A. W. NEEDHAM.

ENGINE LATHE.

APPLICATION FILED MAR. 9, 1917.

1,258,136.

Patented Mar. 5, 1918

6 SHEETS—SHEET 1.

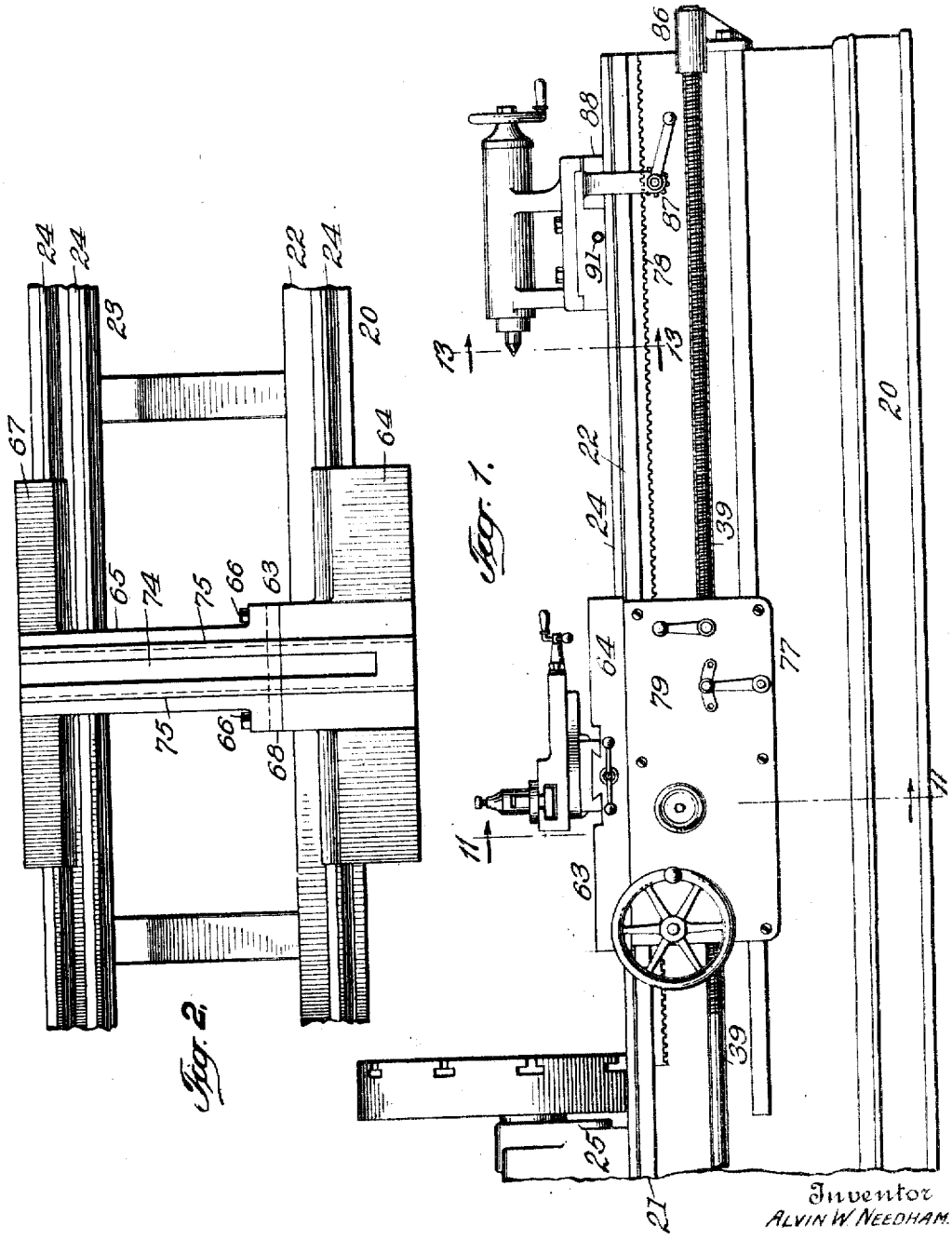

Fig. 1.

Fig. 2.

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By his Attorney

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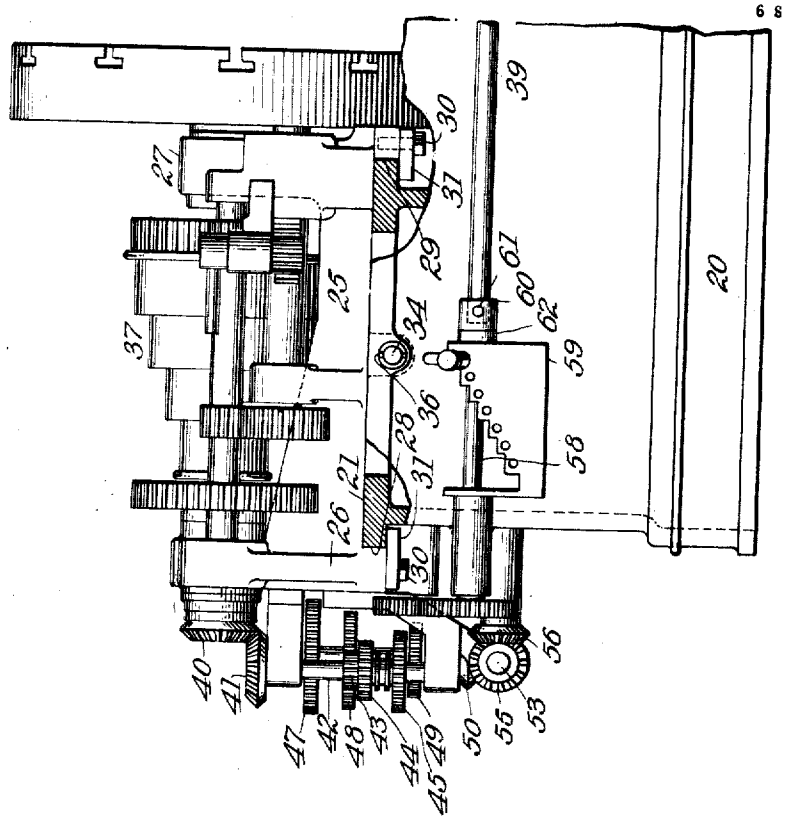

Fig. 3.

