(No Model.) 3 Sheets—Sheet 1.

C. HOLLY.

LATHE.

No. 392,337. Patented Nov. 6, 1888.

Fig. 1.

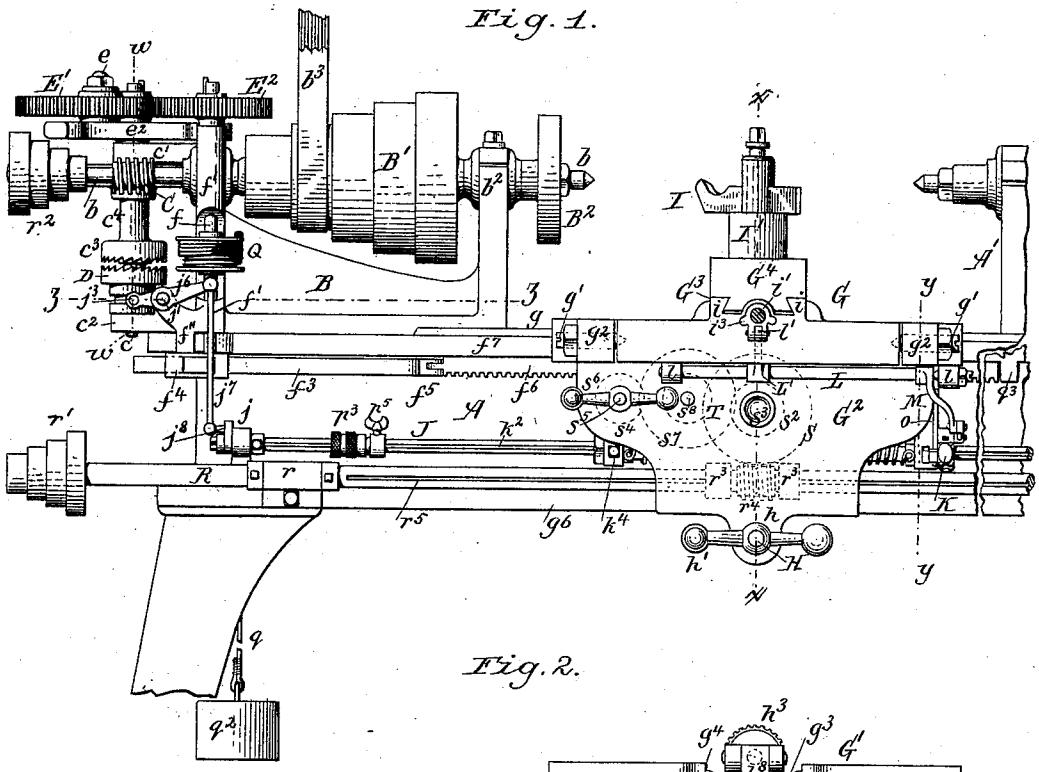
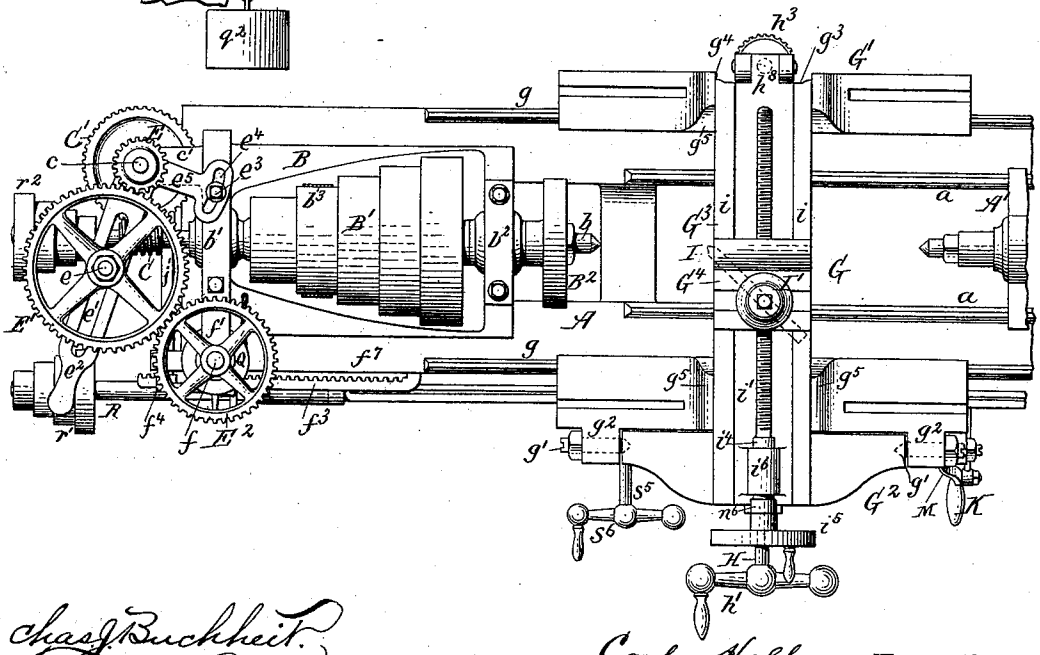


Fig. 2.



