

E. SILVER.  
Gage-Lathe.

No. 199,584.

Patented Jan. 22, 1878.

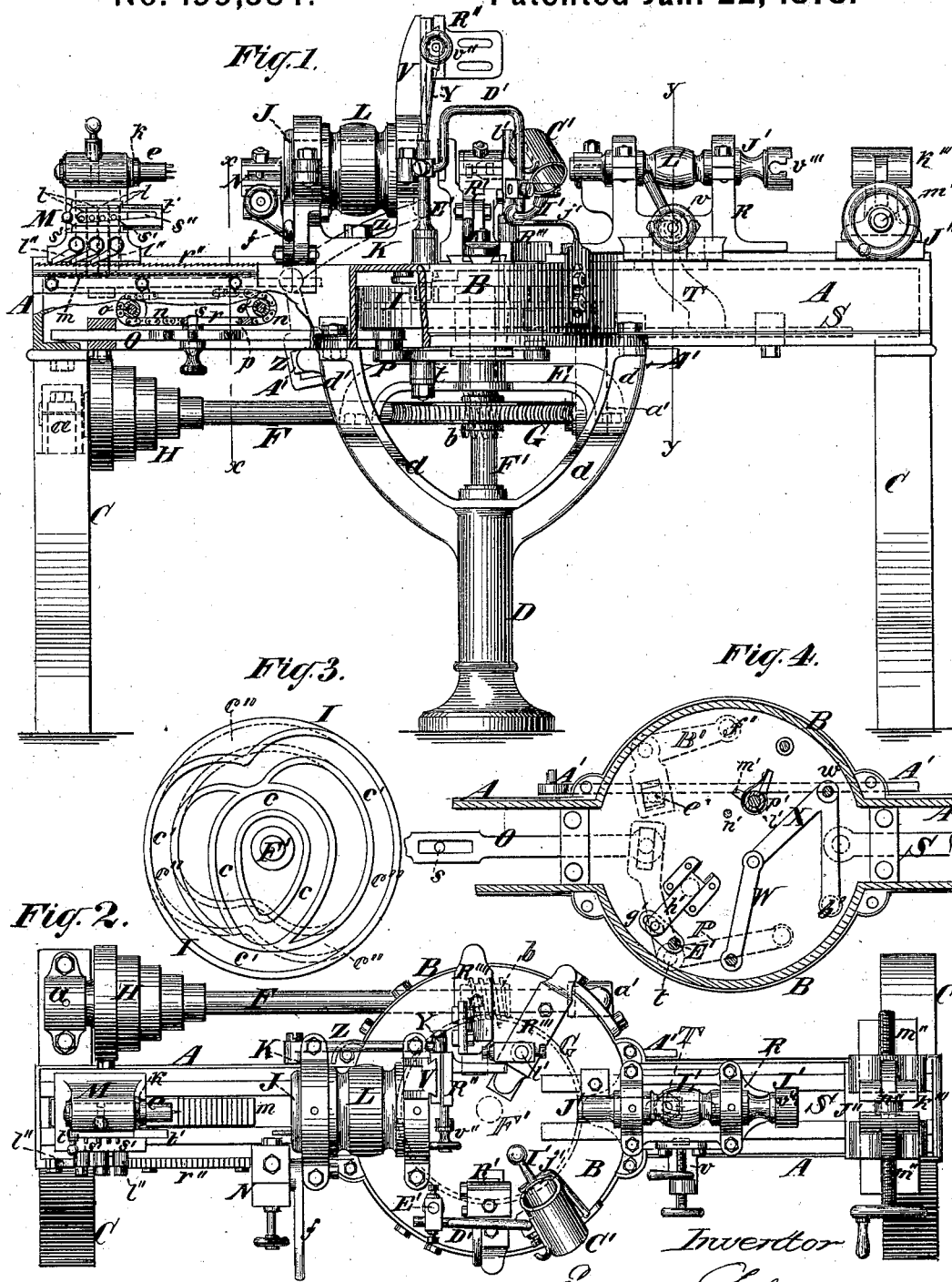


Fig. 2.

Fig. 3.

Fig. 4.

