(No Model.) 4 Sheets—Sheet 1.

F. H. RICHARDS.

TURRET LATHE.

No. 497,212. Patented May 9, 1893.

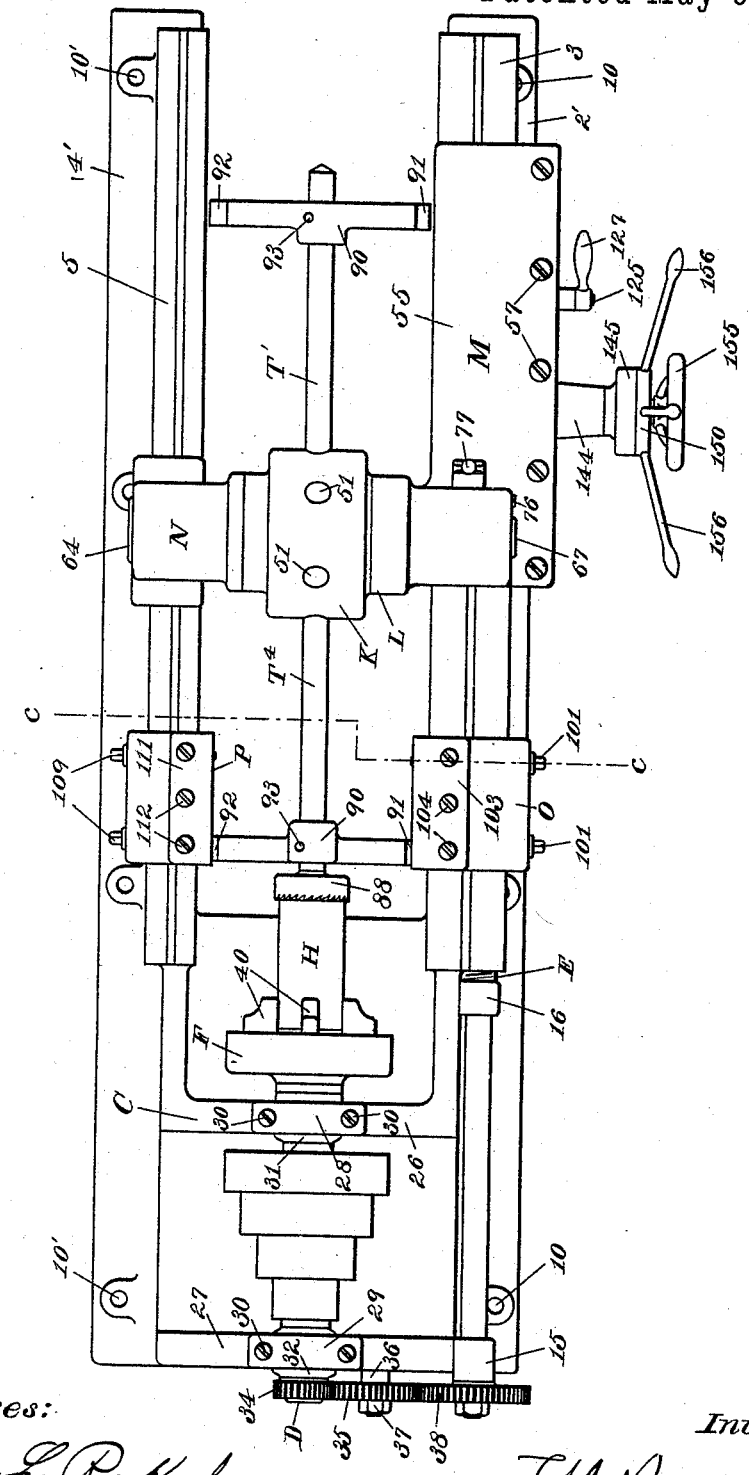

Fig. 1

Witnesses:
Henry L. Reckard.
H. Mallner.

Inventor:
F. H. Richards

(No Model.)

4 Sheets—Sheet 2.

F. H. RICHARDS.

TURRET LATHE.