Witnesses.
Chas. J. Buchheit.
Theo. L. Popp.

Carlos Holly Inventor.
By Wilhelm & Bonner.
Attorneys.

(No Model.) 3 Sheets—Sheet 2.

C. HOLLY.

LATHE.

No. 392,337. Patented Nov. 6, 1888.

Fig. 3.

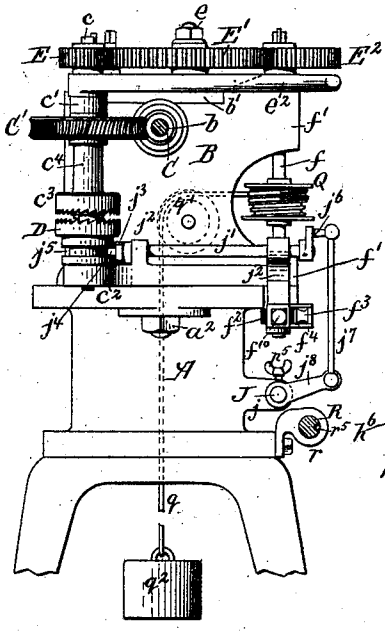


Fig. 4.

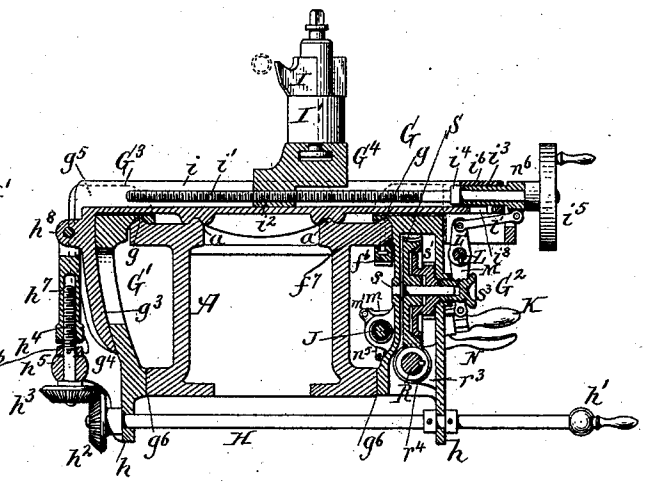


Fig. 5.

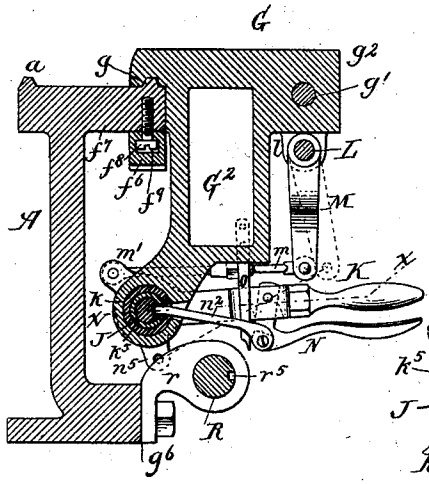


Fig. 6.

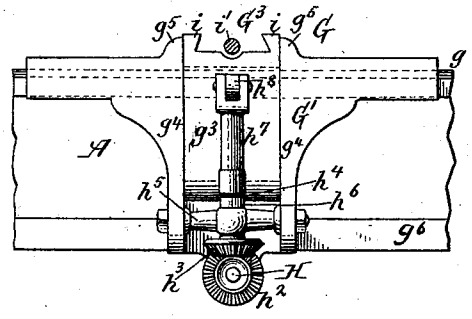
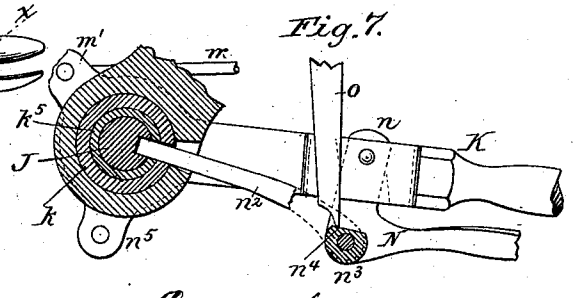


Fig. 7.



Witnesses.
Chas. J. Buchheit.
Theo. L. Popp.

Carlos Holly, Inventor.
By Wilhelm & Bonner.
Attorneys.

(No Model.) 3 Sheets—Sheet 3.

C. HOLLY.

LATHE.

No. 392,337. Patented Nov. 6, 1888.

Fig. 8.

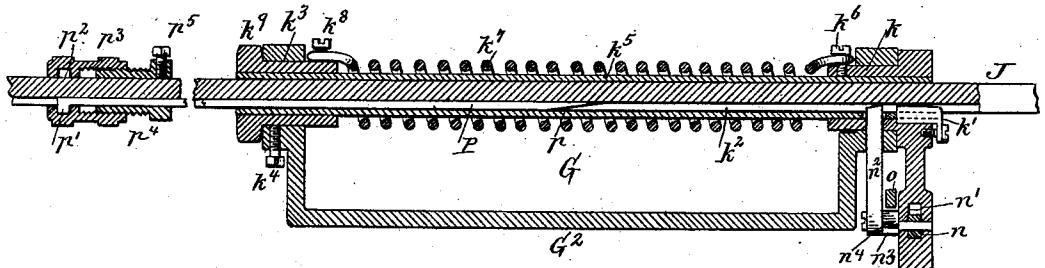


Fig. 10.

