

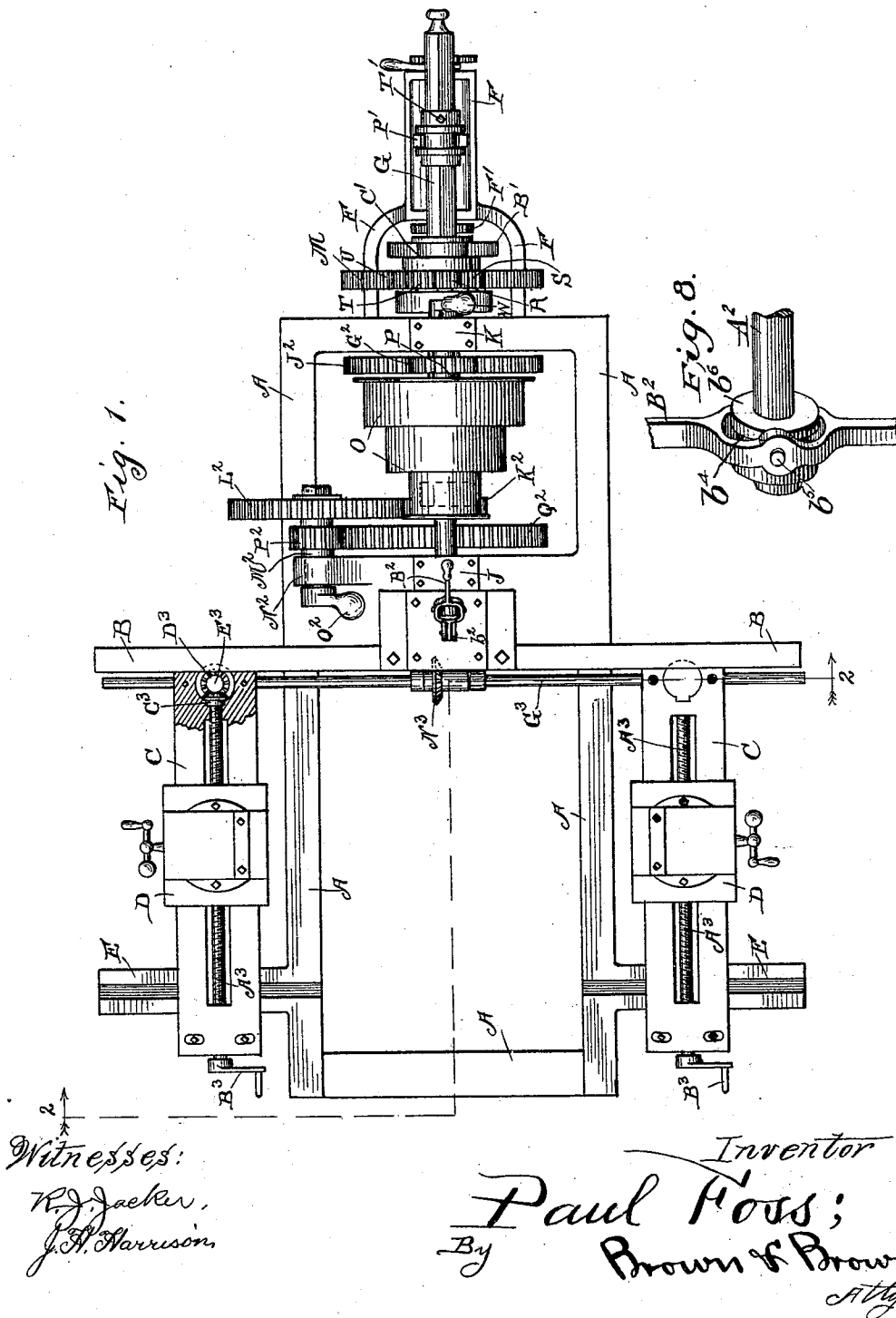
(No Model.)

3 Sheets—Sheet 1.

P. FOSS.
TURNING AND BORING MACHINE.

No. 583,010.

Patented May 18, 1897.



Witnesses:

R. J. Jaeger,
J. H. Harrison.

Inventor
Paul Foss;
By Brown & Brown,
Attys.

