

(No Model.)

3 Sheets—Sheet 1.

P. & W. SHELLENBACK. ENGINE LATHE.

No. 468,183.

Patented Feb. 2, 1892.

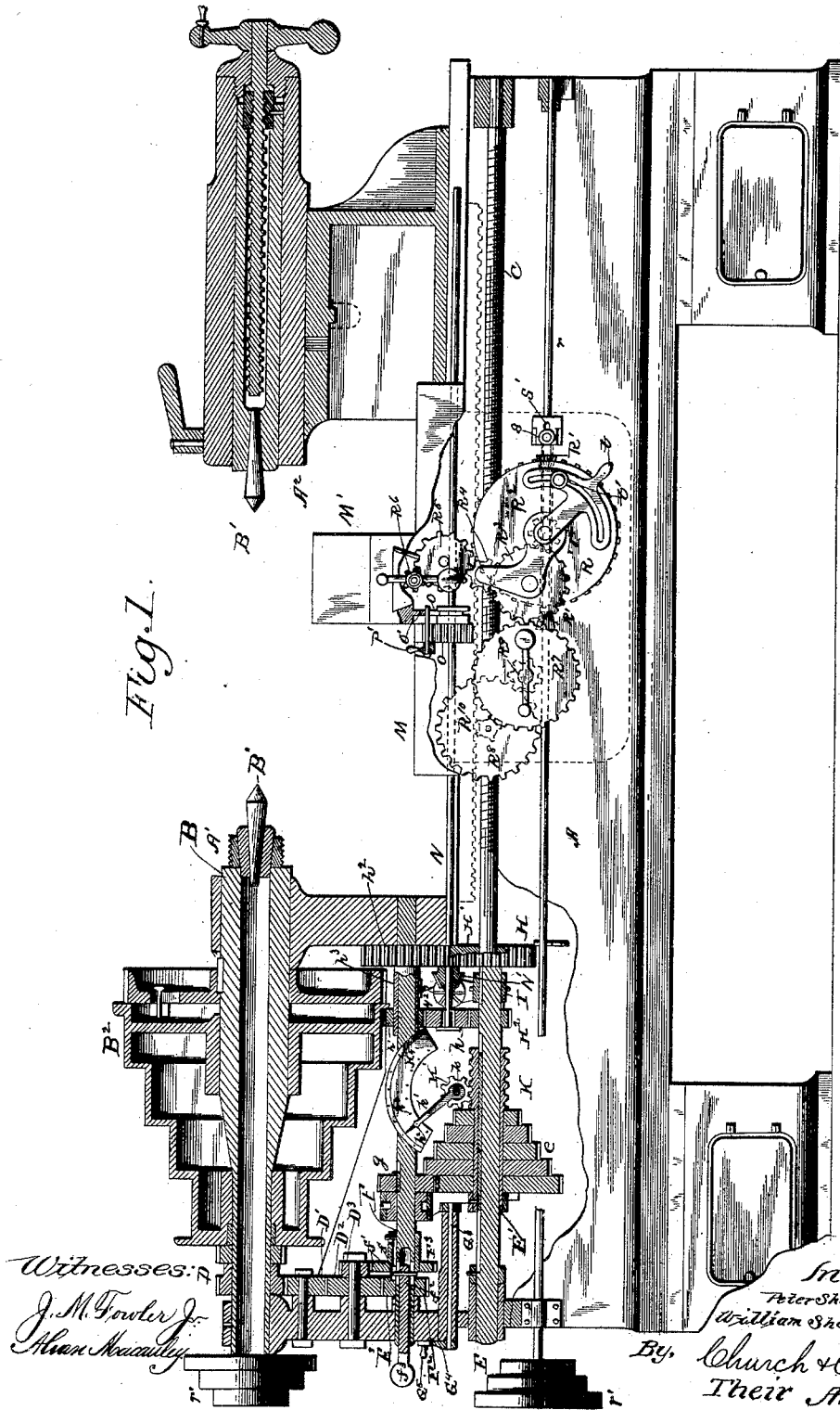


Fig. 1.

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(No Model.)

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Fig. 2.

