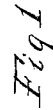


LATHE.

1,374,378.

3 SHEETS—SHEET 1.



David H. Fletcher.

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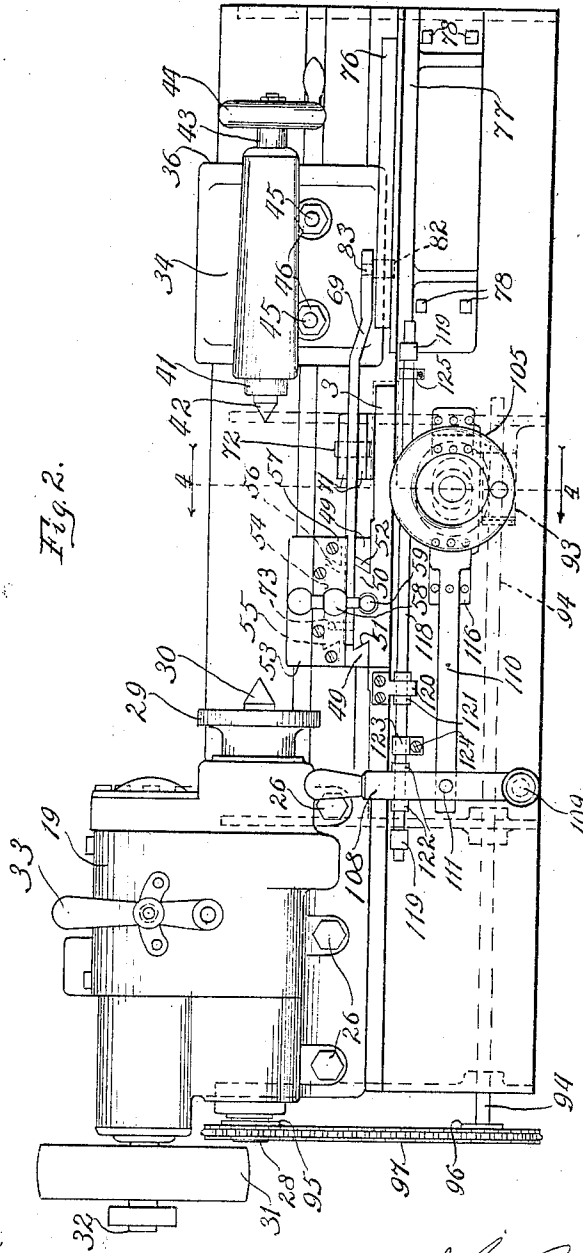
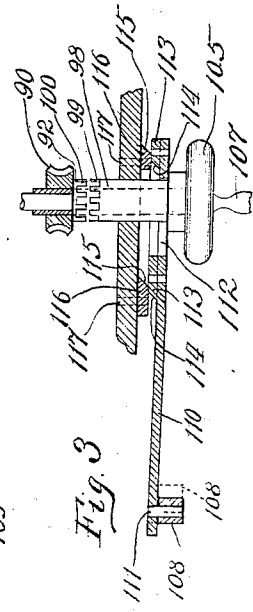
LATHE.

APPLICATION FILED MAY 24, 1919.

1,374,378.

Patented Apr. 12, 1921.

