No. 736,791. PATENTED AUG. 18, 1903.

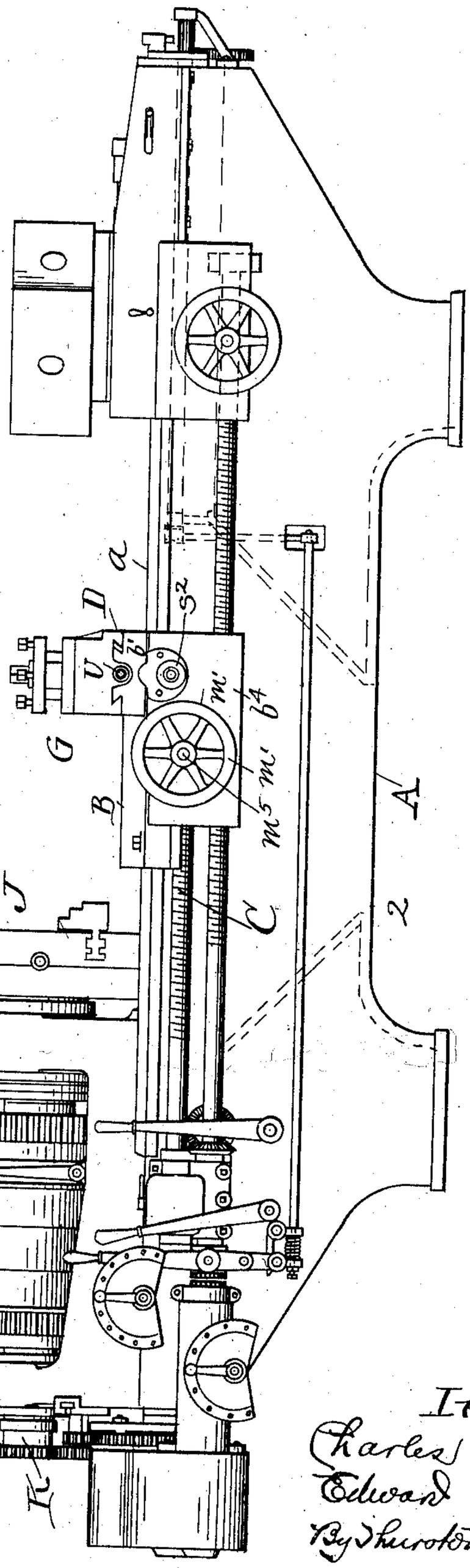
C. E. SEARCH & E. CHESHIRE.

LATHE.

APPLICATION FILED AUG. 12, 1901.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1



Witnesses
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H. M. Wise.

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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.