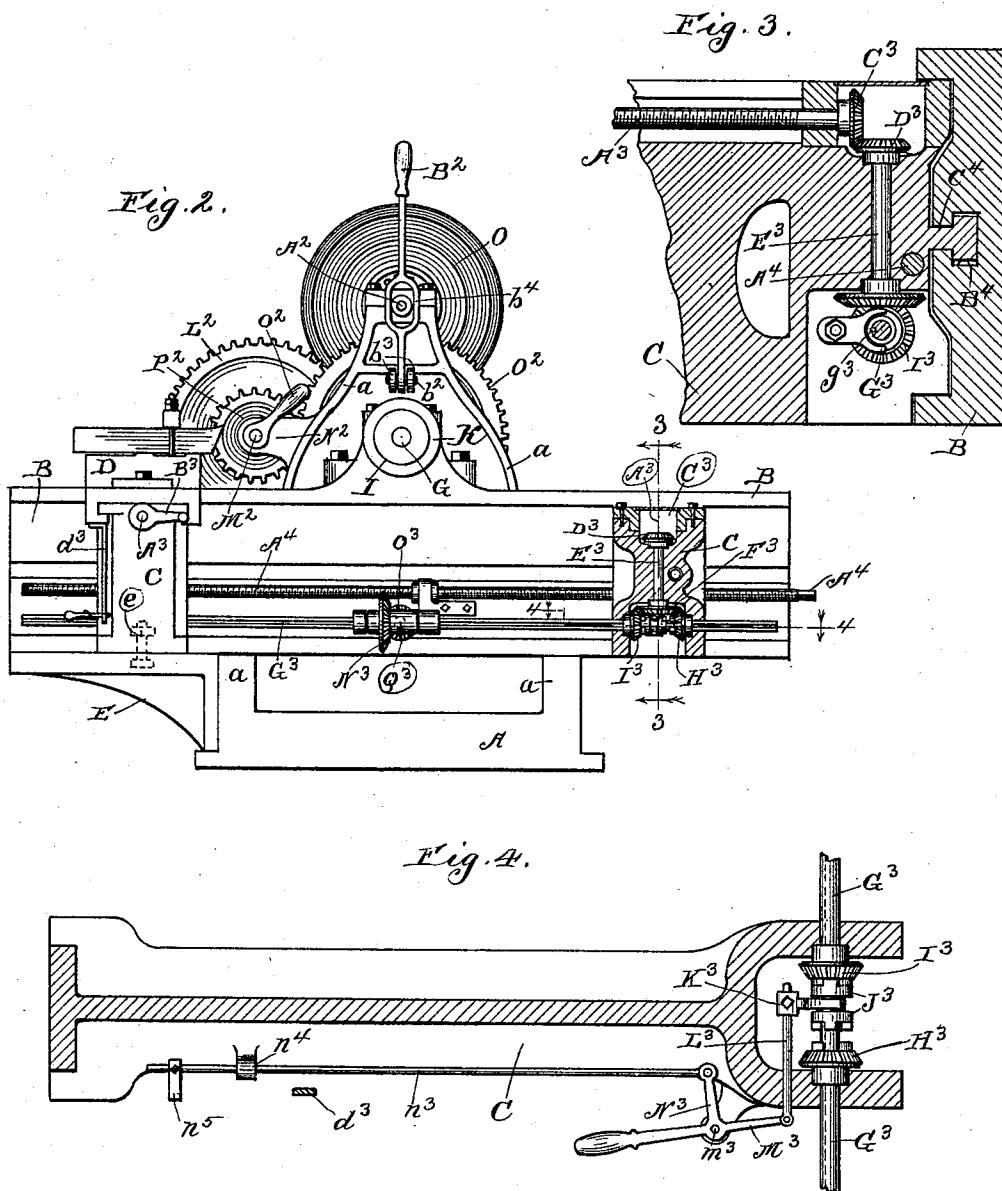
(No Model.)

3 Sheets—Sheet 2.

P. FOSS.
TURNING AND BORING MACHINE.

No. 583,010.

Patented May 18, 1897.