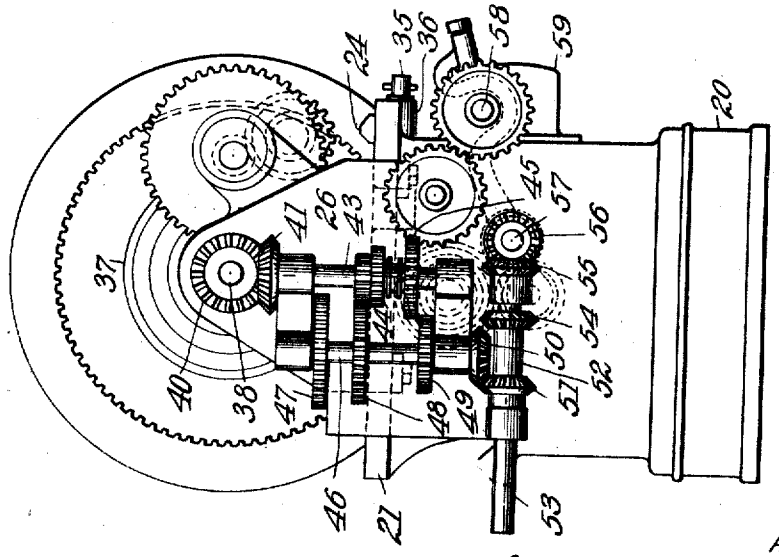

Fig. 4.

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Fig. 5.

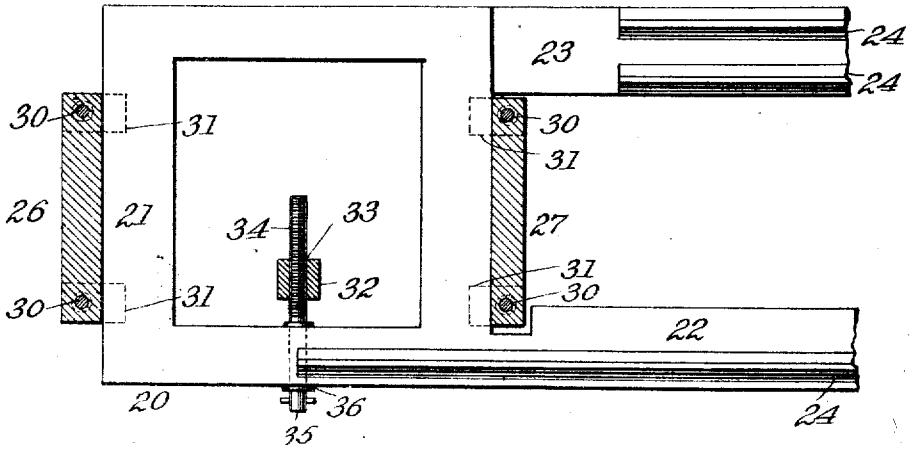


Fig. 6.

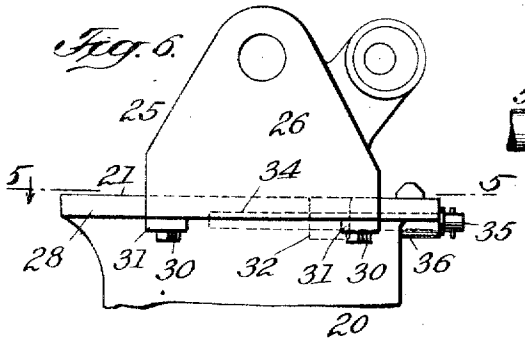


Fig. 7.

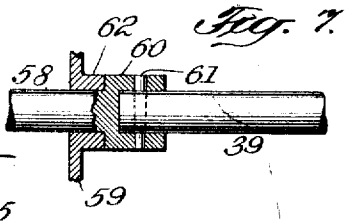
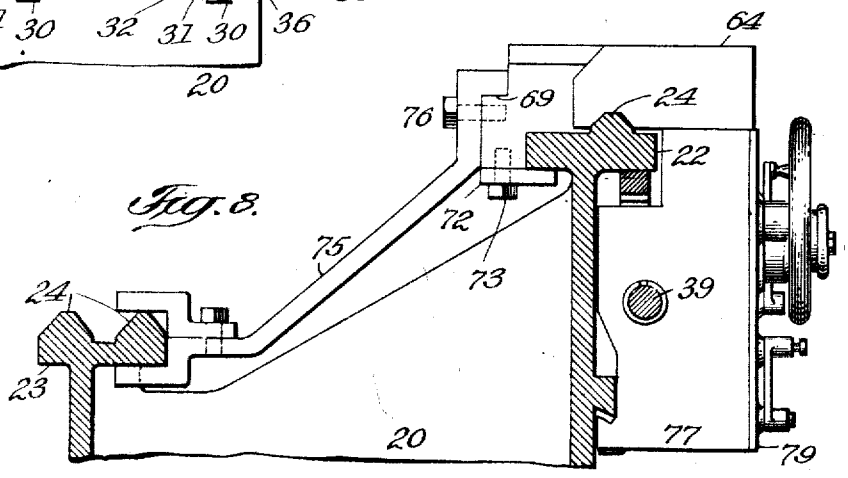


Fig. 8.



