(No Model.) 4 Sheets—Sheet 1.

R. K. LE BLOND & N. D. CHARD.

ENGINE LATHE.

No. 584,001. Patented June 8, 1897.

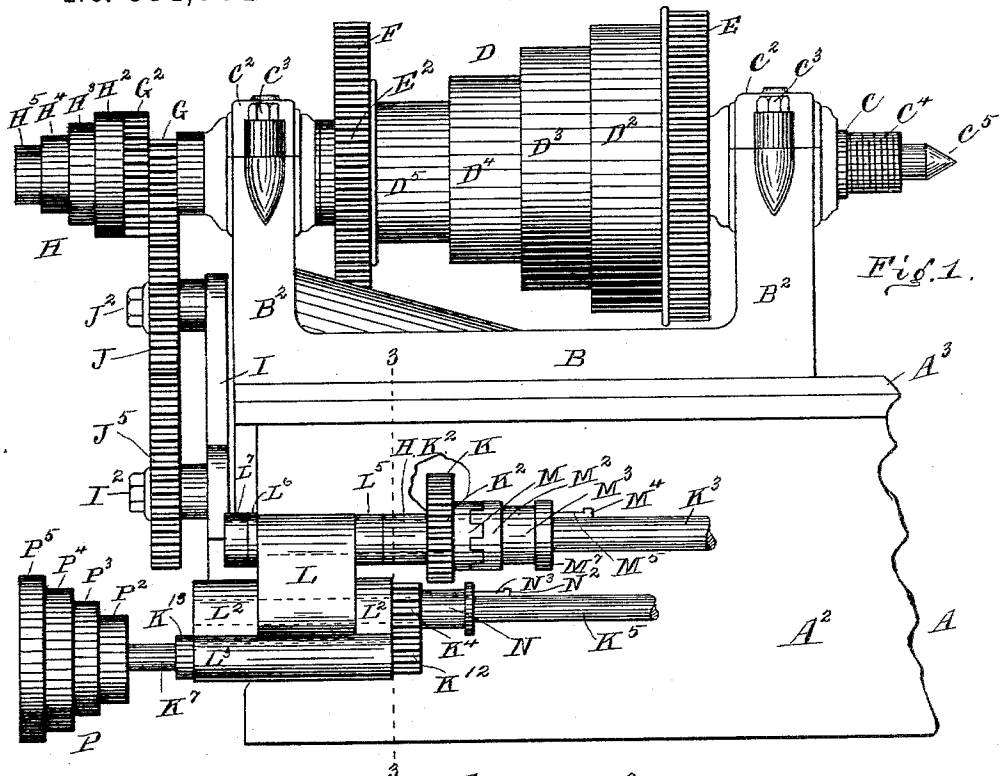

Fig. 1.

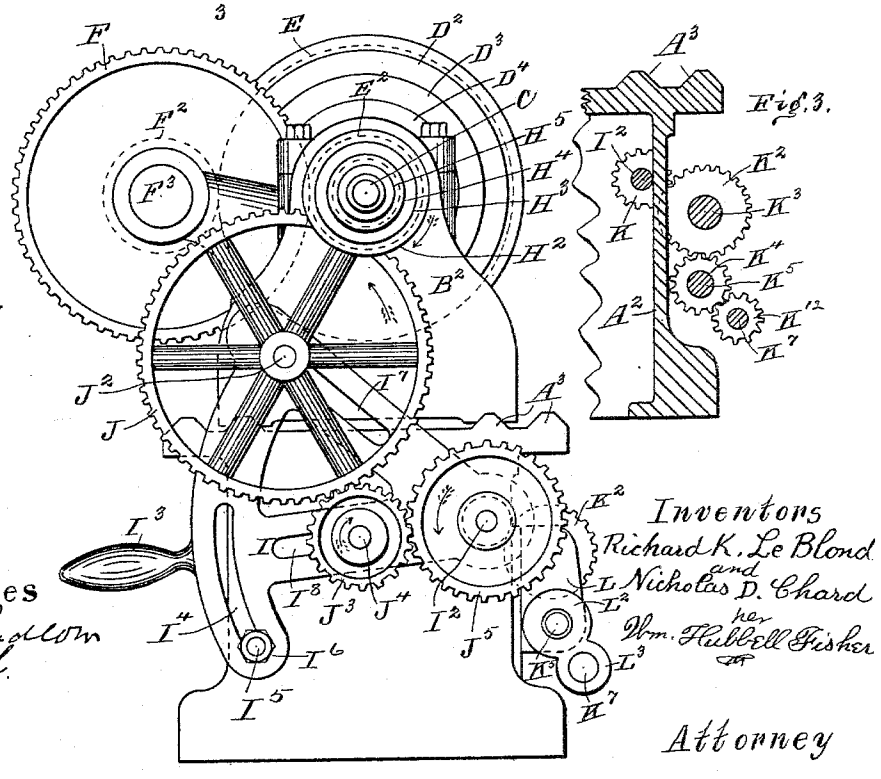

Fig. 2.