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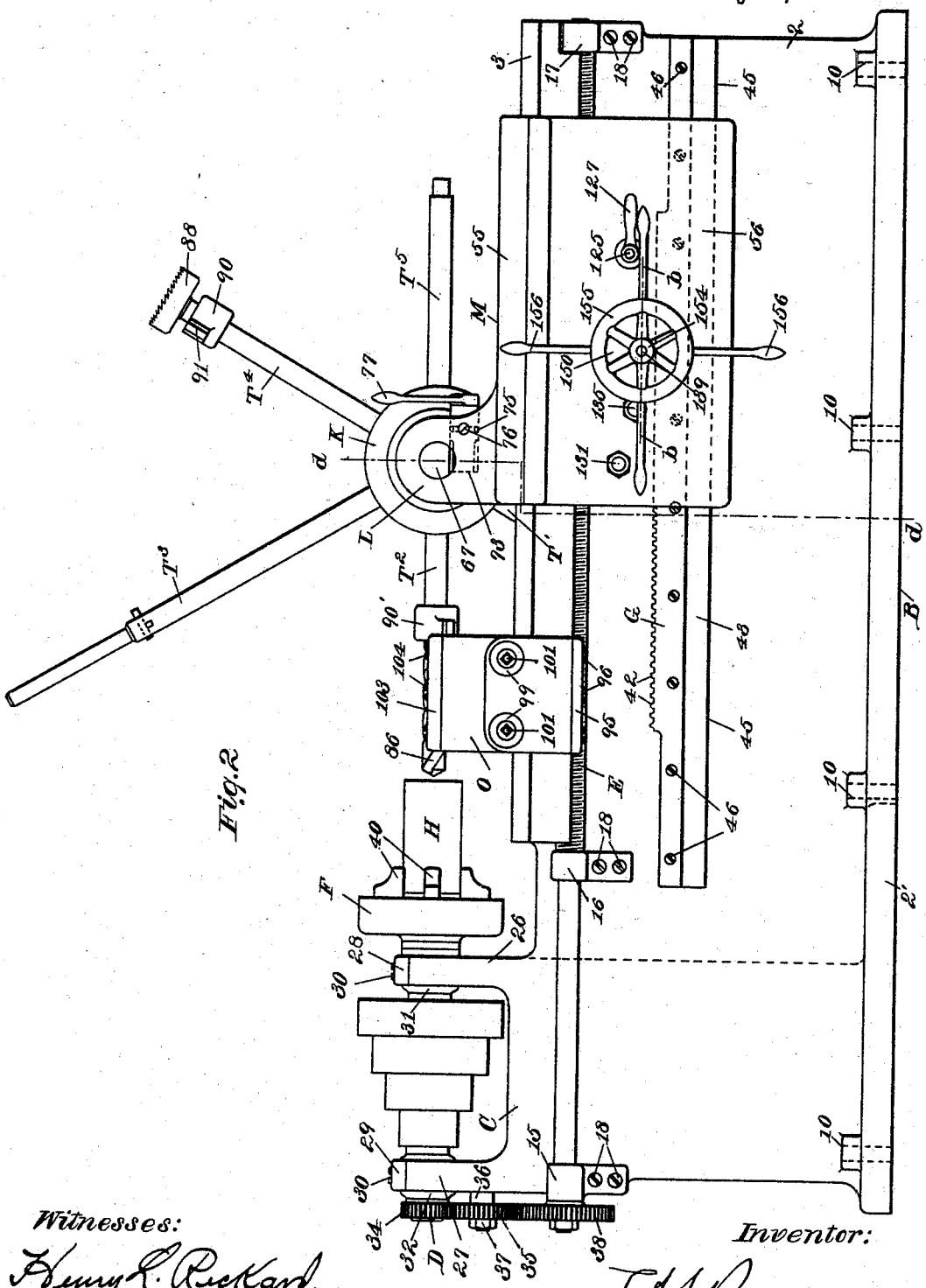

Fig. 2.

Witnesses:
Henry L. Ruckard.
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Inventor:
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(No Model.)

4 Sheets—Sheet 3.

F. H. RICHARDS.

TURRET LATHE.