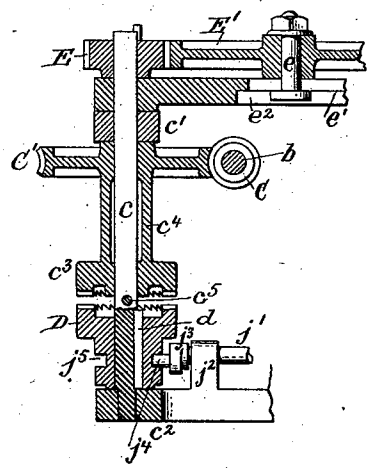


Fig. 9.

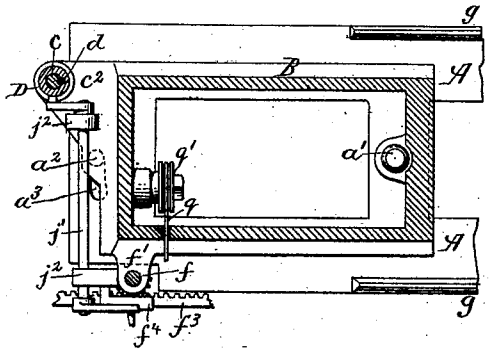


Fig. 11.

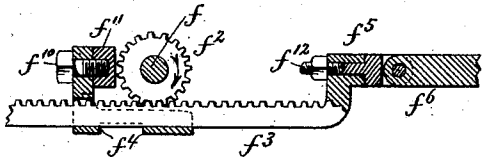


Fig. 12.

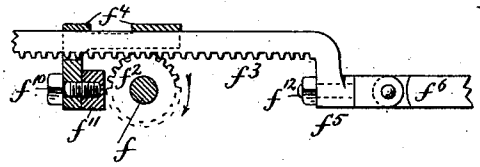
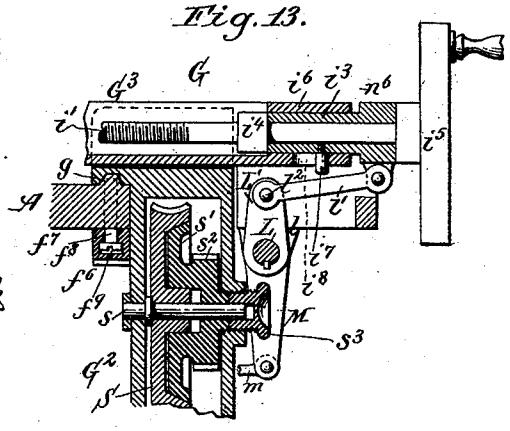


Fig. 13.



Witnesses.
Chas. J. Buchheit.
Theo. L. Popp.

Carlos Holly. Inventor.
By Wilhelm Bonnet
Attorneys.

UNITED STATES PATENT OFFICE.

CARLOS HOLLY, OF LOCKPORT, NEW YORK.

LATHE.

SPECIFICATION forming part of Letters Patent No. 392,337, dated November 6, 1888.

Application filed September 14, 1887. Serial No. 249,679. (No model.)

To all whom it may concern:

Be it known that I, CARLOS HOLLY, of Lockport, in the county of Niagara and State of New York, have invented new and useful Improvements in Lathes, of which the following is a specification.

My invention relates to that class of lathes which are more particularly designed for cutting screw-threads, although they may be used for other work.

The object of my invention is to improve the head-stock and its gearing, so that the same can be more readily adjusted to the various requirements of the work; also, to improve the construction of the feed mechanism for moving the carriage in either direction with greater dispatch; also, to provide means whereby the cutting-tool is moved toward the work simultaneously with the engagement of the carriage-feed mechanism; also, to provide means whereby the cutting-tool and carriage-feed mechanism are automatically and simultaneously released; also, to improve the lathe in other features of construction.

My invention consists of the improvements which will be hereinafter fully set forth, and pointed out in the claims.

In the accompanying drawings, consisting of three sheets, Figure 1 represents a fragmentary side elevation of a lathe provided with my improvements. Fig. 2 is a top plan view thereof. Fig. 3 is an end elevation of the lathe. Fig. 4 is a cross-section in line *x x*, Fig. 1. Fig. 5 is a cross-section in line *y y*, Fig. 1, on an enlarged scale. Fig. 6 is a rear elevation of the feed-carriage. Fig. 7 is an enlarged section of the clutch and tool-operating mechanism, showing the parts in a locked position. Fig. 8 is a horizontal section in line *x x*, Fig. 5. Fig. 9 is a horizontal section in line *z z*, Fig. 1. Fig. 10 is a sectional elevation of the clutch and driving mechanism on line *w w*, Fig. 1, on an enlarged scale. Fig. 11 is a fragmentary horizontal section of the feed rack-bar and pinion. Fig. 12 is a similar view showing the parts in a reversed position. Fig. 13 is an enlarged sectional view of the front portion of the transverse feed-screw and connecting parts.