3 SHEETS—SHEET 2.



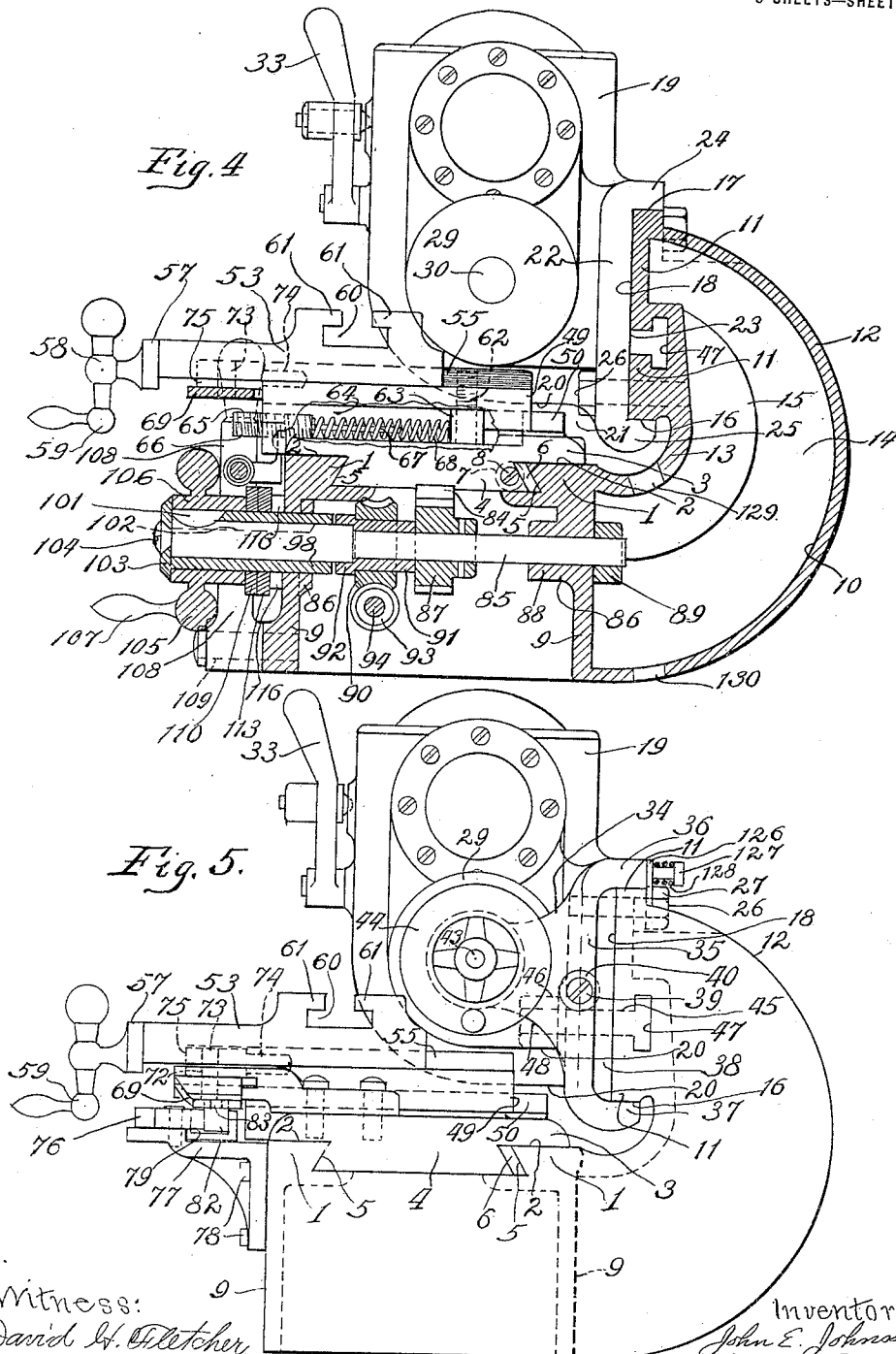
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LATHE.
APPLICATION FILED MAY 24, 1919.

Patented Apr. 12, 1921.
3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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LATHE.

1,374,378.

Specification of Letters Patent.

Patented Apr. 12, 1921.

Application filed May 24, 1919. Serial No. 292,660.

To all whom it may concern:

Be it known that I, JOHN E. JOHNSON, a citizen of the United States, residing in Elgin, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Lathes, of which the following is a specification.

This invention relates to that class of lathes having a head-stock and tail-stock, a bed, a slide rest or carriage adapted to be supported by the bed, and means for supporting and guiding the tail-stock or tail-stock and head-stock in such a manner as to permit the desired extent of movement and facility of operation of the slide-rest mechanism.

The principal object of the invention is to provide a simple, economical, and efficient lathe.

Other and further objects of the invention will appear from the following description and claims, and from an inspection of the accompanying drawings which are made a part hereof.

The invention consists in the features, combinations, arrangement of parts and details of construction herein described and claimed.

In the accompanying drawings, Figure 1 is a plan view of an improved lathe constructed in accordance with my invention;

Fig. 2 is a view in side or front elevation of the lathe shown in Fig. 1;

Fig. 3 is a detail view of the clutch and clutch-operating mechanism, for operatively connecting the slide-rest-operating mechanism with the feed screw mechanism or source of power, and for disconnecting the same;

Fig. 4 is an enlarged view in transverse vertical section, taken on line 4 of Fig. 1, looking in the direction indicated by the arrows, with parts of the slide rest mechanism broken away, to show the means for operating the transversely movable slide-rest mechanism and any tool supported thereby; and

Fig. 5 is a view in end elevation of the lathe shown in Figs. 1, 2 and 4.

In constructing an improved lathe in accordance with my invention, I provide a lathe bed 1 having flat horizontal carriage-supporting top surface portions 2, 2 upon which is slidably mounted a longitudinally movable slide rest or main tool-carriage 3 having the usual bottom guiding member

in the form of a dove-tail 4 slidably mounted between and adapted to be guided by ways or groove portions 5, 5 in the bed, and having the usual means such as a gib 6 operated by a collar 7 on a screw 8, for taking up wear and preventing unnecessary play.

The bed 1 is supported by and forms an integral part of a main frame 9 which is provided with an upwardly projecting back frame 10 which is, by preference in the form of a curved hollow frame which extends rearward from the main bed of the lathe and upward therefrom to the rear side of an upper track or vertical auxiliary lathe bed 11 which is rigidly supported in position by the back frame 10. The back frame 10 is made, by preference, in the form of an outer or back web 12, and inner front curved web 13 a series of vertical inner ribs 14 connected with and connecting the inner and outer webs, and a suitable number of inner relatively short strengthening ribs 15, arranged at suitable intervals to afford the required degree of strength and rigidity.