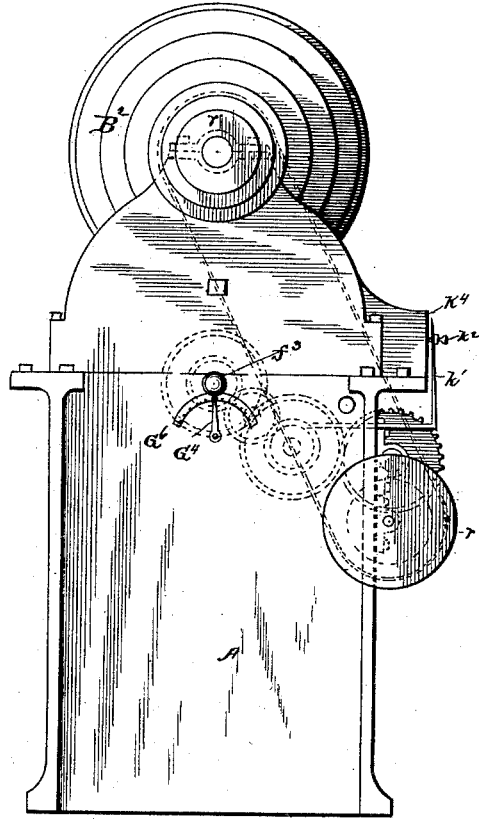


Fig. 3.

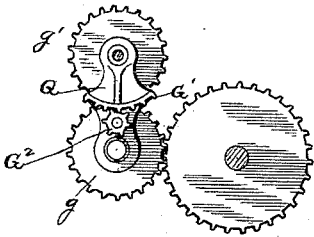
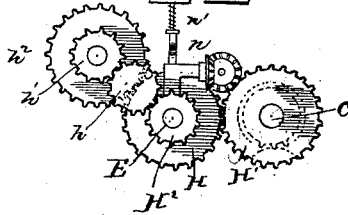


Fig. 4.



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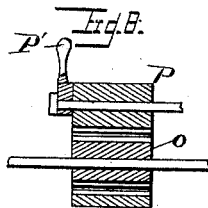
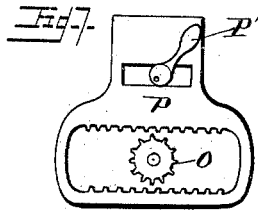
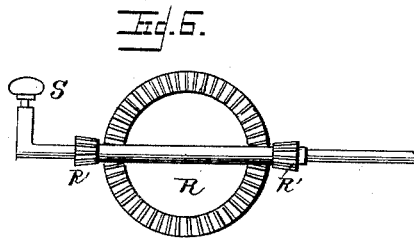
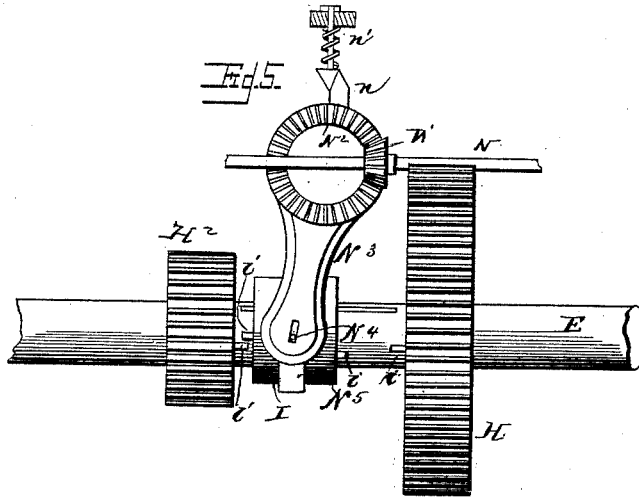
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3 Sheets—Sheet 3.

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ENGINE-LATHE.

SPECIFICATION forming part of Letters Patent No. 468,183, dated February 2, 1892.

Application filed September 12, 1891. Serial No. 405,536. (No model.)

To all whom it may concern:

Be it known that we, PETER SHELLBACK and WILLIAM SHELLBACK, both of Richmond, in the county of Wayne and State of Indiana, have invented certain new and useful Improvements in Engine-Lathes; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in engine-lathes, and has for its object to provide a simple easily-operated lathe in which the adjustments for cutting screw-threads of different pitch may be quickly made without removing and substituting different gears, a further object being to provide an improved automatic feeding mechanism for the carriage and slides and tool-stock, whereby the carriage may be fed quickly from one end to the other of the bed or given the proper feed to cut screws of any pitch in either direction, a further object being to control the feed of the main carriage or lower slide automatically by the transverse movement of the upper slide and tool-stock, whereby when the tool is in one position the feed is in one direction and when the tool is in another position the feed is in the opposite direction, enabling the carriage to be returned to the starting-point by the simple withdrawal of the tool from the work.