Like letters of reference refer to like parts in the several figures.

A represents the bed of the lathe, and A′ the tail-stock arranged upon the bed A and adjustably secured thereto on ways *a*.

B represents the head-stock arranged at the opposite end of the bed A. The head-stock B is pivoted at its inner end to the bed A by a vertical bolt, *a′*, and adjustably secured to the bed at its outer end by a set-screw, a^2, passing through a curved slot, a^3. This construction permits the head-stock B to be swung laterally on the bed A when it is desired to turn tapering surfaces.

B′ represents a cone-pulley mounted on the live-spindle *b*, which is journaled in bearings *b′* b^2 of the head-stock B.

B^2 is the face-plate secured to the inner end of the spindle *b*, and b^3 is the driving-belt applied to the pulley B′.

C represents a worm secured to the spindle *b* and engaging with a wheel, C′, which turns loosely on a vertical shaft, *c*, journaled in bearings *c′* c^2, which are formed on the head-stock B.

c^3 represents a toothed or clutch disk arranged below the wheel C′ and connected therewith by a sleeve, c^4.

The wheel C′ and clutch-disk c^3 are held in an elevated position on the shaft *c* by a pin, c^5, as represented in Fig. 10.

D represents a clutch-disk arranged below the disk c^3 and secured to the shaft *c* by a feather, *d*, on which the disk D can be raised and lowered.

E represents a pinion secured to the upper end of the shaft *c* and meshing with a gear-wheel, E′. The latter is mounted loosely on a vertical stud, *e*, which is adjustably secured in a slot, *e′*, formed in an elbow-lever, e^2, as represented in Figs. 2, 3, and 10. The lever e^2 is pivoted to the shaft *c* above the bearing *c′*, and is secured in position by a set-screw, e^3, passing through a slot, e^4, formed in the short arm e^5 of the elbow-lever e^2, and entering the head-stock.

E^2 represents a gear-wheel which meshes with the wheel E′, and is mounted on a vertical shaft, *f*, journaled in bearings *f′* *f′* of the head-stock B, as represented in Figs. 1, 2, and 3. The wheel E′ transmits the motion from the pinion E to the wheel E^2. When these gears are changed, the position of the lever e^2

is adjusted to support the intermediate gear, E′, in the position in which it meshes with the pinion E and wheel E^2.

The shaft f is provided at its lower end with a pinion, f^2, which meshes with a horizontal rack-bar, f^3, guided opposite the pinion f^2 in a reversible box or guide, f^4, and is connected at its inner end by a swivel, f^5, to the feed rack-bar f^6. The latter extends along the front side of the lathe-bed, and is supported on the under side of the overhanging portion f^7 of the bed A by flat-headed screws f^8, engaging in a groove or way, f^9, formed in the rack-bar f^6, as clearly shown in Fig. 5.

f^{10} represents a set-screw whereby the guide f^4 of the rack-bar f^3 is secured to an overhanging support, f^{11}, formed on the head-stock B, as represented in Figs. 1 and 11. The set-screw f^{10} is set in line with the pin f^{12} of the swivel f^5 to enable the rack-bar f^3 to be reversed and placed on the inner side of the gear-pinion f^2, as clearly shown in Fig. 12. When the rack-bar is in this last position, the direction of the movement of the carriage is reversed. This reversing movement is accomplished by simply loosening the screw f^{10} when the parts are in the position represented in Fig. 11 and swinging the rack-bar f^3 and its guide f^4 under the pinion f^2 to the position shown in Fig. 12, and then again securing the guide by tightening the screw f^{10}.

G represents the feed-carriage, which consists of a rear apron, G′, front apron, G^2, a T-shaped saddle or cross-bar, G^3, and a tool-slide, G^4.

The aprons G′ G^2 are supported on the top of the bed A in V-shaped ribs or ways g, which fit in corresponding grooves formed in the upper inwardly-projecting portions of the aprons. The saddle G^3 is secured to the front apron, G^2, by horizontal pivots g', arranged in lugs or ears g^2, formed on the apron G^2. The saddle is provided at its rear end with a downwardly-projecting wing, g^3, curved concentric with the pivots g', as shown in Fig. 4, and fitting in correspondingly-curved ways g^4, formed in the rear apron, G′. This construction permits the free rear end of the saddle G^3 to be raised a considerable distance and yet permit the saddle to form a firm connection between the aprons G′ G^2. When the saddle G^3 is in its normal position, as shown in Fig. 4, it is supported and guided on the bed A upon the V-shaped ways a, entering corresponding grooves in the saddle G^3.

The aprons G′ G^2 are connected, so as to move together lengthwise of the bed, by the vertical sides of the saddle G^3, which fits snugly between ribs g^5, formed on the upper portions of the apron, as represented in Figs. 1 and 2.

The aprons G′ G^2 rest with their lower inner surfaces against corresponding parallel surfaces g^6 formed on the lower portion of the bed A, as represented in Fig. 4. By this construction the saddle is brought considerably closer to the lathe-bed than heretofore, whereby much larger work can be operated upon on the lathe than when the usual double-bar saddle is employed.

