

(No Model.)

5 Sheets—Sheet 1.

H. VOIGT. AUTOMATIC LATHE.

No. 329,105.

Patented Oct. 27, 1885.

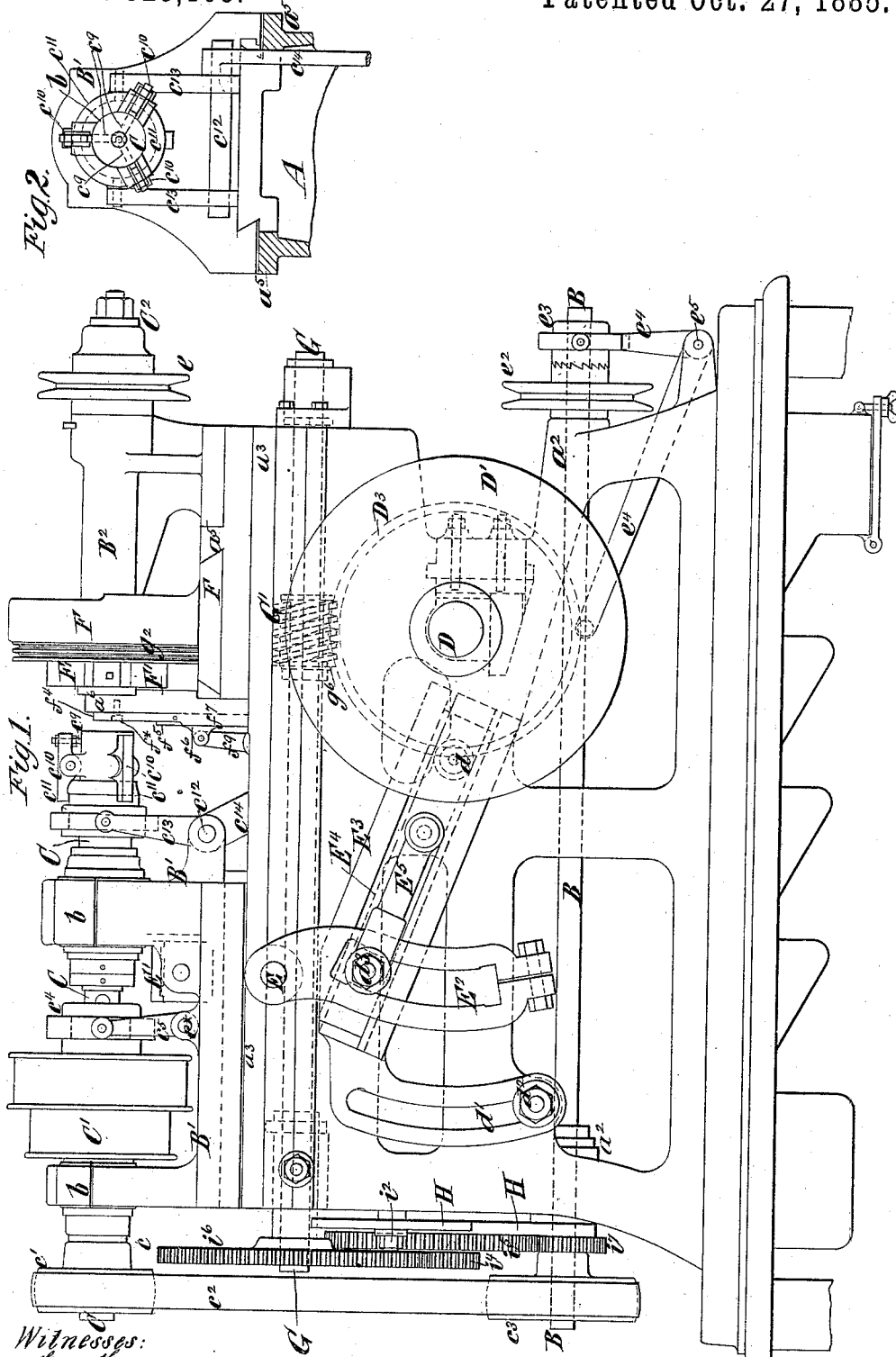


Fig. 1.

Fig. 2.

Witnesses:
Henry Hall
C. Hall.