The invention consists in certain novel details of construction and combinations and arrangements of parts to be hereinafter described, and pointed out particularly in the appended claims.

In the accompanying drawings, Figure 1 is a longitudinal vertical section on an irregular line, with parts broken away to show the underlying mechanism more clearly. Fig. 2 is an end elevation of the lathe. Fig. 3 is a sectional detail showing the connection between the cone-gears and driving train. Fig. 4 is a detail section showing the reversing-gear for the feed-screw. Fig. 5 is an enlarged detail elevation of the clutch in the reversing-gear. Fig. 6 is a rear view of the reversing mechanism in the apron-gearing. Figs. 7 and 3

are details of the connection between the upper slide and screw-feed-reversing mechanism.

Similar letters of reference in the several figures indicate the same parts.

The bed or main frame A of the machine, together with the head-stock A', tail-stock A², spindle B, and dead-center B', together with the cone-pulley B², to which the driving-belt is applied, are all of ordinary construction and need no particular description further than to say that the castings for the stationary parts are preferably made hollow for the sake of lightness as well as to provide room for the main portion of the gearing.

The usual feed-screw C is journaled in bearings immediately in front of the bed upon which the carriage travels and is rotated to feed said carriage in either direction and at varying speeds to form screws of different pitch by mechanism to be now described.

On the outer end of the spindle is mounted a gear-wheel D, which, through an idler D', communicates its motion to a gear D², having, for illustration, forty teeth, and rigidly connected to a smaller gear D³, having, for illustration, twenty teeth. Below the gear D² D³ is a shaft F, having gears F² F³ mounted loosely thereon and meshing with the corresponding gears D² D³, said gears F² F³ having, respectively, twenty and forty teeth in the machine shown. A clutch on the shaft is adapted to connect either one or the other of said last-mentioned gears rigidly to the shaft and impart thereto a rotation of different speed. Thus when the gear F³ is connected with the shaft it will rotate just one-half as fast as when the gear F² is connected therewith, it being understood, of course, that the speed of the spindle remains the same in both instances.

The form of the clutch just mentioned is immaterial; but we prefer to employ a simple pin *f*, working through a slot in the shaft and co-operating with slots *f'* in the gear, the pin itself being mounted in the end of a rod *f*², working in a longitudinal opening in the shaft F and having a knob *f*³ projecting from the end of the head-stock and adapted to be grasped and moved by the operator.

Below the shaft F is journaled a shaft E of

corresponding length and lying parallel thereto, which shaft carries what we shall herein term a "cone," the same consisting of a series or pile of gear-wheels e , of varying size, mounted rigidly on a sleeve E' , adapted to slide longitudinally of the shaft E , but connected thereto for rotation by means of a spline and groove. Any one of the gears of this cone is adapted to mesh with a gear-wheel g , journaled in the end of an arm G and in turn meshing with a gear g' , rigidly connected to the shaft F . (See Fig. 3.) The arm G is hung on the shaft F and may be swung toward and from the cone to bring the gear g into mesh with any one of the gear-wheels e , composing the same, and in the preferred form this arm is provided with a segmental rack G' , with which a pinion G^2 on the end of a shaft G^3 meshes. The bearing for this shaft is of relatively great length, and on the outer end of the shaft is provided with an operating arm or handle G^4 , which also serves as a pointer to indicate the position of the gear g . This pointer is provided with a spring-pin G^5 , adapted to co-operate with any one of a series of holes G^6 to secure the pin g rigidly in adjusted position.

The shaft E is geared directly with the screw-feed shaft C by means of the gears H H' (see Fig. 4) when the screw is turned in one direction; but for the purpose of feeding the screw in the opposite direction the gears H H^2 are loosely mounted upon the shaft E and are connected by a train of gearing comprising the idler h and gears h' h^2 , rigidly mounted on a sleeve h^3 , journaled on the shaft F , by which arrangement, when the gear h^2 is connected with the shaft E by means of a clutch to be presently described, the direction of rotation of the gear H , and consequently that of the feed-screw, is reversed.