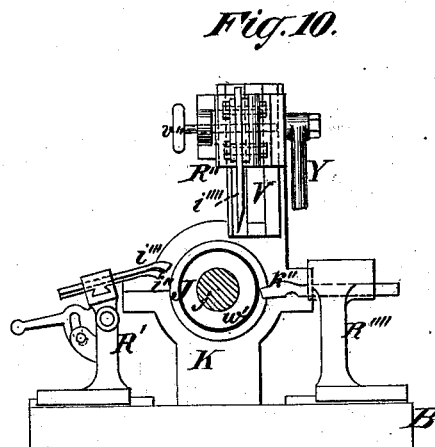
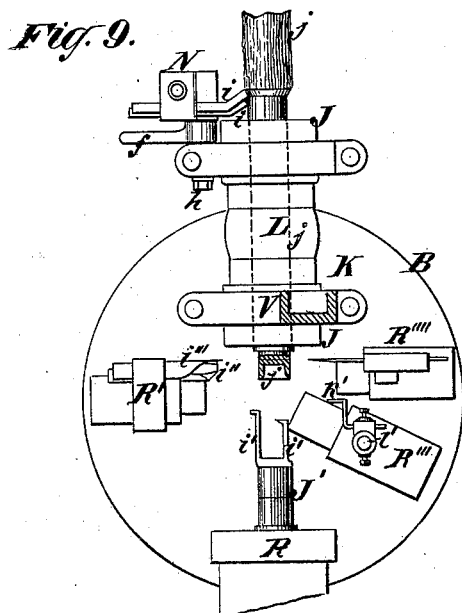
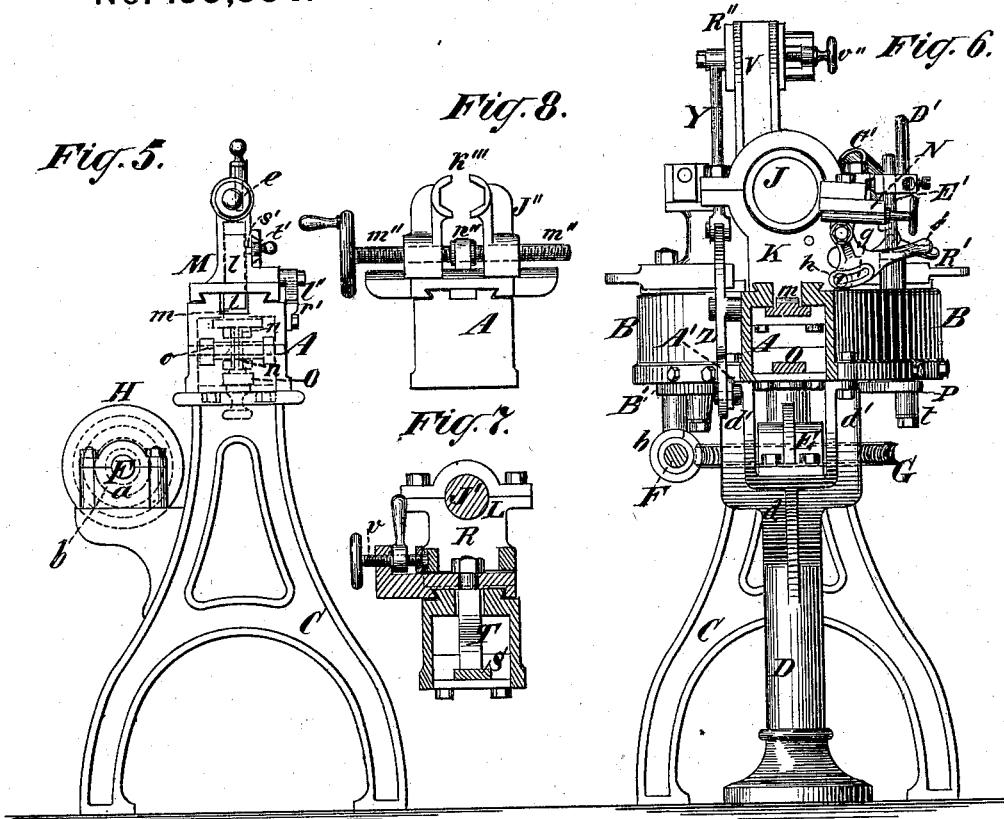
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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN GAGE-LATHES.

