



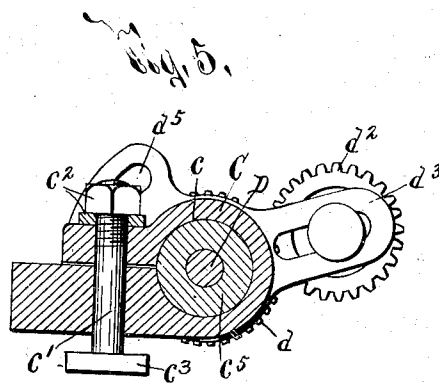
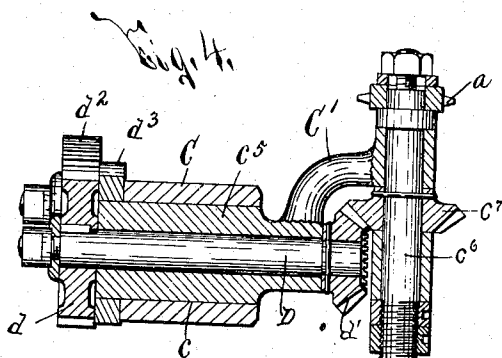
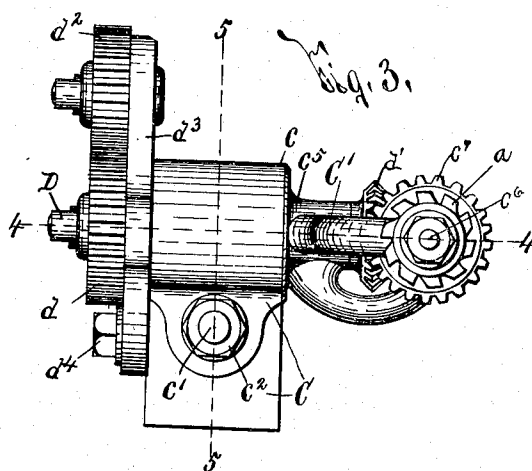
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PATENTED SEPT. 24, 1907.

H. M. DARLING.  
GEAR CUTTING MECHANISM.

APPLICATION FILED MAR. 6, 1900.

5 SHEETS—SHEET 2.



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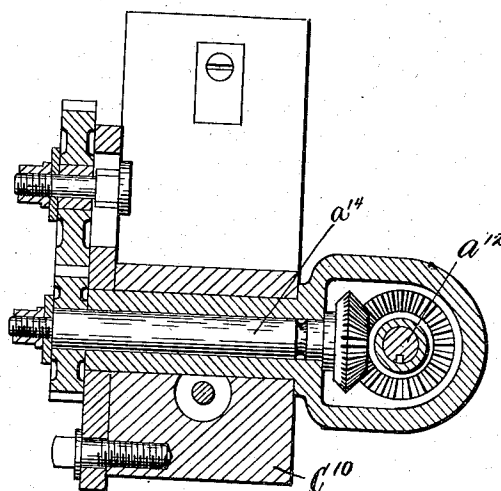
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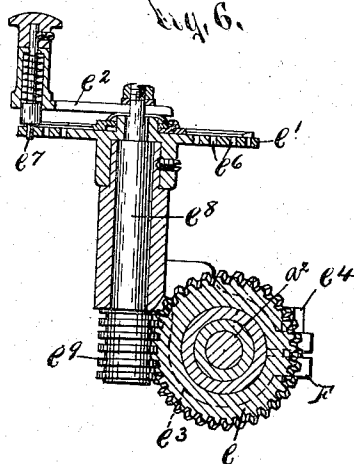
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5 SHEETS—SHEET 3.