The upper track or vertical auxiliary lathe bed 11 has a flat front face which is perpendicular to the plane of the top flat face of the main or horizontal lathe bed 1 and parallel with respect to the guiding grooves or ways 5, 5, in the main lathe bed; and the upper track 11 is located back of and spaced apart from the rear edge of the main lathe bed 1, so as to leave an ample unobstructed space above and in front and rear of the latter adapted to permit the movement of the slide-rest or tool-carriage mechanism slidably mounted on the horizontal lathe bed, to any desired position with respect to the head-stock and tail-stock when the latter are mounted upon or connected with the track 11.

The track 11 has a bottom face 16 and a top face 17 which are both parallel with respect to the top face of the lathe bed 1; and the upwardly projecting frame 10 is attached at its lower extremity to the rear side of the horizontal lathe bed 1 or the main frame at a point below the level of the top face of the horizontal lathe bed, the upper extremity of the frame 10 being attached to the rear side of the top track 11 in such a manner as to leave the front face 18 the top face 17 and the bottom face 16 of the track entirely unobstructed. The upper track 11 is thus rigidly supported in

position with its front face 18 parallel with the ways or guiding grooves 5, 5, in the horizontal bed 1, and with the top face 17 and bottom face 16 parallel with respect to the top face 2 of the horizontal lathe bed.

A head-stock 19 is slidably mounted in engagement with the top track 11, and, by preference, supported by the latter in such position that the bottom portion 20 of the head-stock which is located over the lathe bed 1 is spaced apart with respect to the latter so as to leave an unobstructed space 21 above the lathe bed and between said bed 1 and the bottom of the head-stock. The head-stock, when constructed as shown in the drawings, has its rear supporting base 22 at its rear side with its rear vertical flat face 23 in sliding engagement with the front vertical face 18 of the upper track, and the head is provided with a top rearwardly projecting supporting flange 24 extending over and in sliding engagement with the top face 17 of the track, and a bottom flange 25 which projects rearward beneath and in sliding engagement with the bottom face 16 of the track. And the head-stock is secured in fixed relation to the track by means of headed bolts 26 and nuts 27 in threaded engagement with said bolts. (See Figs. 2, 4 and 5.)

The head stock is of course provided with a mandrel 28, rotatively mounted in suitable bearings in the head, and adapted to support a face plate 29 and center point 30 in operative position, and to permit the face plate and center point to be removed and a chuck or other device to be mounted upon and operated by the mandrel or hollow shaft. The mandrel or hollow shaft 28 is operatively connected with a suitable source of power, such, for instance, as a belt pulley 31, by means of a main driving shaft 32 rotatively mounted in suitable bearings in the head stock, and a suitable train of gears—not shown—which may be of any ordinary and well known or desired form. The connecting shaft and gear mechanism may include the usual reversing gear mechanism of any suitable known form, and any suitable form of reversing lever 33 for reversing or changing the gears; and may be provided with the usual clutch mechanism and belt and pulley mechanism for connecting the main driving shaft with the source of power or disconnecting it therefrom, all of which are familiar to those skilled in the art, in so far as the devices mentioned are not shown in the drawings or described herein.

A tail-stock 34, comprises in its construction a rear or side base 35 having an upper rearwardly projecting supporting flange 36, which extends rearward over and in sliding engagement with the top face 17 of the track 11, and having a bottom flange 37 which extends rearward beneath and in slid-

ing engagement with the bottom edge or face 16 of said track, and having a tapered or wedge-shaped gib 38 interposed between the upright rear face of the tail-stock base and the upright front face 18 of the track 11 and in sliding engagement with the latter, and held in place and adapted to be tightened or loosened, as desired, by means of an adjusting screw 39 in threaded engagement with the tail-stock and having a collar 40 in engagement with a recessed or notched portion of the gib, and adapted to enable the latter to be adjusted and secured in any desired adjusted position. The tail-stock has the usual dead spindle 41, in which is shown a removable center point 42; and a spindle-operating screw 43 and hand wheel 44 are rotatively mounted in the tail-stock and in operative engagement with the dead-spindle, for operating the same. The tail stock is provided with securing bolts 45 and nuts 46 in threaded engagement with said bolts, the headed ends of the bolts being mounted in the flanged slot 47 in the track 11, and movable lengthwise of the track and said slot to any desired position, for securing the tail-stock in any position to which it is moved lengthwise of the track 11 and horizontal lathe bed 1. (See Figs. 1, 2 and 5.) The tail-stock has its bottom side or extremity 48 spaced apart from the horizontal top face of the lathe bed 1, and extends over and entirely out of engagement with said lathe bed, so as to provide ample space to permit the tail stock to be moved longitudinally of the lathe bed 1 and track or upright tail-stock supporting member 11 to any desired position with respect to the head-stock, the carriage mechanism, and other parts, and so as to enable the carriage mechanism to be moved longitudinally of the lathe bed to any desired extent, and to be moved beneath the tail stock or between it and the lathe bed to the desired extent. Ample space between the tail-stock and the horizontal lathe bed 1 is thus provided to enable the carriage mechanism to be operated automatically or otherwise in an efficient manner and to permit the carriage mechanism and carriage-operating mechanism to move past the tail stock in either direction lengthwise of the lathe bed and track, and to be mounted and to operate in the manner herein described and shown.