Specification forming part of Letters Patent No. **199,584**, dated January 22, 1878; application filed  
October 16, 1877; patented in England, April 24, 1877.

*To all whom it may concern:*

Be it known that I, EDWIN SILVER, of Reading, in the county of Berks, England, have invented an Improvement in Lathes for Wood-Turning; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention has for its object the construction of an automatic lathe for the rapid and accurate turning of wooden pill-boxes, spools for thread, bobbins for spinning-frames and other cotton and woolen manufacturing machinery, and other small articles of wood manufactured by turning in lathes.

The invention consists, partly, in various mechanisms, hereinafter described, for the production of the automatic movements of the tail-stock, the sliding stocks for the cutting-tools, a carrier for taking the turned articles from the lathe when finished and depositing them in a suitable receptacle, a hollow arbor being used for the rotation of the wood to be turned, and another solid arbor for the insertion of a boring tool or tools for interior cutting.

The invention consists, further, in certain constructions of the various parts of the machine and features of its general organization.

Figure 1 is a front view of the machine, with portions broken away to show parts otherwise hidden. Fig. 2 is a top view of the same. Fig. 3 is a top view of a cam-wheel, which actuates the sliding cutter-stocks, the cam-grooves on the upper side of the said wheel being shown in full outline, and a cam-groove on the bottom of the same being shown in dotted outline. Fig. 4 is a sectional plan view of the central portion of the bed and some of its attachments. Fig. 5 is a view of that end of the lathe at the left in Fig. 1. Fig. 6 is a vertical section on the line *x x* in Fig. 1. Fig. 7 is a vertical section on the line *y y* in Fig. 1. Fig. 8 is a view of that end of the lathe-bed at the right in Fig. 1, and of its attachments. Fig. 9 is a top view of the central part of the lathe-bed and some of its attachments. Fig. 10 is a detail view, illustrating some of the cutters, their relation with the hollow arbor, and their functions.

A, Figs. 1, 2, 4, 5, 6, 7, and 8, represents the lathe-bed, which has a hollow box, B, preferably circular in plan, in the middle thereof. The said bed is supported by legs C at the ends, and by a pillar, D, under the central box B. The said pillar D has two branches, *d*, Figs. 1 and 6, at its upper part; and each of said branches is subdivided into two other branches, *d'*, the upper ends of which are attached to the bed. To the branches *d*, between the branches *d'*, is bolted the cross-beam E, Figs. 1 and 6.

The said bed A, pillar D, and cross-beam E support all the working parts of the machine, including the horizontal shaft F, Figs. 1, 2, 5, and 6, and its attachments. The said shaft is supported in bearings *a* and *a'*, Figs. 1, 2, and 5, the bearing *a* projecting laterally from one of the legs C, and the bearing *a'* projecting downward from the central enlargement or box B of the bed A. Said shaft A drives every working part of the lathe, except the arbors, through intermediate mechanism, hereinafter described, receiving its motion from a belt running on the cone-pulley H.

The first intermediate transmitter of motion between the shaft F and the working parts to which it transmits motion is a worm-gear, G, Figs. 1, 2, and 6, keyed to a vertical shaft, F', Figs. 1 and 2, which has its bearings in the pillar D and the cross-beam E. Upon the shaft F is an endless screw, *b*, Figs. 1, 2, 5, and 6, which meshes with the worm-gear G.

Upon the shaft F' is also keyed the cam-wheel I, Figs. 1 and 3, the cam-grooves of which are indicated in Fig. 3, and designated by the letters *c c' c''*. The grooves *c* and *c'* are on the upper face of the cam, and the groove *c''* is on the lower face of the same. Said cam-wheel may be considered either as a cam or as a series of cams arranged on the same shaft.

J, Figs. 1, 2, 6, 9, and 10, is a hollow arbor fitted in bearings in a head-stock, K. Said head-stock is adjustable on the lathe-bed, but is, in use, clamped to said bed in the usual manner. Said arbor J is driven directly by belt from a pulley on a counter-shaft, said belt running on the pulley L, Figs. 1, 2, and 9, and said counter-shaft also carrying a cone-pulley

for the belt which drives the cone-pulley H on the shaft F.