*Fig. 10.*



*Fig. 6.*



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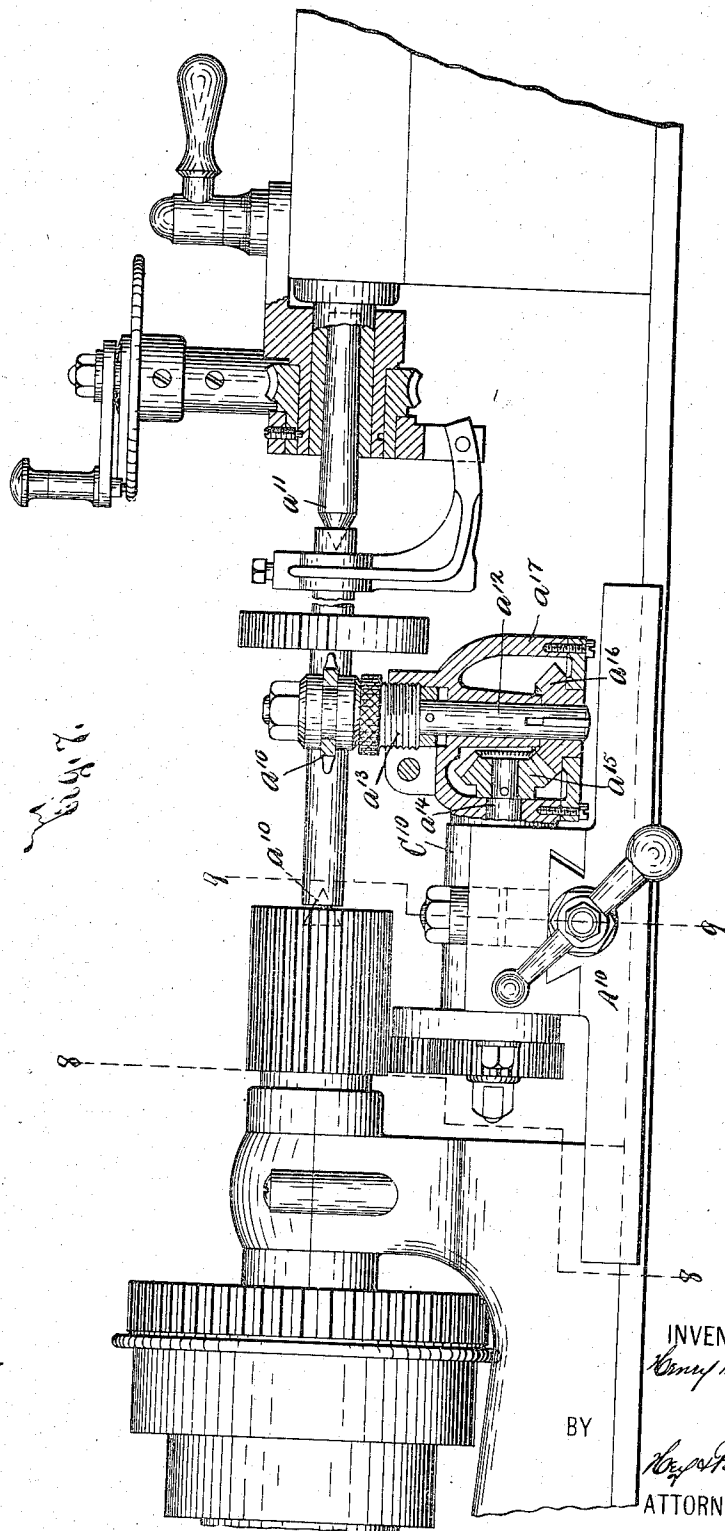
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5 SHEETS—SHEET 4.