Witnesses:

R. J. Jaeger,
J. A. Harrison.

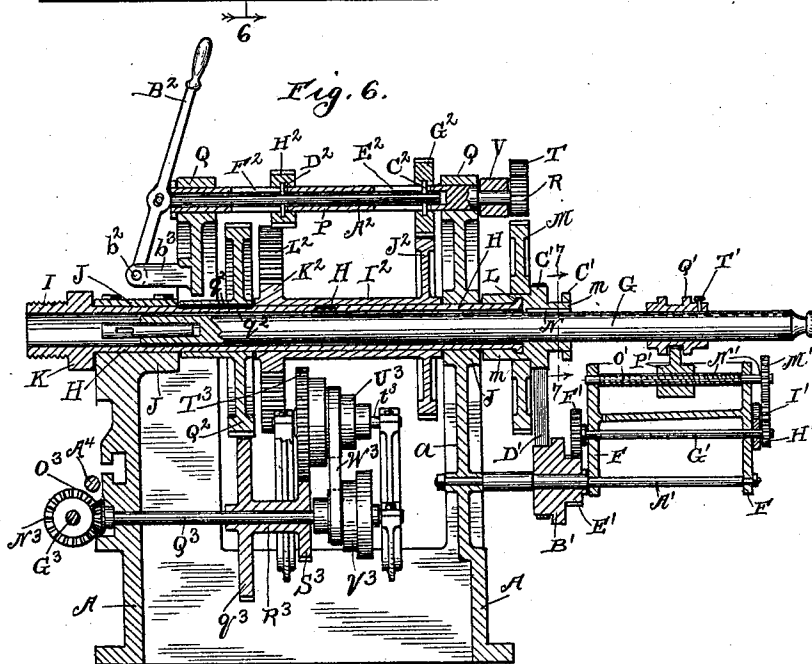
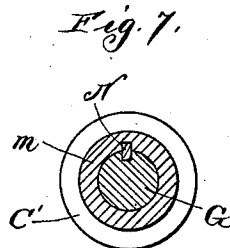
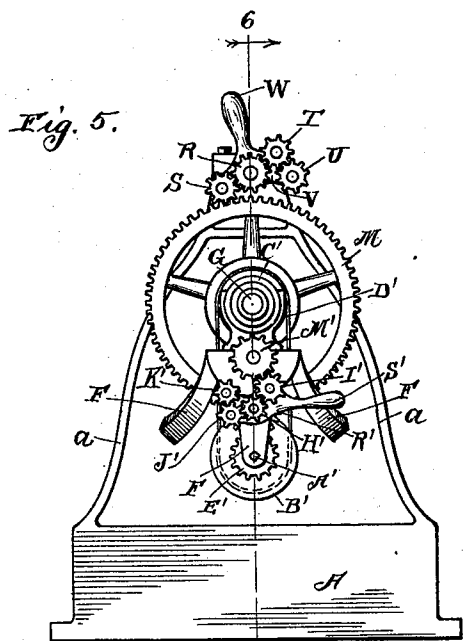
Inventor:

Paul Foss;
By Brown & Brown,
Attys.

P. FOSS.
TURNING AND BORING MACHINE.

No. 583,010.

Patented May 18, 1897.



Witnesses:
R. J. Jaeger,
J. H. Harrison.

Inventor:
Paul Foss;
By Brown & Brown,
Attys.

UNITED STATES PATENT OFFICE.

PAUL FOSS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO HERMAN FLORENTZ.

TURNING AND BORING MACHINE.

SPECIFICATION forming part of Letters Patent No. 583,010, dated May 18, 1897.

Application filed June 24, 1896. Serial No. 596,699. (No model.)

To all whom it may concern:

Be it known that I, PAUL FOSS, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Turning and Boring Machines, of which, when taken in connection with the drawings accompanying and forming a part hereof, the following is a full and complete description, sufficient to enable
10 those skilled in the art to which it pertains to understand, make, and use the same.

One of the objects sought by me in this invention is to obtain a machine whereby pulleys or other wheels can be bored and the
15 face thereof turned concentrically therewith at the same time when desired.

A further object of my invention is to obtain a machine of the character described wherein the pulley-face turned on the machine will be convex when desired, although
20 such turning is done simultaneously with the boring of the pulley.