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Fig. 4

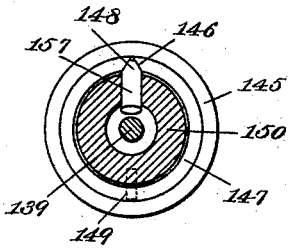


Fig. 3

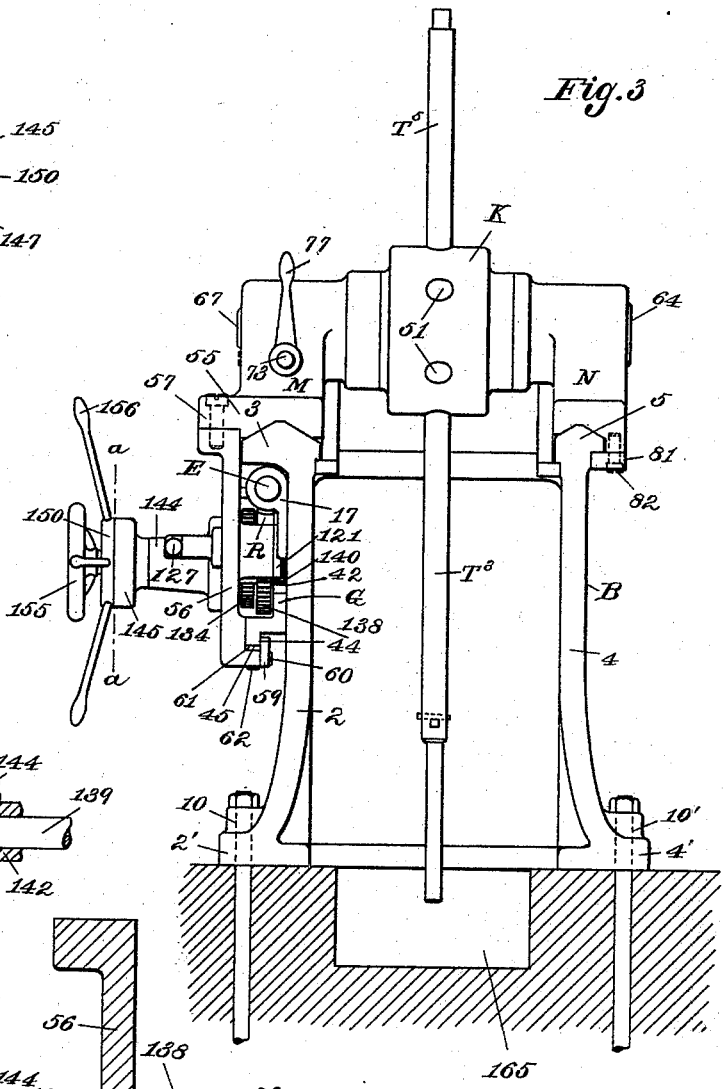


Fig. 5

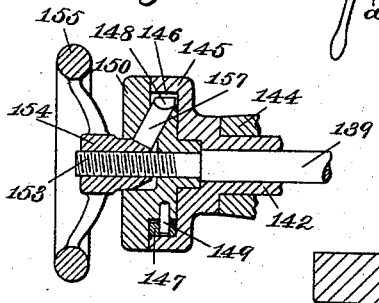
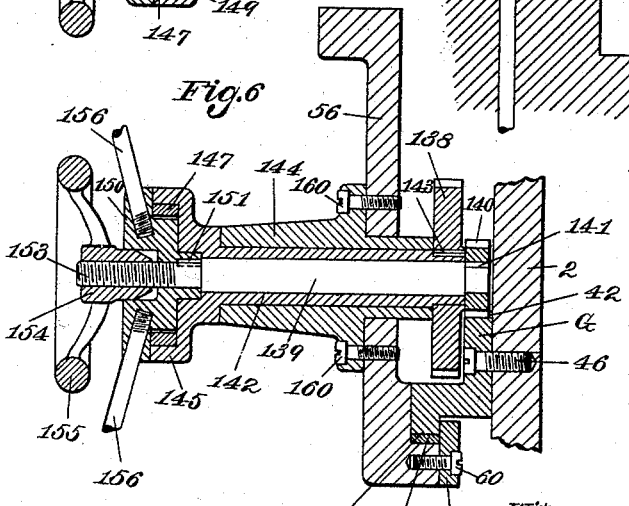


Fig. 6



Inventor:

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H. Mallmer.

(No Model.)

4 Sheets—Sheet 4.

F. H. RICHARDS.

TURRET LATHE.

No. 497,212. Patented May 9, 1893.