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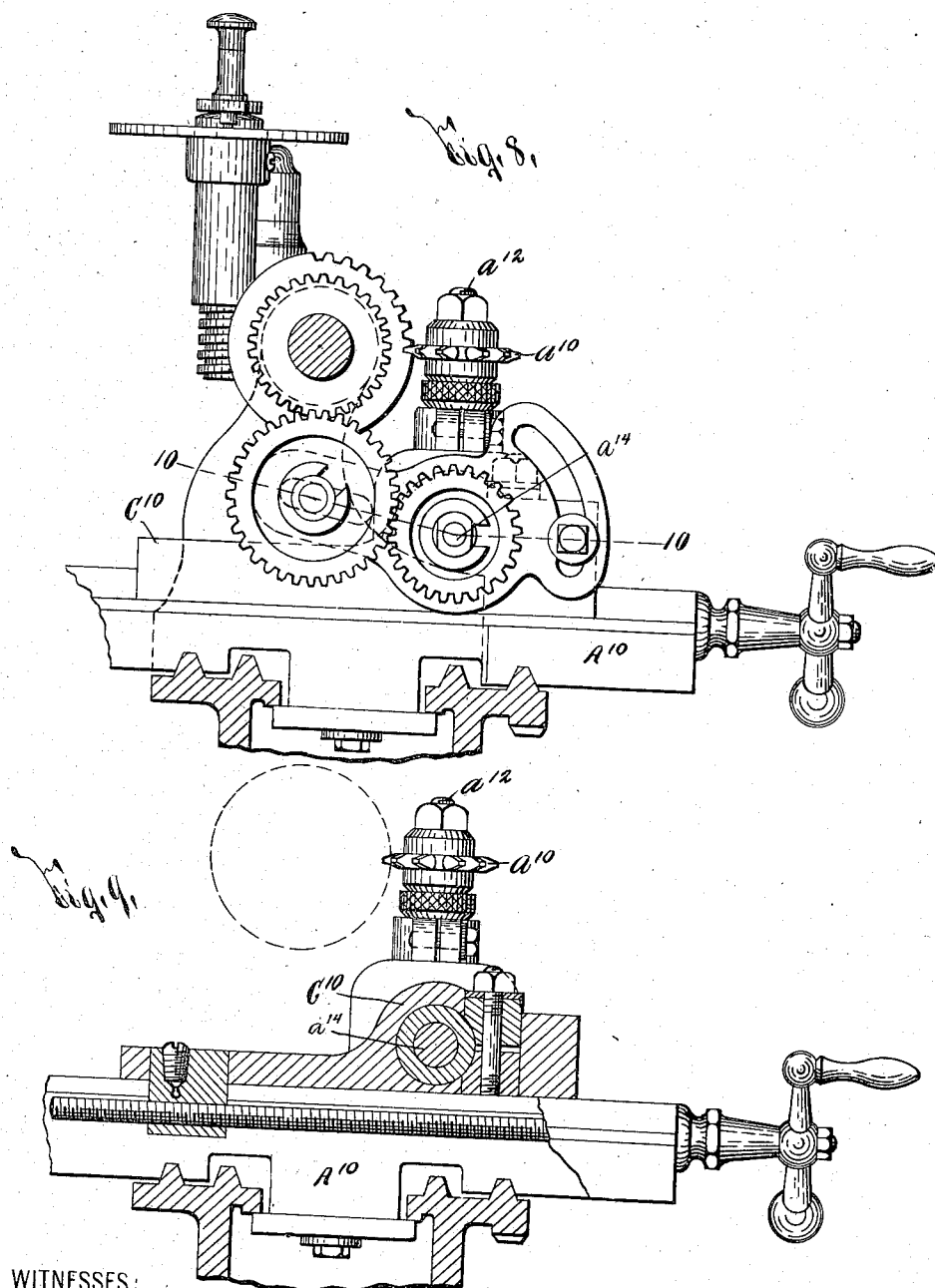
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5 SHEETS—SHEET 5.



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# UNITED STATES PATENT OFFICE.

HENRY M. DARLING, OF SENECA FALLS, NEW YORK, ASSIGNOR TO THE SENECA FALLS MANUFACTURING COMPANY, OF SENECA FALLS, NEW YORK, A CORPORATION OF NEW YORK.

## GEAR-CUTTING MECHANISM.

No. 867,189.

Specification of Letters Patent.

Patented Sept. 24, 1907.

Application filed March 8, 1900. Serial No. 7,451.

*To all whom it may concern:*

Be it known that I, HENRY M. DARLING, of Seneca Falls, in the county of Seneca, in the State of New York, have invented certain new and useful Improvements in Gear-Cutting Mechanism, of which the following is a specification.

My invention has for its object the production of a mechanism for cutting or otherwise machining gears and other articles, which is particularly simple in construction, economical in manufacture, and strong, durable and effective in use; and to this end, it consists in the combination, construction and arrangement of the component parts of a mechanism for the desired purpose, as hereinafter fully described and pointed out in the claims.