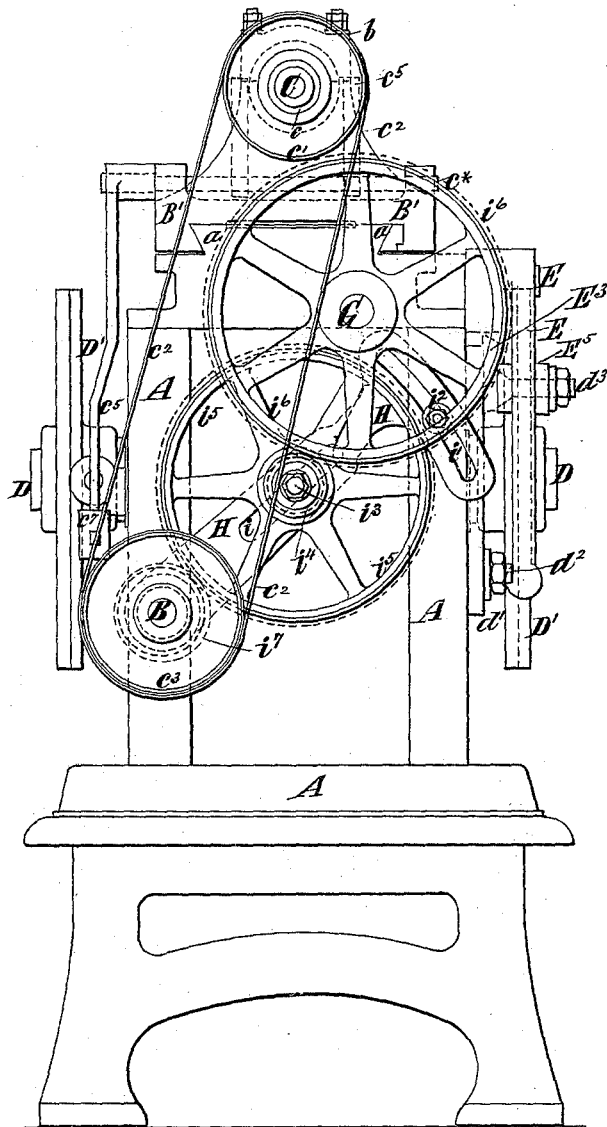
Inventor
Heinrich Voigt
by his Attys *Brown & Brown*

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Fig. 3.



Witnesses:
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(No Model.)

5 Sheets—Sheet 4.

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Fig. 5.