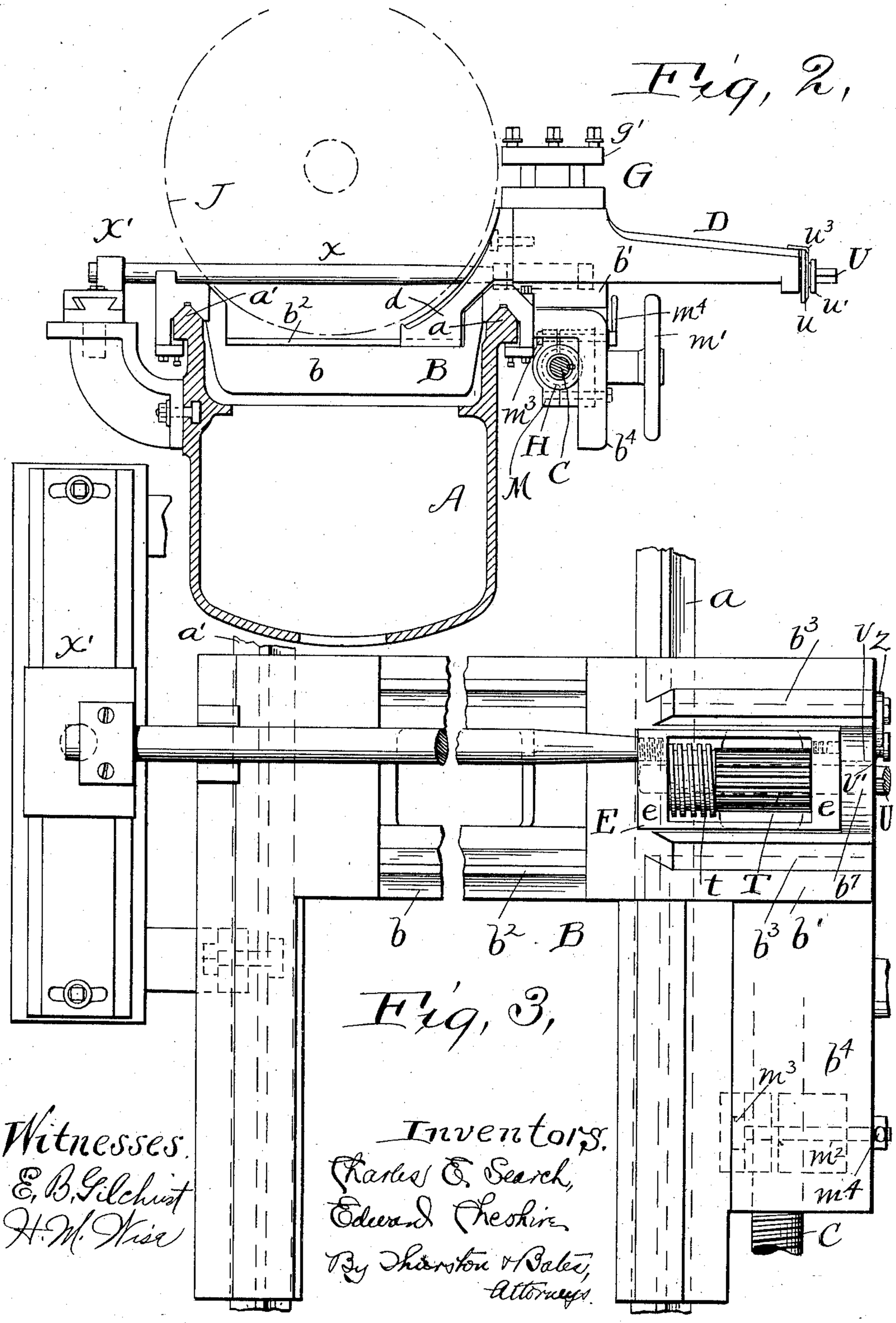

Fig. 3.

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NO MODEL. 4 SHEETS—SHEET 3.