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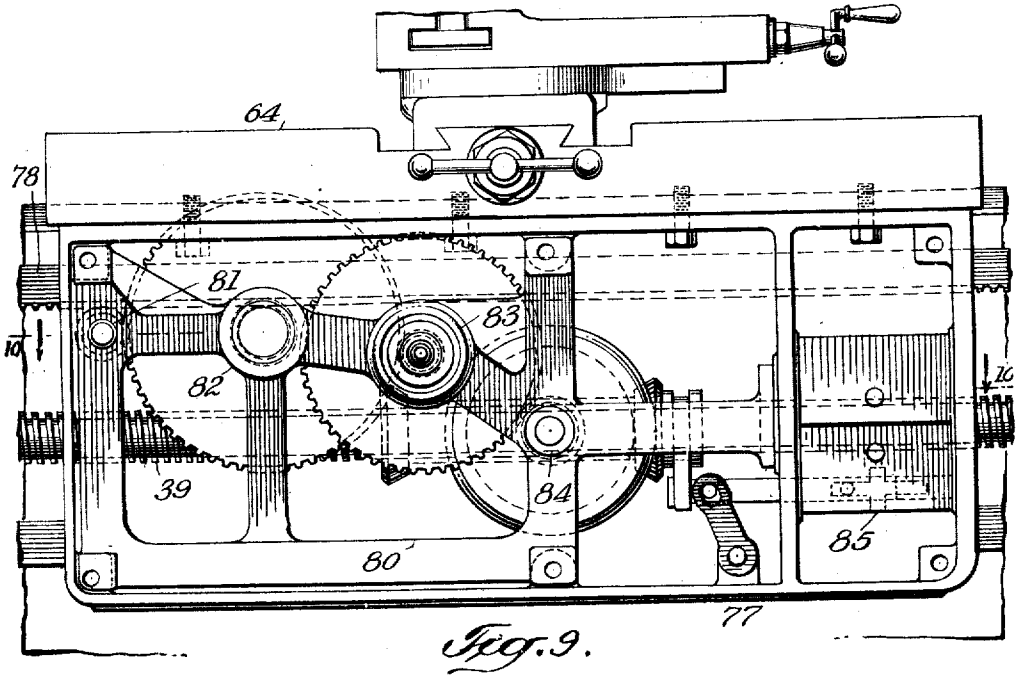
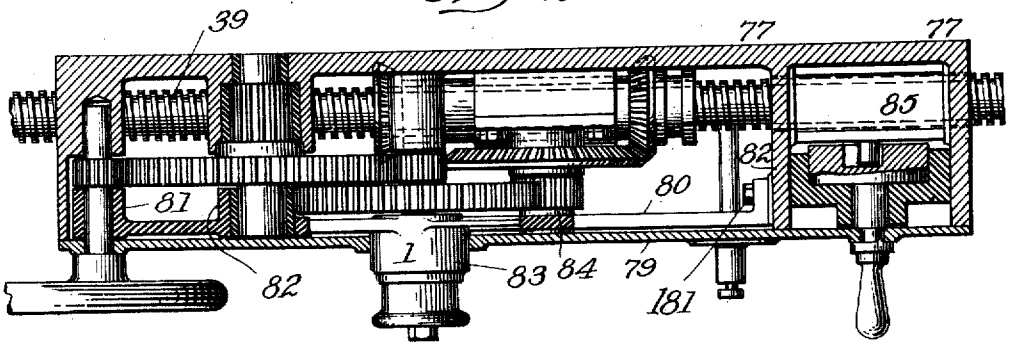


Fig. 9.

Fig. 10.



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6 SHEETS—SHEET 5.

Fig. 12.

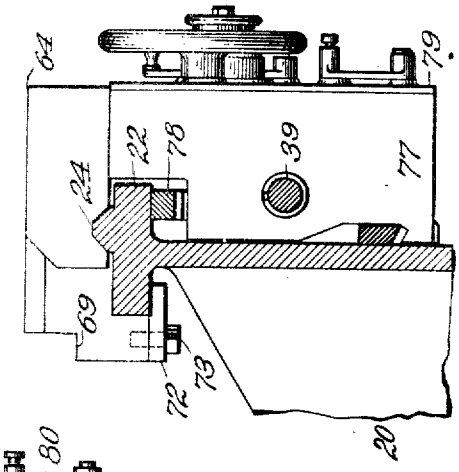
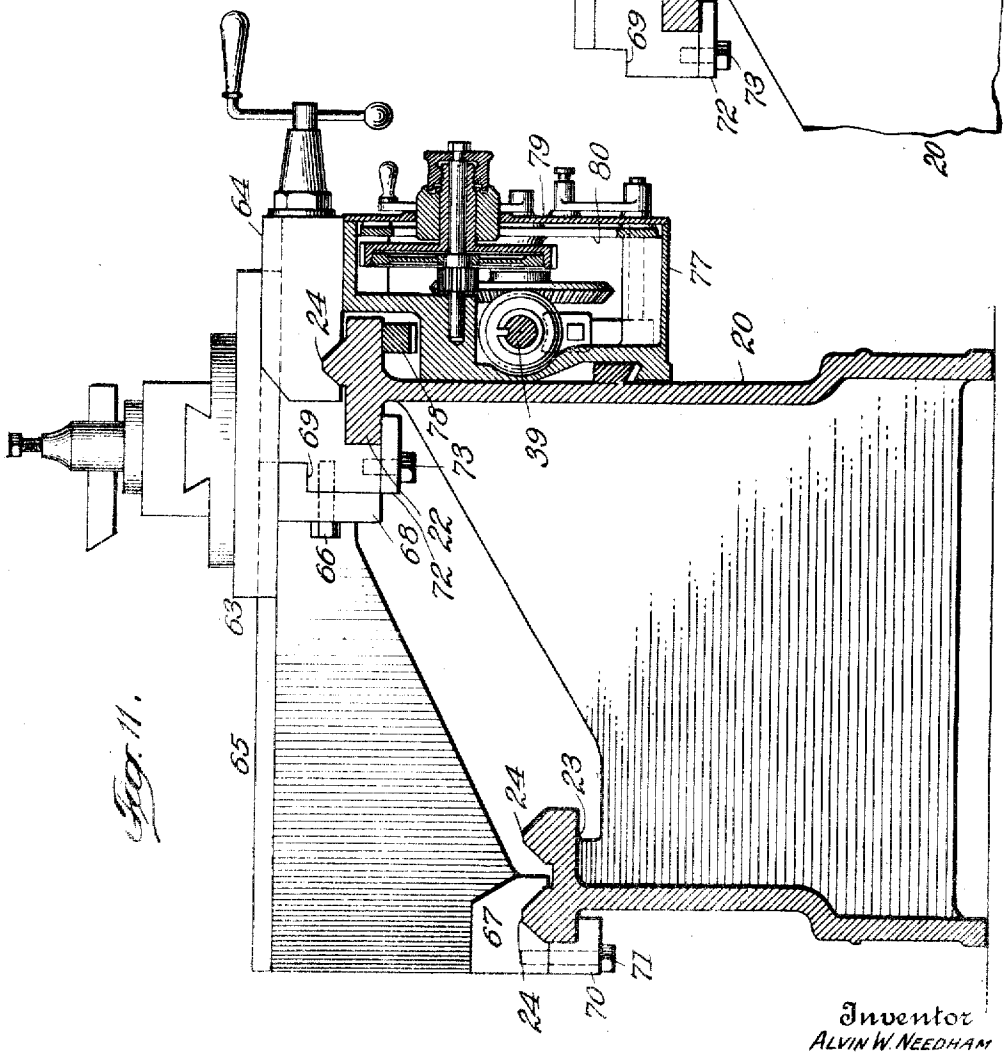