A further object of the invention is to obtain a machine of the character described
25 wherein the relative movement of the cutting-tool and the part of the pulley cut thereby or the relative movement of the part of the pulley being cut to the tool producing the cutting may be suitably adjusted both for the
30 boring and the turning of the pulley or other wheel—that is to say, I desire to obtain a turning and boring machine wherein the proper relative speed of the boring-tool and the pulley or the proper relative speed of the boring-tool to the pulley may be obtained,
35 while at the same time the proper relative speed of the face of the pulley to the cutting-tool thereof is obtained, such boring and turning being simultaneously done by the machine.
40

A further object of the invention is to obtain a machine of the character described wherein either boring or turning may be effected when desired.

45 A further object is to obtain a machine of the character described wherein the movement of the face of the pulley relative to the cutting-tool thereof may be in either direction—that is, so as to require the setting of
50 such tool above or below the center of the pulley, as preferred.

A further object of the invention is to obtain means whereby the relative movement of the pulley and the cutting-tool effecting the boring thereof may be either in the right 55 or left direction, and that independently of the relative movement of the face of the pulley to the cutting-tool thereof.

The manner in which I effect the several purposes sought by me is illustrated and described herein, and may be stated briefly to be the construction of mechanism whereby the pulley or other wheel is held and rotated, thereby presenting the face or rim thereof to properly mounted and adjusted cutting-tools, 65 while boring or drilling mechanism adjusted to turn at a suitable rate of speed for the size of the hole being made is presented to the hub of the pulley or wheel, the mechanism holding and turning the pulley being rotatable at variable rates of speed and the boring or drilling mechanism being arranged so as to be held non-rotatable as the hub is presented thereto or to be turned in either direction and at variable rates of speed and to 75 be adjusted to project beyond the chuck or face-plate of the machine.

In the drawings referred to and forming a part of this specification, Figure 1 is a top plan view of a combined boring and turning 80 machine embodying my invention with the screw-threaded collar on the spindle of the machine, to which an ordinary chuck or face-plate is attachable, removed to expose to view gearing immediately below such collar; 85 Fig. 2, a front end view on line 2 2 of Fig. 1, viewed in the direction indicated by the arrows and showing one side in section; Fig. 3, a vertical sectional view, on an enlarged scale, on line 3 3 of Fig. 2, viewed in the direction indicated by the arrows; Fig. 4, a horizontal sectional view, on an enlarged scale, on line 4 4 of Fig. 2, viewed in the direction indicated by the arrows; Fig. 5, a rear end elevation of the machine with the 95 front end omitted; Fig. 6, a longitudinal vertical sectional view on line 6 6 of Fig. 5, viewed in the direction indicated by the arrows, with the front end of the machine omitted and with the cone-driving pulley of the machine removed from its shaft to expose the construction of such shaft to view; and Fig. 100

7, a vertical sectional view on line 7 7 of Fig. 6, viewed in the direction indicated by the arrows. Fig. 8 is a perspective view of one end of a longitudinally-movable rod in the driving-shaft of the machine, a portion of the shifting-handle, and the connection between them.

A reference-letter used to designate a given part is employed to indicate such part throughout the several figures of the drawings wherever the same appears.

A is the base of the machine, and *a a* are side and end walls, firmly secured to base A, forming, together with such base, the frame of the machine.

B B are wings to the frame of the machine, rigidly secured to the front end of such frame and forming the means of connecting to the frame the tool-carriages C C, respectively.

D D are movable tool-post heads, mounted on carriages C C, respectively.

E E are wings rigidly secured to base A, on which wings, respectively, one end of the respective carriages C C rests and to which such carriages are respectively arranged to be rigidly secured by an ordinary fastening—as, say, bolt *e*, Fig. 2—upon and after their proper adjustment.

F is a frame forming part of the frame of the machine, in which are rotatably mounted the several shafts whereby feed motion to the boring-bar of the machine is obtained.

G is the boring-bar, rotatably mounted in the spindle II. Rotatable spindle II extends longitudinally through the frame of the machine in which it is mounted, and at the end thereof adjacent to the tool-carriages C C screw-threads I I are placed thereon, fitting into corresponding screw-threads in a chuck, face-plate, or other equivalent device for securing thereto the pulley or other thing to be bored or turned, or bored and turned, on the machine.

J J are journal-bearings of the spindle II in the frame of the machine.

K is a flange on spindle II, against which a chuck or face-plate abuts when in position on the spindle.

L is a flange on the rear or back end of spindle II, and M is a gear-wheel, the hub *m* whereof fits over the end of such spindle II, (and over the flange L on the spindle,) and also over boring-bar G, so as to turn loosely thereon, (but fitting reasonably close thereto.)