The clutch employed consists, preferably, of a simple collar I , connected with the shaft E by a spline and groove and having on opposite sides pins i , adapted to contact with corresponding pins i' on one or the other of gears H H^2 . (See Fig. 5.) The sleeve E' , upon which the cone is mounted, is extended and formed into a rack K , the teeth of which pass entirely around the sleeve, and while limiting its longitudinal movement permit of its free rotation. Meshing with the rack K is a pinion K' on a transverse shaft k , carrying a pointer k' with a spring-pin k^2 , adapted to hold the cone in adjusted position by co-operation with one of a series of holes k^3 in the bottom of a gage-plate k^4 on the front of the head-stock. The gage-plate is provided with a double series of indices, one series of which indicates the number of threads cut when the shaft F and feed-screw are driven at one speed and the other the number of threads when said parts are driven at the other speed, as will be readily understood by those skilled in the art.

The carriage lettered M in the drawings slides on the usual ways on the lathe-bed, and

it is provided with an upper slide M' , moving transversely thereto for carrying the tool-stock and tool, which may thus be caused to assume any desired position with relation to the work held between the centers.

In many kinds of work it is desirable that the carriage should move in one direction while the tool is cutting, and when the tool is withdrawn from the work it should return to the starting-point to enable the tool to make a fresh cut, and in order to accomplish this we provide a mechanism moved by the upper slide, which controls the movement of the clutch I . Thus when the slide is moved out the clutch is thrown into co-operation with one or the other of the gear-wheels H H^2 and when the slide is moved in it is thrown into engagement with the other of said wheels.

Just within the lathe-bed is journaled a small shaft N , preferably square in cross-section and carrying at one end a beveled gear N' , meshing with a corresponding gear N^2 , pivoted on a bridge or hanger (not shown) and having arms N^3 engaging pins N^4 on a collar N^5 , surrounding the clutch-collar I . At the top or at a convenient point the gear N^2 is provided with a retainer n , which, co-operating with a spring-pressed block n' , keeps the clutch in its adjustment and in engagement with one or the other of the gears before mentioned. The shaft N , it will be now understood, is adapted to be turned in one direction or the other by the movement of the upper slide, which result may be accomplished in a variety of ways; but we prefer to mount a pinion O on the shaft and connect it to move longitudinally with the carriage by means of a groove o , into which a projection, such as O' , on the carriage or slide projects. With this pinion a rack-bar P , moving with the upper slide meshes, and in the preferred construction this rack-bar is made double and adapted to engage the pinion at top or bottom and turn it in one direction or the other, as the case may be. The rack-bar is held in vertical guides of any kind and is moved by the cam P' , turned by the operator, and holds the rack-bar in engagement on either side of the pinion or at an intermediate point when the pinion is entirely out of engagement, and the movement of the slide does not affect the direction of movement of the carriage at all.

Provision is made for running the carriage rapidly from end to end of the bed when disconnected from the feed-screw, as well as to feed the slide automatically by means of the apron-gearing, as follows: On the apron of the carriage is journaled a relatively large bevel gear-wheel R , which is driven by the feed-shaft r , belted to the spindle by the belt and cone pulleys r' r' at the end and having a pair of bevel-pinions R' mounted on a sleeve sliding thereon, the shaft being squared or provided with a feather and splined to prevent the independent rotation of the pinions. The pinions R' are separated far

enough to stand out of mesh with the gear R when at an intermediate point; but either one may be thrown into engagement therewith by loosening the knurl S, connected to the sleeve, and moving it along in its slot S' in the apron, thus enabling the direction of rotation of the wheel R to be changed at will. On the gear-wheel R is mounted a pinion R², and journaled on the same center is a bell-crank T, having an operating-handle *t* and segment *t'*, with which a set-screw co-operates to clamp the same in adjusted position. This bell-crank at the bend carries a gear-wheel R³, meshing with the pinion R², and at the end carries a pinion R⁴, meshing with gear-wheel R³ and adapted to mesh with gear-wheel R⁵, which in turn meshes with pinion R⁶ on the feed-screw for the upper slide. This enables the slide to be automatically fed in either direction, when desired, and to feed the carriage quickly a gear R⁷ is provided, adapted to be engaged by either the wheel R³ or pinion R⁴, according to the position of the bell-crank and direction of feed desired, and the gear-wheel is in train with the gear-wheel R⁵ through the medium of the pinion R⁶. (Shown in dotted lines, Fig. 1.) The wheel R⁸ carries a pinion R¹⁰, which meshes with the rack V on the lathe-bed.