H represents a horizontal shaft arranged transversely below the bed A, and hung in bearings h, formed on the lower ends of the aprons G′ G^2. The shaft H is provided at one end with a handle, h', and at its opposite end with bevel gear-wheel h^2.

h^3 represents a similar gear-wheel meshing with the wheel h^2 and secured to the lower end of a vertical lifting-screw, h^4. The latter is journaled in a trunnion or pivoted bearing, h^5, arranged in the vertical way g^4 of the rear apron, and the screw h^4 is supported on this bearing by a collar or offset, h^6, as represented in Figs. 4 and 6.

h^7 represents a sleeve pivoted with its upper bifurcated portion to a lug, h^8, of the saddle-wing g^3, and provided with an internal screw-thread in which the screw h^4 engages. Upon turning the handle h' the rear end of the saddle G^3 is raised or lowered by means of this screw mechanism, which enables the saddle to be raised and lowered very conveniently, as the handle h' is located on the side of the machine at which the operator is stationed.

I represents the tool, and I′ the tool-post secured to the slide G^4, which latter is guided in the saddle G^3 in dovetail ways i, in the usual manner.

i' represents the transverse feed-screw passing through a threaded lug, i^2, of the slide G^4 and held at one end in a sliding sleeve, i^3, by a collar, i^4, and hand-wheel i^5. The sleeve i^3 is capable of movement lengthwise of the feed-screw i' in a socket, i^6, on the saddle G^3, and is held from turning therein by a pin, i^7, secured to the sleeve i^3 and entering a slot, i^8, in the socket, as represented in Figs. 4 and 13.

J represents a longitudinal rock-shaft journaled on the front side of the lathe and in rear of the apron G^2, in bearings j, and extending the full length of the lathe.

j' represents a transverse rock-shaft arranged at right angles to the shaft J, and above the same and journaled in bearings j^2, formed on the lower portion of the head-stock B.

j^3 represents a lifting-finger secured to the inner end of the transverse rock-shaft j', and provided with a pin, j^4, which engages in an annular groove, j^5, formed in the lower clutch-disk, D, as represented in Figs. 1, 3, and 10.

j^6 represents an arm secured to the outer end of the transverse rock-shaft j', and which is connected by a rod, j^7, with an arm, j^8, on the end of the longitudinal rock-shaft J. The rod j^7 is connected with the arms j^6 j^8 by ball-and-socket joints.

Upon turning the longitudinal rock-shaft J, so as to move the arm j^8 downwardly, the live clutch-disk is caused to move upwardly and engage with the disk c^3, and thereby set the feed-carriage in motion.

K, Figs. 5, 7, and 8, represents a hand-lever provided with a hub or boss, k, seated in an opening in one end of the front apron, G^2, and k' represents a feather secured to the lever K.

and engaging in a groove, k^2, of the longitudinal rock-shaft J.

k^3 represents a sleeve seated in an opening in the opposite end of the apron G^2, and secured therein from turning by a set-screw, k^4.

k^5 represents a tube which surrounds the rock-shaft J and extends from the outer end of the hub k to the outer end of the sleeve k^3, and is secured to the hub by a screw, k^6.

k^7 represents a spiral spring which surrounds the tube k^5, and is secured at one end to the sleeve k^3 by a pin, k^8, and at its opposite end to the inner end of the hub k by the screw k^6. The spring is so coiled as to cause the outer end of the hand-lever K to be swung upwardly when released. The outer end of the sleeve k^3 is provided with a suitable head, k^9, to permit of the application of a wrench when it is desired to adjust the tension of the spring k^7. This is accomplished by loosening the screw k^4 of the sleeve k^3 and turning the latter in the proper direction until the desired tension is obtained. The set-screw k^4 is then again tightened.

L, Figs. 1, 4, and 5, represents a short longitudinal rock-shaft journaled in bearings l of the front apron, G^2, and L′ represents an arm secured to the shaft L and projecting upwardly therefrom. The arm L′ is connected with the outer end of the sleeve i^3 of the transverse feed-screw i' by a link, l'. The pin l^2, connecting the arm L′ with the link l', is arranged in line with the pivots g' g' of the front saddle, G^3, so that these parts move freely when the saddle is raised or lowered on its pivots.

M represents an arm secured to the rear end of the rock-shaft L and extending downwardly therefrom. The arm M is connected by a rod, m, with a short arm, m', secured to the hand-lever K and projecting upwardly therefrom.

N represents an elbow-locking lever which is hung to the under side of the hand-lever K by a short arm, n, which is pivoted in a slot, n', of the hand-lever K.

n^2 represents a tripping-finger pivoted to one side of the lever N and resting with its free inner end in the groove k^2 of the longitudinal rock-shaft J.

n^3 represents a hub formed on the finger n^2 and provided on its upper side with a flat surface, n^4.

o represents a locking-finger secured to the front apron, G^2, and adapted to engage upon the flat upper surface of the hub n^3 of the finger n^2 and lock the latter and the hand-lever K in a depressed position, as shown in Fig. 7.