N is a feather or spline extending into hub *m* and into a groove in boring-bar G, so that rotation of such wheel M produces corresponding rotation of the boring-bar G. Longitudinal movement of the boring-bar in hub *m*, as well as in spindle II, is thus provided for.

O is a cone-pulley over which the driving-belt actuating the machine extends. Cone-pulley O is rigidly secured to shaft P. Shaft P is rotatably mounted in the frame of the machine in bearings Q Q.

To rotate the boring-bar G in either direction, I provide gear-wheel R, secured on so as to rotate with shaft P, gear-wheels S T engaging with gear-wheel R and gear-wheel U engaging with gear T. Gears S, T, and U are rotatably mounted on frame V, actuated (or the position thereof controlled) by the handle W, so that such gear-wheels S, T, and U may be alternately engaged with gear-wheel M, hereinbefore described. The rotation of gear-wheel M rotates boring-bar G by the interposed feather or spline N. The direction of rotation of such gear-wheel M is of course determined by the one of the gear-wheels S and U in engagement therewith. The longitudinal movement of the boring-bar G, either to feed the boring-bar to or to withdraw it from work, is effected by the following-described mechanism.

A' is a rod secured in frame F and in the frame of the machine formed by parts *a a*.

B' E' is a combined cone-pulley and gear-wheel rotatably mounted on rod A', such rod forming a shaft or axle therefor.

C' is a cone-pulley on hub *m* of gear-wheel M, and D' is a belt extending over cone-pulley C' and part B' of the combined cone-pulley and gear-wheel B' E', such belt being the driving-belt of the mechanisms moving the boring-bar longitudinally.

F' is a gear-wheel engaging with gear-wheel E'. Gear-wheel F' is mounted on rotatable shaft G', so as to produce, when rotated, corresponding rotation thereof.

I' J' are gear-wheels rotatably mounted to engage with gear-wheel II'.

K' is a rotatably-mounted gear-wheel engaging with gear-wheel J'. Wheels I' and K' are mounted on frame R', controlled by handle S', so as to be alternately in engagement with gear-wheel M'. The one of the gear-wheels I' K' in engagement with gear-wheel M' is determined by the position of the handle S' and frame R'. The direction of rotation of gear-wheel M' is determined by the one of the gear-wheels I' K' in engagement therewith.

N' is the rotatable shaft on which gear-wheel M' is mounted, such shaft and gear-wheel rotating in unison.

O' O' are screw-threads on shaft N', engaging with corresponding screw-threads in the traveler P'.

Q' is a sleeve secured on boring-bar G by bolt T'. Sleeve Q' is adjustable on the boring-bar G after loosening the bolt T', and is immovable thereon when such bolt T' is tightened against the boring-bar. Sleeve Q' and traveler P' are connected so as to move longitudinally in unison, as illustrated in Fig. 6.

A gear (or interposed gears) between wheels or cone-pulleys C' and B' may be used in place of the belt D', if preferred; but I prefer to use the belt, as in such case the belt will be thrown off by an obstruction which would break the teeth of gear-wheels.

To rotate the spindle H at varying speeds, I have constructed the following-described mechanisms:

Shaft P is hollow a portion of its length, and rod or bar A², secured at one end thereof to handle B², is inserted therein, with pins C² D² extending through such rod A² and through slots E² F², respectively, in shaft P into engagement with gear-wheels G² H², respectively, so as to move such gear-wheels longitudinally on the shaft P, but not so as to affect in any way the rotation of such shaft P or the gear-wheels G² H² in unison with such shaft. Handle B² is pivotally secured to the frame of the machine by pin or bolt b², extending therethrough and through the lug b², and such handle is secured to the rod A², so as not to prevent the rotation of the rod, but to produce longitudinal movement therein, as by making groove b⁴ in collar b⁶ on the rod and extending the handle around the rod, with a pin extending in the groove, as at b⁵.

I² is a sleeve rotatably mounted on spindle H.

J² is a gear-wheel on sleeve I², secured to the sleeve to rotate therewith, and K² is an additional gear-wheel on such sleeve, also secured thereto to rotate therewith. Sleeve I² turns on the spindle H freely, and when handle B² is in the position illustrated in Fig. 6 of the drawings gear-wheel G² on shaft P is in engagement with gear-wheel J², thereby (when shaft P is rotated) producing rotation of gear-wheel J², sleeve I², and gear-wheel K².

