

(No Model.)

4 Sheets—Sheet 1.

F. A. LANE.  
TURRET LATHE.

No. 476,205.

Patented May 31, 1892.

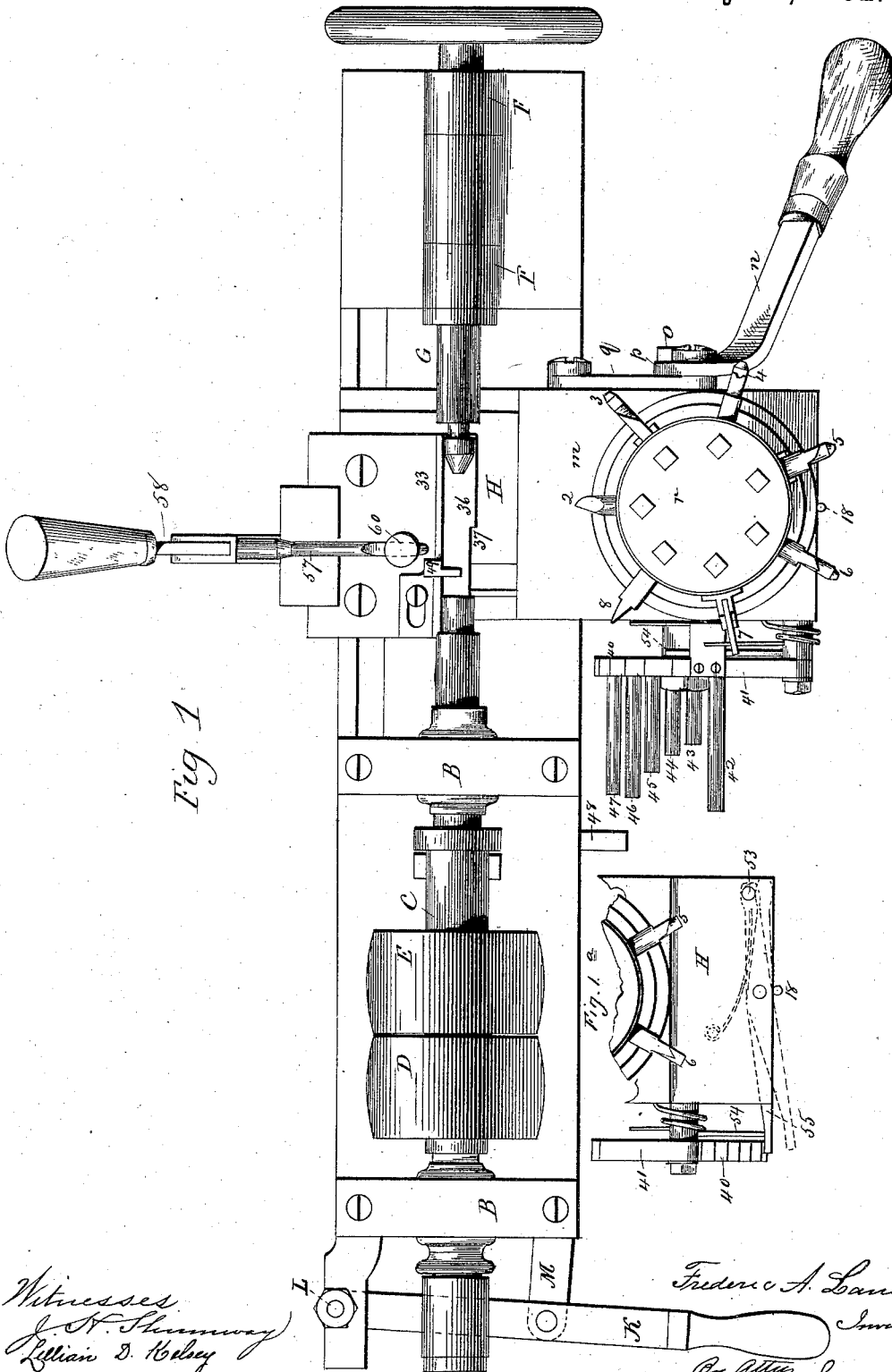


Fig 1

Witnesses  
J. H. Shumway  
Lillian D. Colby

Frederic A. Lane  
Inventor.  
By Atty  
Charles Seymour