Referring to the drawings, Figure 1 is a front elevation, partly in section, of portions of a machine embodying a preferred construction of my invention. Fig. 2 is a vertical sectional view taken on line 2—2, Fig. 1. Fig. 3 is a top plan view of the detached cutter, its supporting means, and part of its driving means. Figs. 4, 5 and 6 are sectional views taken, respectively, on lines 4—4, 5—5 and 6—6, Figs. 3 and 1. Fig. 7 is a front elevation, partly in section, of portions of a machine embodying a modified construction of my invention. Figs. 8, 9 and 10, are sectional views taken, respectively, on lines 8—8, 9—9 and 10—10, Figs. 7 and 8.

My invention consists, essentially, of means for supporting and rotating a tool *a*, and means for varying the position of a gear or other article B to be machined. As illustrated, the tool *a* is mounted on a suitable support, as a carriage A, and the gear or article B is supported between opposing spindles *a' a'*, mounted, respectively, in head and tail-stocks *A' A'*, one spindle, as *a'*, being live and the other being dead. The carriage A and the head and tail-stocks *A' A'* are of any desirable form, size and construction, said carriage and tail-stock being adjustable lengthwise of the bed or frame *A* and the spindles *a' a'* by any suitable means, unnecessary to herein illustrate and describe.

The means for supporting the tool *a* usually consists of a movable support C, and an arm *C'* movable independently of said support. This supporting means is generally mounted on a carriage *C* movable on the carriage A crosswise of the axis of the spindles *a' a'*. The support C, as here illustrated, is provided with a longitudinally split bearing *c* and a clamping member *c'*, which is provided with a movable clamping shoulder *c*<sup>2</sup> for decreasing the internal diameter of the split bearing *c*, and with a pivotal head *c*<sup>3</sup> movable in a guide *c*<sup>4</sup> in the carriage *C*. The arm *C'* is provided with a hollow

hub *c*<sup>5</sup> journaled in the bearing *c* and with a part projecting at an angle from said bearing *c* and provided with a bearing which is arranged at an angle to the bearing *c* and suitably supports a revoluble shaft *c*<sup>6</sup> to which the cutter *a* is secured by any desirable means, unnecessary to herein illustrate and describe.

When the movable clamping shoulder *c*<sup>2</sup> of the clamping member *c'* is in its inoperative position, the support C may be rocked on said clamping member, as a pivot, thus moving the tool *a* toward the article B in a substantially horizontal plane, or in other words, in a plane substantially parallel to the axis of the spindles *a' a'*, and the arm *C'* may be rocked in the bearing *c*, thus moving the tool *a* toward the axis of the spindles *a' a'* in an arc or curved plane arranged at an angle to said axis and the paths of movement of the carriage *C*. On the contrary, when said movable clamping shoulder *c*<sup>2</sup> is in its operative position, the support C and the arm *C'* are positively and firmly held in their adjusted positions. The described means for supporting the tool *a* may be readily attached to any ordinary construction of lathe, since the pivotal head of the clamping member, which holds said supporting means in position, is of such construction, as to enter the ordinary tool-post guide of the cross-feed carriage of a lathe.

The means for rotating the cutter *a* preferably consists of the shaft *c*<sup>6</sup>, previously described, a shaft D extending at substantially right-angles to the shaft *c*<sup>6</sup> in the same general direction as the axis of the spindles *a' a'* and journaled in the hollow hub *c*<sup>5</sup> of the arm *C'*, a power-transmitting wheel *d* secured to one end of the shaft D, and additional power-transmitting wheels, as bevel-gears *d' c'* connecting the other end of the shaft D to the shaft *c*<sup>6</sup>. The power-transmitting wheel *d*, is illustrated as a gear, but may consist of a pulley driven by a belt or other means, not shown. Said power-transmitting wheel *d* is generally connected to a suitable driving gear *a*<sup>3</sup> by an intermediary gear *d*<sup>2</sup> mounted on a movable arm *d*<sup>3</sup> which is pivoted on the hub *c*<sup>5</sup>, and is held in its adjusted position by any desirable means, as a clamping member *d*<sup>4</sup> engaged with the support C and passed through a slot *d*<sup>5</sup> in the arm *d*<sup>3</sup>. The gear *a*<sup>3</sup> is usually fixed to the live spindle *a'*, and is provided with an engaging face of considerable width, so that the gears *a*<sup>3</sup> *d*<sup>2</sup> will remain in engagement, even though the gear *d*<sup>2</sup> is movable lengthwise of the bed *A* by the carriage A.