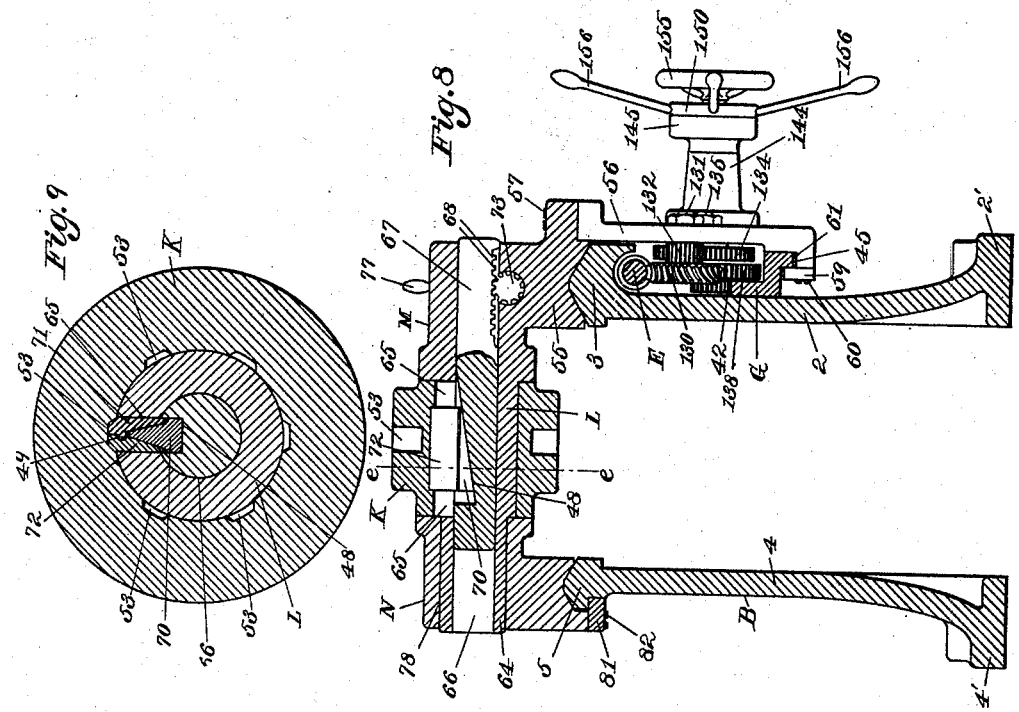

Fig. 9

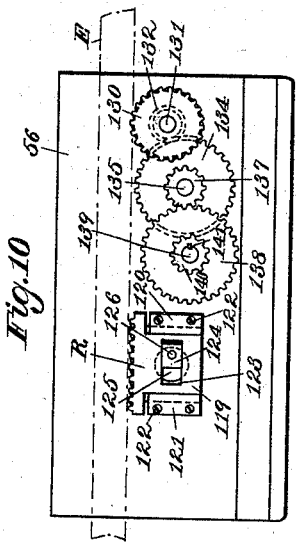

Fig. 10

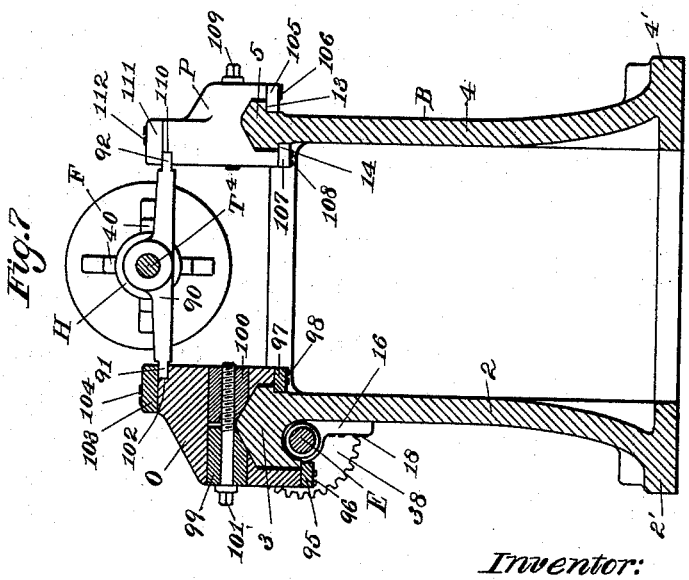

Fig. 7

Witnesses:

Henry L. Reckard.

H. Mallmer.

Inventor:

F. H. Richards

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO WALTER WOOD, OF SAME PLACE.

TURRET-LATHE.

SPECIFICATION forming part of Letters Patent No. 497,212, dated May 9, 1893.

Application filed May 31, 1892. Serial No. 434,859. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Turret-Lathes, of which the following is a specification.

This invention relates to that class of turret-lathes which usually have the turret mounted upon a horizontal axis; the object being to furnish a turret-lathe adapted for using boring-bars or other tools of relatively great length.

The invention consists in the organized machine, and in the features and combinations embodied therein, which are hereinafter more fully set forth.

In the drawings accompanying and forming a part of this specification, Figure 1 is a plan view of a turret-lathe embodying my present improvements. Fig. 2 is a front elevation of the turret-lathe. Fig. 3 is an end elevation of the lathe as seen from the right-hand in Figs. 1 and 2; in this view the head of the lathe shown at the left-hand in Figs. 1 and 2 is omitted. Fig. 4 is a sectional view of certain details of the feed mechanism of the lathe, in line *a a* of Fig. 3. Fig. 5 is a sectional view, in line *b b*, Fig. 2, through the feed-clutch mechanism. Fig. 6 is a vertical transverse section of the carriage-plate, through the feed-shaft bearing. Fig. 7 is a vertical transverse section of the machine, in line *c c*, Fig. 1, showing the parts at the left-hand of said line. Fig. 8 is a vertical transverse section, in the line *d d*, Fig. 2, showing the parts at the right-hand of said line. Fig. 9 is an enlarged section, in line *e e*, Fig. 8. Fig. 10 is a rearward view of the carriage plate, showing the feed-gearing in place thereon.

Similar characters designate like parts in all the figures.