Fig. 11.



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6 SHEETS—SHEET 6.

Fig. 13.

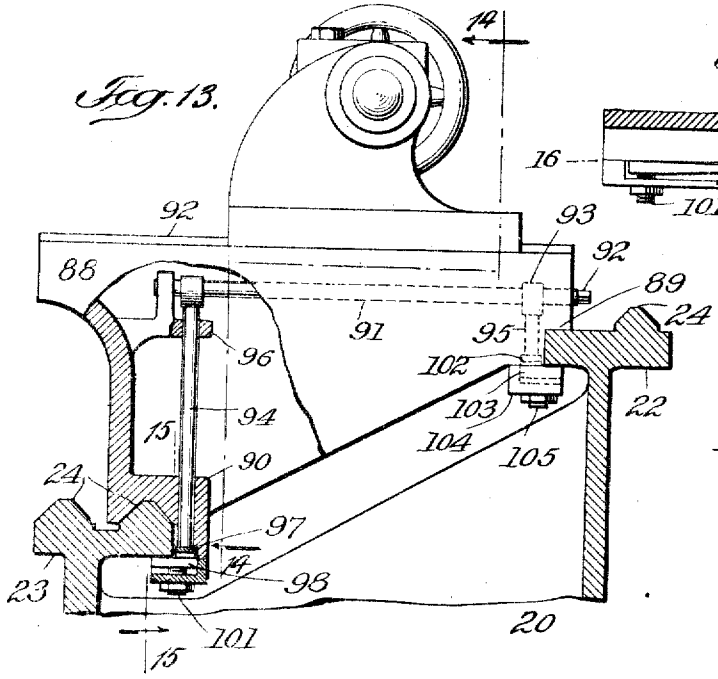


Fig. 15.

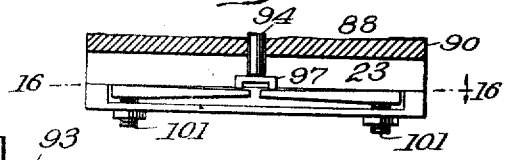
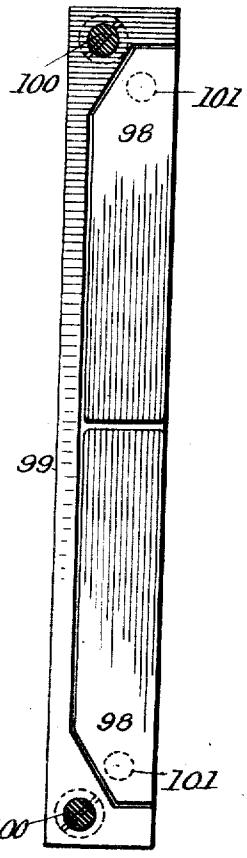


Fig. 16.



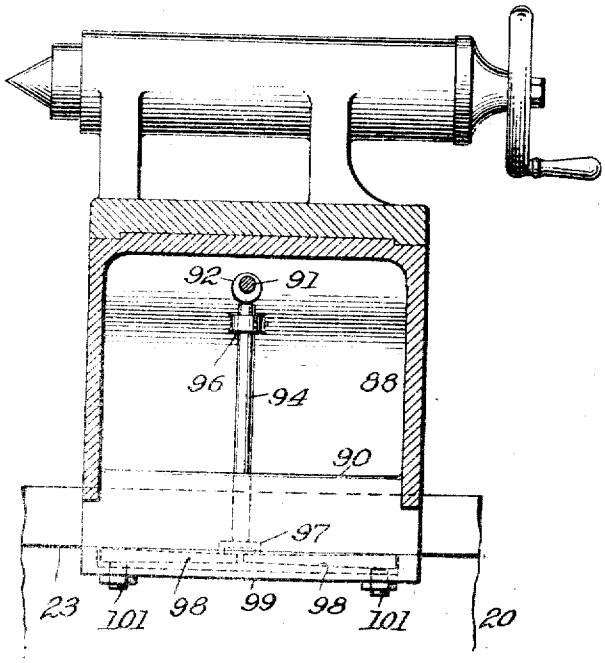


Fig. 14.

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UNITED STATES PATENT OFFICE.

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ENGINE-LATHE.

1,258,136 Specification of Letters Patent. Patented Mar. 5, 1918.

Application filed March 9, 1917. Serial No. 153,592.

To all whom it may concern:

Be it known that I, ALVIN W. NEEDHAM, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Engine-Lathes, of which the following is a specification.