The means for varying the position of the gear or other article B generally consists of a support E, a power-transmitting wheel *e*, a dividing wheel *e'* and a stop-arm *e*<sup>2</sup>. The support E is suitably fixed to the tail-stock *A*<sup>2</sup>, being here illustrated as provided with a

longitudinally split eye or bearing  $e^3$  for receiving the stationary or dead spindle  $a^2$  of the tail-stock, and as also provided with a clamping member  $e^4$  for reducing the internal diameter of the eye or bearing  $e^3$  and compressing the same upon the spindle  $a^2$ . The power-transmitting wheel  $e$  consists of a worm-wheel which is journaled on the support E, is movable about the axis of the spindle  $a^2$ , and is connected to the article B by any desirable means, as a lathe-dog  $e^5$ . Said dividing wheel  $e^4$  is fixed to the support E and is provided with suitable graduations, not illustrated, and with apertures  $e^6$ . The stop-arm  $e^2$  is provided with a plunger  $e^7$ , or other means for entering the apertures  $e^6$ , and is mounted on a shaft  $e^8$  which is journaled in the support E and is connected by a worm  $e^9$  to the power-transmitting wheel  $e$ . As the stop-arm  $e^2$  is rotated step by step, the article B is correspondingly rotated and is held in its adjusted position.

In Figs. 7, 8, 9 and 10, I have shown portions of a lathe embodying a modified construction of my invention, in which the support  $C^{10}$  for the cutter  $a^{10}$  is movable directly on the carriage  $A^{10}$ , and is prevented from rocking horizontally toward the axis of the spindles  $a^{10}$   $a^{11}$ . In this form of my invention, the cutter is usually arranged nearer to the carriage than in the construction of said invention previously described. The shaft  $a^{12}$ , upon which the cutter  $a^{10}$  is mounted, may be adjustable vertically by a screw  $a^{13}$  and is connected to a shaft  $a^{14}$  by gears  $a^{15}$   $a^{16}$  arranged in a chamber formed in the supporting arm  $a^{17}$ , in which said shaft  $a^{12}$  is journaled.

Either of the two described constructions of my invention, may be used in connection with the compound rest of a lathe, and it will be readily understood by those skilled in the art that said invention when so used, is particularly useful for performing various forms of beveling or angling work, as cutting bevel or miter gears and milling angles.

The construction and operation of my mechanism, will now be readily understood upon reference to the foregoing description and the accompanying drawings, and as it is obvious that more or less change may be made in the component parts of said mechanism without departing from the spirit of my invention, I do not herein limit myself to the exact construction and arrangement of said component parts.

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

1. The combination with opposing spindles for supporting an article to be machined, one spindle being live and the other dead; of a carriage, a rotary tool supported by the carriage, means for operating the tool from the live spindle, and manually-operated means associated with the dead spindle for rotating said article step by step, substantially as and for the purpose set forth.
2. The combination with opposing spindles for supporting an article to be machined, one spindle being live and the other dead; of a carriage, a rotary tool supported by the carriage, means connecting the live spindle and the tool for rotating said tool, means for adjusting the tool toward and from the axis of the spindles independently of the carriage, and manually-operated means associated with the dead spindle for rotating said article step by step, substantially as and for the purpose described.
3. The combination with means for supporting an article to be machined, said means being revoluble intermittently

for moving the article step by step, driving means revoluble about the axis of the supporting means, and a carriage; of a shaft supported by the carriage and extending in the same general direction as the axis of the supporting means, an arm mounted on the carriage and adapted to swing toward the axis of the supporting means on an axis substantially coincident with the axis of the shaft, said arm being provided with a tool, and power-transmitting means for connecting the tool to the shaft, substantially as and for the purpose specified.

4. The combination with opposing spindles for supporting an article to be machined; of a carriage, a shaft supported by the carriage, and extending in the same general direction as the axis of said spindles, an arm adapted to swing on an axis eccentric to the axis of said spindles and substantially coincident with the axis of the shaft toward and from the axis of said spindles, said arm being provided with a tool, and power-transmitting means for connecting the tool to the shaft, substantially as and for the purpose described.