The main tool carriage or bottom slide rest 3, already described, is adapted to be moved lengthwise of the lathe-bed in either direction between the head-stock and tail-stock, and, if desired, beneath the head-stock and tail-stock, or between the head-stock and lathe bed, on the one hand, and between the tail-stock and the lathe bed, on the other hand, with the tail-stock in any desired position, thus enabling the tool or tools carried by the carriage mechanism to be moved

to the required positions with respect to the work and with respect to the head-stock and tail-stock, with facility and in a very efficient and satisfactory manner, when the machine is in operation.

An intermediate slide-rest or transversely movable tool-carriage member 49 is slidably mounted upon and adapted to be moved transversely with respect to the main carriage member or bottom slide rest 3. The bottom rest 3 has an upwardly projecting transverse dove-tail 50 which extends into and in sliding engagement with a similarly shaped dove-tail slot 51 in the bottom face of the intermediate slide-rest 49; and the usual tapered gib or tightening wedge member 52 is mounted in position between one inclined side margin of the dovetail 50 and the adjacent inclined side wall of the slot 51, to take up wear and enable the desired snug but sliding fit to be obtained between the parts thus slidably connected. (See Figs. 2, 4 and 5.)

A top slide-rest or adjustable tool-post-supporting carriage member 53 is adjustably or slidably mounted on the intermediate slide rest 49, to which it is adjustably secured in any desired ordinary and well known manner, so as to enable a tool post or similar device to be supported in any desired position with respect to the slide-rest 49 and with respect to the work, when the device is in operation.

The top slide-rest 53 shown in the drawings, is provided with a dove-tail groove 54 in its bottom face into which extends a similarly shaped dove-tail 55 on the top side of the intermediate slide-rest 49 already described. The dove-tail 55 and the groove 54 which it slidably engages, are disposed transversely with respect to the lathe bed and at right angles with respect to the longitudinal ways or guiding slots 5 and path of movement of the bottom carriage member or slide rest 3; and a gib 56 is interposed between one of the inclined sides of the dove-tail 55 and the adjacent inclined side wall of the slot or groove 54, and may be of any ordinary construction. A front plate 57 is attached to the front side of the top slide-rest 53; and an operating screw 58 is rotatively mounted in a suitable bearing and in engagement with the front plate, and operatively connected with the intermediate slide-rest 49 and the top slide-rest 53, and provided with an operating crank or handle 59, and adapted to enable the top slide-rest to be moved transversely with respect to the lathe bed and over and in sliding engagement with the intermediate slide-rest in one direction, by the turning of the screw to the right, and in an opposite direction by reversing the direction of rotation of the screw. The top slide-rest 53 has a flanged horizontal slot 60 in its upper face,

the side flanges 61, 61 on the opposite sides of said slot being adapted to admit a tool-post or similar tool-holding device therebetween, so as to enable the tool post or similar tool-holder to be held in operative position in the slot, and in position to hold the tool in engagement with the work, during the operation of the machine. When the top slide-rest has been adjusted to any desired position upon or with respect to the middle or intermediate slide-rest 49 by means of the screw 58, it is held in such position by the screw; and the top slide rest may be operated by means of the screw 58 in the usual manner, while supporting a cutter or other tool in engagement with the work, if desired. It is also plain, however, that either the intermediate slide-rest 49, or the bottom slide-rest 3 may be operated, the intermediate slide-rest transversely of the lathe bed and the bottom rest longitudinally of the bed.

My improved means for operating the carriage mechanism, and, more particularly, the bottom carriage member or slide rest 3 and the intermediate slide rest 49, is constructed and adapted to operate as follows:

A headed bolt 62, having an elongated square or angular head 63 at its bottom end is mounted in threaded engagement or anchored in the intermediate slide-rest 49 near the back extremity of the latter; and the bottom slide-rest or main carriage member 3 has an elongated transverse horizontal slot 64 in its upper face, and of sufficient depth and width to permit the angular head 63 of said bolt to move freely in said slot transversely with respect to the bottom slide-rest and lathe bed, as the intermediate slide-rest in which the headed bolt is anchored, is moved backward or forward transversely of the lathe bed and bottom slide rest. The bottom slide-rest 3 has a threaded horizontal aperture 65 in its front side which opens into the horizontal slot 64, the axial center of the threaded aperture 65 being, by preference, in alinement with the longitudinal center of the horizontal slot 64 and in the same plane with the center of said slot. A screw 66 is mounted in threaded engagement with the threaded aperture 65, and may be provided with a central guiding pin 67; and a spring 68, which is, by preference in the form of a compressible helical spring, is mounted in the slot 64 between the depending head of the bolt 63 and the screw-threaded front part of the slotted bottom slide-rest 3, and, by preference, between the screw 66 and the bolt head 63. The pin 67 thus serves as a guiding member, to hold the spring in place in the slot and in such position that the tension of the spring tends to press the intermediate slide-rest 49 in one direction transversely with respect to the lathe bed and bottom slide rest. The rear