L² (see Fig. 1) is a gear-wheel rotatably mounted on the shaft M². Shaft M² is eccentrically mounted on part N² of the frame of the machine, so that when the handle O² is moved into the position thereof illustrated in Fig. 1 such gear-wheel L² is in engagement with gear-wheel K².

P² is a gear-wheel or a gear-pinion, also mounted on the shaft M² and secured to gear-wheel L² to rotate in unison therewith.

Q² is a gear-wheel mounted on spindle H to rotate in unison therewith. Gear-wheel P² is thrown into engagement with and out of engagement with gear-wheel Q² by the movement of the eccentric shaft M² when handle O² is turned. The gear-wheel H² on shaft P is thrown into and out of engagement with gear-wheel Q² by the movement of handle B². When such handle B² is in the position thereof illustrated in Figs. 1 and 6, gear-wheel H² is out of engagement with gear-wheel Q². When handle O² is in the position thereof illustrated in Figs. 1 and 2, gear-wheel L² is in engagement with gear-wheel K² and gear-wheel or pinion P² is in engagement with gear-wheel Q². Handles B² and O² being in the position illustrated in Figs. 1, 2, and 6, rotation of shaft P produces rotation of gear-wheel J², sleeve I², and gear-wheels K², L², P², and Q². Gear-wheel Q² is secured to the spindle H in the ordinary way, as by a feather or spline, so that the rotation of gear-wheel Q² will produce corresponding rotation of the spindle. When the

gear-wheel G² is out of engagement with gear-wheel J² by the placing of handle B² in proper relative position therefor and gear-wheel H² is forced into engagement with the gear-wheel Q², the rotation of such gear-wheel Q² and corresponding rotation of spindle H is at a greater or faster rate of speed than when the several parts are in the position illustrated in the drawings—that is, with gear-wheel G² in engagement with gear-wheel J².

To obtain the automatic movement of the tool-post head D on carriage C, I have constructed the following-described mechanisms:

A³ A³ are rotatably-mounted screws in the carriages C C, respectively, extending through the tool-post heads D D, respectively, and fitting into corresponding screw-threads in such tool-post heads.

B³ B³, Figs. 1 and 2, are crank-shafts by which the screw-shafts A³ A³ are rotated by hand when desired.

C³ C³ are beveled gear-wheels secured tightly on shafts A³ A³, respectively. D³ D³ are beveled gear-wheels secured tightly on vertical shafts E³ E³ to engage with beveled gear-wheels C³ C³, respectively, and F³ F³ are beveled gear-wheels secured tightly on the lower end of the vertical shafts E³ E³, respectively, to engage with the beveled gear-wheels H³ H³ and I³ I³, which are loosely mounted on shaft G³.

J³ (see Fig. 4) is a sleeve mounted on shaft G³ to rotate therewith and also to move longitudinally thereon. K³ is a fork fitting into a groove on sleeve J³ (see Fig. 4) and secured by connection L³ to handle M³. Handle M³ turns on pivotal point (or on fulcrum) m³.

N³ is an extension to handle M³, and n³ is a rod secured at one end to the extension N³ and at the other end movably mounted in guide n⁴. The turning on the pivot m³ of the handle M³ will move the rod n³ longitudinally, and the movement of the rod longitudinally will turn the handle M³ on the fulcrum thereof, thereby throwing sleeve J³ into engagement with one or the other of the gear-wheels I³ H³, thereby turning vertical shaft E³ in one or the other direction.

n⁵ is a stop on the rod n³, placed in the path of the arm d³, (see Figs. 2 and 4,) so that as the arm d³ (such arm being secured on the tool-post head D) is moved to the right and to the left it will engage with the arm N³ of handle M³ and stop n⁵ of rod n³ and so turn the handle on its pivot. The engagement of the arm d³, as last aforedescribed, shifting the sleeve J³, as stated, changes the direction of movement of the tool-post head. Rotation of the shaft G³ in the operation of the machine is obtained by the beveled wheel N³ engaging with beveled wheel O³ on shaft Q³, cone-pulley V³, tightly secured on such shaft Q³, hub R³, loosely mounted on shaft Q³, with gear-wheels on such hub, one of such gear-wheels q³ engaging with gear-wheel Q³, whereby it is rotated, and the other of such gear-wheels S³ engaging with and turning gear-

wheel T³, and such wheel T³ rotatably mounted on shaft T³ and secured to rotate with cone-pulley U³, also on such shaft T³, and the belt W³ connecting cone-pulleys V³ and U³.