5. The combination with opposing spindles for supporting an article to be machined, one spindle being live and the other dead; of a carriage, a shaft supported by the carriage and extending in the same general direction as the axis of the spindles, an arm mounted on the carriage and adapted to swing toward the axis of the spindles on an axis substantially coincident with the axis of the shaft, said arm being provided with a tool, power-transmitting means for connecting the tool to the shaft, and power-transmitting means for connecting the shaft to the live spindle, substantially as and for the purpose set forth.

6. The combination with opposing spindles for supporting an article to be machined, one spindle being live and the other dead; of a carriage, a shaft supported by the carriage and extending in the same general direction as the axis of the spindles, an arm mounted on the carriage and adapted to swing toward the axis of the spindles on an axis substantially coincident with the axis of the shaft, said arm being provided with a tool, power-transmitting means for connecting the tool to the shaft, power-transmitting means for connecting the shaft to the live spindle, and manually-operated means associated with the dead spindle for rotating said article step by step, substantially as and for the purpose specified.

7. The combination with means for supporting an article to be machined, said means being revoluble intermittently for moving the article step by step, driving means revoluble about the axis of the supporting means, and a carriage provided with a bearing; of an arm journaled in the bearing and adapted to swing toward the axis of the supporting means independently of the carriage, a tool supported by the arm, and power-transmitting means supported by the arm and connected to the tool and to said driving means, substantially as and for the purpose specified.

8. The combination with means for supporting an article to be machined, said means being revoluble intermittently for moving the article step by step, driving means revoluble about the axis of the supporting means, and a carriage provided with a bearing; of an arm journaled in the bearing and adapted to swing toward the axis of the supporting means independently of the carriage and having a part projecting at an angle from said bearing; a tool supported by the angularly-projecting part of the arm, and power-transmitting means supported by the arm and connected to the tool and to said driving means, substantially as and for the purpose set forth.

9. The combination with opposing spindles for supporting an article to be machined, one spindle being live and the other dead; of a carriage provided with a bearing, an arm journaled in the bearing and adapted to swing toward the axis of the supporting means independently of the carriage and having a bearing arranged at an angle to the bearing of the carriage, a shaft journaled in the bearing of the arm and provided with a tool, and power-transmitting means connected to the shaft and to the live spindle, substantially as and for the purpose described.

10. The combination with means for supporting an article to be machined, said means being revoluble intermittently for moving the article step by step, driving means

revoiluble about the axis of the supporting means, and a carriage provided with a bearing; of an arm journaled in the bearing, and adapted to swing toward the axis of the supporting means independently of the carriage, angularly-  
 5 arranged shafts supported by the arm, a tool mounted on one of the shafts, and power-transmitting means for connecting the other shaft to the driving means, substantially as and for the purpose specified.

10 11. The combination with means for supporting an article to be machined; of a carriage, a support pivoted to the carriage and movable on its pivot, said support being provided with a bearing, an arm journaled in the bearing and adapted to swing toward the article to be machined independently of the carriage, a tool supported by the arm, a  
 15 single means for holding both the support and the arm in their adjusted positions, and means for rotating the tool independently of said article, substantially as and for the purpose set forth.

20 12. The combination with means for supporting an article to be machined; of a carriage, a support provided with a split bearing, an arm adapted to swing toward the article to be machined independently of the carriage and having a hub journaled in the split bearing, a tool supported by the arm, a shaft journaled in the hub of the arm and con-

nected to the tool, and a pivotal pin for the support, said  
 25 pin being supported by the carriage and provided with means for clamping the support and the arm in their adjusted positions, substantially as and for the purpose described.

13. The combination with means for supporting an article to be machined; of a carriage, a bearing supported by the carriage, an arm having a hollow hub journaled in the bearing, said arm being adapted to swing toward the article to be machined independently of the carriage and being  
 30 provided with a tool, a shaft journaled in the hollow hub of the arm and connected to the tool, an arm journaled on said hub and movable relatively to the former arm, and power-transmitting means carried by the relatively-movable arm and connected to the shaft, substantially as and  
 35 for the purpose specified.

40 In testimony whereof, I have hereunto signed my name in the presence of two attesting witnesses, at Seneca Falls in the county of Seneca, in the State of New York, this day of March 1900.

HENRY M. DAPLING.

Witnesses:

C. F. HAMMOND,  
 J. W. HAMMOND.