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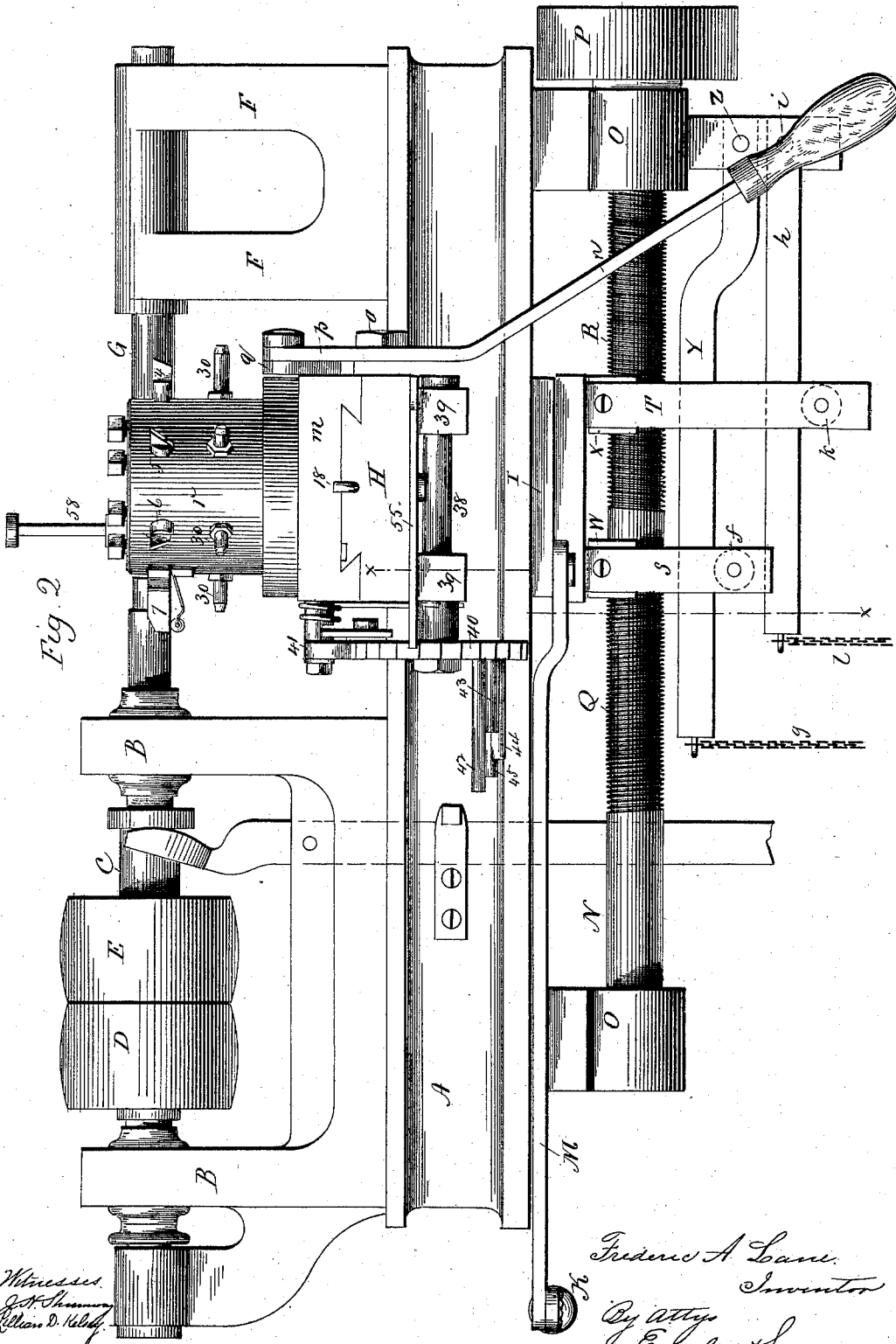


Fig. 2

Witnesses  
J. H. Thompson  
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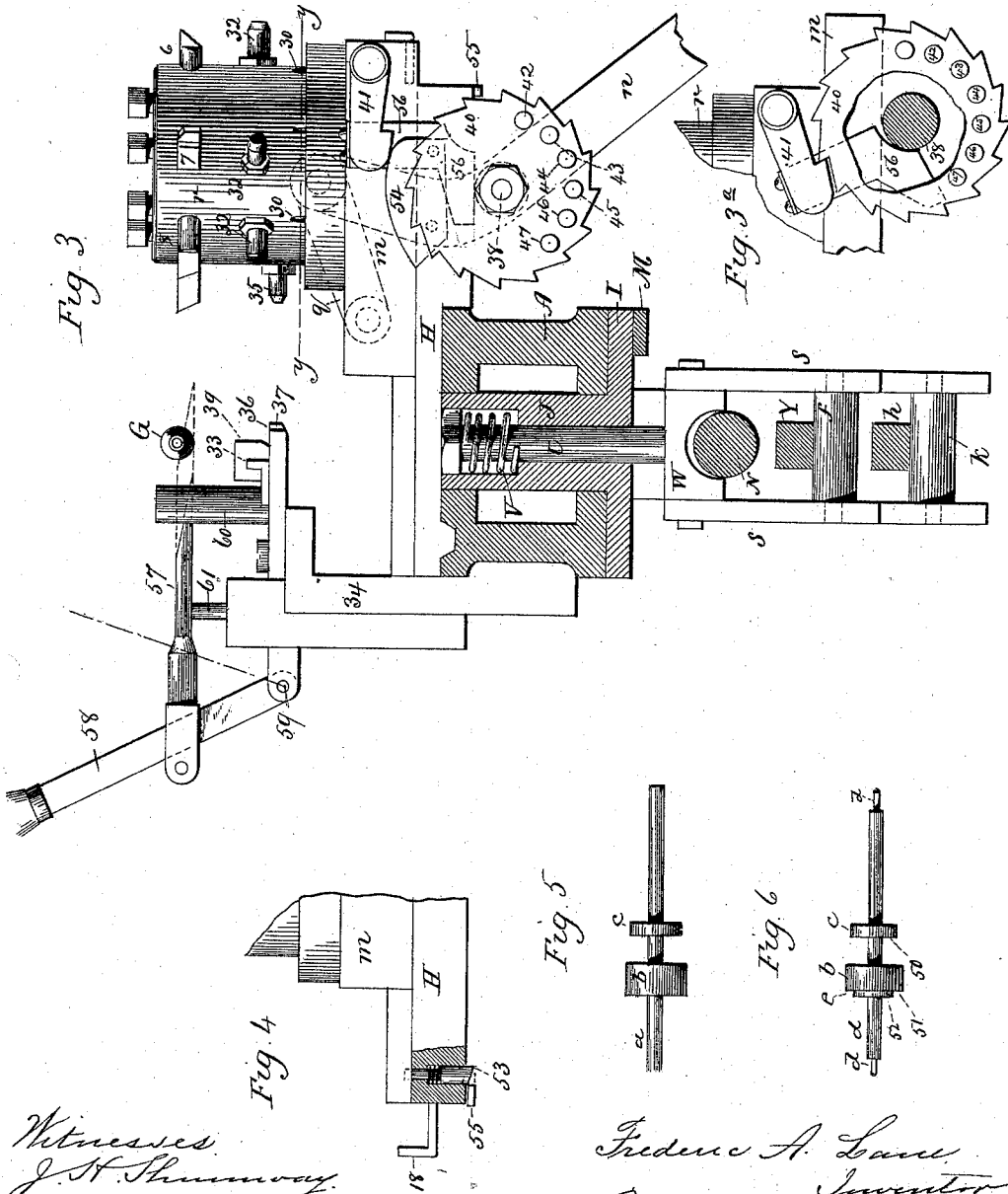
(No Model.)