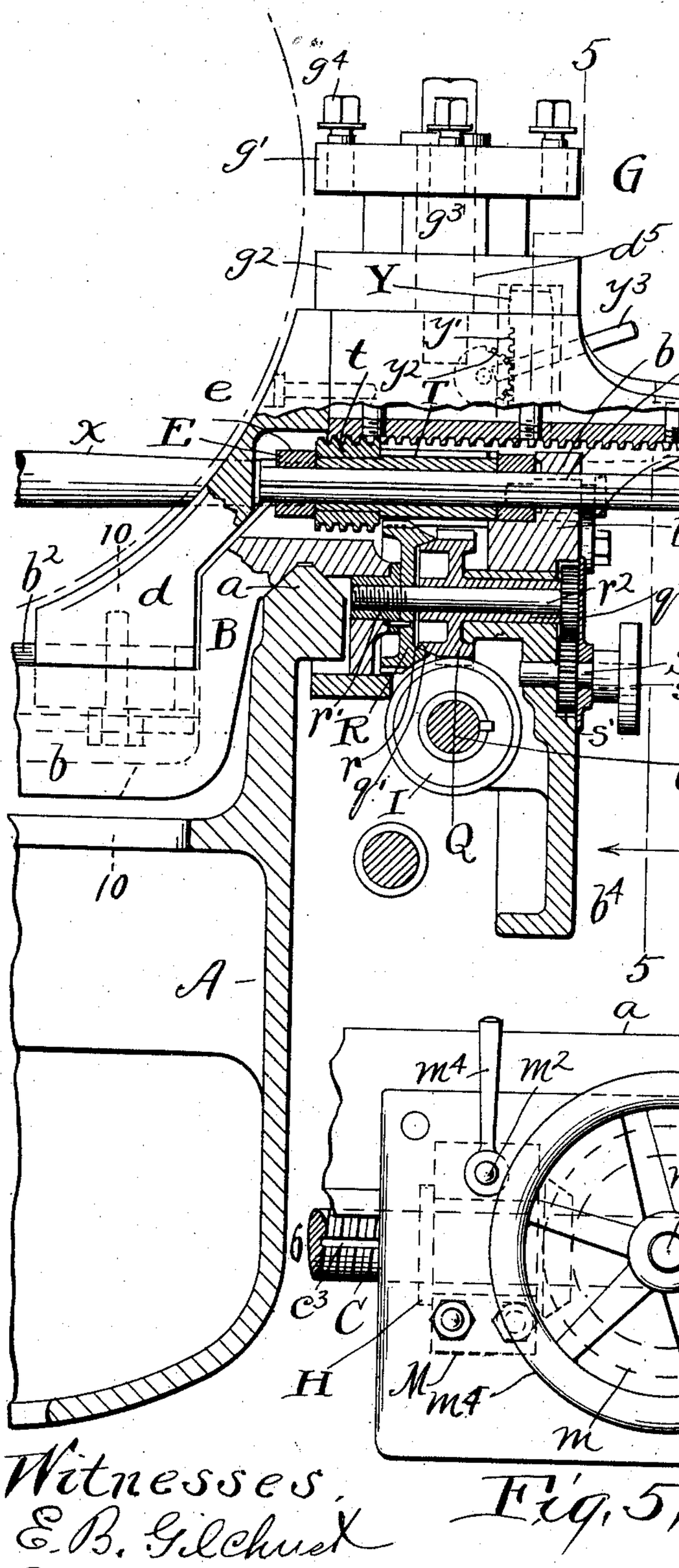

Fig. 4.

Fig. 5.

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NO MODEL. 4 SHEETS—SHEET 4.

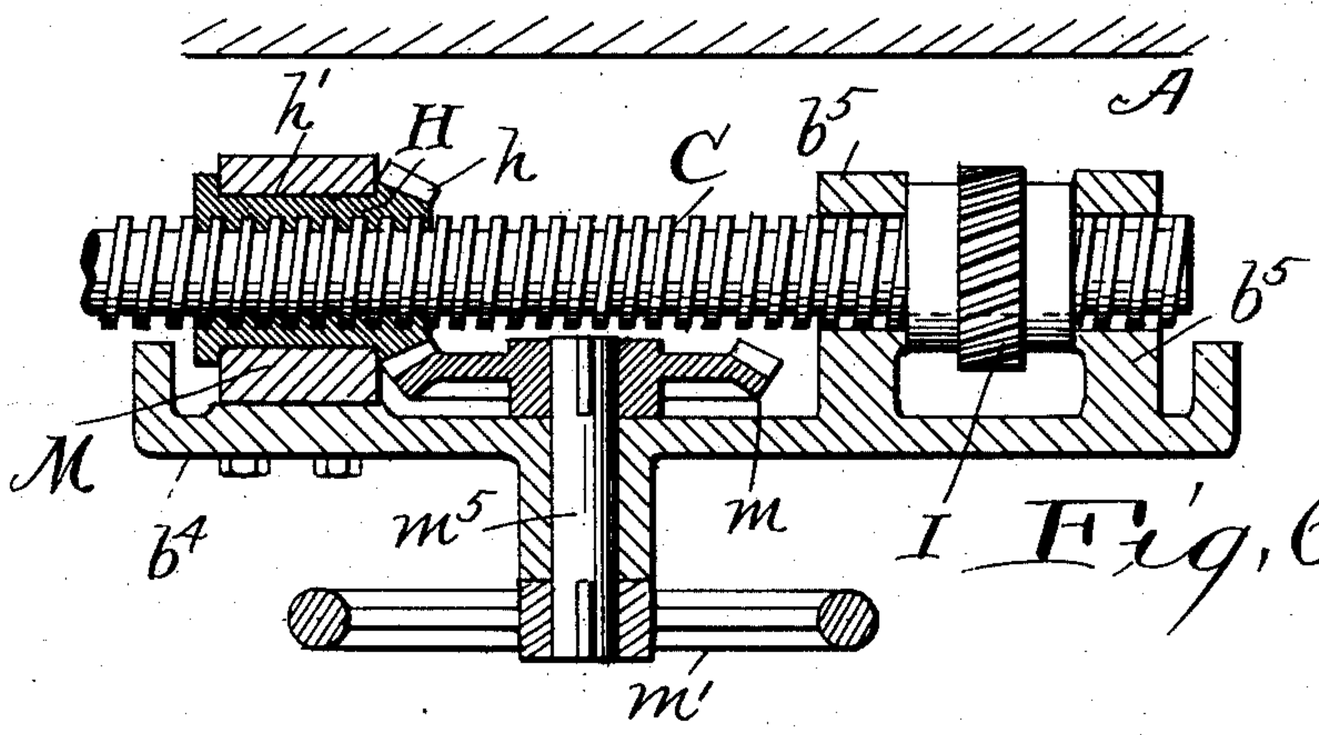

Fig. 6.