The framework of my improved turret-lathe consists, in the preferred form thereof shown in the drawings, of the front-wall 2 and the back-wall 4, these walls being connected together at the left-hand, or head, end of the machine, and usually and preferably (unless the framework should be made of excessive length) left open at the right-hand end thereof, as indicated in Figs. 1 and 3. At the base of the frame, each said side-wall thereof is flanged, as at 2′ and 4′, respectively; and these flanges are provided with suitable holding-down bolts, at a series of points, 10 and 10′, respectively. At one end of the framework (at the left-hand, as herein shown) this is provided with some suitable head, as C, whose uprights, 26 and 27, carry the front and back bearings, 31 and 32, respectively, of the spindle D; said bearings being held in place by caps, 28 and 29, and cap-screws 30. The spindle D is or may be provided with a suitable chuck, as F, for carrying the piece of work, H, which is shown held in the jaws, 40, of the chuck. Of course, the character of the chuck or other work-holding device to be used will depend, in any particular case, upon the shape and character of the work or piece to be operated upon.

The upper edge of each of the frame-walls 2 and 4 is provided with a carriage-way, these being designated by 3 and 5, respectively. On the forward carriage-way, 3, the principal carriage, designated in a general way by M, is fitted to slide, while the back carriage-way, 5, has fitted thereon the separate auxiliary carriage N. These two carriages are operatively connected through the turret-bearing, L, upon which the turret K is journaled, and are otherwise independent.

The main carriage, M, is herein shown constructed of two principal parts, the carriage-frame 55 and the carriage-plate 56, these two parts being rigidly connected together by a series of suitable screws, as 57, Figs. 1, 3 and 8. (In engine-lathes, the part corresponding to the plate 56 is usually designated as the carriage "apron.") Said parts 55 and 56 may, however, be formed integral, being herein made separate only for the purpose of facilitating the construction and assembling of the machine, following in this respect the usual practice referred to in the case of engine-lathes. The lower edge of the carriage-plate 56 is fitted upon the lower carriage-way 45, which way is shown formed integral with a rack, G, (this having the rack-teeth 42) that is shown fixed to the front of the frame-wall

2 by means of a series of screws, 46. For holding the carriage-plate closely to the said lower way, and for adjusting any wear or play thereof, said plate is furnished with the strap 59 held in place by screws, 60, and with the jib 61 adjusted by the gib-screws 62.

The main carriage being fitted and jibbed as described to the front carriage-way and the guide-way 45, is thereby fully controlled in its movement independently of the support, by the supplemental carriage N, of the projecting end of the turret-bearing whereon the turret is revolubly mounted.

As a means for sliding the carriage M on its ways by hand, the carriage-plate carries means for supporting the pilot-wheel-shaft 139, to the rearward end of which is fixed (by means of key 141) the pinion 140, whose teeth mesh with the aforesaid rack-teeth 42. The forward end of said shaft 139 has fixed thereto (by means of key 151, Fig. 6) the pilot-wheel-hub 150, furnished with the usual set of pilot-wheel-arms, 156. The feed-gearing here described is organized as shown in the several figures of the drawings, so that the upper pilot-wheel handle moves in the direction of the carriage-movement, this organization being most convenient for the operator.

For the purpose of feeding the carriage M on its ways by power, a feed-screw, E, is provided, this screw being driven from the spindle D, and operatively connected with the aforesaid pilot-wheel-shaft 139, through intermediate gearing and a feed-clutch. The feed-screw E is located immediately under the front way 3, and should be supported by suitable bearings, as for instance, the bearings 15, 16 and 17, which may be fixed to the framework by suitable screws, as 18. The feed-screw may be actuated from the spindle D, after the ordinary manner of so actuating the feed-screws of engine-lathes; and for this purpose I have shown a set of gears consisting of the pinion 34 fixed to the spindle D, the driven wheel 38 fixed to the end of the feed-screw, and the intermediate wheel 35 fixed by means of the nut 37 to a stud, 36, that projects from the head C, as will be understood by comparison of Figs. 1 and 2.

The feed-screw E may be operatively connected with the shaft 139 through the gearing shown in Figs. 3, 6, 8 and 10. This gearing consists of the worm-wheel 130, which meshes at the upper side thereof with the threads of the screw E, and is carried by a stud, 131, fixed in the carriage-plate 56. Said worm-wheel 130 carries fixed thereon the pinion 132, which meshes with an intermediate wheel, 134, carried on a stud, 135, (also fixed in the carriage-plate 56,) which wheel carries another pinion, 137, that meshes with another gear, 138, fixed (by means of key 143) to the inner end of the sleeve 142. Said sleeve 142 constitutes the immediate bearing for the aforesaid pilot-wheel-shaft 139, and is itself journaled in the bearing 144, which is fixed to the aforesaid carriage-plate 56 by means of a series of screws, 160. The outer end of the sleeve 142 has formed (or fixed) thereon the friction-rim 145; within which rim is fitted a friction-ring, 147, that is carried by the aforesaid pilot-wheel-hub 150, being prevented from rotation on said hub by means of a pin, 149, fixed in the hub and extending into a hole through said ring, as will be understood by comparison of Figs. 4, 5 and 6. The ring 147 is divided on one side thereof by a V-shaped slot, 146, (Figs. 4 and 5,) and a ring-expander, 157, has the outer end thereof formed of a wedge, 148, fitting between the ends of the friction-ring for the purpose of expanding the same. The inner end of the plug, or expander, 157, fits against the conical inner end of the hub, 154, of the wheel 155, so that by turning the threaded hub 154 upon the outer threaded end, 153, of said shaft 139, said expander may be forced outward for the purpose of expanding the friction ring; or, by turning back the hand-wheel, the conical hub thereof is withdrawn, when the contractile force of the friction-ring 147 will retract the plug 157. By means of this friction-clutch, the friction-rim 145 may be readily engaged with the shaft 139, or disengaged therefrom. By this means the power-feed here described may be disconnected from the pinion 140, when the screw-cutting apparatus hereinafter described is to be used; in this case, said pinion, of course, "runs idle" in mesh with said rack.