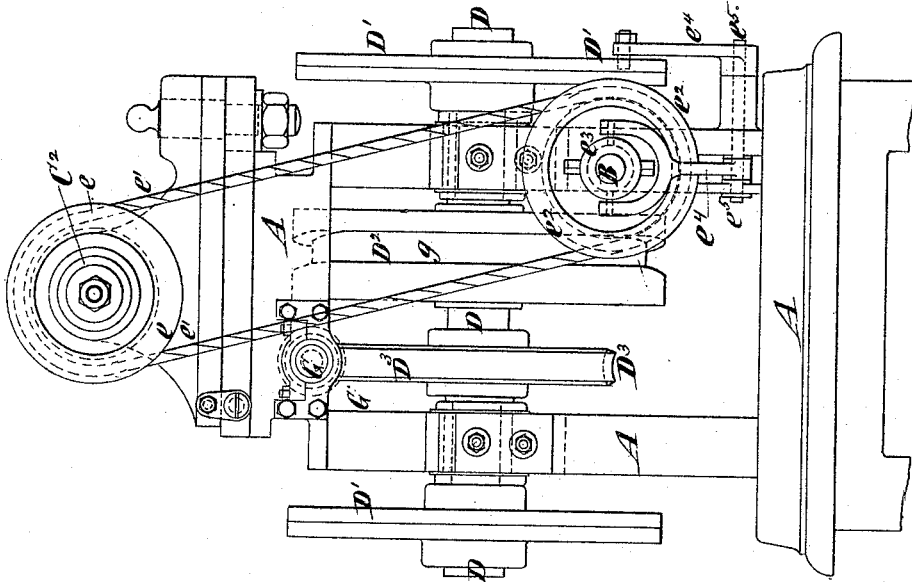
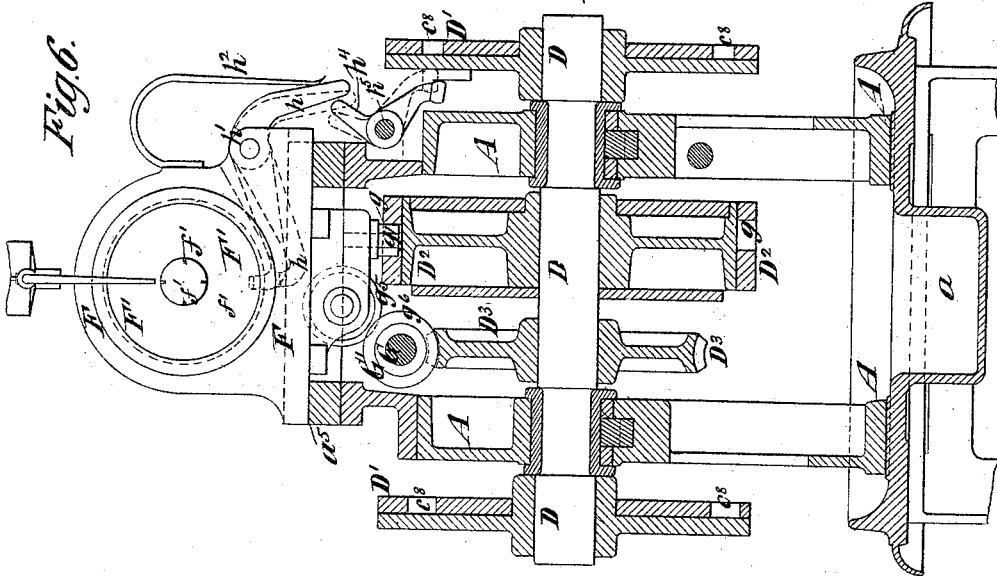


Fig. 6.



Witnesses:
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UNITED STATES PATENT OFFICE.

HEINRICH VOIGT, OF WÜRZBURG, GERMANY, ASSIGNOR OF ONE-HALF TO
WUNIBALD BRAUN, OF FRANKFORT-ON-THE-MAIN, GERMANY.

AUTOMATIC LATHE.

SPECIFICATION forming part of Letters Patent No. 329,105, dated October 27, 1885.

Application filed September 6, 1883. Serial No. 105,688. (No model.) Patented in Germany January 21, 1883, No. 23,708; in France January 25, 1883, No. 153,321; in Belgium January 30, 1883, No. 60,309; in Austria-Hungary March 23, 1883, No. 3,958 and No. 12,516, and in England April 3, 1884, No. 5,897.

To all whom it may concern:

Be it known that I, HEINRICH VOIGT, a resident of Würzburg, in the Empire of Germany, have invented a new and useful Improvement in Automatic Lathes, of which the following is a specification.

The improved lathe which forms the subject of this invention is more particularly intended for producing automatically from rods or bars of metal, screws having ornamental heads.

The machine chosen to illustrate my invention and illustrated in the accompanying drawings comprises a bed or shears, a tail stock mounted at one end thereof, a head-stock having journaled in suitable bearings a rotary hollow spindle or mandrel, a tool-holder having secured in it suitable tools for forming the ornamental heads of screws, and a screw cutting or threading device arranged in the tail-stock.

The metal rod from which the articles are to be made is fed in through the hollow mandrel or spindle, and is gripped and held by an automatic chuck at the end of the spindle or mandrel, so as to turn therewith. The head-stock and its mandrel have a lengthwise movement, whereby the proper length of rod is fed forward and threaded to form a screw, and the tool-holder has a crosswise movement, by which one or more of its cutters are fed against the rod to give form to the head of the screw and cut it off.

The invention consists in various novel combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a machine embodying my invention. Fig. 2 is a transverse section of a part of the bed and an end view of the head-stock and mandrel-chuck. Fig. 3 is an end elevation, looking from the left hand of Fig. 1. Fig. 4 is a longitudinal vertical section of the machine. Fig. 5 is an end elevation, looking from the right hand of Fig. 1. Fig. 6 is a transverse section on the plane of the dotted line *xx*, Fig. 4. Fig. 7 is an end elevation of the tool-holder on a larger scale, and Fig. 8 is an

axial section of the tool-holder on the same scale as Fig. 7.