The invention relates to improvements in lathes, and it resides in the novel structure, arrangements and features hereinafter described, and particularly pointed out in the claims.

The objects of the invention are generally to improve the lathe structure, to adapt the lathe for a wider sphere of usefulness, to increase the efficiency of the lathe as a whole, to simplify the gear mechanism having to do with changes of feed and to so construct, arrange and connect up the apron and its gearing and the feed screw that any of this gearing may be removed from the carriage carrying the tool holder without the removal of the lead screw and also so that, if necessary, the lead screw may be removed from the lathe without the enormous amount of work necessary in lathes as heretofore constructed when necessity arises for removing the lead screw fr n the lathe.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which:

Figure 1 is a front elevation, partly broken away, of a lathe embodying the features of my invention;

Fig. 2 is a top view, partly broken away, of the main base frame and the longitudinally slidable carriage or frame mounted thereon for the tool-carrier parts, which are omitted;

Fig. 3 is a front elevation of the head portion of the lathe, partly in section, this figure showing the portion of the lathe not disclosed at the left hand end of Fig. 1 and being on a larger scale than Fig. 1;

Fig. 4 is an end view of the lathe, taken from the left hand end of Fig. 3;

Fig. 5 is a top view, partly in section and partly broken away, of the left hand portion of the main frame of the lathe, with a portion of the head stock shown in section, the section being taken on the dotted line 5—5 of Fig. 6;

Fig. 6 is an end view of a portion of the frame of the machine and illustrates in end elevation a portion of the head stock frame, together with the means for adjusting the same transversely of the main frame;

Fig. 7 is a detached view, partly in section, of a portion of the lead screw or shaft and the coupling member for detachably engaging its left hand end with the drive for said screw;

Fig. 8 is a vertical transverse section, partly broken away, through a portion of the lathe, taken about on the dotted line 11—11 of Fig. 1 and corresponding with Fig. 11 in many respects, with the exception that in Fig. 8 is illustrated a special bracket which is sometimes employed in connection with the front tool carriage when large work is on the lathe, thereby making adequate room for the large swing required for such work;

Fig. 9 is a front elevation of a portion of the lathe, this figure showing more particularly the apron for the gears which are actuated by the lead screw and coact with a rack for moving the tool carriage longitudinally on the main frame, the front cover for said apron being omitted so as to expose the removable frame or spider for the gears;

Fig. 10 is a horizontal section through the same, taken on the dotted line 10—10 of Fig. 9, the cover plate, which was omitted from Fig. 9, being shown in position in Fig. 10;

Fig. 11 is a vertical transverse section through the lathe, taken on the dotted line 11—11 of Fig. 1 and being on a larger scale than Fig. 1;

Fig. 12 is a sectional view through a portion of the lathe and corresponds with a portion of Fig. 11, except that I omit from Fig. 12 the back half of the tool carriage and show that upon the removal of the back half of said carriage the bracket support shown in Fig. 8 may be applied to the carriage;

Fig. 13 is a vertical transverse section, partly broken away, through the lathe, taken on the dotted line 13—13 of Fig. 1, this figure more particularly illustrating the clamping means provided for the tail-stock;

Fig. 14 is a vertical section, partly broken away, taken on the dotted line 14—14 of Fig. 13;

Fig. 15 is a vertical section through a portion of the lathe, partly broken away, taken on the dotted line 15—15 of Fig. 13, and

Fig. 16 is a sectional view, taken on the dotted line 16—16 of Fig. 15, and illustrating in top elevation and on an enlarged scale a portion of the locking or clamping mechanism for the tail stock.

In the drawings, 20 designates the main supporting frame for the working parts of the lathe, and this frame has at its right hand end an upper horizontal support 21 for the head-stock and parts carried thereby, and to the left of said horizontal support 21 the said frame is formed with a front member 22 on about the same horizontal plane as the support 21 and a rear member 23 which is on a materially lower plane than the top of the member 22, as is represented more clearly in Figs. 8 and 13. The front member 22 of the main frame is formed with a longitudinal rail 24, and the rear member 23 is formed on its upper surface with two parallel rails 24, these rails being guiding members for the carriage carrying the tool-holder parts and apron and gearing for said carriage and the tail-stock carriage and parts connected therewith. I will designate the member 22 as the front rail and the member 23 as the rear rail and call attention to the fact that the rear rail 23 is what I term a drop-rail or bed.

Upon the support 21 is mounted the head-stock 25 and parts carried thereby, and this head-stock comprises a main longitudinal body portion having at its ends standards 26, 27, which project beyond or over-hang the outer transverse edges of the support or bed 21 and extend downwardly along said edges to about the lower edges of the flanges 28, 29 formed on said support or bed 21, as clearly illustrated in Figs. 3 and 6. Upon the lower ends of the standards 26, 27 are secured, by suitable bolts 30, small longitudinally arranged plates 31 which extend inwardly toward each other below the aforesaid flanges 28, 29 and therewith and with the adjacent lower inner edge portions of said standards 26, 27 form transverse guides for the head-stock frame 25. The head-stock frame 25 with the parts carried thereby, many of which parts are of standard construction, is adapted for transverse adjustment upon the bed 21 so as to adapt the lathe for work varying in character and size, the lathe made the subject of this application having been constructed mainly for large heavy work. The head-stock frame 25 has projecting downwardly from its lower side an arm 32 (Figs. 5 and 6), which extends into the opening in the bed 21 and has a threaded transverse hole 33 through it to receive an adjusting screw 34 whose head 35 is exposed at the front of the main frame 20 and the outer portion of which screw is mounted in a bearing 36 in said frame which permits the rotation of the screw, but prevents any longitudinal travel thereof, the result being that the screw 34 in coaction with the arm 32 may be utilized to adjust the head-stock frame 25 frontwardly and readwardly or transversely of the lathe, this adjustment of the head stock frame 25, coupled with the fact that the rear rail or bed 23 is below the front rail 22 and below the bed 21, rendering the lathe capable of a wide range of capacity in holding work varying in size and character.

