No. 756,467. PATENTED APR. 5, 1904.

J. P. BROPHY.

TURRET MECHANISM FOR AUTOMATIC LATHES.

APPLICATION FILED AUG. 20, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. I.

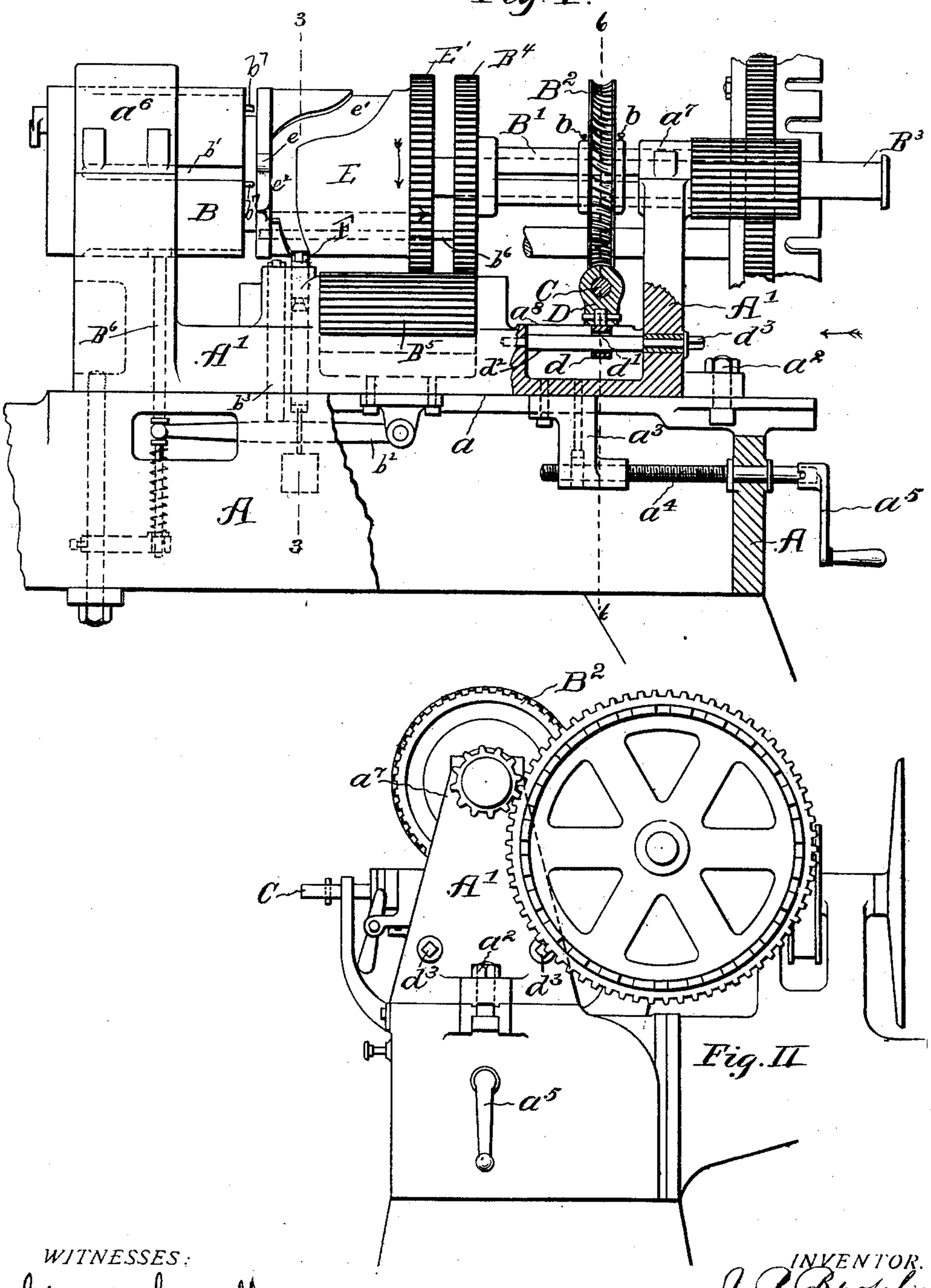

Fig. II.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. III

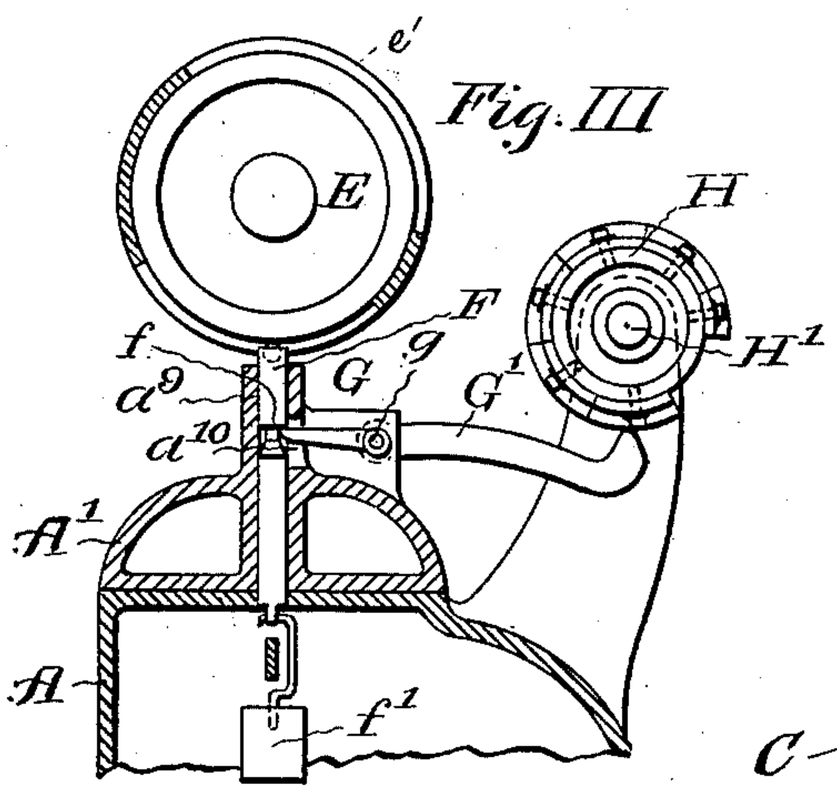


Fig. V.

Fig. VI.