Similar letters of reference designate corresponding parts in all the figures.

A designates the bed and frame of the machine, which has at the bottom a number of pockets, *a*, at different levels, so that oil dropping from the working parts of the machine will overflow from one to another and gradually deposit all chips and dirt, leaving the oil clear in the last pocket, *a'*, from which it may be pumped up for reuse.

B designates a counter-shaft, journaled in suitable bearings, *a''*.

At the top of the frame are shears or ways *a'''*, on which is mounted a reciprocating head-stock, B', having bearings *b* for a hollow spindle or mandrel, C.

C is a cone-pulley, which receives a driving-belt, (not shown,) and which is fast on a sleeve, *c*, fitting the outer bearing, *b*, and loose on the mandrel C. The sleeve *c* also has fast upon it a pulley, *c'*, from which a belt, *c''*, drives on to a pulley, *c'''*, on the counter-shaft B, and rotates said shaft. On the mandrel C is a clutch-sleeve, *c''''*, which is locked to turn with but free to slide on the mandrel, and by which, at the proper time, the sleeve *c* will be locked to the mandrel C, so as to impart rotary motion to it. The clutch-sleeve *c''''* is controlled by a lever, *c'''''*, fulcrumed at *c''''''*, and operated to throw off the clutch by a push-rod, *c'''''''*, arranged to slide in bearings *a''''*, the said lever being operated to throw in the clutch by a weight, *c''''''''*, applied thereto, as shown in Fig. 4. The push-rod *c'''''''*, as well as several levers which control other parts of the machine, as hereinafter described, are operated by cam plates or disks D', secured fast to opposite ends of a cross-shaft, D, as best shown in Fig. 6. These disks have in their faces cam-grooves *c''''''''''*, one being shown in Fig. 6, and these grooves may be of various forms adapted to produce the operation of the several parts in proper time. As the forms of the cam-grooves will vary with each different pattern of work produced, I have not shown them, but to lay them out

requires only ordinary mechanical skill. The levers and other parts operated by the cams D' have rollers entering the grooves e^8 .

At the front end of the mandrel C is a self-acting chuck, which, as here shown, consists of three jaws, c^9 , attached to levers c^{10} , fulcrumed on the mandrel and operated by a sliding conical sleeve, c^{11} , which acts upon the tail ends of the levers, as shown in Fig. 4. The chuck-sleeve c^{11} is moved lengthwise by a rock-shaft, c^{12} , having arms c^{13} , which engage the sleeve, and an arm or lever, c^{14} , which is operated by one of the cams D' , as best shown in Figs. 2 and 4.

The head-stock B' is reciprocated by a rock-shaft, E , having an arm, E' , which is connected with the head-stock, and a curved and slotted arm or lever, E^2 , which is swung to and fro, as I shall now describe.

At the side of the machine is a grooved or slotted guiding-bar, E^3 , which is supported at one end by a fixed pivot or fulcrum, d , and having at the other end a curved and slotted arm, d' , which may be clamped by a screw, d^2 , to hold the guide E^3 at any desired elevation.

In the guide E^3 is fitted a reciprocating sliding block or slide, E^4 , which has a roller engaging one of the cams D' , and which is connected by a rod, E^5 , and screw d^3 with the slotted arm or lever E^2 , as shown in Fig. 1. By raising or lowering the screw-connection d^3 of the rod E^5 with the arm E^2 the length of throw of the arm E^2 may be varied and the desired longitudinal movement given the head-stock and mandrel $B'C$; and it will also be seen that, by raising and lowering the guide E^3 , I provide for keeping it nearly in line with the rod E^5 , so that the force exerted through the rod will be nearly in line with the reciprocating slide E^4 .

On the bed or frame A is mounted a tail-stock, B^2 , wherein is fitted a rotary tail-spindle, C^2 , having fast upon it a pulley, e , which is driven by a belt, e' , from a pulley, e^2 , loose on the shaft B . At the side of the pulley e^2 is a clutch, e^3 , which is controlled by a bell-crank lever, e^4 , fulcrumed at e^5 , and operated by one of the cams D' , as best shown in Fig. 4.