The wood to be turned is forced into and through the hollow arbor J by means of the automatically-sliding tail-stock M, Figs. 1, 2, and 5, which carries a rotating spur-center, *e*, fitted in a bearing in said tail-stock, and the wood is caused to rotate with said hollow arbor and rotating spur-center either by friction in the arbor or by knife edges or spurs fitted in the inside surface of said arbor; but in general the friction in the hollow arbor will be sufficient to cause the wood to rotate. To adapt it to different sizes of bolts, said hollow arbor may be fitted with bushes *w'*, Fig. 10, with different-sized bores.

Upon the side of the head-stock K, into the hollow arbor of which the wood enters, is pivoted a cutter-stock, N, Figs. 1, 2, and 6, having attached to it a lever, *f*. In the said lever is formed a curved slot, *g*, Fig. 6, through which passes a screw-bolt, *h*. By means of the said lever, slot, and bolt the proper angular adjustment of the cutter-stock N is obtained. The other cutter-stocks, hereinafter described, may have similar adjustments.

The said cutter-stock N, in use, carries cutters *i*, Fig. 9, the function of which is to reduce the wood to be turned to a cylinder of the same size as the hollow in the arbor J as the wood is fed up by the automatically-sliding tail-stock M. This action of the cutters is indicated in Fig. 9, in which *j* represents the wood in process of turning. The said cutters *i* reduce the wood to a diameter which snugly fits the hollow arbor J, while the sliding tail-stock forces the wood into and through said arbor, the wood bolt rotating with said arbor, and also rotating the spur-center *e* in the tail-stock M, which center forms a rear bearing for the said wood bolt. The said spur-center has a shoulder, *k*, formed on it, which presses against the end of the box in which said center runs, and thus forms a bearing for the endwise thrust which it receives while pressing the wood into the hollow arbor. The wood bolts *j* are, moreover, roughly pointed, as hereinafter described, at the end which first enters the said hollow arbor, to insure their central entrance into said arbor.

The devices for causing the tail-stock M to automatically traverse toward the head-stock K are as follows: The tail-stock is furnished with vertical sliding pawls *l*, Figs. 1 and 5, in its interior, which engage a reciprocating ratchet-bar, *m*, Figs. 1, 2, and 5, fitted to slide in or on ways attached to or formed in the lathe-bed. Said pawls are preferably four in number, and are placed side by side in a box formed in the said tail-stock, in such manner that their four points or edges are distanced to include six teeth of the ratchet-bar. One or other of said pawls will therefore engage the ratchet-bar *m* when the latter is moved through a distance measured by only a fraction of one of the teeth of said ratchet-bar. To the outside of said tail-stock are pivoted the pawls *l''*,

Figs. 1 and 2, preferably three in number, and so distanced that their three points include a fraction more than eight teeth of a fixed ratchet-bar, *r''*, attached to the outside of the lathe-bed. One or other of said pawls *l''* will act when the tail-stock is moved through a distance equal to a fraction of one of the teeth in the ratchet *r''*. Said pawls *l''* prevent the retreat of the tail-stock M when the ratchet *m* reciprocates.

The said pawls *l''* are so arranged that when the one nearest the head-stock K is raised it abuts against the next pawl, which, in turn, abuts against the next, so that all are raised by raising the inner pawl.

The pawls *l* are each provided with a lateral projection, *s'*, Figs. 1 and 2, which passes out through a slot in the side of the tail-stock M. In ways formed on or attached to said tail-stock is fitted a slide, *t'*, which has formed in it a slot, *s''*, Fig. 1, the lower side of which is an inclined plane. When said slide is pushed to the left, the said inclined plane acts against the projections *s'*, and raises the pawls *l* from their engagement with the ratchet *m*. To slide back the tail-stock and insert a bolt of wood for turning, the operator raises the pawls from their engagement with the ratchets by the means described.