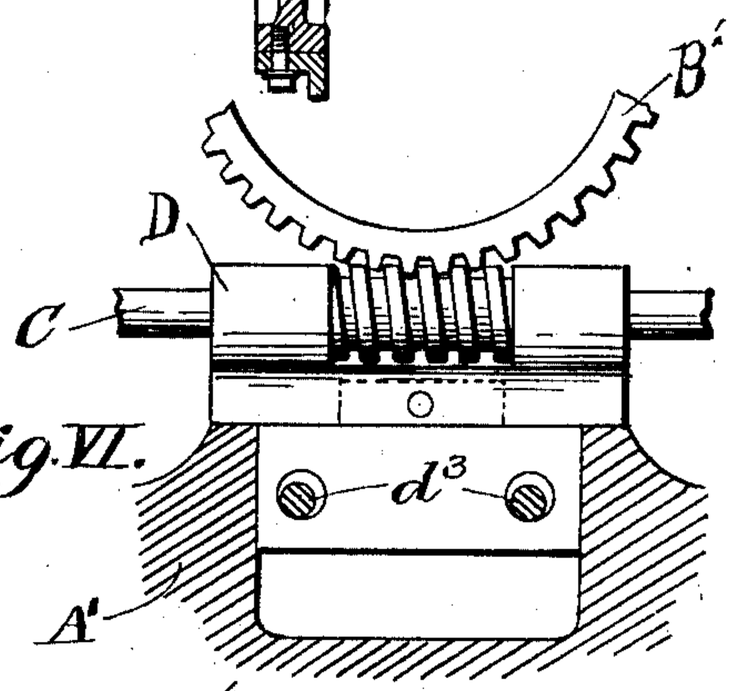
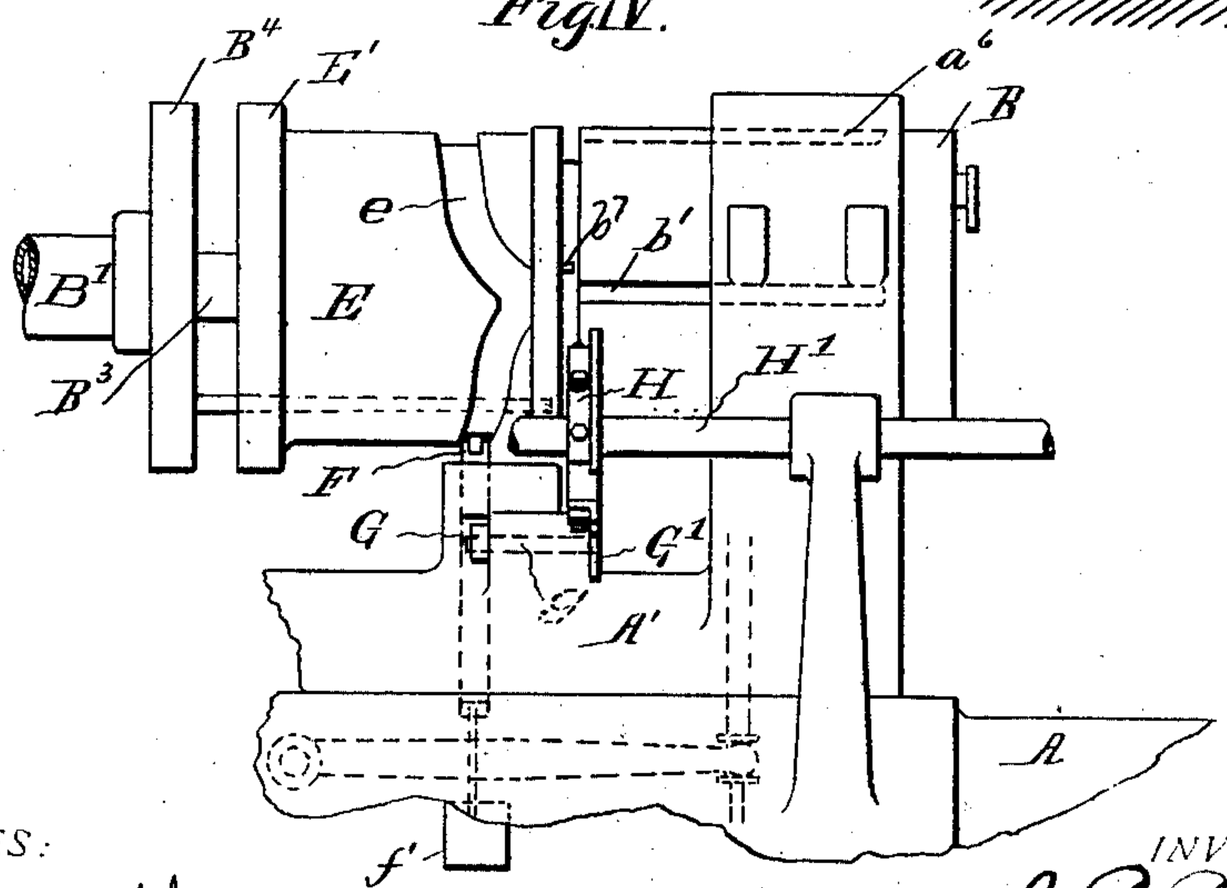


Fig. IV.



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UNITED STATES PATENT OFFICE.

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TURRET MECHANISM FOR AUTOMATIC LATHES.

SPECIFICATION forming part of Letters Patent No. 756,467, dated April 5, 1904.

Application filed August 20, 1902. Serial No. 120,346. (No model.)

To all whom it may concern:

Be it known that I, JOHN P. BROPHY, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Turret Mechanism for Automatic Lathes, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to improvements in automatic lathes, and particularly to improvements in the turret mechanism thereof.