4 Sheets—Sheet 3.

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Witnesses:  
J. H. Shumway  
Lillian D. Welby.

Frederic A. Lane  
Inventor  
By attys  
Earle Seymour

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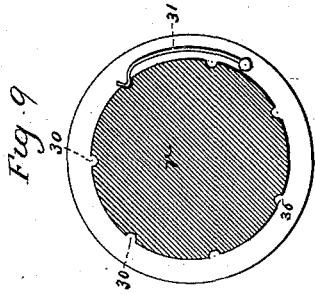


Fig. 9

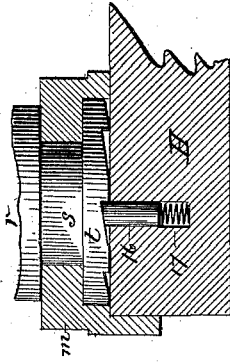


Fig. 10

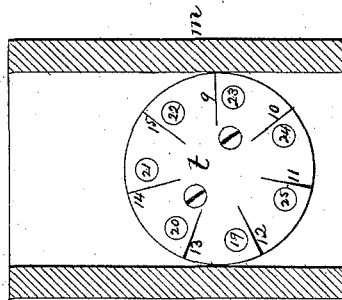


Fig. 8

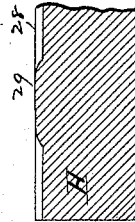


Fig. 12

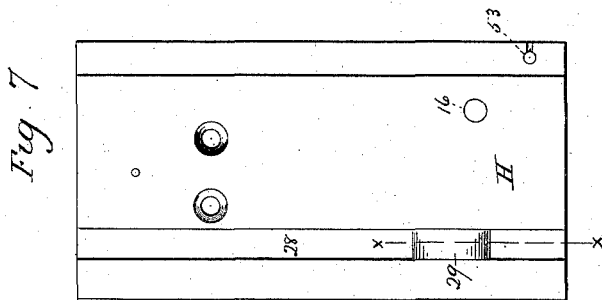
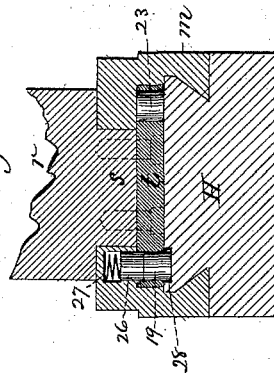


Fig. 7



# UNITED STATES PATENT OFFICE.

FREDERIC A. LANE, OF NEW HAVEN, CONNECTICUT.

## TURRET-LATHE.

SPECIFICATION forming part of Letters Patent No. 476,205, dated May 31, 1892.

Application filed August 13, 1891. Serial No. 402,547. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERIC A. LANE, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Turret-Lathes; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters and figures of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a top or plan view of a lathe having the turret attachment applied thereto; Fig. 1<sup>a</sup>, a plan view of the front portion of the slide, showing the mechanism and operation for arresting the retreating movement of the carriage before it reaches its extreme point of retreat; Fig. 2, a front view of the attachment and lathe complete; Fig. 3, a transverse section cutting on line *xx* of Fig. 2, but showing the turret attachment in side view and representing the turret and carriage at the extreme point of retreat; Fig. 3<sup>a</sup>, a similar view of the carriage, turret, and ratchet as that of Fig. 3, except the position of the turret and carriage is at that point where the pawl is just engaging a tooth of the ratchet; Fig. 4, a partial longitudinal section of the front end of the slide, showing the arrangement of the stop 53, adapted to arrest the retreating movement of the carriage before it shall have reached its extreme retreating position; Fig. 5, a side view of a blank of an arbor for clock-pinions as adapted for introduction to the machine for operation thereon; Fig. 6, the same after the operation of the machine is completed; Fig. 7, a top or plan view of the slide with the carriage and turret removed; Fig. 8, an under side view of the carriage, showing the toothed surface of the turret-plate *r*; Fig. 9, a transverse section through the turret, cutting on line *yy* of Fig. 3 near the carriage; Fig. 10, a longitudinal section through the forward portion of the slide, representing the plate *t* of the turret as engaging with the dog 16 in the slide for the purpose of rotation; Fig. 11, a transverse section through the slide, carriage, and turret, illustrating the interlocking mechanism between the turret and carriage; Fig. 12, a longitudinal section through the front portion of the carriage, cutting on line *xx* of Fig. 7.