By depressing the levers K and N to the position shown in Fig. 7 the rock-shaft J is turned so as to engage the clutch-disks D c^3, the lower arm, M, of the rock-shaft L is forced outwardly, and the upper arm, L′, sleeve i^3, transverse feed-screw i', slide G^4, and tool I are forced inwardly, thereby throwing the cutting-tool I toward the work at the same instant that the clutch is engaged with the mechanism which operates the tool-carriage.

P, Fig. 8, represents an automatic shifting-bar seated in the groove k^2 of the rock-shaft J, and provided at its inner end with an inclined or beveled surface, p, and at its opposite end with a tooth or spur, p', which engages in an annular groove, p^2, formed in a screw-sleeve, p^3. The sleeve p^3 is secured in place upon a threaded collar, p^4, secured adjustably to the rock-shaft J by a set-screw, p^5.

When the carriage in its movement has reached a point at which the inner free end of the tripping-finger n^2 comes in contact with the inclined surface p of the bar P, the finger n^2 is forced outwardly until the hub n^3 of the same is released from under the locking-finger o, when the hand-lever K is elevated by the spring k^7. This disengages the clutch mechanism and stops the further movement of the carriage. At the same time the lower arm, M, of the rock-shaft L is thrown inwardly and the upper arm, L′, sleeve i^3, screw i', and slide G^4 are moved outwardly, thereby moving the tool away from the work simultaneously with the stoppage of the feed motion. The outward movement of the tool I is limited by the pin i^7 of the sleeve i^3 reaching the limit of its outward movement in the slot i^8.

It will thus be seen that the tool I can be allowed to approach very closely to an abrupt shoulder on the work operated upon, as the operator is not required to move the tool away from the work by turning the feed-screw i'. This cannot be accomplished in ordinary lathes without running the same at a very low speed.

When the lathe is used to cut threads on straight work, the automatic shifting wedge P may be dispensed with and the tripping effected by the operator grasping the lower locking-lever, N, and forcing the latter upwardly toward the hand-lever K until the hub n^3 of the finger n^2 is disengaged from the locking-finger o. The levers K N are then elevated by the spring k^7, as above described.

When it is desired to cut internal or female threads, the connecting-rod m of the arm M is detached from the upper arm, m', of the hand-lever K, and is attached to a lower arm, n^5, of the same, as clearly shown in dotted lines in Fig. 5. In making this connection the tool I, slide G^4, and sleeve i^3 are forced inwardly until the shoulder n^6 of the latter strikes against the lug i^6 of the saddle G^3. It is obvious that when the parts are in this position the cutting-edge of the tool I faces the operator and the interior descending side of the work, so that upon depressing the hand-lever the tool I, slide G^4, and sleeve i^3 are moved toward the operator until stopped by the pin i^7, and the parts locked in their working position by the hub n^3 and finger o. When the parts are tripped, the tool is moved in the opposite direction away from the work.

In the drawings the various figures represent the parts in position to operate upon exterior surfaces.

Q represents a drum secured to the vertical feed-shaft f, and q represents a cord or cable

passing over a roller or pulley, q', and provided at one end with a weight, q^2, and secured at its opposite end to the drum Q.

When the clutch mechanism is in engagement and the shaft f is rotated so as to feed the carriage G toward the head-stock, the cord q is wound upon the drum Q. When the hand-lever K and the clutch mechanism are released, the weight q^2 descends, unwinds the cord, and causes the shaft f to rotate in the opposite direction and return the carriage G to its starting-point by the rack-bars f^3 f^6. The backward movement of the carriage is limited by the rack-bar f^6 striking against a stop, q^3, secured to the frame A.

In making a new cut the tool I is carried transversely toward the work by turning the hand-screw i' in the proper direction.

R represents a horizontal feed-shaft journaled at both ends of the lathe in bearings r, and provided at one end with a step-pulley, r'. The latter is driven, when required, from a similar pulley, r^2, on the spindle b by a suitable belt.

r^3 represents sleeves formed on the front apron, G^2, for guiding it on the shaft R, and r^4 is a worm secured to the shaft R between the sleeves r^3. The worm r^4 is provided with a feather which engages in a way or groove, r^5, of the shaft R.

S is a worm-wheel mounted on a short transverse shaft, s, in the apron G^2, and meshing with the worm r^4.

s' represents a beveled friction-disk adapted to engage in a corresponding seat in the wheel S, and carrying a gear-pinion, s^2. The wheel S and disk s' can be connected by applying the hand-screw s^3, so as to force the disk s' into the seat in the wheel S.

s^4 represents a gear-pinion secured to a transverse shaft, s^5, which is provided with a handle, s^6, whereby the same can be turned.

s^7 represents a gear-wheel secured to a transverse shaft, s^8, and meshing on one side with the pinion s^4 and on its opposite side with the pinion s^2 of the worm-wheel S.

T represents a pinion secured to the shaft s^8, and meshing with the rack-bar f^6.

Upon loosening the hand-screw s^3, so as to disengage the pinion s^2 from the worm-wheel S, the carriage G can be moved back and forth by the handle s^6.