Fig. 3.

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(No Model.) 4 Sheets—Sheet 2.

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Fig. 5.

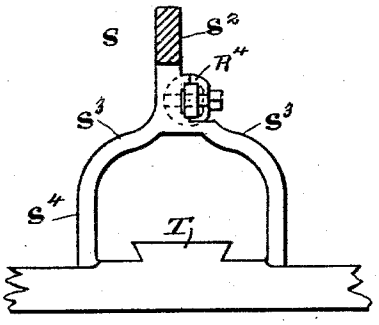

Fig. 4.

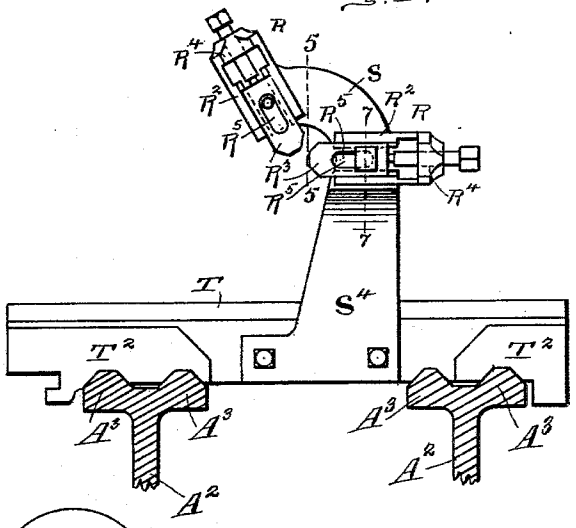

Fig. 7.

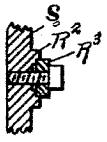

Fig. 6.

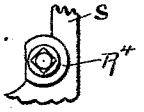

Fig. 10.

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(No Model.) 4 Sheets—Sheet 3.

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ENGINE LATHE.

No. 584,001. Patented June 8, 1897.

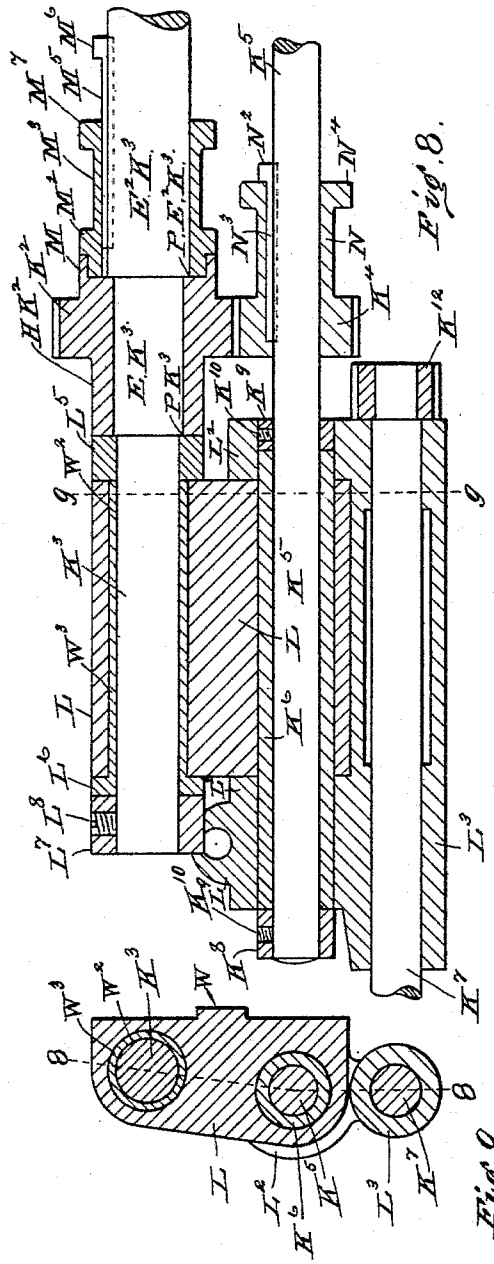

Fig. 8.