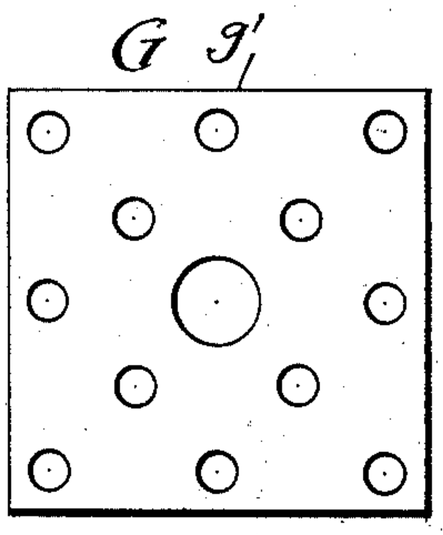

Fig. 7.

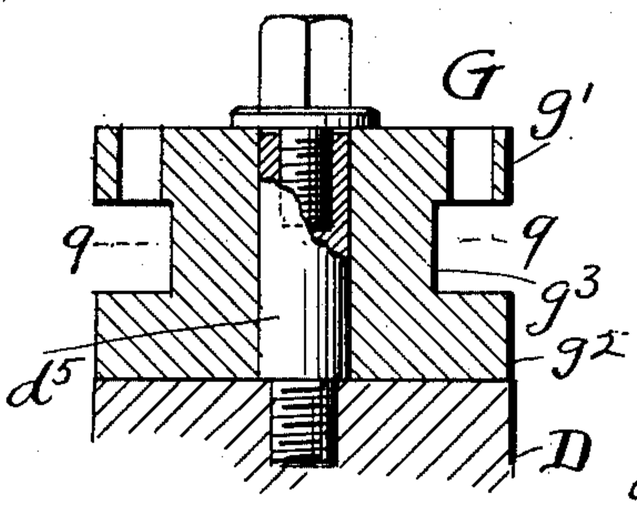

Fig. 8.

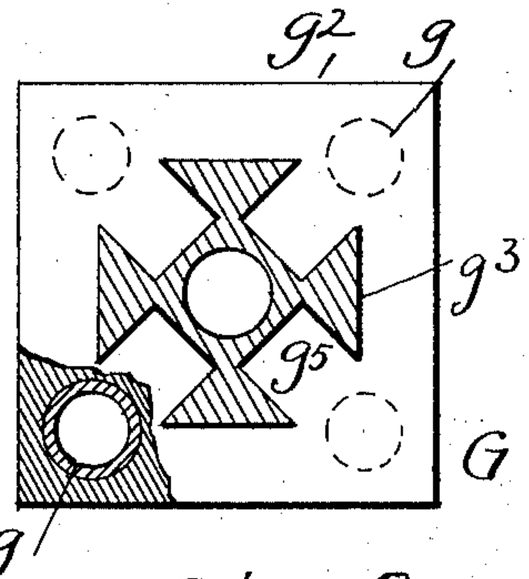

Fig. 9.

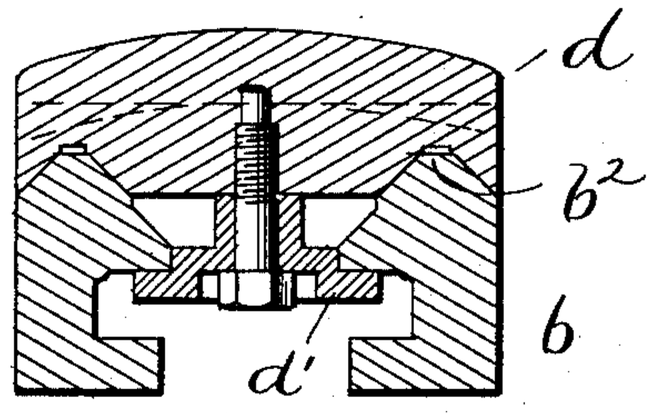

Fig. 10.