5 The tool-post carriages C C are adjusted relative to the spindle H and boring-bar G by means of screw-threaded shaft A⁴ in wing or extension B of the frame of the machine (see Fig. 2) passing through the carriages
10 and fitting into corresponding screw-threads in such carriage. The end of the screw-threaded rod or shaft A⁴ is squared to permit a wrench being placed thereon to turn the same. As the carriages C C are moved to
15 and from the longitudinal center of the machine the sleeves J³ J³ slide on the shaft G³, such shaft being grooved and the shaft and sleeves having feathers or splines g³ fitting therein. The sleeves J³ J³ therefore rotate
20 with the shaft G³, although movable longitudinally thereon.

In turning the face of a pulley, wheel, or other thing on the machine where it is designed to have such face convex the carriages
25 C C are moved out of a position at right angles to the wing B and then bolted (by bolts e) in place. The manner in which the carriages C C are secured to the wings B, respectively, is well illustrated in Fig. 3 of the
30 drawings.

B⁴ is a groove in wing B, and C⁴ a tongue from the carriage C, fitting into such groove. The fit of the tongue C⁴ in groove B⁴ permits
35 all the movement required in the carriage C out of a right angle to the wing B to properly set such carriage. After the carriages C C are set they are respectively bolted in place to wings E E, respectively. In turning the
40 convex face of the pulley or other thing it is designed that the cutting-tool on one tool-post base shall cut on one side of the center line of the pulley and the other cutting-tool
45 on the other side thereof. One of such tools will of course be set below the center of the boring-bar and the other above such center.

The operation last described will not produce a true convex pulley-face, but will produce one that is angular, the angle formed
50 by the meeting of the faces being preferably in a plane midway between the edges of the face of the pulley.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

55 1. In a turning and boring machine, the combination of a spindle journaled in a frame, means for securing a pulley on the spindle to rotate therewith, the axis of the pulley-hub
60 being coincident with the extension of the axis of the spindle, a tool-carriage and tool-head adjustable to cutting contact of the tool therein with the face of the pulley, a boring-
65 bar extending through the spindle, means for rotating the spindle, means for rotating the boring-bar, in either direction, independently of the spindle, and means for automatically advancing independently of the direction in

which it is rotating, the boring-bar longitudinally in the spindle; substantially as described. 70

2. In a turning and boring machine, the combination of a spindle journaled in a frame, means for securing a pulley on the spindle to rotate therewith, the axis of the pulley-hub being coincident with the extension of the
75 axis of the spindle, a tool-carriage and tool-head adjustable to cutting contact of the tool therein with the face of the pulley, a boring-bar extending through the spindle, means for rotating the
80 boring-bar, in either direction, independently of the spindle, and means for automatically moving the boring-bar longitudinally in the spindle while such boring-bar is rotating in either direction; substantially as described. 85

3. A turning and boring machine, consisting of a rotatable spindle, a boring-bar extending through the spindle, cutting-tools on the boring-bar, adjustable tool-carriages on opposite sides of the machine, traveling tool-
90 heads mounted on the respective carriages, cutting-tools mounted in the tool-heads, respectively with means for attaching a pulley or wheel to the spindle, means for rotating the spindle, means for independently rotat-
95 ing the boring-bar, and means for automatically advancing the boring-bar independently of its direction of rotation, substantially as described.