As a means for connecting the carriage M with the feed-screw for screw-cutting purposes, said carriage is furnished with the half-nut R, which is formed on the upper end of a slide, 119, that is fitted to move vertically between the guides 120 and 121, that are fixed to the back side of the plate 56 by means of screws, 122, as will be understood by comparison of Figs. 3 and 10. For operating the feed-nut R, the slide thereof has formed therein a mortise, 123, in which is fitted a crank-block, 124, that is carried by a crank-pin, 126, formed on a shaft, 125, journaled in said plate 56 and furnished with the handle 127 whereby to operate the same for throwing the nut into engagement or out of engagement with said feed-screw E, in a well-known manner.

The connection, as hereinbefore mentioned, between the two carriages M and N, is made by means of the turret-bearing L; this bearing is shown (see Figs. 1, 3 and 8,) formed integral with the carriage-frame 55 or carriage M, and the rearward end, 64, of said bearing L is shown journaled in a bearing, 78, formed on the carriage N, which bearing extends forward against the rearward side of the turret K, as will be understood by comparison of Figs. 1, 3 and 8. The carriage N is fitted to slide on the carriage-way, 5, of the frame-wall 4, being gibbed thereto by a strap, 81, that is fixed to the carriage by suitable screws, as 82. See Figs. 3 and 8.

The turret K, for the purpose of locking the same in its successive positions, has

formed on the inner side thereof a series of notches, 53; and the turret-bearing L, in that part thereof which lies within the turret, has formed therein a slot, 65, into which is fitted a lock-bolt, consisting, in the present instance, of three parts, as follows: The turret-engaging portion of the lock-bolt is formed of two parts, 71 and 72, which together at the outer edges thereof fit in and fill the bevel-sided grooves, or notches, 53; said parts 71 and 72 being, preferably, operatively connected by a tongue-and-groove at 49, as illustrated in Fig. 9. Between the tapered lower edges of the lock-bolt plates 71 and 72 is fitted the wedge 70, whose upper side is tapered, as shown in Fig. 9, to spread the lock-bolt plates, and whose lower side, as shown in Fig. 8, is tapered longitudinally as a means for actuating the same. Said wedge 70 fits into the correspondingly-inclined groove, or channel, 48, formed in the sliding shaft 67; this shaft slides within the bore, 66, of the turret-bearing L, being actuated longitudinally by means of a pinion, 73, whose teeth mesh with the teeth, 68, of said shaft 67. The pinion 73 is actuated by hand by means of a lever, 77, Figs. 1, 2 and 3. A pin or screw, 76, fixed in the carriage-frame 55, has a point entering the groove, 75, (Fig. 2) of the pinion-shaft 73, for the purpose of normally preventing the displacement of said shaft; this simple retaining device, being of itself well known, will be understood without a more particular description thereof.

The turret-bearing L being slotted at 65 as described, and the turret-locking device being constituted of the two plates 71 and 72 and the wedge 70, these parts constitute a turret-locking-and-clamping apparatus operating to simultaneously clamp the turret when the same is locked in position, by expanding the turret-bearing within the bore of the turret. The wedge 70 being forced outward by the incline of the shaft, or wedge, 67, spreads the two plates 71 and 72 apart and against the sides of the slot 65 to expand said turret-bearing firmly within the turret; at the same time, as hereinbefore stated, the wedge forces said plates outward into one of the turret-notches 53, thereby firmly locking the turret against rotation. This turret-locking-and-clamping apparatus constitutes a modification of, or improvement upon, the turret-locking-and-clamping mechanism described in my prior application Serial No. 412,866, filed November 23, 1891.