To the ratchet-bar *m* is attached the chain *n*, Fig. 1. Said chain runs tightly over two pulleys or rollers, *o*, Figs. 1 and 5, the bearings of which are supported by the lathe-bed. Said chain has one link, *p*, Fig. 1, longer than the rest, and in said link is a longitudinal slot, *r*. In the slot *r* plays an adjustable pin, *s*, Figs. 1, 2, and 5, which pin forms a projection from a reciprocating bar, O, Figs. 1, 4, and 5, which slides in suitable bearings formed in or attached to the lathe-bed A. Said bar O is reciprocated by a bell-crank lever, P, Figs. 1, 4, and 6, one end of which engages a pin or projection on the bar O, which projection plays in a slot at one end of said bell-crank lever. Said bell-crank lever is pivoted to the under side of the lathe-bed at *t*. At the other end of said bell-crank lever is a bowl, which plays in the cam-groove *e''*, Fig. 3, of the cam I. Said cam-groove is formed in such manner as to oscillate the bell-crank lever P and reciprocate the bar O, chain *n*, and ratchet-bar *m* immediately after any piece of work in the lathe is finished and cut off, and it thus causes the tail-stock M to advance and force another length of wood through the hollow arbor J, to be operated upon by the cutters in the sliding cutter-heads, hereinafter described.

The first sliding cutter-stock that advances to operate upon the wood bolt after the same is thrust partly through the hollow arbor, in making a pill-box or other hollow article, is the one marked R in Figs. 1 and 2. This cutter-stock is made laterally adjustable by means of a screw, *v*. Said cutter-stock also carries an arbor, *J'*, having formed thereon a pulley, *L'*, which is driven directly from the same counter-shaft that drives the pulley L on the

hollow arbor J. Said arbor carries one or more cutters, *i' i'*, Fig. 9. Said arbor and its cutters are rotated in an opposite direction to that of the hollow arbor J by means of a cross-belt.

The cutter-stock R is advanced to its work and carried backward by means of a bar, S, Figs. 1 and 7, which slides in bearings formed in or attached to the bed A. Said bar has an upwardly-projecting arm, T, which is adjustably connected with the cutter-stock R, and at the end of said bar next the cam-wheel I is a bowl, which plays in the groove *c''* on the under side of said cam.

When the said cutter-stock advances, it presents its boring-cutters *i' i'*, Fig. 9, to the wood, which cutters turn out a cavity therein. Said cavity, when the said cutters are properly formed and adjusted, is a cylindrical cavity; but a single cutter may be employed, and for some purposes a cutter-holder may be rigidly attached to said cutter-stock R.

After the cutter-stock R has advanced and retreated, the sliding cutter-stocks R' and R'', Figs. 1, 2, 6, 9, and 10, are moved to their work, the cutter-stock R moving a little in advance of the cutter-stock R''. The cutter-stock R' slides horizontally in or on ways formed on the central hollow box B of the bed A. The cutter-stock R'' slides vertically on a vertical guide, V, attached to the head-stock K, and said stock is laterally adjustable by means of a screw, *v''*.

The cutter-stock R' is reciprocated by means of a link, W, Fig. 4, pivoted at one end to said cutter-stock and at the other end to a bell-crank, X, Fig. 4, said bell-crank being pivoted to the lathe-bed at *w*, and having at *b'* a bowl, which runs in the cam-groove *c'* on the upper side of the cam-wheel I. The cutter-head R'' is vertically reciprocated by means of a link or connecting-rod, Y, Figs. 1, 6, and 10, pivoted at one end to said cutter-head, and having its other end pivoted to a vertically-oscillating bell-crank, Z, Figs. 1, 2, and 6. Said bell-crank is pivoted to the back side of the lathe-bed, and to its lower end is connected a horizontally-sliding bar, A', Figs. 1 and 4. Said sliding bar runs in bearings formed in or attached to the lathe-bed, and is connected at *e'*, Fig. 4, with a horizontally-oscillating bell-crank, B', Fig. 4, pivoted to the central hollow box of the lathe-bed. Said bell-crank has at *f'*, Fig. 4, a bowl, which runs in the cam-groove *c'* on the under side of the cam I, the motion of which causes the said bell-crank to oscillate.

The cutter-stock R' carries cutters *i'' i''*, Fig. 9, the former of which, in making a pill-box, forms the lip of the box, and the latter of which takes off the rough edge of the lip. The vertically-sliding cutter-stock R'' carries a cutter, *i'''*, Fig. 10, which finishes the periphery of the box.