end of the spring being in engagement with the intermediate slide rest or with the bolt head 63 fixed to said slide rest, the direction in which the tension of the spring tends to move the intermediate slide-rest is rearward. It is obvious, however, that by a mere reversal of parts, the spring is capable of being used to move the intermediate slide-rest toward the front instead of in the direction of the back of the lathe bed or machine. It is also plain that the slide rest 49 is adapted to be fed in either direction transversely of the lathe bed by means of an ordinary feed screw, which the threaded aperture 65 in the bottom slide-rest is adapted to receive and engage, and that the inner end of an ordinary feed screw may be rotatively mounted in the head 63 of the bolt 62 in the ordinary manner.

In order to provide means for automatically operating the carriage mechanism or slide rests in an efficient manner, the compressible spring 68 is mounted in the slot 64 and in operative engagement with the bottom slide rest 3 and intermediate slide-rest 49 so that the tension of the spring tends to press the intermediate slide in one direction with respect the bottom slide rest, as above described, and a slide-operating lever 69 is pivotally mounted upon the bottom slide-rest 3 by means of a supporting bracket or clip 70 having upper and lower projecting jaws 71 between which the lever extends, said jaws forming a support for a vertical pivot 72 which extends through an aperture in the lever and has its upper and lower ends supported by said jaws. One arm of the lever is connected with the intermediate slide-rest 49 by means of a pivot pin 73 which is connected with the intermediate slide-rest by means of a threaded bolt 74 anchored in the slide rest 49 and having an elongated square or angular head 75 which projects forward beyond the front face of said slide-rest 49, to which the bolt is rigidly secured in position to enable the lever to extend below the level of the bottom face of the top slide rest 53, so as to permit the desired freedom of movement of the top rest with respect to the intermediate slide-rest 49 and the lever which is thus pivotally connected with said rest 49. (See Figs. 1, 2, 4, and 5.)

The opposite end of the lever 69 is adapted to be operatively engaged and guided or operated by a master pattern 76 which is supported upon the frame of the machine by means of a supporting bracket 77 secured to the machine frame by means of bolts 78 or other suitable supporting and securing means. (See Figs. 1, 2 and 5.) The pattern 76 shown in the drawings, is in the form of a strip of metal having a cam or groove 79 having parallel opposite side walls 80, 81, adapted to admit and operatively engage

and guide an anti-friction-roller 82 upon a depending guiding pin or projection 83 fixed to or forming a part of the lever 69. It is plain that the movement of the carriage mechanism in the direction of the head stock 19 will cause the intermediate slide rest 49 to be moved forward or against the tension of the compressible spring 68, or in a direction which will cause a tool supported by the top rest to move away from the axis of rotation of the work and the center of the mandrel 28 and center point 30, such movement of the intermediate slide rest being caused by the side wall 80 of the cam slot 79 engaging the roller 82 or projection 83 on the adjacent end of the lever 69. It follows, of course, that the movement of the carriage mechanism in an opposite direction or away from the head stock, will—when the cam slot or pattern is of the shape shown in this instance,—cause the direction of movement of the intermediate slide-rest 49 to be toward the center of rotation of the work or of the mandrel 28 and center point 30 supported by the head stock, and that these movements of the intermediate and top slide rests will be controlled by and will correspond with the shape of the guiding member or pattern whether in the form of side walls 80, 81 of a cam 79 or in any other desired suitable form, for guiding or operating the intermediate slide-rest 49 and thereby the top slide-rest and any tool supported thereby in position to engage the work to be operated upon.

My improved means for operating or moving the bottom or main carriage member 3 lengthwise of the lathe bed in either direction as desired, is constructed and adapted to operate as follows:

The bottom carriage member or bottom slide rest 3 is provided with a toothed rack 84 fixed to the bottom side thereof and extending from end to end of said bottom slide rest 3 in parallel relation to the path of movement of said rest upon the lathe bed. The rack is, by preference located at or near the longitudinal center of the bottom slide-rest and of the lathe bed. A transverse shaft 85 is rotatively mounted in suitable journal bearings 86, 86, in the main frame or lathe bed, and has a toothed pinion 87 fixed to said shaft and in toothed engagement with said rack. The shaft is held in place longitudinally by means of collars 88 and 89 fixed to the shaft on opposite sides of the journal bearing 86. A worm wheel 90 is fixed to a hub or sleeve 91 and clutch member 92; and said worm wheel, sleeve and clutch member are loosely mounted on the shaft 85 in such a manner as to permit the worm wheel and its clutch member 92 to rotate while the shaft is not rotating but disconnected from its source of power. The shaft is also thus enabled to be rotated by

hand without regard to the operation or rotation of the worm wheel 90 when the latter is disconnected from the shaft, as will be more fully explained.