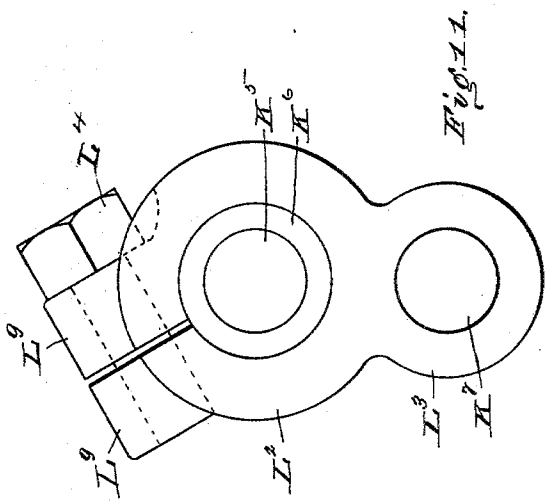

Fig. 11.

Fig. 9.

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(No Model.) 4 Sheets—Sheet 4.

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ENGINE LATHE.

No. 584,001. Patented June 8, 1897.

FIG 12

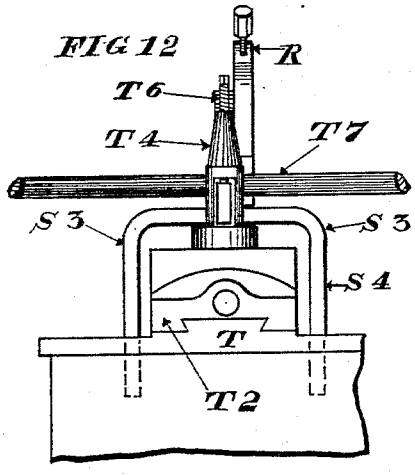


FIG 13

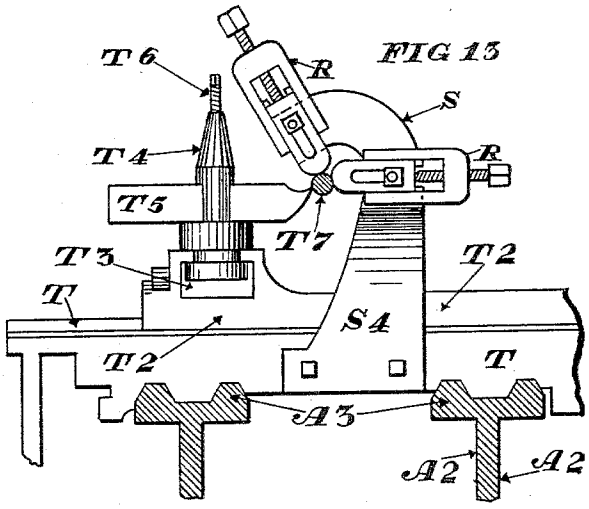
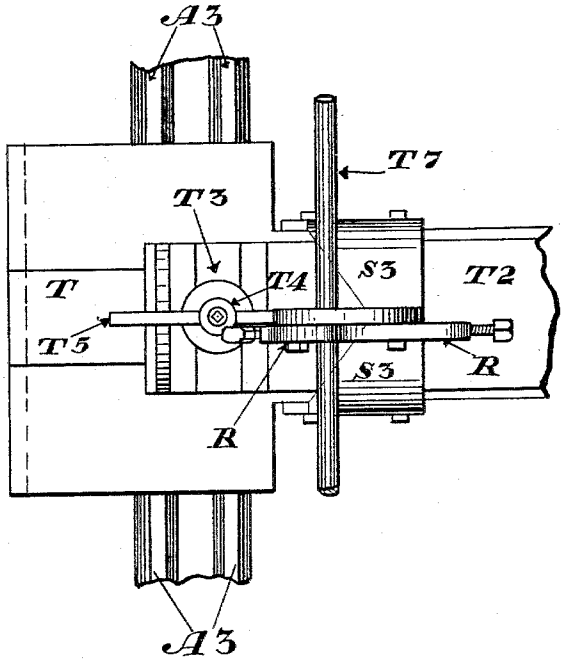


FIG 14



Attest
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Inventors
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UNITED STATES PATENT OFFICE.

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ENGINE-LATHE.

SPECIFICATION forming part of Letters Patent No. 584,001, dated June 8, 1897.

Application filed June 24, 1895. Serial No. 553,844. (No model.)

To all whom it may concern:

Be it known that we, RICHARD K. LE BLOND, a resident of the village of Linwood, and NICHOLAS D. CHARD, a resident of the city of Cincinnati, in the county of Hamilton, State of Ohio, citizens of the United States, have invented certain new and useful Improvements in Engine-Lathes, of which the following is a specification.

The several features of our invention and the various advantages resulting from their use, conjointly or otherwise, will be apparent from the following description and claims.