The gears may be thrown into action, when desired, to feed the carriage in either direction at a more rapid rate than the screw-feed, and, as is usual in this class of lathes, the screw-feed is thrown out before the apron-gear for feeding the carriage is thrown into gear.

In operation the lathe is extremely simple, and to cut screws of different pitch the operator simply throws the cone or movable gear into proper relative position, which position is indicated exactly by the pointer and scale, and the proper speed connection is made by shifting the clutch *f*. This throws the screw-feed into operative connection with the power-train, and the carriage is caused to travel along the way in one direction or the other, according to the position of the feed-screw-reversing mechanism. Assuming that the carriage is traveling away from the head-stock and the rack on the upper slide in mesh with the pinion on the clutch-operating shaft, when the said slide is moved out or in, according to which part of the rack is in engagement, it will reverse the position of the clutch and cause the screw to turn in the opposite direction. When it is desired to move the upper slide automatically, the apron-gear is brought into use and the bell-crank shifted to bring pinion R⁴ into gear with the gear-wheel R⁵, and when the carriage is to be fed quickly the connection is made with the gears R⁷ R⁸, which operate in the well-known manner in connection with the rack-bar.

Having thus described our invention, what we claim as new is—

1. In an engine-lathe, the combination, with

the bed, head-stock, spindle, carriage, and feed-screw therefor, of the cone of gear-wheels in train with the feed-screw, the movable gear meshing with any one of the gear-wheels composing the cone, and the variable-speed gearing between the movable gear and spindle, substantially as described.

2. In an engine-lathe, the combination, with the bed, head-stock, spindle, carriage, and feed-screw therefor, of the cone of gear-wheels for driving the screw, the rack and pinion for moving the cone longitudinally, and the movable gear in train with the spindle and adapted to mesh with any one of the gear-wheels constituting the cone, substantially as described.

3. In an engine-lathe, the combination, with the bed, head-stock, spindle, carriage, and feed-screw therefor, of the cone of gear-wheels interposed in the train of gearing between the spindle and feed-screw, the collar upon which said cone is mounted, having the extended end and provided with rack-teeth, and the pinion engaging said rack-teeth to move the cone, substantially as described.

4. In a lathe, the combination, with the bed, spindle, feed-screw, carriage, and train of gearing interposed between the feed-screw and spindle, of the cone and gearing interposed in said train, the sleeve upon which said cone is mounted, having its end extended and provided with annular rack-teeth, and the pinion co-operating with said rack-teeth to move said cone, provided with a pointer for indicating the position of the cone, substantially as described.

5. In a lathe, the combination, with the bed, spindle, carriage, feed-screw, and train of gearing interposed between the feed-screw and spindle, of the cone of gears, the movable gear meshing therewith, the arm carrying said movable gear having the rack thereon, the pinion meshing with said rack, and the shaft and handle for turning it to shift the movable gear, substantially as described.

6. In a lathe, the combination, with the spindle, carriage, feed-screw, and train of gearing, substantially as described, of the shaft interposed in the train, the longitudinally-movable cone of gear-wheels mounted on said shaft, the shaft lying parallel thereto, the arm journaled on said shaft and having the segmental rack thereon, the movable gear carried by said arm, and the shaft and pinion co-operating with the rack to move the gear into mesh with any one of the gear-wheels constituting the cone, substantially as described.

7. In a lathe, the combination, with the bed, spindle, carriage, feed-screw, and train of gearing between the feed screw and spindle, of the shaft interposed in said train, the gear-wheels of different sizes, loosely mounted on said shaft, the driven gear-wheels of different sizes, meshing with said last-mentioned wheels, and the clutch for connecting either of said wheels with the shaft, as desired, whereby the speed

of the feed-screw may be varied, substantially as described.

8. In a lathe, the combination, with the bed, spindle, carriage, feed-screw, and train of gearing between the feed-screw and spindle, of the shaft interposed in said train, the gear-wheels of different sizes, loosely mounted on said shaft, the driven gear-wheels of different sizes, meshing with said last-mentioned wheels, the pin passing through the shaft and co-operating with said loose gears to connect either of the same with the shaft, the rod connected with said pin and passing out through a longitudinal opening in the shaft, substantially as described.