5 A worm or feed screw 93 is fixed to a rotative shaft 94, and in toothed engagement with the worm wheel 90, the shaft 94 being journaled in suitable bearings in the frame of the machine. The shaft 94 is at right
10 angles to the shaft 85 and has its axis in parallel relation to the path of movement of the carriage mechanism. Said shaft 94 is connected with a suitable driven part, such, for instance as the shaft or mandrel
15 28 in the headstock, or other rotative part, adapted to enable the shaft 94 to be rotated in either direction as desired, in any ordinary and well known manner. It is shown in the drawings operatively connected with
20 the shaft or mandrel 28 by means of a sprocket wheel 95 fixed to the shaft or mandrel 28, a sprocket wheel 96 fixed to the shaft 94 and a sprocket chain mounted upon and connecting said sprocket wheels.
25 The sprocket chain is indicated by the numeral 97, and is shown in Figs. 1 and 2.

A clutch member 98 in the form of a sleeve having clutch teeth 99 adapted to be moved into and out of clutching engagement with clutch teeth 100 on the clutch member 92, is mounted upon and in longitudinally movable relation to the shaft 85 already described. This sleeve clutch member 98 is connected with the shaft 85 by
35 means of a spline or feather 101 fixed to the sleeve clutch member and in sliding engagement with a longitudinal peripheral slot 102 in said shaft. An end washer 103 fixed to the outer end of the shaft 85 by
40 means of a screw 104, or other suitable securing means, serves to hold the sleeve 98 in operative position upon the shaft, so that said sleeve 98 turns with but is movable longitudinally of the shaft into and out
45 of clutching engagement with the clutch member 91 fixed to the worm wheel 90. A hand wheel 105 having a hub 106 is fixed to and movable with the sleeve clutch member 98, and has a handle 107 adapted to
50 enable the sleeve clutch member to be moved into and out of clutching engagement with the clutch member 92 manually, when desired, and adapted to enable the shaft 95 with its rack-engaging pinion 87 fixed to said shaft, to
55 be rotated manually when the shaft 85 is not connected with the worm wheel 90 and worm 93 or with the source of power. The carriage mechanism may thus be moved in either direction rapidly and with facility, by
60 hand, whenever desired.

It is desirable that suitable simple and efficient means be provided for automatically disconnecting the shaft 85 from the worm mechanism and source of power when
65 the carriage mechanism has reached a de-

sired predetermined position, or the desired limit of its movement when in operation; and also to provide suitable means for disconnecting the shaft 85 from its driving mechanism or source of power by hand, 70 whenever desired. To accomplish this, a lever 108 is pivotally mounted in the main frame of the machine by means of a pivot pin 109, and a clutch-operating rod or bar 110, which is, by preference in the form 75 of a flat strip of metal, is pivotally connected at one end with said lever, by means of a pivot 111. The opposite end of said bar 110 has an elongated slot 112 therein which is adapted to slidably engage and 80 encircle the clutch or sleeve member 98 on the shaft 95 in such a manner as to permit the movement of the bar longitudinally of itself and transversely of said sleeve clutch member and shaft encircled thereby. Bosses 85 113 are fixed to said bar and located on opposite sides of the sleeve clutch member 98, and form inclined cam or shoulder portions 114, 114, which are adapted to slidably engage similarly inclined faces 115, 115 on 90 fixed bosses 116, 116 which are fixed to the main frame by means of pins 117, 117, or other securing means. (See Figs. 2, 3 and 4.)

The inner end of the hub 106 of the hand wheel 105 abuts against the outer face of 95 the clutch-operating bar 110, so as to permit the bar to move longitudinally in sliding engagement with said hub. It is plain that the movement of the bar 110 and hand lever 108 from the position in which they 100 are shown in Fig. 2 in the direction of the head-stock or to the position in which they are indicated in Fig. 3, will cause the inclined faces 114, 114 to slidably engage and be forced outward by the inclined faces 115 105 on the fixed bosses 116 thus forcing the sleeve clutch member 98 out of clutching engagement with the clutch member 92, as shown in Fig. 3 and also in Fig. 4. And the movement of the lever and said bar 110 in an opposite direction or in the direction of the tail-stock-supporting end of the machine, will permit the hand wheel 105 and its sleeve clutch member 98 to be moved 115 inward by hand or in any desired manner, into clutching engagement with the clutch member 92 of the worm wheel mechanism, whenever desired.