The object of said invention is to provide means whereby the sphere of operation of the turret and through it the sphere of operation of the tools in the turret may be changed to conform with requirements of varying character, and, further, to permit of the automatic interruption of the reciprocating movement of the turret without involving the interruption of the operation of the lathe's driving mechanism.

Said invention consists of means hereinafter fully described, and particularly set forth in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure I represents a front elevational view, partly in section and broken away, of the turret end of automatic lathe of the general type of that shown in Patent No. 554,814, issued to James B. Clyne and embodying my invention. Fig. II represents an end view of such part of said lathe viewed in the direction indicated by the arrow in Fig. I. Fig. III represents a vertical transverse section of the lathe, taken upon the plane indicated by the line 3 3, Fig. I, the scale upon which such section is drawn being somewhat reduced from that on which Fig. I is drawn. Fig. IV represents a rear elevation of such lathe part drawn on the scale of Fig. III. Fig. V represents, on an enlarged scale, a vertical cross-section of a cam-disk used in connection with my invention. Fig. VI represents an enlarged vertical section of a portion of the machine, such section being taken upon the plane indicated by line 6 6, Fig. I.

In order that the nature and object of my invention may be more fully understood, I shall first describe the general construction of the lathe to which my invention is applied.

The lathe is divided into two main parts—the turret-operating part and the work feeding and rotating part. The work feeding and rotating part being unaffected by my invention, further reference thereto will hereinafter be omitted. Besides these two parts there are one or more automatically-operated cross-slides which are used for carrying and operating cutting off and forming tools, as required. These latter parts being also unrelated to my invention will also be omitted from the following description. The turret carries a variety of tools which are adapted to perform operations progressively lengthwise of the work, such as threading, boring, milling, and finishing.

The aim sought for in automatic lathes is to provide a structure such as will permit the greatest number of different forms of work to be produced consistent with economy of construction. This means that the machine should be able to carry and operate as many tools of different kind as possible and each tool should have the longest possible range relatively to each piece of work—that is, the maximum length of the work upon which the machine is adapted to operate should be as great as possible. In the above-named patented lathe such maximum length of work is determined by the reciprocatory stroke of the turret, a part only, however, of the forward stroke of reciprocation being utilized for the actual operation of the tools—that is, the last portion of such stroke—that is, each forward stroke is divided into two parts, the first part of which is traversed at a comparatively high speed and the last or operative part of which is traversed

at a comparatively slow speed, these different speeds in such forward movement being obtained automatically by changing the driving mechanism from direct to differentially operating. The sphere of active operation of the turret—that is, the length of that part of the advance stroke traversed at a low speed—in said machine is capable of alteration as required by one means only, and that by laboriously removing and accurately changing the position of a pin or knock-off operating a clutch for changing the driving gear from a direct to a differential transmission. In my improved lathe, however, a change of field may be obtained without removal or change of position of any of the cams or similar parts. In such improved construction I provide upon the main bed or frame A a secondary frame A′, which is slidably mounted upon suitable slideways a and fixedly secured by means of a clamping-bolt and nut a^2, Fig. II. A hanger a^3 is securely bolted upon the under surface of the frame A′ and is provided with a threaded bore adapted to receive the threaded end of a shaft a^4, having a bearing in the main frame A, as shown in said Fig. I, whereby by attaching a crank a^5 to said shaft and loosening the clamp-bolt and nut a^2 the frame A′ may be moved back and forth longitudinally of the main frame. This secondary frame A′ is provided with a bearing a^6 for the turret B and a bearing a^7 for the hollow turret-spindle B′, the turret, as explained in said above-named patent, being connected with said spindle and rotatable and longitudinally reciprocable in its bearing. Upon said spindle is rotatively secured a driving worm-wheel B^2, which is so secured by means of a spline and groove whereby movement longitudinally relatively to said turret-spindle B′ may be had. Suitable set-screws b are provided for fixing the worm-wheel to prevent such longitudinal movement. Said wheel is driven by means of a worm mounted upon a driving-shaft C, located transversely of spindle B′, in a bearing D, which is mounted upon a slideway a^8, Fig. I, so as to permit of relative movement of such bearing and frame longitudinally of the latter. This bearing D is provided with a downwardly-projecting hanger d, which is provided with two cylindrical holes d', each of which is engaged by one of two eccentric rotatable rods d^2, having bearings in the frame A′. These rods are so located that by turning them they may be caused to frictionally engage or to disengage the said holes d', thereby clamping or loosening the bearing D. These rods are each provided with a squared head d^3, to which a wrench may be applied for the purpose of turning them. Assuming that the turret's reciprocatory path is included between certain transverse planes and it is desired to alter the position of these planes in order to permit the tools in the turret to operate over a different field in accordance with the previously-mentioned requirements, set-screws b and clamping-rods d^2 are turned to loosen the worm-wheel B^2 and bearing D, respectively. Screw-shaft a^4 is turned and frame A′, carrying the turret and turret-shaft, thereby moved into the position required to give the turret the desired field of operation. During this movement wheel B^2 and bearing D remain stationary relatively to the main frame A. The required position having been so imparted to the frame A′, the set-screws b and rods d^2 are then turned so as to secure wheel B′ and bearing D.