In the accompanying drawings, making a part of this application, Figure 1, Sheet 1, represents a side elevation of one end of a lathe illustrating certain features of our invention. Fig. 2, same sheet, represents an elevation of that end of the said lathe which faces toward the left in Fig. 1. Fig. 3, same sheet, represents an end elevation of certain gear—to wit, for operating the shafts for respectively operating the longitudinal feed and the cross-feed. This view shows a part of the bed of the lathe and that in section. The elevation, &c., is taken in the plane of the dotted line 3 3 of Fig. 1 and is that seen by the spectator when standing at the left end of Fig. 1. Fig. 4, Sheet 2, is a view in elevation, excepting the V-ways, which latter are in section, and showing the supports for the "jaws" of the follow-rest, which supports we have devised and employ for steadying shafts or rods to be operated on or belonging to parts to be turned. Fig. 5, Sheet 2, is a view, partly in elevation and partly in section, taken at the plane of the dotted line 5 5 of Fig. 4 and showing that part of the device which at said plane faces toward the left in said Fig. 4. Fig. 6, Sheet 2, is an elevation of detail of the follow-rest which holds the jaws. Fig. 7, Sheet 2, is a vertical transverse section of one of the jaws or holders of the follow-rest shown in Figs. 4 and 5, this section being taken in the plane of the dotted line 7 7 of Fig. 4. Fig. 8, Sheet 3 is a vertical central longitudinal section of the mechanism seen in Figs. 1 and 2, whereby the belt-pulleys are enabled to always keep the belt taut irrespective of which pulleys the belt is running upon. This section is taken in the plane of the dotted line 8 8 of Fig. 9, the operating shafts and rods being left in elevation. Fig. 9, Sheet 3, is a vertical transverse section of the devices shown in Fig. 8, said section being taken in the plane of the dotted line 9 9 of Fig. 8, that face of the section being shown which faces toward the right hand of Fig. 8. Fig. 10, Sheet 2, is a rear elevation of the tail-stock and transverse guideways and longitudinal V ways or guides, the latter in section, and illustrating another feature of our invention. Fig. 11, Sheet 3, is an end elevation of swinging link for tightening belt on cone-pulleys. On Sheet 4, Fig. 12 is an end view of the novel devices for supporting the steadying-jaws and the immediate accompanying parts. Fig. 13 represents a side view of the same. Fig. 14 represents a top or plan view of the same.

A indicates the bed of the lathe.

A^2 A^2 respectively indicate the sides of the lathe-bed. These sides carry the V-ways A^3, on which certain adjustable portions of the lathe slide.

B indicates the head-stock, and B^2 B^2 the respective end uprights of the same.

C is the spindle, duly journaled in the head-stock. The caps C^2 of the journal-boxes of said spindle and bolts C^3, for securing the caps in place, are shown in Fig. 1. The spindle is provided with the customary screw-thread C^4 and the turning-center C^5. On the spindle is a cone-pulley D of any desired number of steps. Here four are shown—to wit, D^2, D^3, D^4, and D^5—for enabling the speed of rotation of the spindle to be changed and maintained at will. At each end of the cone-pulley D is a gear-wheel. The gear-wheel E at the right-hand end is of large diameter, while the gear-wheel E^2 of the left-hand end is of small diameter.

On a shaft F^3, duly supported, is a small gear-wheel F^2, meshing with the aforesaid gear E, and a large gear F, meshing with said gear E^2. The gears E and F^2 are conventionally indicated by dotted lines in Fig. 2. The purpose of these gears F and F^2, in combination with the gears E and E^2 and the spindle C and cone-pulley D, to increase the power, &c., is well known, and further description thereof is deemed unnecessary.

The spindle-shaft C is extended to the left

beyond the upright of the head-stock and carries a small pinion G and a larger pinion G^2 and cone-pulley H, having steps, as H^2, H^3, H^4, and H^5, all of which are keyed to the spindle C.

The pinion G^2 is capable of being reciprocated longitudinally on the spindle C, the pinion G^2, when slid to the right, encircling the pinion G. The latter construction is a feature of invention more fully described in another application for Letters Patent. Consequently further description of it is omitted herefrom.

At the end of the lathe is a frame I, termed a "quadrant," pivoted at the point I^2—to wit, at and on the shaft I^2, as hereinafter mentioned. This quadrant-frame has a handle I^3 at its peripheral end for enabling it (the frame) to be raised and lowered. In the portion of the quadrant near its periphery is a slot I^4, and a set-screw bolt I^5 is present therein and carries a nut I^6, the bolt I^5 being fixed in the lathe. In this quadrant are two other slots, respectively lettered I^7 and I^8. The purpose of these slots is to admit of the changing of the gear and for cutting left and right hand threads. Such changing of the gear being already well known further description thereof is deemed unnecessary. In the upper left-hand corner of this quadrant I and in the slot I^7 is an adjustable bush J^2, carrying a large gear J. A pinion J^3 rotates on an adjustable bush J^4, located in slot I^8, and a larger gear-wheel J^5 rotates on the shaft I^2. The intermediate pinion J^3 meshes with the gear J at one point and with the gear J^5 at another. The gear J meshes with pinion G or G^2, as the case may be, and is rotated thereby. These gears J, J^3, and J^5 may be severally exchanged for gears of other diameters, thereby altering the speed and direction of the shaft I^2, whose use is now to be described. This shaft I^2 is duly journaled in the bed of the lathe or supports thereof, and within the bed it carries a pinion K, which latter is the first of a series of gears, the others of this series and their connections and accompanying mechanism being described as follows:

The pinion K^2 turns loosely on shaft K^3. The latter shaft K^3 is journaled in the double journal-piece L, fixed to the side of the lathe-bed A^2. The preferred means of connecting piece L to the bed-plate consists of a ridge or elongated lug W, which latter is received into a suitable recess in the bed-plate and clamped in place there. The shaft K^3 turns within such journal-piece L in opening W^2, but to enable the wear of the parts to be taken up without the necessity of replacing the shaft K^3 and the journal-piece L we locate a bushing W^3 within the opening W^2 of the journal-piece L. The bushing W^3 is held in place by means of a ring L^5 on shaft K^3 at the right-hand end of the journal-piece bearing against that end of the latter (see Fig. 8, Sheet 3) and at the other end by an enlargement of itself in the shape of a flange L^6, bearing against the left-hand end of the journal-piece L. On the left-hand end of the shaft K^3 is fixed a detent-ring L^7, set fast on the shaft K^3 by means of a set-screw L^8. The shaft K^3 carries a suitable projection PK^3, located directly at the right of the ring L^5. By the foregoing construction both the shaft K^3 and the bushing are held in place.

The preferred mode of providing the projection PK^3 is by enlarging the shaft K^3, thereby forming the enlarged portion EK^3. On this enlarged portion rotates the gear K^2, having the hub HK^2. The gear is prevented from sliding to the left on the shaft K^3 by means of the ring or collar L^5, and is prevented from sliding to the right on shaft K^3 by a projection PE^2 K^3 on the latter shaft. The preferred mode of providing this projection consists in the further enlargement of the shaft K^3, forming the enlarged portion E^2 K^3. On this portion of the shaft is fixed a key or spline M^5, whose length is parallel to the axis of said shaft K^3. On the shaft K^3 (E^2 K^3) slides a sleeve M^3. The latter engages and slides on the spline M^5, and is thereby compelled to rotate with the shaft. The sleeve M^3 has on its left end one half, M^2, of the clutch. On its right-hand end is a projecting ring M^7, for moving the clutch M^2 to the left. On the right-hand end of the gear K^2 or its hub is the other half, M, of the clutch. A projection M^6 on the right-hand end of the spline prevents the sleeve M^3, with clutch-piece M^2, from sliding too far to the right and off the spline.

When the clutch-piece M^2 is slid to the right, the gear K^2 is disengaged therefrom and from the shaft K^3 and turns loosely thereon. When the clutch-piece M^2 is moved to the left and into engagement with its complementary clutch-piece M, the gear K^2 is in engagement with the shaft K^3. Then the shaft K^3 (the lead-screw shaft) is turned by the gear.

In the lower portion of the double journal-box piece L rotates an end portion of the feed-rod K^5. A bushing K^6 is fixed within the piece L and surrounds the rod K^5. The rod K^5 rotates within the bushing and is prevented from slipping lengthwise out of place by means of a ring K^8 on the rod at one end of the bushing and a set-ring K^9 on the rod at the other end of the bushing, the rings being fixed on the rod by means of set-screws K^{10}, substantially as shown.

On the feed-shaft, to the right of the set-ring K^9, is a gear K^4, having a hub N, provided with a right-hand end annular flange or projection N^4 for sliding the gear K^4 on the feed-shaft K^5 to the right or left, as occasion may require.

Fixed to the rod K^5 is a spline or feather N^3, and the hub of the gear K^4 engages this feather. Thus the gear K^4 is compelled to

turn with the rod K^5. A projection N^2 at the right-hand end of the feather limits the movement of the gear to the right.

Below the double journal-piece L is a swinging journal-box piece L^3, having end pieces L^2 L^2, whereby the journal-box piece L^3 is pivotally swung on the rod K^5, or rather on the bushing K^6 of the latter, as shown. As the pieces L^2 L^2 closely embrace the box L^3 between them the box-piece L^3 is held firmly from slipping laterally—viz., in the direction of the length of the rod K^5.