9. In a variable-feed mechanism for the feed-screws of engine-lathes, the combination, with the two parallel shafts and the longitudinally-movable cone of gear-wheels mounted on one of said shafts, of the swinging arm journaled on the other shaft, the rack on said arm, the pinion and shaft co-operating with the rack to move the arm, the gear on the shaft on which the arm is journaled, and the gear journaled in the end of the arm and meshing with the cone, substantially as described.

10. In a variable-feed mechanism for engine-lathes, the combination, with the two substantially parallel shafts, the cone of gear-wheels carried by a sleeve on one shaft, the rack formed by an extension of said sleeve, the pinion gearing with said rack, and the pointer and gage-plate for indicating the position of the cone, of the movable arm journaled on the parallel shaft, the gear carried by the arm and meshing with the cone, and the gear on the shaft with the arm meshing with said last-mentioned gear, substantially as described.

11. In an engine-lathe, the combination, with the spindle, feed-screw, and system of gearing for driving said screw, and the carriage having the transversely-moving top slide, of the reversing mechanism interposed in said train and controlled by the top slide, whereby the direction of feed of the carriage is controlled by the transverse movement of said slide, substantially as described.

12. In an engine-lathe, the combination, with the spindle, feed-screw, and system of gearing for driving said screw, and the carriage having the transversely-moving top slide, of the reversing-gearing interposed in said train and the clutch controlling said reversing-gearing, moved by the top slide, substantially as described.

13. In an engine-lathe, the combination, with the spindle, feed-screw, system of gearing for driving said screw, and the carriage having the transversely-moving top slide, of the reversing-gearing interposed in said train, the clutch for said reversing-gear, the clutch-rod extending longitudinally of the bed, the pinion sliding on said rod, and the rack on the top slide, engaging said pinion, substantially as described.

14. In an engine-lathe, the combination, with the spindle, feed-screw, and system of gearing for driving said screw, and the carriage having the transversely-moving top slide, of a reversing-gear for the feed-screw, a rod controlling said gear, running longitudinally of the bed, a pinion sliding on said rod, and a rack on the top slide, meshing with said pinion to reverse the feed when the slide is moved, substantially as described.

15. In an engine-lathe, the combination, with the spindle, feed-screw, system of gearing for driving said screw, and the carriage having the transversely-moving top slide, of a reversing-gear for the feed-screw, a rod controlling said gear, running longitudinally of the bed, a pinion sliding on said rod, and a vertically-movable rack on the top slide, meshing with said pinion to reverse the feed when the slide is moved, substantially as described.

16. In an engine-lathe, the combination, with the spindle, feed-screw, system of gearing for driving said screw, and the carriage having the transversely-moving top slide, of a reversing-gear for the feed-screw, a rod controlling said gear, running longitudinally of the bed, a pinion sliding on said rod, and a two-part vertically-movable rack lying above and below said pinion and carried by the upper slide, whereby the pinion may be moved in either direction by the movement of the slide in either direction, substantially as described.

17. In a feed-screw-driving mechanism for engine-lathes, the combination, with the driven shaft carrying the two gears loosely mounted thereon and the gear connecting said loose gears for reversing the rotation of the same, of the clutch-collar keyed to the shaft, the shifter for moving said collar, and the rod for moving said shifter, running longitudinally of the bed, substantially as described.

18. In an apron-gear for engine-lathes, the combination, with the carriage having the transversely-movable top slide and the driven shaft running longitudinally of the bed, of the oppositely-arranged beveled pinions sliding on the driven shaft, the gear-wheel meshing with either of said pinions, and movable gearing connecting said gear-wheel and feed-screw for the top slide, substantially as described.

19. In an apron-gear for engine-lathes, the combination, with the carriage and the driven shaft running longitudinally of the bed, of the sleeve on said shaft, the oppositely-arranged pinions on said sleeve, the knurl for shifting said sleeve and pinions with relation to the carriage, and the gear-wheel in the train adapted to mesh with said pinions, substantially as described.

20. In an apron-gear for engine-lathes, the combination, with the carriage, the longitudinal driven shaft, and longitudinal rack, of the pinion on the shaft, the gear meshing therewith, the gear meshing with the rack, and the

gear mounted on a movable support for completing the train between the shaft and rack, substantially as described.

21. In an apron-gear for engine-lathes, the combination, with the carriage, the longitudinal driven shaft, and longitudinal rack, of the pinion on the shaft, the gear meshing therewith, the gear meshing with the rack, the bell-crank, and the intermeshed gears jour-

naled thereon, whereby the train between the shaft and rack is completed, substantially as described.

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