The tail-spindle C^2 carries a threading die or tool, C^3 , the stem or shank of which extends through the tail-spindle and is locked to turn therewith, and after the die has cut a thread on the end of the rod, as hereinafter described, the clutch e^3 is thrown in to rotate the pulley e^2 , and the tail-stock is thereby rotated in a direction to unscrew the die C^3 from the rod, which is then held rigidly, and the die will back off the threaded rod, the spring e^6 yielding to permit of this.

The construction of the tool-holder is best shown in Figs. 7 and 8, but also in Fig. 4. It consists of a slide, F , which is fitted to a slide-way, a^5 , in the bed A , and adapted to reciprocate in a direction transverse to the mandrel C . The slide F has a circular bore, f ,

wherein is fitted a hub or annular tool-stock, F' , capable of rotary motion, and having a number of cutting-tools, f' , having different profiles arranged radially at different points in its circumference and secured by set-screws f^2 . The stock F' has at the front a die or support, f^3 , for the rod W to be operated on, by which it is steadied when operated on by the cutters f' . The die f^3 is inserted in a standard or post, a^6 , on the bed, and on the front of this standard are gripping-jaws f^4 , which are pivoted at f^5 , and are forced together by a wedge, f^6 , which projects from a sliding block or slide, f^7 , moving in a vertical slideway, f^8 . The slide f^6 is thrown upward to free the jaws f^4 by means of a spring, f^9 , arranged as shown in Fig. 8, and is drawn down to clamp the jaws on the work W by means of a link or rod, f^{10} , and a bell-crank lever, f^{11} , which is fulcrumed at f^{12} , and engages with one of the cams D' , as shown in Fig. 4. In order to give the gripping-jaws f^4 a certain amount of elasticity and enable them to strongly hold rods without danger of breaking any of the said parts, I have shown them slotted at f^{12} , and provided with screws f^{13} for regulating the degree of elasticity.

The slide or tool-holder F is moved cross-wise of the machine by a cam, D^2 , having a groove, g , engaging a stud, g' , on the tool-holder and made fast to the shaft D , as best shown in Fig. 6. This groove g will be of a form to bring the two or more cutters f' into successive operation, and to allow the desired dwell while the head-stock is moving longitudinally.

The shaft D is driven by a worm or screw, G' , on a worm-shaft, G , gearing into a worm-wheel, D^3 , on the shaft D .

On the cutter-stock F' is a pulley, g^2 , on which are drive-belts g^3 , from a pulley, g^4 , carried by the sliding holder F , and the pulley g^4 has a friction-flange, g^5 , which is brought into frictional engagement with a similar flange, g^6 , on the worm or screw G' when the tool-holder is moved back to its original position after being moved crosswise of the machine. The rotary stock F' will then be turned slightly, if unlocked. In order to hold the cutter-stock F' against accidental turning, I have represented a catch-lever or locking-lever, h , fulcrumed at h' on the sliding tool-holder F , and which is acted upon by a spring, h^2 , to hold its tooth or end in engagement with notches or sockets in the periphery of the annular stock F' . As represented in Fig. 8, the slide or sliding holder F is notched or slotted at g^* to receive the locking end of the lever h , and that figure also shows one of the notches or sockets h^3 with which the lever engages.

In the same plane as the lever h is a second lever, h^4 , one end of which bears against the face of one of the cams D' , and which is pivoted at h^5 . When the tool-holder F is moved back to the position shown in Fig. 6, the tail

of the lever h comes against the lever h^4 , and if a lump or projection on the cam D' now comes opposite the lever h^4 the latter will be actuated to withdraw the locking-lever h from its notch or socket h^3 , and the friction-flange g^5 now being in contact with the flange g^6 on the worm G' , the cutter-stock F' will be turned a quarter of a turn and a new cutter, f' , brought into horizontal position, so that the next cross movement of the tool-holder will cause that cutter to operate on the rotating work W . The locking-lever h , springing into the next notch, will prevent the cutter-stock F' from turning more than the desired fraction of a turn. In this way the cutters f' will be successively brought to horizontal position for successive operation to form the head of the screw, and then to cut it off.