4. A turning and boring machine, consisting of a rotatable spindle, mounted in a frame, a boring-bar extending through the spindle, means for rotating the boring-bar in either
100 direction, a cutting-tool on the boring-bar, means for attaching a pulley or wheel to the spindle, tool-heads, tools in the tool-heads engaging with the face of the pulley, on the spindle, a gear-wheel on the spindle engaging with a driving gear-wheel, a second gear-
105 wheel mounted on the rear end of the spindle to turn loosely thereon and with the hub thereof extending beyond the spindle and turning loosely on the boring-bar, a feather interposed between such hub and boring-bar, such second-named gear-wheel engaging with
110 a driving gear-wheel, whereby the relative movement of the part of the pulley being cut to the tool producing the cutting, and the relative movement of the cutting-tool and the part of the pulley cut thereby, may be suit-
115 ably adjusted both for the boring and turning of the pulley or other wheel; substantially as described. 120

5. A turning and boring machine, consisting of a rotatable spindle, a boring-bar extending through the spindle tool-heads and cutting-tools in the tool-heads and in the boring-
125 bar respectively, with means for attaching a pulley or wheel to the spindle, means for rotating the spindle and means for independently rotating the boring-bar in either direction, and means for automatically advancing the boring-bar, independently of the direction in which it is rotating, whereby the
130

proper relative speed of the boring-tool and the pulley, and at the same time the proper relative speed of the face of the pulley to the cutting-tools thereof in the tool-heads is obtained, such turning and boring being simultaneously done by the machine; substantially as described.

6. The combination of a frame, a spindle rotatably mounted therein, a boring-bar extending through the spindle, a sleeve loosely mounted on the spindle, gear-wheels on the sleeve, a gear-wheel rigidly mounted on the spindle, a rotatable driving-shaft, gear-wheels mounted on such shaft to rotate therewith and to be moved longitudinally thereon and means for moving such gear-wheels longitudinally on such shaft, whereby the gears on the driving-shaft may be disengaged from the gear on the spindle and from the gears on the sleeve, and may be alternately engaged with one of the gears on the sleeve and the gear on the spindle, and means for interposing connecting-gear between the gear on the spindle and one of the gears on the sleeve; substantially as described.

7. In a turning and boring machine, mechanism whereby a pulley or other wheel is held and rotated, thereby presenting the face or rim thereof to properly mounted and adjusted cutting-tools, and boring or drilling mechanism, adjusted to turn at a suitable rate of speed for the size of the hole being made, means for presenting such cutting mechanisms simultaneously to the face and to the hub respectively of the pulley or wheel; mechanisms whereby the rotatable mechanism holding the pulley can be rotated at different rates of speed, and mechanisms for turning such boring and drilling mechanism in either direction and for varying the rate of speed thereof; the boring and drilling mechanism arranged to be adjusted to project beyond the chuck or face-plate of the machine, and to be automatically moved longitudinally forward while rotating in either direction; substantially as described.

8. A frame having wings extending outward therefrom, a spindle rotatably mounted

in the frame with means for attaching a pulley or wheel to the end thereof, tool-carriages adjustably mounted on such wings, means for moving the tool-carriages on the wings toward and away from the axis of the spindle, means for adjusting the angle of the tool-carriages relative to the wings and means for rigidly securing such tool-carriages in place when adjusted, tool-posts on the tool-carriages respectively, screw-threaded shafts rotatably mounted in the tool-carriages and extending through the bases of the tool-posts respectively, a shaft rotatably mounted in the wings of the frame, beveled gear-wheels loosely mounted on the shaft in the tool-carriage so as to be longitudinally movable thereon, a clutch on the shaft between the beveled gear-wheels, such clutch rotatable with the shaft and longitudinally movable thereon, a handle on the tool-carriage and a connection between the handle and the clutch whereby it can be brought into and out of engagement with the beveled gear-wheels, respectively, a vertical shaft rotatably mounted in the tool-carriage with a beveled gear thereon, engaging with both the beveled gears, and a gear-wheel on the other end thereof engaging with a beveled gear-wheel on the screw-threaded shaft; substantially as described.

9. In a turning and boring machine the combination of wings B, B, tool-carriages C, C, rotatable shaft G³, beveled gears H³, I³, clutch J³, handle M³ having projection N³, and longitudinally-movable rod n³, a connection between the handle and the clutch, shaft E³ having thereon beveled gear F³ engaging with beveled gear H³, I³, and beveled gear D³ engaging with beveled gear C³, shaft A³ on which the beveled gear C³ is mounted, tool-head D which tool-head the shaft A³ engages, and with an arm extending from such tool-head into the path of abutment, n⁵ on rod n³, and abutment N³ on handle M³; substantially as described.

PAUL FOSS.

In presence of—

CHARLES TURNER BROWN,
F. L. BROWN.