This invention relates to an improvement in a turret attachment for lathes for turning articles of various diameters and shapes, the object being to provide an attachment for an ordinary lathe which may be readily applied thereto and by which shaping or reducing articles of circular shape in transverse section may be readily produced; and it consists in the construction and combination of mechanism as hereinafter described, and particularly recited in the claims.

In illustrating the invention it is shown as adapted for turning the arbor and collets for lantern-pinions for clock-work.

In Fig. 5 a blank for such an arbor and pinion is represented and the finished article in Fig. 6. The arbor *a* is usually made from wire of the required diameter and in length slightly greater than that of the finished article. Upon this arbor two collets *b c* are applied, usually by casting, these collets being somewhat larger than required for the finished article. In turning the blank to the finished shape gudgeons *d* are formed on each end of the arbor and the two collets are reduced to the required diameter and thickness, the collet *b* being somewhat larger than the collet *c*, so as to form the hub for the gear-wheel to be attached thereto, and this collet *b* is reduced to form a shoulder *e* upon which the gear-wheel is set, the two collets being distant from each other as required for the formation of the pinion, the pinion being completed by drilling through the collet *c* into the collet *b* and introducing wires to form the leaves of the pinion, this latter operation being performed in the usual manner.

The machine of this invention is adapted to convert the blank, Fig. 5, to the shape of the finished article, as seen in Fig. 6.

A represents the bed of the lathe, B the head-stock, in which the mandrel C is arranged and carrying the pulleys D and E in the usual manner.

F represents the tail-stock, which is arranged upon the bed in the usual manner, and, as usual, is provided with a spindle G, which is adapted for adjustment longitudinally, so as to centrally hold the work between its inner end and the mandrel, as usual in this class of lathes.

The attachment to be applied to the lathe consists of a slide H, arranged transversely across the bed of the lathe and so as to slide

longitudinally thereon in the usual manner of the slide-rest of a lathe and it is connected to the bed, so as to be held firmly thereon yet permitted longitudinal sliding movement.

5 As here represented, the slide H is secured upon the bed A of the lathe by means of a binding-plate I upon the under side of the bed of the lathe, connected to the slide through the bed by a stud J or otherwise, so that the

10 slide may be held firmly in its place upon the top of the bed, yet permitted to move freely toward and from the head-stock. As here represented, the longitudinal movement is imparted to the slide H by means of a hand-

15 lever K, hung upon a fulcrum L at the left-hand end of the lathe and connected by a rod M to the binding-plate I, the lever being arranged to swing in a horizontal plane and so that the operator, applying his hand to the

20 lever K and moving that lever in such horizontal plane, will impart a corresponding longitudinal movement to the slide H. This movement of the slide is adapted for quick adjustment or movement of the lathe. In

25 some cases, however, a regular feed is desirable, as in engine-lathes. To accomplish such regular movement of the slide H, a leading-screw N is supported in bearings O below the lathe-bed and which receives a continuous

30 rotation through a pulley P, arranged on the leading-screw or otherwise, it being understood that the screw is arranged for free rotation, but without longitudinal movement, and, as usual in lathes provided with a lead-

35 ing-screw, but that the slide may be moved in either direction—that is, toward or from the head-stock—a portion Q of the screw toward one end is cut with a right-hand thread and at the other end R the screw is cut with

40 a left-hand thread. From the slide two stirrups S and T project downward, through which the leading-screw extends, they being connected to the slide by a spindle U, (see Fig. 3,) which extends up into the stud J,

45 where it is provided with a spring V, the tendency of which is to hold the stirrup in its up position, but so as to yield to a pressure which will draw the stirrup downward, the two stirrups being of like construction. The

50 one stirrup S carries a half-nut W, which is threaded corresponding to the right-hand screw-threaded portion Q of the leading-screw N. Normally this half-nut stands above and out of engagement with the screw, as represented in Fig. 3, so held by the spring V, but

55 yet so that by drawing the stirrup downward the nut W may be brought into engagement with its screw-threaded portion of the leading-screw N, and so that when so engaged the

60 leading-screw will impart to the nut a travel in the direction of the screw, which travel will be communicated to the slide H. The other stirrup T is provided with a like half-nut X, which may be drawn into engagement

