, OF PAWTUCKET, RHODE ISLAND, ASSIGNORS TO POTTER AND JOHNSTON COMPANY, OF SAME PLACE.

TURRET-LATHE.

SPECIFICATION forming part of Letters Patent No. 672,742, dated April 23, 1901.

Application filed October 7, 1899. Serial No. 732,867. (No model.)

To all whom it may concern:

Be it known that we, JAMES C. POTTER, a citizen of the United States, and JOHN JOHNSTON, a subject of the Queen of Great Britain, both residing at Pawtucket, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Turret-Lathes, of which the following is a specification.

This invention has reference to an improvement in turret-lathes; and it consists in the peculiar and novel construction and the combination of parts whereby operations of successive tools on the work are facilitated and greater accuracy in the work is secured, as will be more fully set forth hereinafter.

In the manufacture of duplicate articles in conformity with a fixed standard it is desirable to perform as many steps successively on the article by a number of tools, and it is essential that each step should be performed with the greatest possible accuracy to secure perfect duplicates of the standard piece. To facilitate the work, it is desirable that the lathe be as nearly as possible automatic in its action and that all the changes required to complete the actions of the lathe on each piece may be readily performed by the mechanic in charge while in the best position to overlook the work.

The object of this invention is to secure these desirable ends.

Figure 1 is a side view of our improved lathe, showing the relative positions of the operating parts. Fig. 2 is an end view of the same. Fig. 3 is an end view of the arbor, showing the mechanism for operating the work-clamping devices. Fig. 4 is a sectional view of the forward end of the arbor, showing the expanding collet secured to the actuating-tube extending through the length of the arbor. Fig. 5 is an end view, on an enlarged scale, of the expanding collet. Fig. 6 is a longitudinal sectional view of the headstock, showing the mandrel provided with a contracting collet. Fig. 7 is an end view, on an enlarged scale, of the contracting collet. Fig. 8 is a view of the end of the collet-actuating tube. Fig. 9 is a top view of the tool-slides, part of which is cut away to show the rack and pinion for operating the slide carrying the tool-post. Fig. 10 is a transverse sectional view of the tool-slides on the line A A of Fig. 9. Fig. 11 is a horizontal section of part of the tool-slide bed, showing the clamping-wedge by which the bed is clamped in the adjusted position. Fig. 12 is a longitudinal section of the turret-slide, showing the turret and the automatic device for locking and unlocking the turret. Fig. 13 is a top view of the turret-slide, showing the device for maintaining the accurate adjustment of the turret. Fig. 14 is a plan view of the base of the turret, showing the registering slots in the base and indicating in broken lines the tool-sockets. Fig. 15 is a sectional view of the base of the turret, showing the automatic locking-slide in connection with the registering slots. Fig. 16 is an end view of the turret-slide, showing the arrangement of the wedge for taking up the wear and adjusting the locking-slide. Fig. 17 is a sectional view of part of the turret-slide, showing the means for adjusting the locking device.

Similar marks of reference indicate corresponding parts in all the figures.

In the drawings, A indicates the standard forming the support of the machine; A′, the bed secured to the standard and forming the support of the operative parts of the machine; A^2, a shelf surrounding the standard A, preferably dish-shaped, as indicated in broken lines in Figs. 1 and 2; a, the standard supporting the front journal-bearing a^2, and a' the standard supporting the rear journal a^3. The standards a and a' are formed integral with the bed A′. The arbor b consists of a tubular shaft provided near the front end with the annular collar b' and in the front end with a conical seat for the contracting collet b^2. The outer surface of the arbor b in front of the collar b' is screw-threaded to receive the internally-screw-threaded ring b^3 or the screw-threaded sleeve b^4. (Shown in Fig. 6.) On the arbor b the sleeve b^4 is secured to form the support for the cone-pulleys b^5. In the rear of the journal a^3 the sleeve b^6 is secured to the arbor b. The pawls b^7 are pivotally supported in the sleeve b^6. Within the arbor b the collet-tube b^8 is supported in sliding contact with the interior surface of the arbor. The contracting collet b^2 is secured directly to the collet-tube by screw-thread engagement, as shown

in Fig. 6. When the expanding collet b^9 is used, the cup b^{10} is secured, preferably by screw-thread engagement, to the collet-tube b^8. The cup b^{10} is provided with the post b^{11}, to the end of which the expanding collet b^9 is secured. The post b^{11} extends through and slides within the conical post b^{12}, which is firmly supported in the tubular collar b^{13}, one end of which extends into the arbor b, while the other end is secured to the sleeve b^{41}, secured to the arbor b, as is shown in Fig. 4.