The varying character of the articles produced on a lathe of this character frequently necessitates the operation of a less number of tools than the maximum number for which provision is made in the turret. In the patented lathe previously referred to the turret was reciprocated toward and from the field of operation of the tools and intermittently rotated a number of times in each complete revolution of the turret equal to the total number of tools for which provision was made in the turret. The mechanism for accomplishing such reciprocation and rotation I shall now briefly describe in order that the application of my invention may be more readily understood.

The turret-spindle B′ is hollow and through it extends and is rotatably mounted a rod B^3, and upon the end of said spindle is secured a gear-wheel B^4. This gear-wheel B^4 meshes with a long pinion B^5, which is engaged by a gear E′, secured to the cam-drum E. This drum is slidably mounted upon the rod B^3 and connected with the turret B in a manner such that the drum while rotating will transmit its longitudinal movement to the turret, but not its rotary movement, except under the conditions hereinafter described. The turret B is rotatably mounted in the bearing a^6 and is provided with a series of longitudinal slots b', each of which may be engaged by a depressible spring-pressed rod B^6, normally held in engagement with one such slot. This rod is operated through a lever b^2 by a rod b^3, which is periodically actuated by a small cam e on the cam-drum E. Secured to the gear B^4 and extending through the drum E is a rod b^6, whose end extends into the path of a number of studs b^7, secured to the end face of the turret B, Fig. I, when the drum E is at its greatest distance from the turret bearing—that is, as viewed in the drawings, at its extreme right-hand position. These studs are equal in number to the tools in the turret, and hence the slots b'. The cam-drum is provided with a cam-slot e', engaged by a post F, hereinafter described, which effects the reciprocation of the cam-drum, and hence the turret.

The mechanism just described operates as follows: The spindle B′ is rotated and transmits its motion through gears B^4 E′ and pinion B^5 to the drum E in the direction indi-

cated by the arrow on the drum in Fig. I. The post F, engaging the cam-groove e', effects the reciprocation of the drum and turret, rod B^6 and a slot b' preventing rotation of the latter. The turret is so advanced to the end of its operative stroke, whereupon, the direction of the cam-groove changing, it and the drum are withdrawn. At the end of the return stroke cam e engages rod b^3 and so disengages rod B^6 from the turret-slot b', the rod b^6 at the same time engaging one of the studs b^7. During this period post F engages a straight part e^2 of the cam-groove e', whereby rotation of the drum, which is continued, is effected without any reciprocatory movement. Such action partially rotates the turret, such partial rotation being limited by the subsequent engagement of the post F with an inclined part of the cam-groove, whereby the forward turret-stroke is commenced. This forward movement disengages rod b^6 with the stud b^7, and the turret is locked rotatively by the reëngagement of rod B^6 with the next slot b', said rod having previously been released by the disengagement of cam e with rod b^3.