65 with the other threaded portion of the screw, so as to impart to the slide a movement in the direction opposite to that which would be

imparted to it by the operation of the screw upon the other nut W, this nut X being held up out of engagement with its portion of the screw in like manner as described for the nut W. To draw these nuts into engagement with their own portion of the leading-screw N, as may be required, a lever Y is hung upon a fulcrum Z at one side of the stirrup S, the lever extending through the stirrup and over a bearing or anti-friction roll *f* in the stirrup, and to the free end of the lever a foot-pedal is connected, as by a chain *g*, so that the operator by his foot may depress the stirrup S and draw the nut W into engagement with its portion of the leading-screw whenever required. A similar lever *h* is hung upon a fulcrum *i* at one side of the stirrup T and extends through the stirrup and so as to bear upon an anti-friction roller *k*, in like manner as described for the lever Y in the stirrup S, and it is also in like manner provided by a connection *l* with a foot-pedal, so that the stirrup T may be drawn downward to bring its nut X into engagement with its portion of the screw, as required, thus by his foot the operator may bring either nut into engagement with the leading-screw, so as to impart to the slide a corresponding movement toward or from the head-stock, as occasion may require.

Upon the slide H a carriage *m* is arranged and suitably guided, so as to receive a reciprocating movement in a line transversely across the bed of the lathe, or at substantially right angles to the axis of the mandrel and spindle and as usual in the slide-rest of lathes. The reciprocating movement is imparted to the carriage *m* by means of a hand-lever *n*, hung upon a fulcrum *o* and so as to swing in substantially a vertical plane. From the hub of the lever an arm *p* extends upward, to which a link *q* is attached and connects the said lever with the slide *m*, and so that as the lever is moved up and down it will impart a corresponding forward and backward movement to the carriage *m*. Upon this carriage the turret *r* is arranged and so as to rotate in a horizontal plane—that is, the axis of rotation of the turret is vertical. The turret is connected to the carriage as represented in Fig. 11. The turret is constructed with a trunnion *s* upon its lower end, which passes through a corresponding seat in the top of the carriage, and upon the under side of the trunnion a collar *t* is secured, the collar taking a bearing upon the inside of the carriage around the trunnion, and so as to hold the trunnion firmly upon the carriage, yet permit rotation of the turret, the collar *t* rotating with it. The turret is provided with a series of tools, as 2, 3, 4, 5, 6, 7, and 8, (may be more or less in number, according to the work required,) the tools being of the shape to produce the proper cut upon the article to be operated upon and are arranged radially in the turret and adjusted according to the work to be accomplished. The rotation of the turret is such as to present

either tool as it may be required. The rotation of the turret is made automatic and is produced in the reciprocating movement of the carriage. To produce such rotation of the turret, the collar *t* upon the lower end of the turret is constructed with ratchet-teeth 9, 10, 11, 12, 13, 14, and 15 upon its under surface, corresponding in number to the number of tools in the turret.

In the slide H below the collar *t* a vertically-movable dog 16 is arranged. (See Fig. 10.) This dog is a pin set in a corresponding cavity in the slide H and rests upon a spring 17, the tendency of which is to force the dog upward. The nose of the dog is beveled backward and so that its forward surface may engage the teeth of the collar *t*. (Represented in Fig. 10 as engaged with the tooth 9.) This dog stands near the forward end of the slide H, but so that as the carriage *m* retreats the dog stands in the path of a tooth of the collar *t*, and when that tooth is so engaged with the dog 16, as seen in Fig. 10, the completion of the retreating movement of the carriage will cause the collar *t* and the turret to rotate accordingly—that is, to the extent of one tooth on the collar *t*. Then on the next advance of the carriage the next tooth, operating upon the bevel nose of the dog, will cause the dog to descend, so that the turret may escape therefrom, and then on the next retreat the tooth which so passed over the dog will be engaged and the next step in rotation imparted to the turret. A stop 18 is provided between the slide H and the carriage, (see Figs. 1 and 2,) which limits the retreating movement of the carriage and so as to stop it at the point when the required tool is presented for work. When the turret has been thus properly adjusted, it is necessary to lock it to the carriage, so as to prevent any accidental rotative movement of the turret in its next advance. To accomplish this object, the collar *t* is provided with a series of pins 19, 20, 21, 22, 23, 24, and 25, corresponding to the number of teeth on the collar—that is, with the number of tools or steps of rotation required for the turret. These pins work freely through corresponding holes in the collar and in length correspond to the thickness of the collar, as seen in Fig. 11, and so that normally they work between the under surface of the carriage and the upper surface of the slide, as shown, for the pin 23 in Fig. 11. In the carriage above the collar *t* and at a point corresponding to one of the pins—say 19—when the turret is at rest a follower 26 is arranged, (see Fig. 11,) which is of a size and shape corresponding to the said pins and is provided with a spring 27, the tendency of which is to force the said follower 26 downward and so that when one of the pins, as 19, is presented below this follower, as seen in Fig. 11, the said follower under the force of its spring will have a tendency to force that pin 19 downward. In line with the point where such pin, as 19, stands when the turret is at rest the slide is constructed with a

longitudinal groove 28, (see Figs. 7 and 11,) which in width corresponds to the width of the pins in the collar *t*, and so that when a pin stands over that groove, as seen in Fig. 11, the follower will force that pin downward into the groove 28 of the slide H, the follower itself entering the upper end of the hole of the pin which it has thus depressed, and, as seen in Fig. 11, the follower thus engaged with both the collar and the carriage firmly interlocks the two, so as to prevent the possible rotation of the turret while thus interlocked. The pin thus depressed by the follower works through the groove 28 in the carriage, so as to permit the interlocking to continue during the advance and retreating movement of the carriage.