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No. 736,791. Patented August 18, 1903.

UNITED STATES PATENT OFFICE.

CHARLES E. SEARCH AND EDWARD CHESHIRE, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO MILWAUKEE MACHINE COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

LATHE.

SPECIFICATION forming part of Letters Patent No. 736,791, dated August 18, 1903.

Application filed August 12, 1901. Serial No. 71,683. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. SEARCH and EDWARD CHESHIRE, citizens of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Lathes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The invention relates especially to the longitudinally-movable carriage, transversely-movable tool, the slide thereon, the tool-block on the said slide, and the mechanism associated with these parts for operating and controlling them.

The principal objects of the invention are to provide these parts in such form that, first, the tools carried by the tool-holder may operate on work of any diameter up to or even greater than the diameter of the face-plate or chuck, and, second, that the turret may be moved close to said face-plate, whereby it will be unnecessary to employ turret-tools which extend a great distance from the turret which supports them.

The invention consists in the construction and combination of parts hereinafter described, and pointed out definitely in the claims.

In the drawings, Figure 1 is a front elevation of a turret-lathe embodying our invention. Fig. 2 is a sectional end view of the machine in the plane indicated by the line 2 2 of Fig. 1. Fig. 3 is a plan view, enlarged, of the parts shown in Fig. 2 when the tool-slide is removed. Fig. 4 is a vertical sectional end view of the front side of the machine in the plane indicated by line 4 4 of Fig. 5. Fig. 5 is an enlarged side view of the carriage and a sectional view of the superposed tool-slide in the plane indicated by line 5 5 of Fig. 4. Fig. 6 is a sectional plan view in the plane indicated by line 6 6 of Fig. 5 and shows the mechanism of feeding the carriage. Figs. 7, 8, and 9 are views of the tool-block, Fig. 7 being a plan, Fig. 8 a vertical section, and Fig. 9 a sectional plan view on line 9 9 of Fig. 8. Fig. 10 is a sectional view of the foot of the tool-slide and of the depressed part of the carriage on line 10 10 of Fig. 4.

Referring to the parts by letter, A represents the main frame or bed of the machine.

F represents the head-stock, in which the live-spindle K is rotatably mounted.

J represents the face-place, which is secured to the spindle and carries the usual clamping and chucking dogs.

On the front and rear edges of the bed of the machine are the longitudinal ways a a', on which the carriage B slides. Between these ways the bed is depressed or absent, and the part b of the carriage between these ways is depressed to such an extent as will enable it to pass beneath the face-plate. On the top of this depressed part b of the carriage are the V-shaped ways b^2, which are at the extreme edges of said carriage, and the carriage between these ways is absent or cut away. The depressed part of the carriage consists for the most part of two transverse bars whose top surfaces are made of inverted-V shape and serve as ways or guides for a part of the tool-slide. The front part b' of the carriage overhangs the front side of the machine-frame, and on the top of this elevated front part b' of the carriage are other ways b^3. The tool-slide D rests and slides transversely of the machine upon these ways. To the inner end of this slide a depending foot d is secured. This foot extends down to and rides upon the ways b^2 upon the depressed part of the carriage, and this foot is held upon said ways by a clamping-plate d', which extends under the ways and is fastened to the foot by a bolt. This slide has by reason of the described construction a very firm support upon the carriage. When the slide is moved as far forward as it can be, it and its foot are outside of the face-plate and may pass it. The advantages of the described construction, which is a very important part of the invention, are, first, that the tools carried by the slide may operate upon work of any diameter which may be clamped to the face-plate; second, that the carriage and the slide may be moved toward the head-stock past the face-plate, whereby the turret-slide may be moved close to the said face-plate, and thereby making it unnecessary to ever use long turret-tools capable of reaching wholly or