The expanding collet b^9 and the contracting collet b^2 are both operated to grip the work when the collet-tube b^8 is drawn backward and to release the work when the collet-tube is moved forward. The collet-tube b^8 is provided at its rear end with the shoulders b^{14}, extending through the slotted portion of the arbor b in the rear of the sleeve b^6, on which the cam-sleeve b^{15} slides to operate the pawls b^7 b^7. The rear end of the arbor b is partially closed by the screw-ring b^{16}. The coiled spring b^{17} bears at one end on the ring b^{16} and at the other end against the end of the collet-tube b^8. By this construction a rod or bar may be passed through the collet-tube and gripped by the contracting collet b^2. The arms b^{18} b^{18} engage with the cam-sleeve b^{15}. These arms b^{18} b^{18} are secured to the shaft b^{20}, supported in the bearings b^{19} b^{19} on the end of the bracket a^4, extending from the bed A′. The hand-lever b^{21} is secured to the end of the shaft b^{20}. By moving the handle of the hand-lever b^{21} downward the cam-sleeve is moved forward to force the ends of the pawls b^7 apart and cause the heels of the pawls to draw the collet-tube b^8 and the collet rearward to grip the work. As soon as the hand-lever is released the coiled spring b^{17} acts to push the collet-tube and the collet forward to release the work.

B indicates the adjustable and pivoted stop used in connection with this class of machines. The bed A′ is provided with the ways a^5, on which the carriage C is supported. The leading-screw c is journaled in the carriage C and provided with the hand-crank c'. The leading-screw is in screw-thread engagement with a nut secured to the bed A′, so that the carriage C may be moved on the ways a^5 toward and from the end of the arbor b. The carriage C is provided with ways extending transversely to the ways a^5, and in these ways the carriage C′ is mounted. The slide C^2 and the slide C^3 are mounted on ways in the carriage C′, extending at right angles to the line of movement of the carriage C′, parallel to the line of movement of the carriage C and the axial line of the arbor b.

In the preferred construction the slide C^2 supports the tool-post D and the slide C^3 the turret E. The slides C^2 and C^3 are each provided with a gear c^2, engaging with a rack c^3. The gears are secured to vertically-extending shafts c^4 c^4, to the upper ends of each of which a hand-lever c^5 is secured, by which the slides are operated.

The transverse movement of the carriage C′ on the carriage C is effected by the gear c^6, which engages with the rack c^7, secured to the carriage C′. The gear c^6 is secured to the shaft c^8, journaled in bearings on one side of the carriage C. To one end of the shaft c^8 the hand-lever c^9 is secured. The construction is clearly shown in Figs. 1 and 10.

In the preferred use of these machines the tool supported on the tool-post D and the tools supported in the turret E are from time to time moved to bear on the work. At each change the carriage C′ must be moved by the hand-lever c^9 to bring the turret or the tool-post into the position required for the tools to perform their desired functions. To facilitate the accurate adjustment of the tools, we provide the carriage C′ at the opposite ends with the screw-spindles c^{10} in screw-thread engagement with the carriage. The outward-extending ends of the screw-spindles c^{10} we provide, preferably, with a milled head and place a clamp-nut c^{11} on each screw-spindle to secure the same in the adjusted position. In the body of the carriage C the stop c^{12} is pivotally secured and connected with the rod c^{13}, on the outer end of which the arm c^{14} serves to turn the rod c^{13} and swing the stop c^{12} upward in the path of the screw-spindles c^{10} or below the same. When adjusted the stop c^{12} and the screw-spindles c^{10} limit the traverse of the carriage C′, the tool-post D, and the turret E from the operative position of one to the operative position of the other, thereby greatly facilitating the operation and increasing the production of work.