Between the lathe-carriage and the head of the machine, each of the carriage-ways 3 and 5 is shown furnished with a guide-block, O and P, respectively, adjustable longitudinally of the ways and projecting inwardly beyond the inner sides of the ways for the purpose of receiving and steadying the tools carried by the turret. The guide-block O, fitted to the forward way 3, is shown held in place by means of straps, 95 and 97, which are attached to the block by means of screws, 96 and 98, said straps fitting under the outer and inner edges respectively, of said way. On the inner side of said block, at the upper edge thereof, is formed a guide-way, 102, whose upper side consists of the strap 103, which is fixed to the guide-block O by means of screws, 104. For the purpose of clamping and unclamping the guide-block O from the front way 3, said block is furnished with suitable clamping devices, as for instance, the wedges 99 and 100 actuated by the screws 101. By tightening these screws, the wedges are drawn toward each other to impinge upon the inclined upper sides of the carriage-way 3, as will be understood from Fig. 7. The rearward guide-block P is of a similar construction, having the straps 105 and 107 fixed thereto by screws, 106 and 108, and engaging the projecting edges, or ways, 13 and 14, respectively, of said carriage-way 5. The upper edge of the block P is formed with the guide-way 110, whose upper surface is formed of the strap 111, which is held in place by screws 112. Said block P may be clamped and unclamped from its way 5 by means of wedges (similar to the wedges 99 and 100) actuated by the clamp-screws 109.

The function and mode of operation of the guide-blocks O and P will be understood by comparison of Figs. 1, 2 and 7. A series of tools or tool-carrying bars, designated respectively by T, T′, T^2, T^3, T^4, and T^5, are shown carried by the turret K, being supported by the shanks thereof in the turret-holes 51. In Figs. 1 and 3, some of these tool-bars are omitted for the purpose of simplifying the figures of drawings. The tool-bar T^4 is shown carrying the tool 88, and is also shown provided with the cross-head, or guide-bar, 90, whose ends 91 and 92 fit in the aforesaid ways 102 and 110, respectively, of the guide-blocks O and P. The cross-head 90 may be fixed to the tool of the tool-bar T^4 by means of a pin, as 93, or in some other well-known manner; or, said cross-head and said bar may be formed integral.

In Fig. 2 the tool-bar T^2 is shown carrying the drill 86, and is provided with a cross-head, 90′, whose ends are fitted to slide in the aforesaid ways of the guide-blocks. As shown in Fig. 2, said head has just entered the guide-block, it being supposed that at this time the operator has fed forward the carriage ready to begin drilling the piece H. That operation having been accomplished, the operator may withdraw the carriage M toward the right-hand to draw the guard 90 out of the guide-block; after which, by means of the handle 77, the sliding wedge-shaft 67 may be withdrawn, thereby withdrawing the lock-bolt and permitting the turret to be turned to bring the succeeding tool-bar, T^3, into position for use. And so in succession each of the tools may be brought into successive action, the carriage being at the same time fed by hand by means of the pilot-wheel hereinbefore described, or fed by power by means of the gear-

ing and friction-clutch described; or actuated for screw-cutting purposes by means of the guide-screw and the nut R.

By comparison of Figs. 1, 3, 7 and 8, it will be seen that the carriage-frame 55 projects little, if any, beyond the plane of the inside of the front way 3, thus leaving substantially the entire space between the two carriage-ways 3 and 5 for the sweep of the guide-bars of the tool-arms carried by the turret. This will be obvious from inspection of Figs. 1 and 7, in both of which the guide-blocks O and P are shown projecting inwardly from their respective ways for a distance equal to, or greater than, the width of their respective guide-grooves 102 and 110. By means of this organization of the mechanism, the entire space between said carriage-ways is made available for the passage of the boring appliances carried by the turret, and the guide-blocks are made available for supporting any of those appliances which may be provided with a suitable guide for that purpose.

In Fig. 3, a pit, 165, is shown underneath the machine and between the frame-walls 2 and 4 thereof. This illustrates one of the principal objects of the machine, which is to furnish a mechanism adapted for the use of long boring-bars, as for instance, the boring-bar T^3, which bar may, as shown in the drawing, project from the turret a much greater distance than the length of the lathe-carriage, the necessary room for swinging the same (when the bar is longer than the height of the machine) being obtained by means of a pit, as here described.

By means of the organized machine herein described, the long boring-bars required for finishing certain parts of steam-engines, for boring cylinders and like work, may be carried by a turret, and at the same time the operator may stand close to the machine, where he can properly manage the same and observe the progress of the work as this proceeds.

Having thus described my invention, I claim—

1. In a turret machine of the class specified, the combination with the front carriage-way and the back carriage-way, of the main carriage on one of said ways and having a turret-carrying bearing, rigidly fixed to said carriage and extending toward the other of said ways, the turret mounted on said bearing, and a separate turret-bearing-supporting carriage on the other way carrying the projecting end of the turret-bearing, substantially as described.

2. In a turret-machine of the class specified, the combination with the framework having two ways, of two separate carriages fitted to travel on said ways respectively, a turret intermediate to said carriages, a turret-bearing rigidly fixed to one carriage and joining the two carriages through the turret, and one or more tools carried by the turret and extending in the sweep thereof beyond said carriages, substantially as described.