partly over the carriage to engage with the work. By reason of the fact that the carriage is cut away between the ways b^2 on the depressed part thereof the chips and cuttings from the tools will fall through the carriage and will not find lodgment thereon to impede the movements of the slide. The movements of the carriage and of the slide are taken from a feed-screw C, suitably mounted between the apron b^4 of the carriage and the front of the machine-frame. This feed-screw may be rotated by any appropriate mechanism. It is not thought necessary to describe herein the mechanism contained in the machine as shown for this purpose. A nut H (see Figs. 5 and 6) is threaded onto the feed-screw. It has a circumferential groove h', which is embraced by a clamp M, which is attached to the apron b^4. This clamp prevents endwise movement of this nut relative to the carriage; but when the clamp is loosened it does not prevent the rotation of said nut. On one end of the nut is a miter-gear h, which meshes with a miter-gear m, attached to a shaft m^5, which is journaled in and projects through the apron and has attached to its outer end a hand-wheel m'. This wheel may be manually turned with the result (when the nut is not gripped by said clamp) of turning said nut upon the screw, and thereby causing the carriage to move. If, however, this nut is gripped by the clamp and its rotation thereby prevented, the carriage will be moved by the rotation of the screw in the nut. The clamp is tightened by a bolt m^2, which passes through the apron and both parts of the clamp and screws into a nut m^3, abutting the rear side of the clamp, which nut is prevented from rotating by its engagement with a shoulder on the clamp. This bolt is turned by the handle m^4. A spiral gear I embraces the feed-screw and lies between two lugs b^5 on the apron of the carriage. The feed-screw C has a longitudinal groove c^3, into which a spline carried by this spiral gear projects. The spiral gear must rotate with the feed-screw, but may move lengthwise upon it and does so move when the carriage moves. This spiral gear meshes with a spiral gear Q, whose hub q is rotatably mounted in the apron. The inner edge of the spiral gear Q is beveled, as at q', and forms one member of a cone-clutch. A gear R, concentric with said spiral gear Q, has an annular flange r, which is beveled to form the other member of this cone-clutch. This gear R lies between the spiral gear Q and a nut r', which is doweled to the gear, and a clamping-screw r^2 passes through the hubs of the spiral gear Q and of this gear R and screws into the nut r', said nut being rotatably mounted in the carriage. By turning this clamping-screw the two cone-clutch members are forced into engagement, and the simultaneous rotation of said spiral gear Q and the gear R necessarily follows. For convenience in turning this screw r^2 its outer end is provided with a pinion meshing with another pinion s', fastened to a short shaft S, rotatably mounted in the apron and having a knurled head s^2, by which it may be rotated. This gear R meshes with a toothed sleeve or long pinion T, which has a worm t, secured to one end. This sleeve is splined to a shaft U, which is rotatably supported in a part of the slide and a part b^7 of the carriage, and it passes loosely through the end members $e\ e$ of a frame E, which is supported upon the carriage and, under the circumstances, to be presently explained, is adapted to slide upon said carriage. The pinion T lies between the end members of this frame and moves upon the shaft U when the frame moves. Under normal conditions this frame is fastened to the carriage with its outer end abutting against the upturned part b^7 thereof by the following means, to wit: A rod v passes through the part b^7 of the carriage and screws into the frame. In that part of the rod which projects outside of the carriage is a circumferential groove v', into which projects the forked end of a locking-plate Z, which is, for the time being, bolted to the carriage. The worm t, which is fastened to the sleeve T, engages with a spiral rack d^4, attached to the under side of the slide. When the spiral gear Q and the gear R are clutched together, the slide D is mechanically moved in one or the other direction, depending upon the direction in which the feed-screw C is rotating, the movement of said feed-screw being transmitted to the slide through the spiral gears I and Q, gear R, pinion T, worm t thereon, and the spiral rack d^4 on the slide. If the spiral gear Q and gear R are unclutched, the slide may be moved by turning splined shaft U, whose outer end is squared to receive a key or other tool for turning it. A graduated micrometer-disk u is clamped by nut u' to this shaft close to the front end of the slide. A pointer u^3, attached to the slide, projects over the edge of this graduated disk and coöperates with it. If, for example, a piece of work is nearly finished, the workman may caliper it and find out just how much must be taken off. Then by turning the shaft as much as may be necessary, which will be indicated by this micrometer-disk and coöperative pointer, the slide may be set in the position to make the finishing cut. When it is desired to use the machine to turn or bore taper, the frame E and the carriage are disconnected, and said frame is then connected by means of the rod x with any suitable or well-known taper attachment, one of which is represented more or less conventionally at x' in Figs. 2 and 3. When this connection is made, of course the spiral gear Q and gear R are unclutched, and as the carriage moves along the ways on which it is supported the frame E, and consequently the slide D, are moved on the carriage, the resultant movement of the slide being in a path parallel with the movement of the slide of the taper attachment.