In order to provide for driving the worm-shaft G at varying speeds, I have represented change-wheels very similar to those used in a lathe for imparting motion from the shaft B to said shaft G . Supported concentrically with the shaft B is a bracket or swinging support, H , slotted at i^1 , and having a clamping-screw, i^2 , for holding it in different positions. Free to turn on a stud, i^3 , adjustable in the slot i , are a pinion, i^4 , and a wheel, i^5 , connected to rotate as one piece. The pinion i^4 engages with a wheel, i^6 , on the shaft G , and the wheel i^5 engages with a wheel or pinion, i^7 , on the shaft B . The wheels and pinion i^6 i^5 i^4 may be replaced by others larger or smaller, the bracket or swinging support H being adjusted accordingly, and the speed of rotation of the shaft G and the shaft D with its cams, may be thereby varied as may be desired, according as the articles to be produced are long or short. I have in Fig. 3 represented the wheels i^6 i^5 i^4 without their teeth, the pitch-lines of their teeth being indicated by dotted lines around them.

The operation of the machine is as follows: The rod or bar of metal W to be operated on is introduced into the hollow mandrel C , and the chuck-jaws e^9 close thereon, so as to grip it strongly. The head-stock B' is now moved forward, and at the same time the clutch e^4 is thrown in to connect the cone-pulley C' and the mandrel C , and the latter is then rotated, and a thread is cut by the die or tool C^3 on the rod. The rotation of the mandrel C then ceases, the rod W is grasped by the gripping-jaws f^4 , and the chuck-jaws e^9 open, whereupon the head-stock B' and mandrel C retire or move back, and the chuck-jaws e^9 again grasp the rod. In the mean time the clutch e^3 has been thrown in to turn the pulley e^2 , and the tail-spindle C^2 has been rotated to unscrew the threading-tool C^3 from the rod, and the said tool backs off the thread, the spring e^6 being compressed to permit of this.

The jaws f^4 now open, and the mandrel C , with the rod W held therein, is rotated, and at the same time the tool-holder F' F' is moved transversely by the cam D^2 to cause one of the tools f' , which is presented horizontally, to operate upon the rotary rod. As the tool-holder retires or moves back, the friction-flange g^5 of the pulley g^4 is brought against the flange g^6 of the worm G' , and the locking-lever h being at the same time withdrawn from the rotary stock F' , the latter will be turned a quarter of a turn to bring another cutter or tool f' into horizontal position for operation, after which the tool-holder is again moved transversely to apply said cutter to the work. The movements of the tool-holder are repeated until the necessary number of cutters have operated to form the head of the screw, and the latter is cut off from the rod by the last cutter.

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

1. In an automatic lathe, the combination, with the head-stock and its mandrel, and the bed whereon the head-stock is movable, of the arm E^2 and connections through which the swinging of said arm reciprocates the head-stock, the adjustable guiding-bar E^3 with its slotted arm d' and clamping-screw d^2 , the slide E^4 , fitting said guiding-bar, the rod E^5 , connecting the slide E^4 and the arm E^2 , and a rotary cam for operating the slide, substantially as herein described.

2. The combination, with the head-stock and its mandrel and the bed whereon the head-stock is movable, of the swinging arm E^2 and connections between it and the head-stock, the adjustable guiding-bar E^3 d' , the slide and rod E^4 E^5 , the cam-disk D' for operating the slide, the shaft D and worm-wheel D^2 , the shaft B and the worm and worm-shaft G' G , and change-gears for operating the shaft G from the shaft B , substantially as herein described.

3. In an automatic lathe, the combination, with the reciprocating head-stock and its mandrel and the bed whereon the head-stock is movable, of the tool-holder F , fitting a transverse slideway on the bed, a cam whereby the said tool-holder is reciprocated in its slideway, an annular tool-stock, F' , fitted to turn in the holder F , and cutting-tools f' , arranged radially in the tool-stock for operating one or other of them upon the work as the tool-holder is moved transversely to the length of the mandrel, substantially as herein described.

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

HEINRICH VOIGT.

Witnesses:

JOSEPH PATRICK,
J. GRUND.