After the cutter-stocks R' and R'' have performed their functions the cutter-stock R''' advances. Said stock R''', Figs. 2 and 9, slides

in or on ways formed on or attached to the box B; and it receives its motion through a connection operated by the cam-groove *c'* on the upper side of the cam I. Said cutter-stock carries the cutter *k'*, Fig. 9, which trims the inner edge of the box or other hollow article. The cutter *k'* is attached to a vertical tool-post, *l'*, Figs. 2, 4, and 9, which, by a projection, *m'*, Fig. 4, a stop, *n'*, Fig. 4, and a spring, *p'*, Fig. 4, is caused, when the cutter-stock advances, to turn on its vertical axis and place its cutter *k'* to enter slightly into the interior of the box or other hollow article in the lathe.

At the same time that the cutter-stock R''' advances, the carrier C', Figs. 1, 2, and 6, advances to receive the article after the same is cut from the bolt *j*. Said carrier is a short tube of metal pivoted to the lower and outer end of a bent arm, D'. The outer end of said bent arm is attached to a vertical tool-post, E', which is oscillated on its vertical axis by a crank-arm, *g'*, Fig. 4, and slide *h'*, said slide having a bowl which runs in the cam-groove *c* on the upper side of the cam I. Said carrier is provided with a descending weighted lever, I', Figs. 1 and 2, which, in its retreat, hits against a stop, *j'*, and inclines said carrier outward and downward, as shown in Figs. 1 and 2, in which position the article received by it is dropped out into any suitable receptacle.

When said carrier has advanced to receive the article the cutter-stock R'''' is advanced to cut said article off the wood bolt from which it has been turned. Said cutter-stock has on its under side a bowl, which enters the cam-groove *c'* on the upper side of the cam I, and is actuated by that groove without other connections. The said cutter-stock R'''' carries a cutter, *k''*, for cutting off the finished piece of work.

It will now be seen that all the movements of the cutter or tool stocks are automatic, and that all an attendant will be required to do will be to supply the wood bolts to the lathe, after roughly pointing them to permit their entrance concentrically into the hollow arbor.

The pointing is done by a cutter (not shown in the drawings) fastened in the cutter-holder *v'''* in the end of the arbor J' opposite the boring-cutters *i' i'*, and the wood bolt is held while pointing by a screw-clamp, *k'''*, Figs. 1, 2, and 8, attached to a sliding stock, J'', fitted to slide on the same ways that guide the stock R. The jaws of said screw-clamp *k'''* are operated by a right and left threaded screw, *m''*, the middle of which is fitted to a holding-boss, *n''*, attached to the stock J''.

What I claim as my invention is—

1. The lathe-bed A, having the central hollow box B, which partly incloses the mechanism for operating the cutter-stocks, and is provided with ways for supporting and guiding cutter or tool stocks arranged thereon, substantially as described.

2. The combination, with mechanism, substantially as described, below the ways of the

lathe-bed for operating two or more cutter-stocks, and a vertical cam-shaft carrying the cam or cams for actuating said mechanism, of a horizontal shaft supported in bearings upon the lathe below the bed and geared with said cam-shaft, substantially as and for the purpose set forth.

3. The combination, with the automatically-moving tail-stock M for feeding the wood through the rotating hollow arbor J, of the rotating spur-center *e*, substantially as and for the purpose described.

4. The combination, with the ratchet *m* for moving the tail-stock reciprocated by the cam I through intermediate mechanism, of the pawls *l*, carried by the tail-stock M, for engaging the said ratchet, the projection *s'* on said pawls, and the slide *t'* for disengaging said pawls from said ratchet, substantially as and for the purpose specified.

5. The combination of the tail-stock M, the stationary ratchet *r''* attached to the lathe-bed, and the pawls *l''*, pivoted to said tail-stock in such manner that all of said pawls are raised by raising the inner one of said pawls, substantially as and for the purpose set forth.

6. The combination, with the head-stock K, of the swinging tubular carrier C', substantially as and for the purpose herein specified.

7. The combination of the sliding cutter-stock R''', the tool-post *l'*, having the projection *m'* and oscillating on its vertical axis, the spring *p'*, and stop *n'*, substantially as and for the purpose specified.

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