3. In a turret-machine of the class specified, the combination with the framework having two parallel carriage-ways, of the turret located to turn in the space between said ways, and with its axis cross-wise thereto and two separate turret-supporting carriages connected with each other only through the turret by a turret-bearing, substantially as described.

4. In a turret-machine of the class specified, the combination with a framework substantially as described having two parallel carriage-ways, of the main carriage fitted to slide on one of said ways and having the laterally-projecting turret-bearing extending across the space between said ways, a turret mounted on said bearing over the space between the carriage-ways, turret-locking devices carried within the turret-bearing, and a turret-bearing-support fitted to slide on the opposite carriage-way, substantially as described.

5. In a turret-machine, the combination with the turret-bearing constructed to receive turret-locking devices, and with the turret mounted on said bearing and having internally thereof lock-bolt notches, of the lock-bolt consisting of two plates together engaging the turret-notches, the wedge 70 actuating said plates, and means for operating said wedge, substantially as set forth.

6. In a turret-lathe, the combination with a framework having two ways, of the carriage mounted on the framework and carrying a turret substantially as described, a tool-arm carried by the turret and furnished with a guide-bar, and two guide-blocks, one on each way, constructed for receiving and guiding the tool-arm guide-bar, substantially as described.

7. In a turret-machine, the combination with the turret-bearing L having the bore 66 and the slot 65, of the turret mounted on said bearing and having the notches on the inner side thereof, the lock-bolt consisting of the plates 71 and 72, the wedge 70, and a wedge fitted to slide within the bore of the turret-bearing for operating the lock-bolt wedge, substantially as set forth.

8. In a turret-machine, the combination with a framework having projecting ways, and with a carriage fitted to slide on said ways and carrying a turret, of a tool-arm projecting from said turret and having the guide-arm, a guide-block fitted to the carriage-way and having its guide projecting inwardly beyond the inner side of said way and of the carriage on said way and having a guide-way for receiving the tool-arm guide, and means for fixing the guide-block in place on the way, substantially as set forth.

9. In a turret-machine of the class specified, the combination with a framework having two ways with a clear space between the

same, of two separate carriages on said ways connected only by a turret-bearing extending over said space, a turret mounted on said bearing and carrying one or more tool-arms extending in the sweep thereof into the space between the carriage-ways, and means for feeding the carriage on its ways, substantially as set forth.

10. In a turret-machine of the class specified, the combination with a framework having the two parallel carriage-ways and having a clear space between said ways, and with the work-carrying spindle mounted on the framework, of the carriage M fitted to one of said ways and having the turret-bearing extending transversely of the framework to the opposite way, a turret-bearing-supporting carriage fitted to slide on the said opposite carriage-way and supporting the outer end of said turret-bearing, the tool-carrying turret mounted on said bearing, the feed-screw driven substantially as described, and means for actuating the carriage from the feed-screw, all organized and co-acting substantially as set forth.

11. In a turret-machine of the class specified, the combination with a framework having the front carriage-ways 3 and 45 and the back carriage-way 5, there being a space between said ways 3 and 5, of the carriage M, fitting on said front ways, the turret-bearing L projecting from the carriage M over said space between the ways 3 and 5, means for feeding the main carriage on its ways, and means for supporting the projecting end of the bearing L on the carriage-way 5, substantially as set forth.

12. In a lathe, the combination with a framework having the ways 3 and 45, of the carriage fitted substantially as described to slide on said ways, the feed-screw E, the rack G, the shaft and pinion revolubly supported in the carriage and engaging the rack, means for turning said shaft and pinion by hand, feed-gearing carried on the carriage and engaging said feed-screw, and a clutch arranged for engaging the feed-gearing with, and disengaging the same from, said pinion-shaft, whereby the carriage may be fed either by hand or power, substantially as set forth.

13. In a turret-machine, the combination with a framework having the front carriage-way, the back carriage-way, and a guide-way below the front carriage-way, of a main carriage, substantially as described, gibbed to slide on said front way and guideway, and having a turret-bearing rigidly fixed thereto and extending toward the back carriage-way, the turret revolubly mounted on said turret-bearing, and the supplemental carriage on said back carriage-way for supporting the projecting end of said bearing.

FRANCIS H. RICHARDS.

Witnesses:
WM. H. DE LACY,
E. M. DAWSON.

Correction in Letters Patent No. 497,212.

It is hereby certified that the residence of the assignee in Letters Patent No. 497,212, granted May 9, 1893, upon the application of Francis H. Richards, of Hartford, Connecticut, for an improvement in "Turret-Lathes," was erroneously written and printed "of same place," (*i. e.*, Hartford, Connecticut), whereas said residence should have been written and printed *Philadelphia, Pennsylvania;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 30th day of May, A. D. 1893.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

S. T. FISHER,
Acting Commissioner of Patents.