When it is desired to cut screw-threads, the carriage is locked to the feed-rack by tightening the hand-screw s^3 and forcing the disk s' into the beveled seat of the worm-wheel S. The latter is held from turning by the worm r^4, and the pinion T, which engages with the feed-rack, is locked and held from turning on its shaft by the pinions s^2 s^7. The carriage is now compelled to move with the feed-rack, the worm r^4 sliding on the shaft R during the movement of the carriage. The carriage G can be moved forward or backward by turning the shaft R, thus enabling an operator to easily cause his tool to again engage in the proper path when replacing a tool which required sharpening before the screw-thread operated upon had been completed.

When it is desired to cut a left-hand screw-thread, the rack-bar f^3 is swung under the feed-pinion f^2 to the position shown in Fig. 12. The feed-carriage G will now be moved away from the head-stock while the tool is operating on the work, and toward the head-stock by the weight q^2 when a new cut is to be made.

When it is desired to do ordinary plain turning upon the lathe, the pulley r^2 of the spindle b and the pulley r' of the feed-shaft R are connected by a suitable belt. The clutch-disk D is then released from the disk c^3, causing the weight to rotate the drum Q and pinion f^2 and force the carriage G toward the tail-stock A' by the rack-bars f^3 f^6. This backward movement continues until the rack-bar f^6 is arrested by the end of the rack-bar engaging against the stop q^3 of the bed A. The rack-bars f^3 f^6 are now held in this position by the weight q^2. The forward movement of the carriage is now effected by the shaft R, worm r^4, wheel S, pinion s^2, wheel s^7, and the pinion T, which latter engages against the rack-bar f^6. When the lathe is thus used, the transverse feed-screw i' is used to move the tool I toward and away from the work.

In my improved construction all of the gearing required for cutting screw-threads or tapers are secured to the head-stock B, thus enabling the head-stock and connecting parts to be adjusted at one operation and without shifting or changing the position of the gears.

The worm C on the lathe-spindle and the worm-wheel C' on the clutch-shaft c are so proportioned with reference to the teeth on the clutch-disks D c^3 that one revolution of the spindle turns the clutch-disk c^3 the distance of one tooth. This insures the proper engagement of the tool in the groove or thread when the clutch-disks engage with each other, because if the clutch-disks should fail to engage promptly when the hand-lever K is depressed the spindle will have completed a revolution before the disks engage with each other.

I claim as my invention—

1. The combination, with the lathe-bed and a head-stock secured to said bed and provided with a lathe-spindle, of a feed-rack capable of longitudinal movement on the lathe-bed, feed-gearing whereby motion is transmitted from the spindle to the feed-rack, a feed-carriage, connecting-gears secured to said feed-carriage and connecting with the feed-rack, whereby the carriage is moved independently of the feed-rack, and a locking device whereby the feed-carriage is locked to the feed-rack, substantially as set forth.

2. The combination, with the lathe-bed and a laterally-movable head-stock pivoted to said lathe-bed and provided with a lathe-spindle, of a feed-carriage, a feed-rack having a lateral and longitudinal movement on the lathe-bed, feed-gearing mounted on the head-stock and connected with the lathe-spindle and feed-rack,

whereby motion is transmitted from the spindle to the feed-rack, gears mounted on the feed-carriage and connecting said carriage with the feed-rack, and a locking device whereby the feed-carriage is locked to the feed-rack, substantially as set forth.

3. The combination, with the lathe-bed, of a head-stock provided with a lathe-spindle, *b*, a worm, C, secured to the spindle, a vertical shaft, *c*, provided with a clutch-disk, D, a worm-wheel, C′, provided with a clutch-disk, c^3, horizontal gear-wheels E E′ E^2, a vertical shaft, *f*, provided with pinion f^2, and a feed-rack, substantially as set forth.

4. The combination, with the feed-pinion f^2 and the feed carriage, of a rack-bar, f^6, connected with the feed-carriage and provided with a reversible rack-bar, f^3, meshing with said pinion, substantially as set forth.

5. The combination, with the feed-carriage, the stationary support *f′*, and the feed-pinion f^2, of the rack-bar f^6, and the rack-bar f^3, swiveled on the rack-bar f^6 by a pivot, f^{12}, and the guide f^4, swiveled on the support *f′* by a pivot, f^{10}, substantially as set forth.

6. The combination, with the feed-carriage, the feed-rack bars, and the lathe-spindle, of gearing for transmitting motion from the spindle to the rack-bars, a clutch whereby said gearing is connected with said spindle, and whereby the carriage is moved in one direction, and a weight which causes the carriage to be moved in the opposite direction when the clutch is released, substantially as set forth.

7. The combination, with the feed-carriage, the feed-rack bars, and the lathe-spindle, of a feed-shaft, *f*, a pinion, f^2, secured thereto and meshing with said rack-bars, gearing for transmitting motion from the spindle to the feed-shaft, a clutch whereby said gearing is connected with said spindle, and whereby the feed-shaft *f* is moved in one direction, a drum, Q, secured to the shaft *f*, and a weight, q^2, connected with said drum and whereby the feed-shaft *f* is moved in the opposite direction, substantially as set forth.