By the use of my improved lathe construction means are provided for effecting a number of reciprocatory movements of the turret equal to the number of turret-tools operating upon the work when the number of operating-tools is less than the maximum capacity of the turret. In this connection the cam-drum E, used in the previously-described construction, is employed to effect the reciprocatory movement as before. This drum is provided, as described in said former construction, with a cam-groove e', provided with the straight portion e^2, which engages the post F, fixed relatively to the lathe-frame, and was formerly preferably made an integral part of the latter and provided with an antifriction-roller which directly engaged the cam-surfaces of the groove. In my improvement instead of providing a fixed post for effecting the engagement of the said groove post F is made movable into and removable from the path of the groove's cam-surface. To this end a vertical bore a^9 is provided in the secondary frame A′ below the cam-drum. The said post F is mounted in this bore and is urged upwardly by an arm G, which extends through an aperture a^{10}, piercing bore a^9 from the back, and pivoted on a rock-shaft g, journaled in said frame A′ at the rear portion of the latter. Said arm engages the post in a shoulder f, formed on it, as shown in Fig. IV. To the lower end of the post is hung a weight f', which tends to pull the post downwardly. A lever G′ is secured to said shaft, extends rearwardly, and rests upon the under surface of a cam-disk H, which is secured to a shaft H′, which is rotated by suitable connections (not shown) once for each complete rotation of the turret. Said disk is provided with a number of removable segments h, by means of which the location of the cam-surface of this disk may be changed or more than one such surface provided. Such surface is formed by a depression in the disk's periphery, whereby the rear end of the lever G′ is permitted to periodically rise, thereby effecting a periodic drop on the part of the post F. The segments are so located as to effect the depression of the post at such time or times as mark the inception of the forward movement of the turret. These periods, however, are limited only to that one or those during which it is desired that the turret should not advance, as will be readily understood.

I therefore particularly point out and distinctly claim as my invention—

1. In an automatic lathe, the combination of the main frame, a secondary frame movable longitudinally upon the main frame, a turret and mechanism mounted upon said secondary frame for rotating and reciprocating said turret, a driving-shaft bearing slidable on said secondary frame, means for fixing the latter upon said main frame, means for fixing said bearing relatively to said secondary frame, a driving-shaft in such bearing and journaled in stationary bearings in the main frame, and means connecting such shaft with said mechanism, said rotating mechanism including a gear adjustably slidable on the turret-shaft.

2. In an automatic lathe, the combination of a main frame, a secondary frame movable upon such main frame, a turret-spindle upon such secondary frame, a movable bearing upon the latter, a driving-spindle in such bearing and journaled in stationary bearings in the main frame, a gear adjustably secured upon such turret-shaft, and a worm upon such driving-shaft engaging such turret-shaft gear.

3. In an automatic lathe, the combination of the main frame, a secondary frame movable longitudinally upon said main frame, a turret-spindle journaled in said secondary frame, means for securing said frames relatively to each other, a driving-gear rotatively secured to but longitudinally movable upon said spindle, a transverse bearing having sliding connection with said secondary frame, a driving-spindle journaled in said bearing, a gear meshing with said driving-gear and mounted upon said spindle, and means for securing said bearing upon said frame.

4. In an automatic lathe, the combination of a turret mounted so as to be capable of reciprocation, a cam connected with said turret, a post fixed relatively to the direction of turret reciprocation for engaging said cam and means for periodically disengaging said post from said cam whereby reciprocation may be periodically prevented.

5. In an automatic lathe, the combination of a turret mounted so as to be capable of reciprocation, a cam connected with said turret, a post fixed relatively to the direction of turret reciprocation for engaging said cam and mov-

able out of the path of the latter, means for so moving said post, and a cam and driving means therefor for periodically effecting such movement of the post, whereby reciprocation of the turret may be periodically prevented.

6. In an automatic lathe, the combination of a turret mounted so as to be capable of reciprocation, a cam connected with said turret, a post fixed relatively to the direction of turret reciprocation for engaging said cam and movable into and out of the path of the latter, an oscillatory lever connected with said post and adapted to move it out of the cam-path, and a cam and driving means therefor, adapted to periodically engage and actuate said lever.

Signed by me this 12th day of August, 1902.

JOHN P. BROPHY.

Attest:

GEO. W. SAYWELL,

A. E. MERKEL.