Those portions of the mechanism carried by the head-stock frame 25 and, looking at Fig. 3, which are at the right of the standard 26, are of usual character and of standard construction and arrangement and therefore not necessary to be referred to in detail. The cone-pulley is, however, numbered 37 and the shaft on which it is mounted is, in Fig. 4, numbered 38. Those portions of the mechanism connected with the head-stock and which constitute a part of my invention are shown in Figs. 3 and 4 and are at the extreme left hand end of the lathe, as represented in Fig. 3, and these parts have to do with the gearing or means for transmitting motion from the shaft 38 to the lead-screw or feed-shaft 39, the object here being to provide a gear mechanism of simple and effective character capable of ready adjustment to secure changes of feed, these changes of feed being accomplished without any necessity of removing a gear. In the ordinary spur gear drives the changes of feed require the adding of gears, whereas with the present invention the changes of feed require merely the adjustment of the gears on their shafts without either removing or adding a gear.

The shaft 38 has on its left hand end a bevel gear wheel 40, and this gear wheel is in mesh with a corresponding bevel gear wheel set at right angles thereto, numbered 41, and which gear wheel 41 is secured upon the upper end of a vertical shaft 42 carrying gear wheels of three sizes 43, 44, 45, which gears 43, 44, 45 are adjustable on the shaft 42 so that any one of them may be placed in operative position when desired. Adjacent to the shaft 42 is a vertical shaft 46 upon which are secured a large gear wheel 47, a smaller gear wheel 48 and a still smaller gear wheel 49, and these gear wheels have, respectively, at the proper time, placed in engagement with them the proper gear wheels 43, 44, 45 to secure the desired changes of feed. The gear 43 may be placed in mesh with the gear wheel 47, and when this is the case the gear wheels 44, 45 are idle, or the gear wheel 43 may be lowered from the gear wheel 47, and the gear wheel 44 placed in mesh with the gear wheel 48, thus securing a change in speed, or the gear

wheels 43, 44 may both be moved to idle position and the gear wheel 45 placed in mesh with the gear wheel 49, thus securing another change in the drive. Upon the lower end of the shaft 46 is secured a bevel gear wheel 50, and this gear wheel is normally in mesh with a corresponding gear wheel 51 secured upon the rear end of a sleeve 52 which is keyed upon a transverse shaft 53 and has at its front portion a bevel gear wheel 54 which is only used when a reversal in the direction of the lathe operation is required, and this is not often. When a reversal is required the sleeve 52 is shifted rearwardly so as to carry the bevel gear wheel 51 from mesh with the gear wheel 50 and place the bevel gear wheel 54 in mesh with said gear-wheel 50. Upon the front end of the shaft 53 is secured a bevel gear wheel 55, and this bevel gear wheel 55 is in mesh with a bevel gear wheel 56 secured on the left hand end of a shaft 57 which leads into the change speed gearing confined within the left hand end portion of the base frame of the lathe and which is of standard construction and therefore not illustrated nor necessary to be described. So far as this part of the present invention goes it resides in those features which are shown in Figs. 3 and 4 intermediate the shaft 38 and shaft 57. It will readily be observed without extended comment how easy it is to change the feed when gearing of the character and arrangement shown in Figs. 3 and 4 are considered. When the lathe is in use the gearing shown in Figs. 3 and 4 and identified by the reference numerals above specified, will be concealed by a suitable hood which may be wholly or in part detachable from the lathe when it is desired to inspect or shift the gearing. The gearing illustrated at the left hand end of the lathe is carried by the head-stock frame 25, and hence permits of the transverse adjustment of said headstock frame.

The shaft which finally communicates the desired motion to the lead screw or feed shaft 39 is numbered 58 and it extends through the change gear box 59, which in itself is old and in common use. The shaft 58 receives its motion from the shaft 38 through the intermediate gearing and may be termed the drive shaft for the lead screw or feed shaft 39. The manner of connecting the left hand end of the shaft or screw 39 to the right hand end of the drive shaft 58 is illustrated more clearly in Fig. 7, in which it may be seen that the right hand end of the shaft 58 is formed with a head 60 which contains a socket receiving the left hand end of the screw or shaft 39, the latter being transversely apertured at said end and receiving a pin 61 which extends through the head 60 and said shaft 39, thereby detachably connecting the shafts 39, 58 to each other. The left hand side of the head 60 has a bearing against a sleeve or boss 62 formed on the gear box 59. It is of considerable moment that in accordance with my invention the shaft 39 may be detached from the lathe without disturbing the gear box 59, shaft 58 or any of the parts connected therewith, and my invention provides additional means whereby the shaft 39 may be removed without involving the large amount of work that has heretofore been necessary in removing the lead shafts from lathes.

The tool-carriage and its apron are shown more clearly in Figs. 1, 2, 8, 11, 12, with the details of the apron illustrated more clearly in Figs. 9, 10, 11.

The tool-carriage is numbered as a whole 63 and comprises a front section or carriage part 64 and a rear or back carriage part 65 which is secured to the front carriage part 64 by means of bolts 66 (Figs. 2 and 11). The back carriage 65 is a heavy casting comprising a bed member, a web member, a rear part 67 engaging a rear rail 24 and a front angular flange 68 abutting against the rear end of the carriage part 64 and resting on a shoulder 69 formed on said part 64, as shown in Fig. 11. The rear end of the back carriage 65 is confined to the rail 24 by means of a block 70 and bolt 71 or other suitable means. The front carriage 64 is grooved in its lower side to ride upon the front rail 24, as shown in Fig. 11, and the rear portion of the carriage 64 is provided with a plate 72 which extends below the upper front portion of the main frame and is secured by a bolt 73. The bed portion of the carriage parts 64, 65 are formed with a longitudinal groove 74 and dove-tail ribs 75 to serve as guides for the tool carrier parts mounted thereon and which parts being of standard construction it is not necessary to describe them. The groove 74 and ribs 75 permit of the transverse movement of the tool-carrier parts as usual, and the carriage itself is adapted to travel longitudinally of the lathe along the rails 24, 24; and in this way the tool is rendered capable of a wide range of adjustment.