The box-piece L^3 carries a shaft K^7 rotatable therein. At the left this shaft carries a cone-pulley P, fixed thereto. On the right-hand end of the shaft is fixed the gear K^{12}. This shaft K^7 is prevented from slipping toward the left by means of the bushing K^6 and is prevented from slipping toward the right by means of collar K^{13}. The right-hand point L^2 is split and the split portion L^9 secured together by a set-screw L^4. Thus by tightening the set-screw L^4 the split portions are approximated and are caused to tightly embrace the bushing K^6 and thus hold the box-piece L^3 at a desired angle in relation to the rod K^5. Such setting operates to tighten the belt running from cone-pulley P to cone-pulley H.

The speed of rotation of the feed-rod, and consequently the rapidity of movement of the feed, will be governed by the interchangeable gears G, G^2, and J^5.

Where the gear G is exchanged for gear G^2 the speed of the system J J^3 J^5 will be increased, and by a proper exchange of gears for gear J^5 the speed of this system will be increased. Likewise by an inverse arrangement the speed of this system will be diminished. Thus the speed of rotation of the cross-feed shaft K^5 can be increased or diminished at will.

These last-described portions of our invention are as follows: To operate the lead-screw shaft K^3 by means of the gears, we cause the clutch-piece M^2 to engage clutch M, and the lead-screw shaft will be operated. The feed-shaft is operated by the pulley-feed when gear K^4 is at the left and in engagement with pinion K^{12}. When the gear K^4 is moved to the right out of engagement with pinion K^{12} and into engagement with gear K^2 and the clutch M^2 is to the right and disengaged, the feed-shaft is rotated by the gears. When the pulley-gear is used, the gear K^4 is out of engagement with the gear K^2. One of the functions of the lead-screw shaft when revolving is well known. That function is to move or feed forward the screw-thread cutter or cutters in chasing (feeding) threads on the rod presented to be operated upon. The function of the lead-screw is to impart motion to the lathe-carriage for any desirable purpose connected with lathework where the carriage requires to be fed forward at certain definite speeds.

It will be perceived that while gear K^4 is in engagement with the gear K^2 it is out of engagement with the gear K^{12}. Consequently there can be no breakage of parts caused by the pulleys operating the gear K^4 at a given speed while the gear K^{12}, driven by the pulleys on cones H and P, move at a different rate of speed or in an opposite direction. Thus there is no necessity of throwing off the belt when changing from a belt to a geared feed. Where the lead-screw shaft K^3 is to rotate at a different speed, gear J^5 is to be exchanged for gear of a different diameter. To get a belt-feed, the gear K^4 is moved to the left and into engagement with the gear K^{12} and will then be rotated by the latter through the agency of the cone-pulleys H and P, and the rate of speed of the feed-rod K^5 will depend upon the location of the belt on the two cone-pulleys H and P. A belt-feed is often preferred under certain well-known conditions.

As to clutch M M^2 it may be further remarked that in chasing threads the clutch-piece M^2 is engaged with piece M, practically making this one piece and revolving shaft K^3. In using geared feed—that is to say, in employing the gear to rotate the feed-rod K^5 (without rotating shaft K^3)—the gear K^2 revolves loosely on shaft K^3, the clutch-piece M^2 being disengaged from clutch-piece M, and the gear K^4 is moved over to the right and into engagement with the pinion K^{12}.

Another feature of our invention relates to the construction whereby the jaws serving to steady the work while being operated on are supported.

R R are the jaws, each having a runway R^2 and a sliding jaw R^3 thereon and a cap R^4.

A screw-bolt passing through all and screwed into the support S secures these parts in place. The sliding jaw R^3 has a central slot R^5, with a stop secured to the runway to limit the movement of the jaw. The support S of the jaws is of a novel form, and its arrangement on the sliding cross-slide or carriage T is novel. The support S consists of an upper portion or plate S^2, to which the jaws R are attached, and a lower portion consisting of an arch S^3. At each end of the arch straight supporting-pieces S^4 are placed. The lower support S^3 S^4 of the arch spans the narrow portion of the bed T^2 of the carriage T. One of the supports S^4 is bolted to one side of the neck of this carriage T and the other support S^4 is bolted to the other side of the neck of the carriage-bed, all substantially as shown in Figs. 4 and 5. Beneath the arch S^4 slides the cross-slide carriage T^2 on the slide or guide, the latter being preferably of a dovetail form, as shown, and interfitting the corresponding recess of the carriage T^2. This carriage has a transverse groove T^3. To a suitable piece sliding in said groove T^3 and set by a set-screw is connected a tool-post T^4, which carries a tool, as T^5, capable of operating on the article to be worked. A set-screw T^6 sets the tool at a proper point in the post so that the tool can do its work on the article to be fashioned, shaped, cut, bored, &c. In the present instance a rod T^7 is shown

being turned by the tool, while the steadying-jaws hold the article (rod) steady and in place. The cross-slide carriage T^2 is moved along the slide and is set by suitable and well-known means—*e. g.*, by a screw, &c. (Not shown, because well understood.) This arrangement and construction afford a strong and perfectly rigid "steady-rest," thereby insuring accurate work.