On the top of the slide a rotatable tool-block G is mounted on a vertical stud d^5. This tool-block has on its under side as many sockets g as there are positions in which it is desired to fasten it. In the slide D is a vertically-movable pin Y, adapted to engage one of said sockets, and this pin is under the influence of a spring y, tending always to move it upward. This pin has racked teeth y' on one side, which are engaged by a pinion y^2, rotatably mounted in the slide and capable of being operated by the handle y^3, whereby said pin may be drawn downward to release the tool-block. This block may be said to consist of an upper and lower flange g' g^2 and an intermediate body part g^3. The tools which lie between these flanges are clamped upon the lower flange by said screws g^4 passing through the upper flange. The intermediate body part is substantially square in horizontal section except that at each corner thereof it has a diagonal recess g^5 to receive the end of a diagonally-placed tool. This provides a firm base upon which a diagonally-placed tool may be clamped without any enlargement of the tool-block itself.

Having described our invention, we claim—

1. In a lathe, the combination with the machine-frame having longitudinal carriage-ways, and a face-plate rotatably mounted upon said frame, of a carriage slidable upon said ways and having its front part extended in front of the frame, and having its middle part depressed between said ways, substantially as shown, whereby the top surface of said depressed part is in a plane below the lowest point of the face-plate, transverse ways on the elevated part of said carriage and other parallel transverse ways on the depressed part thereof, a tool-slide supported on both sets of ways on the carriage and adapted to be moved to position where all of its parts are distant from the axis of the face-plate more than the length of the radius thereof, substantially as specified.

2. In a lathe, the combination with the frame having longitudinal ways on its front and rear edges, and a face-plate rotatably mounted upon the said frame, of a carriage mounted on said ways and having its front part lying over and extended in front of the front way, and having its middle part, between said ways, depressed and formed of parallel transverse bars whose top surfaces form ways for the cross-slide, the elevated front part of said carriage having also transverse parallel ways on its top surface, and a tool-slide supported on the last-named ways, and having, fast to its inner end, a downwardly-extended foot which rides upon the ways on the depressed part of the carriage, substantially as and for the purpose specified.

3. In a lathe, the combination of a main frame, a longitudinally-movable carriage, a transversely-movable slide supported upon said carriage, a splined shaft carried by said slide, a spiral rack rigidly carried by said slide, a rotatable worm mounted upon said splined shaft and adapted to engage said spiral rack, a longitudinal feed-screw operating said worm, mechanism including a friction-clutch for transmitting motion from said feed-screw to said worm and means for locking said worm to said carriage.

4. In a lathe in combination of a main frame, a longitudinally-movable carriage mounted thereon, a transversely-movable slide supported upon said carriage, a frame supported upon said carriage and movable transversely thereon, a spiral rack secured to the slide, a rotatable worm engaging the said frame substantially as described, whereby it necessarily accompanies the frame when the latter moves, a pinion secured to said worm, a feed-screw and a train of gears transmitting motion from said feed-screw to said pinion.

5. In a lathe, the combination of a main frame, a longitudinally-movable carriage, and transversely-movable slide supported on said carriage, and a spiral rack secured to said slide, a frame supported upon the carriage, a rotatable grooved shaft extending through the end members of said frame and movable endwise with said slide, a pinion splined to said shaft and lying between the end members of said frame, a worm fixed to said pinion and meshing with said rack, a carriage feed-screw, a train of mechanism for transmitting motion from said feed-screw to said pinion, means for disconnecting said train of mechanism, and means for fastening said frame to the carriage, substantially as specified.

6. In a lathe, the combination of a main frame, a longitudinally-movable carriage, a transversely-movable slide supported on said carriage, and a spiral worm-rack secured to said slide, with a frame movably supported upon the carriage, a rotatable grooved shaft extending through the end members of said frame and movable endwise with said slide, a pinion splined to said shaft and lying between the end members of said frame, a worm fixed to said pinion and meshing with said rack, a carriage feed-screw, a train of mechanism for transmitting motion from said feed-screw to said pinion means for disconnecting said train of mechanisms, and means for fastening said frame to the carriage, a rod fast to said frame and having a circumferential groove, and a locking-plate adapted to engage in said groove and to be fixed to the carriage, substantially as specified.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

CHARLES E. SEARCH.
EDWARD CHESHIRE.

Witnesses:
JAMES F. GRIFFIN,
LUCIAN R. WORDEN.