In the groove 28 and near the forward end a stationary rise or cam 29 is formed, presenting an inclined surface into the groove and so that as the carriage retreats and approaches its rear position and before the tooth of the collar *t* has reached the dog 16 the pin, as 19, then standing in the groove 28 will ride onto the stationary cam 29 in the groove and thus be forced upward and so as to press the follower into its recess in the carriage and out of engagement with the turret and so that in the completion of the retreating movement of the carriage from this disengaged position the dog 16 will operate, as before described, to impart one step of rotation to the turret when the next pin will be brought into line with the follower 26 and so that on the next advance of the carriage that second pin will ride off from the cam 29 into the groove and permit the interlocking, as before. The cam 29 is made of a length only sufficient to hold the follower out of engagement with the turret while the rotation is being produced and so that the pin may pass off from the other side of the cam again into the groove, and so as to make the engagement with the turret so soon as the rotation has been completed, and so as to insure the rotation of the turret stopping at the proper point, for so soon as the next pin of the collar comes below the follower it will be forced into the groove and thus arrest the rotation of the turret. Hence on the next advance the pin will ride over the cam, but again return into the groove before the turret shall have been advanced to bring the tool into operation. The extension of the groove beyond the cam 29 at the outer end may be omitted, but is desirable as being a certain means of arresting the rotation of the turret at the proper point.

To insure the registering position between the pins on the plate *t* and the follower 26, the turret is constructed with a series of notches 30, corresponding to the number of tools, as seen in Fig. 9, and combined with these notches is a spring-dog 31, made fast to the carriage, the nose of which is adapted to engage one of the said notches when presented thereto, and as seen in Fig. 9, but yet

so as to yield when the forced rotation of the turret commences. The position of these notches with relation to the nose of the dog corresponds to the point where the pins of the plate *t* will register with the follower 26 of the carriage, and so that said dog will temporarily arrest the rotation of the turret when this registering position is attained and so as to force the follower into engagement with the turret, as before described.

As a means for stopping the advance movement of the turret whenever the tool shall have reached its required advanced position, the turret is provided with a series of stops 32 below the cutters and projecting radially from the turret and made adjustable as to length of projection. In the plane of these stops 32 and at the rear a stationary stop 33 is arranged, which consists of a longitudinal flange secured to a bracket 34, which projects up from the rear of the lathe, (see Fig. 3,) and so that as the turret advances the stop beneath the advancing cutter will strike the said flange when the full advance of the cutter is completed, the stops 32 being adjustable to vary the advance of the cutter as occasion may require. These stops, combined with the flange 33, provide for depth of cut.

In some cases different depths of cut are required to be made by the same cutter—as, for illustration, the collets *b* and *c* are of different diameters, but their surface or periphery may be produced by the same cutter. To permit such action of the same cutter, an independent stop, as 35, is provided for that particular cutter in a plane out of the plane of the stop-flange 33, and in the plane of this stop 35 an independent stop-flange 36 is provided, (see Figs. 1 and 3,) this flange 36 presenting a longitudinal surface, but with an offset, as at 37, Fig. 1, thus presenting two stop-surfaces, according to the variation required for the depth of cut. This same stop-flange 36 may present any irregularity in its edge and so as to serve as a guide for the varying longitudinal movement of the turret. The stop working against the edge of that flange will vary this backward and forward movement, according to the irregularities of such edge and consequently produce a cut of corresponding shape.

To stop the longitudinal movement of the slide *H* at the proper positions for the operation of the tools on the turret, a rotating shaft 38 is arranged in suitable bearings 39 beneath the slide *H*, the shaft being parallel with the path of movement of the slide. This shaft carries at its end a ratchet-wheel 40, and on the carriage a pawl 41 is hung, which is adapted to engage the teeth of this ratchet as the carriage retreats and as seen in Fig. 3<sup>a</sup>, and so that as the carriage completes its retreat a partial rotation will be imparted to the ratchet-wheel 40. The ratchet-wheel 40 carries several longitudinally-projecting pins, as 42, 43, 44, 45, 46, and 47, more or less in number, according to the longitudinal stops required.

(Here represented as six.) These stops rotate with the ratchet-wheel 40, and so that under each rotation the position of the projecting pins will be changed.