The hand lever 108 is operatively connected with and adapted to be automatically 120 operated by the carriage mechanism, as follows:

A trip or clutch-lever-operating rod 118 is slidably mounted in bearings 119, in such a manner as to permit the desired limited 125 longitudinal movement of said rod. This rod extends through and in slidable relation to a supporting arm or bracket 120, fixed to and projecting forward beyond the front side of the bottom slide-rest or main car- 130

riage member 3; and an adjustable sleeve 121 may be mounted in threaded engagement with said arm and in sliding engagement with and in position to encircle the rod 118.

5 The rod 118 extends through an opening in the lever 108 and has collars 122 fixed to the rod on opposite sides of and in position to engage and operate said lever when the rod is operated in either direction.

10 A split collar 123 is adjustably mounted on the rod, and is adapted to be securely fixed thereto in any desired adjusted position by means of a securing screw 124 which is mounted in the extremities of the split
15 ring and adapted to clamp the ring tightly upon the rod in any desired adjusted position.

A similar collar or ring 125 is fixed to the rod in such position that the arm 120 and
20 sleeve 121 are located between the collars 123 and 125, and adapted to engage the former when the desired limit of movement of the carriage mechanism in one direction has been reached, thereby operating the lever
25 108 so as to operate the bar 110 and throw the sleeve clutch member 98 out of clutching engagement with the clutch member 92 of the worm mechanism, thereby disconnecting the shaft 85 from its source of power. The
30 further movement of the carriage mechanism in the direction of the lever 108 is thus prevented.

It is obvious that the movement of the carriage in an opposite direction until the sleeve
35 121 or arm 120 is brought into operative engagement with the collar 125 will operate the lever 108 and bar 110 in an opposite direction, and move the bar 110 into such position as to permit the hand wheel and
40 its sleeve clutch member to be moved inward to position to cause the clutch mechanism to again connect the shaft 85 with the worm mechanism and source of power, when desired.

45 The tail stock has a securing plate 126 yieldingly attached to the upper flange 36 and projecting downward over the rear upper margin of the track 11, and held in yielding slidable engagement with the track
50 by means of headed bolts 127 having compressible springs 128 interposed between said securing plate and the heads of the securing bolts or pins.

Apertures 129 in the web 13 and 130 in
55 the web 12 are provided at suitable intervals, for enabling the frame to be cleaned, and may be of any desired form.

I claim:

1. In a lathe, the combination with a lathe
60 bed, of a back frame projecting above the bed at one side, and a track arranged on said extension at right angles to the lathe bed, a head-stock mounted in position to travel over the lathe bed, a tail-stock slid-
65 ably connected with the vertically exposed

track on the extension, and projecting over and spaced from the lathe bed, and a carriage movable on said lathe bed.

2. In a lathe, the combination of a horizontal lathe bed, a vertically disposed track
70 spaced apart from and located rearward beyond and above the level of the top of the lathe bed and in parallel relation to said bed, a head-stock mounted in position to extend over the lathe bed, a tail-stock slidably
75 supported by said track and extending over and spaced apart from the lathe bed, a tool-supporting carriage slidably mounted upon the lathe bed and out of engagement with the track and adapted to be moved into position to extend between the tail-stock and
80 the lathe bed, and means for operating the tool-supporting carriage.

3. In a lathe, the combination with a lathe bed horizontally disposed, of a back frame
85 projecting thereabove, and a vertically positioned track carried by said extension at one side of the lathe bed, and parallel therewith, a tail-stock mounted to extend over the lathe bed and slidably engaging said track, a head-
90 stock mounted on the bed, in combination with a bottom slide rest movable longitudinally of the lathe bed, and tool supporting mechanism supported by said slide rest and adapted to be operated during a movement
95 thereof.

4. In a lathe, the combination of a lathe bed, a track spaced apart from and located in parallel relation to the lathe bed, said track being disposed in a substantially vertical plane and at an angle to the lathe bed,
100 a head-stock mounted upon said track and extending over and spaced apart from the lathe bed, a tail-stock slidably mounted upon said track and extending over and spaced
105 apart from the lathe bed, said tail-stock having along one side outwardly projecting shoulders cooperating with the vertical track, a tool-supporting carriage slidably mounted upon the lathe bed and out of engagement with the track upon which the
110 head-stock and tail-stock are supported, and means for operating the tool-supporting carriage.

5. In a lathe, the combination of a lathe
115 bed, a track spaced apart from and located rearward beyond and above the level of the top of the lathe bed and having top and bottom faces parallel with the top face of the lathe bed, said track having a side face
120 parallel with the longitudinal center of the lathe bed, a track-supporting frame member fixed to the back of the lathe bed at a point below the level of the top of said bed and extending upward back of the lathe
125 bed and track and attached to the back of the track, a head-stock mounted in position to extend over the lathe bed, a tail-stock slidably mounted upon said track and extending over and spaced apart from the lathe
130

bed, slide-rest mechanism slidably mounted upon the lathe bed and adapted to be moved into position to extend between the tail-stock and the lathe bed, and means for operating the slide-rest mechanism.