One purpose in constructing the tool carriage in two sections or parts 64, 65 is to provide for the removal of the back carriage part 65 when the requirements of work being performed necessitate such removal, and upon the removal of the back carriage part 65 suitable means must be provided for bracing the front carriage part 64 and assuring its regular and proper movement, and to this end I provide as a substitute for the back carriage 65, when the latter is to be removed, a bracket 75, shown in position in Fig. 8, this bracket having at its lower end a jaw to pass over the inner edge of the rear bed 23 and upon one of the rails 24.

The upper end of the bracket 75 is bent angularly to rest upon the shoulder 69 of the front carriage 64 and abut against the rear vertical surface of said carriage 64, to which the upper portion of the bracket 75 is secured by means of bolts 76. When the bracket 75 is not in use the back carriage 65 will be made use of, and ordinarily the back carriage 65 will be made use of under all ordinary conditions, but there are some characters of work requiring a large swing, and in these instances the back carriage 65 will be removed and the bracket 75 substituted for it, thereby affording greater space for the work that may be on the lathe.

At the front of the main base frame 20 and directly below and connected with the front carriage 64, is the apron 77 which travels with the carriage on its longitudinal movements, as usual, and contains the customary gearing for coöperation with the screw shaft 39 and also with the rack bar 78 rigid with the front upper portion of the main frame 20, in a manner well understood in this art. The interior mechanism of the apron 77 is illustrated more clearly in Figs. 9, 10, 11, and while this gearing is of standard character my invention provides special features which permit of the ready mounting and removal of the gears without difficulty. The apron 77 has a cover plate 79 which, as shown in Fig. 1, is detachably held in place by means of screws. It is obvious without comment that the cover 79 may be quickly removed from the apron. Within the apron and just in rear of the cover 79 is mounted a vertical frame, preferably a spider frame, 80, which is in part held in place by the same screws by which the cover 79 is secured in position. The spider frame 80 may be further secured in position, at its right hand end, by a screw 181, entering a partition 82 in the apron 77. The frame 80 is removable, and said frame is formed with bearing sleeves 81, 82, 83, 84 for the shafts or stems of the various features mounted within the apron 77, the gears having stud shafts extending within the bearing sleeves carried by the frame 80. It will be obvious that upon the withdrawal of the frame 80 all of the gearing within the apron 77 becomes exposed and may be removed, replaced or otherwise handled with minimum labor, and this is one of the main purposes of this part of the invention.

Within the right hand end of the apron 77 is the customary sectional nut 85 to engage the threaded shaft 39 which extends through the apron 77 and imparts motion to said apron and to the tool carriage. The spur-gears within the apron 77, due to the manner of mounting the same, may be withdrawn without disturbing the screw 39, and by reason of the mounting of the screw shaft 39 and of its detachable connection with the change gear box 59, said shaft may be withdrawn from the lathe with the minimum effort, the right hand end of the shaft being removably held in a simple bearing 86, and this is another one of the beneficial features of the invention. I deem it unnecessary to enter into a detailed explanation of the gearing within the apron 77, since as hereinbefore stated, the gearing shown is of usual character and forms no part of my invention, my invention having to do, so far as the gearing is concerned, with so mounting the same by means of the inner frame 80 that the gearing may be readily gotten at at any time and a gear removed or replaced at will.

A proper coöperation of the tail-stock with the head-stock and other portions of the lathe is important, and to this end I present efficient means for securing the tail stock carriage in fixed position, after the usual adjustment of said carriage on the bed-frame has been attended to in the usual manner by means of the gear wheel 87 and rack 78 (Fig. 1). The tail-stock carriage is numbered 88 and it receives the tail-stock proper in the usual way, said tail-stock being adjustable transversely of the carriage and the carriage being longitudinally adjustable along the upper front bed 22 and lower drop-bed 23. The carriage 88 is a hollow casting and is recessed, as at 89, to receive and rest upon the inner longitudinal edge of the front bed 22, and said carriage at its lower rear portion is formed with a forwardly projecting member or section 90 which is grooved to engage a rail 24 and also to extend downwardly at the inner side of the rear bed 23, as shown more clearly in Fig. 13. Extending transversely through the carriage 28 is a shaft 91 having an exposed end 92 to receive a key or wrench for imparting rotary motion to said shaft, and upon the shaft 91 are cams or eccentrics 92, 93, the cam or eccentric 92 being in engagement with the upper end of a vertical rod 94 and the cam or eccentric 93 being in engagement with the upper end of a vertical rod 95. The rod 94 extends through a hole in a bracket 96 forming an integral part of the carriage 88 and affording a bearing for the inner or rear end of the shaft 91. The lower end of the rod 92 extends downwardly through an opening in the section 90 of the carriage 88 and rests upon a bridge 97 (Fig. 15), which straddles the facing ends of two correspondingly tapered bars 98 which are loosely held within a three-sided receptacle or frame 99 fastened by screws or bolts 100 to the lower edge of the section 90 of the carriage 88. The outer ends of the bars 98 rest upon adjustable screws or studs 101 which extend upwardly through the frame 99. When the shaft 91 is turned to clamp

the tail-stock carriage 88 in fixed position, the eccentric or cam 92 will turn downwardly against the rod 94 and cause the latter at its lower end to press against the bridge 97 and force the adjoining ends of the bars 98 downwardly, with the result that said bars at their outer ends will be tilted upwardly against the drop-bed 23 and operate to clamp the carriage 88 to said drop-bed. The rod 95 at the front end of the carriage 88 corresponds with the rod 94 at the rear end of said carriage and performs a corresponding duty. The rod 95 extends downwardly through a portion of the carriage 88, and at its lower end it engages a bridge 102 (corresponding with the bridge 97 hereinbefore referred to and shown in Fig. 15) straddling adjacent ends of bars 103, corresponding with the bars 98 hereinbefore described, held within a frame 104, corresponding with the frame 99, and at their outer ends resting upon adjustable studs 105, corresponding with the studs 101 hereinbefore referred to. The rod 95 and its coacting parts correspond with the rod 94 and its coacting parts, and when the shaft 91 is turned to clamp the tail-stock carriage in fixed position, the eccentric or cam 93 depresses the rod 95 against the bridge 102 and causes said bridge to depress the adjoining ends of the bars 103, with the result that the outer ends of said bars are tilted upwardly against the lower surface of the front bed 22 with binding effect.