Stationary on the lathe-bed is a stop 48, and this stop stands in the position corresponding to the path of movement of one of the pins on the wheel 40—that is, so that these pins may be successively brought into line with the stop 48. Consequently one of those pins being in line with the stop 48 that pin will come against the stop 48 when the slide has been moved so far longitudinally as to bring the pin into contact with the stop. These pins correspond in position to the respective tools and so that one tool brought into a position to operate its pin will be at the same time brought into line with the stop 48, and so that with that tool working and the carriage moved longitudinally the further operation of that tool will be arrested when the pin reaches the stop; or the pins may serve to locate the tools with relation to the work to be done—that is to say, if simply a radial cut is to be made. Then the pin of the particular tool which has to do that work will reach the stop when the position for that tool to operate is reached, and so that, the slide being held thus arrested by the stop 48, the tool may then be advanced to make its cut. For illustration, the pins for the respective tools will come against the stop 48 when the tool which is to cut the sides of the respective collets is reached. In such case there is no longitudinal movement during the operation of the tool. It is simply a depth of cut. Again, in cutting the gudgeon *d* there will be a depth of cut which will be governed by the stop-flange 33. A corresponding pin will locate the cutter at the point where the shoulder is to be formed. Then a longitudinal movement therefrom will cut that gudgeon. For the other gudgeon an adjustable stop 49 is arranged over the flange 33, projecting toward the turret, and against which the stop on the turret will strike when the slide is moved to bring the tool for cutting that other gudgeon into the right position for the shoulder. Then that tool is advanced and moved longitudinally to cut that other gudgeon.

In some cases more than a single operation is required to be produced by a single tool—as, for illustration, the cutting down of the face 50 of the collet *c*, the cutting of the surface 51 of the collet *b* down to the shoulder *e*, and then the cutting of the surface 52 from the shoulder to the arbor may be produced by the same tool and without rotation of the turret, the change of position of the tool longitudinally being all that is required. To accomplish this object, the rotation of the turret is prevented by providing a stop which will arrest its retreating movement before the dog 16 is brought into operation upon the turret. This stop consists of a vertically-movable dog 53, arranged in the slide *H*, as seen in Fig. 4, the dog being provided with a

spring the tendency of which is to hold the dog in the down or disengaged position; but the nose of the dog is adapted to pass up through the upper surface of the slide and so as to stand in the path of the retreating carriage, as represented in broken lines, Fig. 4, and which will serve to arrest the retreat of the carriage before it reaches the stop 18. This point of arrest of the dog 53 occurs before the dog 16 can come into operation.

To bring the dog 53 into operation at the required time, a cam 54 is arranged on the wheel 40, so as to revolve with it, and upon the under side of the slide H is a lever 55, arranged to swing in a horizontal plane. One arm of this lever is adapted to pass below the lower beveled end of the dog 53 and so as to force the dog upward, as indicated in broken lines, Fig. 4. Normally, however, this end of the lever stands so far away from the dog 53 as to permit that dog to stand in the down position. The other arm of the lever extends into the path of the cam 54, as seen in Fig. 1<sup>a</sup>, and so that as the cam 54 advances under the rotation of the ratchet-wheel 40 it will strike the projecting arm of the lever 55 and turn that arm outward, as seen in broken lines, Fig. 1<sup>a</sup>, and so as to bring the other arm of the lever onto the beveled end of the dog 53 and correspondingly force that dog upward, as before described, that its upper end may stand in the path of the retreating carriage to arrest it, as before described, and so long as the cam thus holds the lever with the dog raised the reciprocating movement of the carriage and turret may continue without producing rotation of the turret. The length of this cam is therefore made according to the number of reciprocating movements which it is desired the carriage and turret should receive without change of tool. So soon as the lever escapes from the cam the dog 53 drops and leaves the carriage free to resume its full movement, by which rotation will be imparted to the turret. The rotation of the ratchet-wheel continues, notwithstanding there is no rotation of the turret, for the reason that the extent of movement of the tool for each operation is varied, and therefore requires an independent pin for each movement. As the pawl 41, which operates the ratchet, necessarily moves with the carriage, and because of the stopping of the carriage before the extreme rear position is reached, as before described, it is necessary that the dog should escape from the ratchet-wheel before the extreme retreat of the carriage is reached, otherwise the dog being engaged with the wheel 40 would turn the wheel to a greater extent when the carriage made its full retreat than when it was stopped prior to such extreme rear position. Therefore to produce the proper action of the pawl upon the ratchet, it is thrown out of engagement with the ratchet so soon as the required movement of the ratchet is made. To thus throw out the pawl a finger 56 (represented in broken

lines, Fig. 3) is attached to the pawl and is adapted to ride upon the shaft 38. Thus riding upon the shaft the pawl is out of engagement with the ratchet, as seen in Fig. 3; but when the carriage advances the finger escapes from the shaft and drops, as seen in Fig. 3<sup>a</sup>, so as to bring the pawl into engagement with the ratchet that on the next retreat of the carriage it will impart a step in rotation to the wheel 40, and so soon as that rotation is accomplished the back of the finger strikes the shaft 38 and operates as a cam to throw the pawl 41 out of engagement with the wheel and leave it free to retreat with the carriage without effect upon the ratchet-wheel 40, as seen in Fig. 3; but this escape of the pawl from the wheel must occur on or before the carriage will reach the position to be stopped by the dog 53.

As the article is placed in the lathe for turning—such, for illustration, as the arbor represented in Fig. 5—it is a common practice in hand operation for the workman to place the end of his tool beneath the arbor or article, and, using his tool as a lever over the rest, bear upward upon the article while it is revolving rapidly, which will bring the article to a true and central line. This “truing up” is as desirable in a lathe with the turret attachment as when the work is to be performed by hand.