8. The combination, with the spindle *b*, the vertical shaft *c*, geared therewith, the movable clutch-disk D, mounted on said shaft, and the clutch-disk c^3, connected with the feed-gears, of the transverse rock-shaft *j′*, the longitudinal rock-shaft J, arms and rod connecting said rock-shafts, and an actuating-lever, K, mounted on the rock-shaft J, substantially as set forth.

9. The combination, with the clutch of the feed mechanism, the feed-carriage, and the rock-shaft J, of a locking-finger, *o*, attached to said carriage, a hand-lever, K, mounted on the rock-shaft J, and a locking-lever, N, attached to the lever K, substantially as set forth.

10. The combination, with the clutch of the feed mechanism, the feed-carriage, and the rock-shaft J, of a locking-finger, *o*, attached to said carriage, a hand-lever, K, mounted on the rock-shaft J, a locking-lever, N, pivoted to said lever, and a tripping-finger, n^2, attached to the lever N and engaging with the rock-shaft J, and a shifting wedge, P, attached to the shaft J, substantially as set forth.

11. The combination, with the clutch of the feed mechanism, the feed-carriage, and the rock-shaft J, of a hand-lever, K, whereby the shaft J is turned in one direction, a locking-finger, *o*, and locking-lever N, whereby the hand-lever K is locked in position, and a spring whereby the shaft J is turned in an opposite direction when the locking-lever is released, substantially as set forth.

12. The combination, with the rock-shaft J, of the shifting wedge P and the screw-threaded sleeves p^3 p^4, whereby said wedge is adjusted on the shaft, substantially as set forth.

13. The combination, with the feed-carriage provided with a socket, i^6, tool-slide, and transverse feed-screw, of a sleeve, i^3, mounted on said feed-screw and made lengthwise movable in the socket i^6, and a hand-lever attached to the feed-carriage and connected with the sleeve i^3, and whereby the tool-post can be moved toward and from the work without turning the feed-screw, substantially as set forth.

14. The combination, with the feed-carriage provided with a socket, i^6, tool-slide, and transverse feed-screw, of a sleeve, i^3, rock-shaft J, rock-shaft L, and arms and rods whereby said rock-shafts are connected with each other and with the sleeve i^3, substantially as set forth.

15. The combination, with the feed-carriage provided with a socket, i^6, tool-post, and transverse feed-screw, of a sleeve, i^3, rock-shaft L, arm L′, link *l′*, connecting the shaft L with the sleeve, arm M, rod *m*, rock-shaft J, and hand-lever K, provided with arms m' n^5, projecting upwardly and downwardly, either of which may be connected with the rod *m* for reversing the movement of the tool-post, substantially as set forth.

16. The combination, with the feed-carriage, the feed mechanism provided with a clutch, and the tool-post having its transverse feed-screw provided with a sleeve, i^3, capable of lengthwise movement in a socket, i^6, of the rock-shaft J, the rock-shaft *j′*, connected with the clutch and with the rock-shaft J, and a hand-lever, K, connected with the rock-shaft J and with the sleeve i^3, substantially as set forth.

17. The combination, with the feed-carriage, the feed mechanism provided with a clutch, and a tool-post having its transverse feed-screw provided with a sleeve, i^3, capable of lengthwise movement in a socket, i^6, of the rock-shaft J, the rock-shaft *j′*, connected with the clutch and with the rock-shaft J, the rock-shaft L, connected with the sleeve i^3 and with the rock-shaft J, and the hand-lever K, whereby the rock-shaft J is operated, substantially as set forth.

18. The combination, with the lathe-bed, of a front apron, a rear apron, a saddle pivoted to the front apron and provided with a wing extending downwardly over the rear apron, and a tool-post mounted on the saddle, substantially as set forth.

19. The combination, with the lathe-bed, of a front apron, G^2, a rear apron, G', provided with guides g^4, and a saddle, G^3, pivoted to the front apron and provided with a curved wing, g^5, arranged between the guides g^4, substantially as set forth.

20. The combination, with the lathe-bed, of the aprons G' G^2, a saddle, G^3, pivoted to the front apron and resting upon the rear apron, an actuating-shaft arranged transversely under the lathe-bed, and adjusting mechanism connecting said shaft with the rear end of the saddle, whereby the latter can be raised and lowered from the front side of the lathe, substantially as set forth.

21. The combination, with the lathe-bed, of the aprons G' G^2, a saddle, G^3, pivoted to the front apron and resting upon the rear apron, a screw-sleeve, h^3, attached to the rear end of the saddle, an adjusting-screw, h^4, attached to the rear saddle, and a transverse actuating-shaft, H, geared with said adjusting-screw, substantially as set forth.

22. The combination, with the lathe-bed, the longitudinally-movable feed-rack bar f^6, and the feed-carriage provided with a pinion, T, meshing with said rack-bar, of the longitudinal shaft R, provided with a worm, r^4, turning with said shaft and moving with the feed carriage, and gear-wheels connecting said worm with the pinion T, substantially as set forth.

Witness my hand this 9th day of August, 1887.

CARLOS HOLLY.

Witnesses:
FRED. C. GEYER,
CHESTER D. HOWE.