The construction of the arch is such as to allow the cross-slide carriage T^2 to slide beneath it and allow the tool to be brought into action in the same vertical plane in which the steadying-jaws are located. The steadying-jaws are therefore of the greatest possible service in preventing the vibration of the article operated on at the very locality where the tool in working causes the most flexion or vibration of the article which is being fashioned, &c., and by steadying the latter article best enables the tool to do the best work.

The remaining feature of our invention relates to a graduation of the tail-stock slide, whereby great accuracy in the setting of the slide for a repetition of a given class of work is obtained. The construction is as follows: The tail-stock bed V carries the usual slide V^2, on which the superstructure of the tail-stock is supported. The rear faces of the slide V^2 and bed V in the vicinity of each other and where they meet are graduated in fractions of an inch. The relative position of the parts as to the scale being known while doing a piece of work the parts can be readily and accurately reset when a like piece of work is to be performed.

What we claim as new and of our invention, and desire to secure by Letters Patent, is—

1. In a lathe, the combination of the gear K^2, mounted loosely on shaft K^3, operating the lead-screw, and clutch M, M^2, and sleeve, and feather with stop M^7, interconnecting the gear K^2, with shaft K^3, and the gear K on shaft I^2, and interchangeable gears in turn operated by the gear on spindle-shaft C, and gear K^4, shaft K^5 on which gear K^4 is arranged to slide with the length of said shaft, gear K^{12} on shaft K^7 and located at one side of gear K^2, and cone-pulley P on shaft K^7, and cone-pulley H on spindle C for enabling the speed of the feed to be varied, substantially as and for the purposes specified.

2. The combination, in a lathe, of the shaft K^3 operating the lead-screw shaft, gear K^2 thereon, clutch thereof sliding on said shaft and capable of engagement with the gear K^2, the latter meshing with gear K, connected to the spindle C by interchangeable intermediate gear, and the feed-rod K^5, carrying the gear K^4, sliding thereon, and capable of being brought into mesh with gear K^2, gear K^{12} in mesh with the gear K^4 when the latter is out of mesh with gear K^2, shaft K^7 thereof and cone-pulley P thereon, and cone-pulley H on spindle C, substantially as and for the purposes specified.

3. In a lathe, the spindle, cone-pulley H thereon, shaft K^7, cone-pulley P and gear K^{12} thereon, swinging support L^2, L^2, L^3, the shaft K^7 journaled in the swinging support L^2, L^2, L^3, and feed-rod K^5, forming the pivotal support of the swinging support L^2, L^2, L^3, substantially as and for the purposes specified.

4. The combination, in a lathe, of the lead-screw shaft K^3 operated by the gear K^2 thereon, clutch thereof sliding on said shaft and capable of engagement with the gear K^2, the latter meshing with gear K, connected to the spindle C by interchangeable intermediate gear, and the feed-rod K^5, carrying the gear K^4, sliding thereon and capable of being brought into mesh with gear K^2, gear K^{12} in mesh with the gear K^4 when the latter is out of mesh with gear K^2, shaft K^7 thereof and cone-pulley P thereon, and cone-pulley H on spindle C, and the swinging support L^2, L^2, L^3, in which shaft K^7 is journaled, and which is pivoted on shaft K^7, substantially as and for the purposes specified.

5. The combination, in a lathe, of the lead-screw shaft K^3 operating the gear K^2 thereon, clutch thereof sliding on said shaft and capable of engagement with the gear K^2, the latter meshing with gear K, connected to the spindle C by interchangeable intermediate gear, and the feed-rod K^5, carrying the gear K^4, sliding thereon and capable of being brought into mesh with gear K^2, gear K^{12} in mesh with the gear K^4 when the latter is out of mesh with gear K^2, shaft K^7 thereof and cone-pulley P thereon, and cone-pulley H on spindle C, and the swinging support L^2, L^2, L^3, in which shaft K^7 is journaled, and which is pivoted on shaft K^5, and the support L fixed to the bed A^2, and having a journal-bearing for the shafts K^3 and K^5, substantially as and for the purposes specified.