What I claim as my invention and desire to secure by Letters Patent, is—

1. A lathe comprising a main base frame, a head-stock, a tool-carriage and a tail-stock, said frame having at one end a bed for said head-stock whose parts overhang said bed, a front rail about on the same horizontal plane with said bed and a rear drop-rail on a horizontal plane materially below that of said bed, and said tool-carriage being mounted on said rails, combined with means for adjusting said head-stock transversely on said bed and securing the same in adjusted position.

2. A lathe comprising a main base frame, a head-stock transversely adjustable thereon, means for adjusting said head-stock and securing the same in adjusted position, and a tool-carriage mounted on said frame, said frame having a front rail about on the same horizontal plane with the base of said head-stock and a rear very much lower rail, on which rails said tool-carriage is mounted.

3. A lathe comprising a main base frame affording at one end a bed for a head-stock, a front rail about on the same horizontal plane with said bed and a rear very much lower rail, a head-stock mounted for transverse adjustment on said bed, a tool-carriage engaging said front and rear rails and adapted to receive the tool-holder parts, and a tail-stock carriage engaging said front and rear rails and adapted to receive the tail-stock holding parts, said tool-carriage comprising a front section on said front rail and having an upturned shoulder on its rear end and means at said end for retaining the said section on the front portion of the main-frame, and a rear section which engages said rear lower rail and at its front end conforms and is bolted to the rear end of said front section.

4. A lathe comprising a main base frame affording at one end a bed for a head-stock, a front rail about on the same horizontal plane with said bed and a rear very much lower rail, a head-stock mounted for transverse adjustment on said bed, a tool-carriage engaging said front and rear rails and adapted to receive the tool-holder parts, and a tail-stock carriage engaging said front and rear rails and adapted to receive the tail-stock holding parts, said tool-carriage comprising front and rear sections bolted together so that the rear section may, when desired, be replaced by a rear section differing with respect to the space it will occupy according to the position of the head-stock and the nature of the work on the lathe.

5. In a lathe comprising, among other well-known features, a base-frame, a set of change-gears for the feeds and a head-stock having the drive or belt pulleys secured on a drive-shaft, means for securing the different changes of feed comprising a shaft geared to said drive-shaft and having sliding gears thereon differing in diameter, a second shaft parallel with the other shaft and having gears thereon differing in diameter and respectively to be engaged by the sliding gears, and means connecting said second shaft with the main change-gears comprising a bevel gear wheel on said second shaft, and a horizontal shaft having a bevel gear wheel thereon, in mesh with said bevel gear wheel on said second shaft and a second bevel gear wheel in mesh with a bevel gear wheel on a shaft leading to the main change gears.

6. In a lathe comprising, among other well-known features, a base-frame, a set of change-gears for the feeds and a head-stock having the drive or belt pulleys secured on a drive-shaft, means for securing the different changes of feed comprising a shaft geared to said drive-shaft and having sliding gears thereon differing in diameter, a second shaft parallel with the other shaft and having gears thereon differing in diameter and respectively to be engaged by the sliding gears, and means connecting said second shaft with the main change gears comprising a bevel gear wheel on the lower end of said second shaft, and a horizontal shaft having a slidable gear wheel thereon in mesh with said bevel gear wheel on said

second shaft and a fixed bevel gear wheel in mesh with a bevel gear wheel on a shaft leading to the main change gears.

7. In a lathe comprising, among other well-known features, a base-frame, a set of change-gears for the feeds and a head-stock having the drive or belt pulleys secured on a drive-shaft, means for securing the different changes of feed comprising a shaft geared to said drive-shaft and having sliding gears thereon differing in diameter, a second shaft parallel with the other shaft and having gears thereon differing in diameter and respectively to be engaged by the sliding gears, and means connecting said second shaft with the main change gears comprising a bevel gear wheel on the lower end of said second shaft, a horizontal shaft having on one end a bevel gear wheel in mesh with a bevel gear wheel on a shaft leading to the main change gears, and a sleeve feathered on said horizontal shaft having a bevel gear at each end adapted respectively to be placed in mesh with the said bevel gear on the lower end of said second shaft, for driving or reversing as the case may be.

8. In a lathe comprising, among other features, a set of change-gears for the feeds and a head-stock having the drive or belt pulleys secured on a drive-shaft, means for securing the different changes of feed comprising an auxiliary driving shaft, a second and parallel shaft, slidable gear wheels of varying diameter on one of said shafts, fixed gear wheels of varying diameter on the other of said shafts and respectively to be engaged by the sliding gear wheels, means gearing said auxiliary shaft with said drive-shaft, and bevel gear transmission connecting one of said shafts with a shaft leading to the main change gears.

9. In a lathe comprising, among other features, a set of change-gears connected with the driving mechanism, a tool-carriage having an apron and a lead screw connected with said change-gears and extending through said apron and engaged with the gearing therein, means for mounting, securing and protecting the gears within said apron comprising a removable cover for the apron and a removable frame secured within said apron at the back of said cover and having bearings for the front ends of the shafts of the gears within the apron, whereby when said cover and frame are removed the gears may quickly receive any necessary attention.

Signed at New York city, in the county and State of New York, this 6th day of March, A. D. 1917.

ALVIN W. NEEDHAM.

Witnesses:
ARTHUR MARION,
CHAS. C. GILL.