In the production of accurate work each a duplicate of a standard microscopic accuracy in the relation of the tools to the revolving work is essential. Carriages moving on slides require a sufficiently loose sliding fit to secure the ready moving of the carriages.

To secure the firm support of the tool-carriage, the wedge c^{15} is placed on one side of one of the ways extending across the carriage C, in which the carriage C′ slides, preferably on the rear way, as is indicated in broken lines in Fig. 9 and shown in Fig. 11, so as to bear against the carriage C′ and force it against the front way of the carriage C. The wedge c^{15} is a long slightly-tapering wedge. It is operated by the screw c^{16}, the shank c^{17} of which is provided with a groove and collar engaging with the wedge, while the post beyond the collar is in screw-thread engagement with the carriage C. The particular arrangement and construction may be modified. The wedge may be connected with the carriage C′, and it may be used on the slides or other part of this or any other machine. It is essential, however, that the member to which the wedge is attached shall have

the tapering bearing for the wedge, so that the other side of the wedge extends along the line of motion of the member. By adjusting the wedge any wear of the ways may be taken up.

The turret E is provided with the sockets *e e*, in which the tools are secured. The turret is secured to the slide C^3 by the post *e'*, the lower end of which is secured in the slide C^3. The upper end of the post *e'* is screw-threaded and engages with the nut e^2, provided with the handle e^3. A washer is placed between the nut e^2 and the upper surface of the turret. The turret rests on a slightly-raised annular surface surrounding the circular cavity e^9 in the slide C^3. The bottom of the turret is provided with the circular ring e^4, having the locking-ports e^5 corresponding with the sockets *e e* in the turret. The post *e'* has the elongated opening e^6, which extends through the post. The locking-slide e^7, provided with the stop e^8, is mounted on ways formed in the portion of the slide C^3 surrounding the post *e'* and extends through the opening e^6 of the post. The locking-slide e^7 contains the spiral spring e^{10} and is secured to the rod e^{11}, which extends through the slide C^3 and projects beyond the forward end of the slide. The collar e^{12} on the rod e^{11} limits the movement of the locking-slide e^7 and holds it under the pressure of the spiral spring e^{10} in the locked position in one of the ports e^5, thereby securing the turret in the proper position in which one of the tools may operate on the work. When the action of the tool in the turret on the work is completed, the slide C^3 is drawn backward from the work and the end of the rod e^{11} encounters the arm e^{13}, projecting from the post e^{14}, secured to the carriage C', thereby pushing the rod e^{11} and the locking-slide backward against the pressure of the spiral spring e^{10} and moving the stop e^8 inward from the port e^5 within the circular ring e^4. The turret may now be turned to bring another tool into action. The forward movement of the slide C^3 permits the spring e^{10} to push the locking-slide e^7 forward into the port c^5, registering with the position of the tool.

The accuracy of the actions of the successively-acting tools secured in the turret depends on the device by which the turret is held in the locked position. Wear and loose motion are incompatible with accuracy of work. To secure the accurate adjustment and take up wear, the tapering wedge e^{15} is placed on one side of the locking-slide e^7. The screw e^{16} in screw-thread engagement with the material of the slide C^3 bears against the end of the wedge e^{15}, and the screw e^{17} in screw-thread engagement with the wedge serves to draw out the wedge, so that by the adjustment of the wedge any wear in the slide may be taken up and the locking device maintained in the adjusted position to accurately lock the turret and hold the operating-tool in the exact position required for perfect work.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a lathe, the combination with the bed of the lathe, a rotating tubular arbor supported in bearings at one end of the bed and a longitudinally-sliding carriage supported on ways on the other end of the bed, of a carriage mounted on ways extending transversely to the ways on the bed, means, substantially as described, for limiting the transverse movement of the carriage, two slides in this upper carriage, a turret supported on one of the slides, a tool-post on the other slide, means for operating the carriages and the slides, and means for locking and unlocking the turret, as described.