To provide a means for thus truing up the work, a sliding finger 57 is arranged at the rear of the mandrel and spindle and so as to move in a line at right angles to the axis of the article to be operated upon. A forward-and-back movement is imparted to this finger by means of a hand-lever 58, hung upon a fulcrum 59 below and connected to the finger at its rear end and so that by pulling the lever forward the finger will be advanced, or forcing the lever backward the finger will correspondingly retreat. The finger works through a post 60, and at its forward end the upper side is inclined upward and rearward and so that as the finger advances it will pass under the article in the lathe to be operated upon, that article revolving, and so that the inclined surface will produce an upward force upon the revolving article substantially the same as does the lever-like action of the tool in the hand of the operator, as before described and as represented in broken lines, Fig. 3. The elevation of this finger may be adjusted with relation to the diameter of the article in the lathe, and this may be accomplished by raising or lowering the stud 61, which stands beneath the finger and over which the finger moves.

The illustration of the invention as adapted for turning clock-arbors will be sufficient to enable others skilled in the art to adjust the lathe for various purposes to which it is adapted.

While preferring the mechanism hereinbefore described for imparting to the turret its rotative movement, it will be understood that

any of the known mechanisms for performing this operation may be substituted therefor. The invention is therefore not to be understood as limited to any specific mechanism for imparting the intermittent rotation to the turret; but

What is claimed is—

1. As an attachment for a lathe, the slide arranged on the bed and adapted for longitudinal movement thereon, the carriage on said slide arranged for reciprocating movement in a path at right angles to the path of movement of said slide, a turret on said carriage adapted to rotate upon a vertical axis, mechanism, substantially such as described, between the said slide and turret, whereby under the reciprocating movement of the carriage and turret a rotative movement will be imparted to the turret during the last part of its retreating movement, a ratchet-wheel arranged upon said slide and in a plane parallel with the path of movement of said carriage, a pawl on said carriage adapted to engage the teeth of said ratchet, the said wheel provided with a series of pins projecting longitudinally therefrom, and a stationary stop against which said pins are adapted to successively bear to arrest the longitudinal movement of the slide, substantially as described.

2. As an attachment for lathes, the combination of a slide H, arranged to move longitudinally on the bed of the lathe, a carriage *m*, arranged upon said slide to reciprocate in a path at right angles to the path of movement of said slide, mechanism, substantially such as described, to impart rotation to said turret during the last part of the retreating movement of the carriage, a stop upon the slide adapted to arrest the movement of the carriage at its extreme retreating position, and a dog, as 53, arranged in the slide and adapted to be brought into position to arrest the carriage before it reaches its extreme rear movement, a ratchet-wheel 40, supported in said slide and so as to move therewith, a pawl on the carriage, arranged to engage the said ratchet in the retreating movement of the carriage, the said ratchet-wheel provided with a series of pins projecting longitudinally therefrom and corresponding to more or less of the tools in the turret, with a stop against which said pins are adapted to bear at a predetermined point in the longitudinal movement of said slide, and a lever 55, adapted to operate upon said dog 53, with a cam 54 on said ratchet-wheel, arranged to engage the said lever 55 at a predetermined point and for a predetermined length of time, substantially as described.

3. As an attachment for a lathe, the combination of a slide arranged on the bed of the lathe and so as to be moved longitudinally thereon, a carriage arranged on said slide and so as to reciprocate in a path at right angles to the path of movement of said slide, a turret

on said carriage and adapted to rotate upon a vertical axis, and mechanism between the said slide and turret, whereby under the reciprocating movement of the carriage a rotative movement is imparted to the turret during the last part of the retreating movement of the carriage, the turret provided with a series of tools and also provided with a series of stops corresponding to said tools, with a stop-flange at the rear against which said stops are adapted to bear to govern the advancing movement of the carriage and turret, substantially as described.

4. As an attachment for a lathe, the combination of a slide arranged upon the bed of the lathe and so as to be moved longitudinally thereon, a carriage arranged upon said slide and so as to reciprocate in a path at right angles to the path of movement of the said slide, a turret arranged upon said carriage upon a vertical axis and so as to rotate thereon, mechanism between said slide and turret, whereby rotative movement will be imparted to said turret during the last part of the retreating movement of said carriage, a finger arranged at the rear and so as to slide backward and forward toward the turret, and mechanism, substantially such as described, to impart said sliding movement to said finger, the said finger constructed with an upward and rearwardly inclined surface at its forward end, substantially as and for the purpose described.

5. In a turret attachment for lathes, the combination of the slide H, arranged upon the bed of the lathe and so as to move longitudinally thereon, a carriage *m*, arranged upon said slide and so as to reciprocate in a path at right angles to the path of movement of said slide, a turret arranged upon said carriage and so as to rotate upon a vertical axis thereon, the turret carrying a series of tools, mechanism between the slide and turret, whereby a rotative movement is imparted to said turret during the last part of the retreating movement of said turret, a leading-screw N, arranged below but parallel with the path of said slide, said screw having a portion of its thread right hand and another portion of its thread left hand, stirrups S and T, hung to said slide and carriage, respectively, and half-nuts W and R, adapted to engage the corresponding threaded portions of said screw, with mechanism, substantially such as described, to draw said nuts into and take them out of engagement with their respective portions of the screw, substantially as described.

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

FREDERIC A. LANE.

Witnesses.

FRED C. EARLE,

LILLIAN D. KELSEY.