6. The combination of gear K^2, and gearing for operating the same, and journal-box piece L, and shaft K^3 therein and intermediate bushing W^3 having annular enlargement L^6, set-ring L^7, L^8, at one end of the shaft K^3, and ring L^5 at the other end of the journal-box piece L, enlarged portion EK^3 of shaft K^3, next to the ring L^5, the gear K^2 having the hub HK^2, and the clutch-piece M, enlarged portion E K^3 of shaft K^3 against which the hub of gear K^2 abuts, and clutch-piece M^2, sliding on the shaft K, and feather M^5, M^6, on the shaft, substantially as and for the purposes specified.

7. The combination of gear K^2, and gearing for operating the same, and journal-box piece L, and shaft K^3, therein and intermediate bushing W^3 having annular enlargement L^6, set-ring L^7, L^8, at one end of the shaft K^3, and ring L^5 at the other end of the journal-box piece L, enlarged portion EK^3 of shaft K^3, next to the ring L^5, the gear K^2 having the hub HK^2, and the clutch-piece M, enlarged portion E^2, K^3 of shaft K^3, against which the hub of gear K^2 abuts, and clutch-piece M^2 sliding on the shaft K, and feather M^5, M^6 on

the shaft, and feed-rod K^5 in the journal-box piece L and bushing K^6 surrounding the rod K^5 therein, set-ring K^8, K^{10}, at end of the shaft, and set-ring K^9, K^{10}, at the other end of the bushing, and gear K^4, sliding on rod K^5, and feather N^3, N^3, substantially as and for the purposes specified.

8. The combination of gear K^2, and gearing for operating the same, and journal-box piece L, and shaft K^3 therein, and intermediate bushing W^3 having annular enlargement L^6, set-ring L^7, L^8, at one end of the shaft K^3, and ring L^5 at the other end of the journal-box piece L, enlarged portion EK^3 of shaft K^3 next to the ring L^5, the gear K^2 having the hub HK^2, and the clutch-piece M, enlarged portion E^2, K^3 of shaft K^3, against which the hub of gear K^2 abuts, and clutch-piece M^2 sliding on the shaft K^3, and feather M^5, M^6 on the shaft, and feed-rod K^5 in the journal-box piece L and bushing K^6 surrounding the rod K^5 therein, set-ring K^8, K^{10} at end of the shaft, and set-ring K^9, K^{10} at the other end of the bushing, and gear K^4 sliding on rod K^5, and feather N^3, N^2, and link-piece L^3 having link-eyes L^2, L^2, respectively embracing the bushing K^6 at the adjacent ends of the journal-box piece, and capable of being tightened thereon, and shaft K^7, in the part L^3 and gear K^{12} thereon, and pulley-cone P, pulley-cone H on spindle C, substantially as and for the purposes specified.

9. The combination of lead-screw shaft K^3, gear K^2 and clutch M, M^2 thereon, journal-box piece L, feed-rod K^5 in journal-box, bushing K^6 therein and around the shaft K^5 and its feather on rod K^5, oscillatory piece L^2, shaft K^7 therein carrying cone-pulley P for use in connection with a complementary cone-pulley, and gear K^{12} capable of engagement with gear K^4, and the eyes L^2, L^2, embracing the bushing, and capable of being tightened thereon, substantially as and for the purposes specified.

10. In a lathe, the combination of the steadying-jaws, and the carriage, and the arch for supporting the superstructure to which the jaws are attached, and having legs S^4 respectively connected to the narrow neck of the carriage, between the V-ways of the lathe, and the cross-sliding carriage T^2, and its guideway located on the main carriage, transversely thereto and extending between the legs S^4 and under the arch S^3, the cross-sliding carriage being adapted to slide beneath the arch and between the legs S^4, substantially as and for the purposes specified.

11. In a lathe, the combination of the work-steadying jaws, an arch for supporting the jaws, and having legs connecting the arch to the carriage, and the cross-sliding carriage T^2 carrying the tool and sliding beneath the arch, and carrying the tool-post, substantially as and for the purposes specified.

12. In a feed mechanism for lathes, the combination of the lead-screw shaft, feed-rod, and cone-pulley shaft K^7, stationary mounting for the lead-screw shaft and feed-rod, and swinging bearing L^3 of said cone-pulley shaft K^7, and the pinions K^2 and K^4, respectively on the lead-screw shaft and feed-rod, and the pinion K^{12} on shaft K^7, substantially as and for the purposes specified.

13. In a feed mechanism for lathes, the combination of the lead-screw shaft, feed-rod and cone-pulley shaft K^7, stationary mounting for the lead-screw shaft and feed-rod, and swinging bearing L^3 of said cone-pulley shaft K^7, and the pinion K^2 and clutch of lead-screw shaft, and pinion K^4 splined on the feed-rod, and pinion K^{12} fixed on the cone-pulley shaft, substantially as and for the purposes specified.

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Attest:
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