2. In a turret-lathe, the combination of the following instrumentalities: a rotatable tubular arbor, a collet-tube in the arbor, a collet-tube, means comprising a cam and pawls for operating the collet-tube, a rotatable turret mounted on a slide, a tool-post mounted on another slide, said slides having capacity for longitudinal movement, means, comprising racks and gears, for moving the slides longitudinally and the support of the slides transversely, a stop limiting the transverse movement of the slide-support, an automatic locking device for the rotatable turret, and levers, for operating the slides and the collet-tube, extending within reach of the operative, as described.

3. In a turret-lathe, the combination with the arbor, of a sleeve adapted to be secured to the end of the arbor, a conical tubular post supported by the sleeve, a collet-tube, a post connected to the collet-tube and extending through the conical tubular post, and an expansible collet secured to the post connected with the collet-tube and bearing on the conical post; whereby the longitudinal movement of the collet-tube in one direction operates to expand the collet so as to secure the work, as described.

4. In a lathe of the nature described, the combination with the rotatable arbor *b*, the conical tubular post b^{12}, and means for securing the conical tubular post b^{12} to the rotatable arbor, of the collet-tube b^8, the post b^{11} connected to and operated by the collet-tube b^8, the expansible collet b^9 secured to the post b^{11}, and means for operating the collet-tube; whereby the longitudinal movement of the collet-tube in one direction operates to expand the collet so as to secure the work, as described.

5. In a lathe, the combination with the rotatable arbor *b*, the journal-bearings for the arbor, the cone-pulleys, the sleeve b^4, the tubular collar b^{13}, the conical post b^{12}, the pawls b^7, the cam-sleeve b^{15}, the hand-lever b^{21}, and connections between the hand-lever and the cam-sleeve for operating the same, of the collet-tube b^8, the shoulder b^{14}, the coiled spring b^{17}, the ring b^{16}, the cup b^{10}, the post b^{11}, and the expansible collet b^9, as described.

6. In a lathe, the combination with a car-

riage having two tool-supporting slides, of two stops adjustably secured to the two opposite sides of the carriage, ways on which the carriage slides, and a stop pivotally supported below the carriage; whereby the pivoted stop may be swung into and out of the path of the adjustable stops, as described.

7. In a lathe, the combination with the carriage C and the carriage C′, of the screw-spindles c^{10} c^{10} in screw-thread engagement with the opposite parts of the carriage C′, the stop c^{12} pivotally secured to the carriage C, the rod c^{13} and arm c^{14}; whereby the stop may be raised into the path of the screw-spindles or swung out of the path, as described.

8. In a turret-lathe, the combination with the carriage C, the pivoted stop c^{12}, means for raising and lowering the stop, of the carriage C′ supported on ways extending transversely across the carriage C, means for sliding the carriage C′ on the ways, the slide C^3 supporting the turret, the slide C^2 supporting a tool-post, and the screw-spindles c^{10} c^{10} forming adjustable stops; whereby the tools in the turret and the tool on the tool-post may be each moved to operate on the work to the desired extent, as described.

9. In a turret-lathe, the combination with the carriage C′, the slide C^3, the turret E, the slotted post e' and the nut e^2, of the ring e^4, the ports e^5 in the ring, the spring-pressed locking device e^7, the stop e^8 on the locking-slide, the rod e^{11} extending from the locking-slide through and beyond the end of the slide C^3, the collar e^{12} on the rod e^{11} limiting the movement of the rod e^{11} and the locking-slide e^7, and the arm e^{13} secured to the carriage C′; whereby the turret is locked and unlocked, as described.

10. In a turret-lathe, the combination with the locking-slide e^7 and the slotted post e', of the wedge e^{15}, the screw e^{16} in screw-thread engagement with the slide C^3, and the screw e^{17} in screw-thread engagement with the wedge; whereby the locking-slide may be adjusted and the wear taken up, as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JAMES C. POTTER.
JOHN JOHNSTON.

Witnesses:
J. A. MILLER, Jr.,
B. M. SIMMS.