6. In a lathe, in combination, a bed, a back frame projecting over the bed and terminating at a point above said bed, a track carried by the extension and disposed at right angles to the bed and fashioned to present guiding surfaces, a head-stock movable over the lathe bed, a tail-stock having shoulders slidably engaging surfaces on the vertically disposed track, a bottom slide mounted upon the lathe bed, tool supporting mechanism carried by said slide, movable at an angle to the path of movement of the slide rest, and means for operating said slide mechanism.

7. In a lathe, the combination of a lathe bed, said lathe having a track, a head-stock mounted in position to extend over the lathe bed, a tail-stock slidably supported upon said track, a bottom slide-rest mounted upon and movable longitudinally of the lathe bed, upper tool-supporting slide-rest mechanism supported by and movable at an angle to the path of movement of the bottom slide-rest, lever mechanism pivotally mounted upon the bottom slide-rest and pivotally connected with the said upper tool-supporting slide-rest mechanism, guiding means in operative engagement with said lever, and means for operating the bottom slide rest.

8. In a lathe, the combination of a lathe bed, said lathe bed having a track disposed thereabove, a head-stock mounted in position to extend over the lathe bed, a tail stock slidably supported upon said track and extending over and spaced apart from the lathe bed, a bottom slide-rest mounted upon and movable longitudinally of the lathe bed and spaced apart from said track, upper tool-supporting slide-rest mechanism supported upon and movable at an angle to the path of movement of the bottom slide rest, lever-mechanism pivotally mounted upon the bottom slide rest and operatively connected with said upper tool-supporting slide-rest mechanism, a stationary guide in operative engagement with said lever mechanism, and means for automatically operating the bottom slide-rest.

9. In a lathe, the combination of a lathe bed, said lathe bed having a tail-stock track positioned thereabove, a head-stock mounted in position to extend over the lathe bed and provided with a rotative mandrel, a tail-stock slidably supported upon said track and extending over the lathe bed, a bottom slide rest mounted upon and movable longitudinally of the lathe bed and spaced apart from said track, upper tool-supporting slide rest mechanism supported upon and movable at an angle to the path of movement of the bottom slide rest, spring mechanism op-

eratively connected with said upper tool-supporting slide rest mechanism and acting to tend to press the same in a predetermined direction at an angle to the direction of the path of movement of the bottom slide-rest, lever mechanism pivotally mounted upon the bottom slide rest and operatively connected with said upper tool-supporting slide-rest mechanism and adapted to operate the same against the tension of said spring mechanism, a guide mounted upon a stationary support and in operative engagement with said lever mechanism, driving mechanism operatively connected with said mandrel, and automatic actuating means adapted to be operatively connected with said bottom slide rest and with said driving mechanism.

10. In a lathe, in combination, a lathe bed disposed in a horizontal plane, a back frame projecting therefrom at one side and of a curved formation, and a track carried by one end of said extension disposed above the lathe bed and in a vertical plane at right angles to said bed, a head-stock mounted upon the lathe bed, a tail-stock having a surface arranged in a vertical plane fashioned to cooperate with the track to guide said stock in a horizontal movement, and a tool supporting carriage movably mounted upon the lathe bed.

11. In a lathe, in combination, a lathe bed disposed in a horizontal plane, a back frame projecting therefrom at one side and of a curved formation, and a track carried by one end of said extension disposed above the lathe bed and in a vertical plane at right angles to said bed, a head-stock mounted upon the lathe bed, a tail-stock having a surface arranged in a vertical plane fashioned to cooperate with the track to guide said stock in a horizontal movement, and a tool supporting carriage movably mounted upon the lathe bed, in combination with mechanism cooperating with a tool rest on said carriage for shifting the same angularly during a movement of the carriage.

12. In a lathe, the combination with a lathe bed, of a back frame projecting from one side, and a track carried by said extension adjacent one side of the lathe bed and at right angles thereto, a tail-stock having projecting portions cooperating with surfaces on said track for supporting said stock, a head-stock carried by the lathe and a movable bed interposed between said head and tail-stocks.

13. In a lathe, the combination with a lathe bed, of a back frame carried thereby and having a track disposed in a vertical plane at right angles to the lathe bed, said track being parallel to the lathe bed and having shoulder portions, a tail-stock fashioned to cooperate with said shoulder portions to support the same above the lathe

bed, a head-stock, and a movable carriage between said head and tail-stocks disposed upon said lathe bed.

14. In a lathe, the combination with a
5 lathe bed, of a back frame carried thereby and having a track disposed in a vertical plane at right angles to the lathe bed, said track being parallel to the lathe bed and having shoulder portions, a tail-stock fashioned to coöperate with said shoulder portions to support the same above the lathe
10 bed, a head-stock, and a movable carriage

between said head and tail-stocks disposed upon said lathe bed, said carriage being provided with tool supporting means, mechanism for shifting said supporting means during a movement of the carriage, substantially as described. 15

Signed at Chicago, Illinois, May 16, 1919.

JOHN E. JOHNSON.

Witnesses:

HARRY I. CROMER,
W. HARDING.