(No Model.)

2 Sheets—Sheet 1.

D. STEVENSON.

METAL BORING MACHINE.

No. 521,922. Patented June 26, 1894.

Fig. 1.

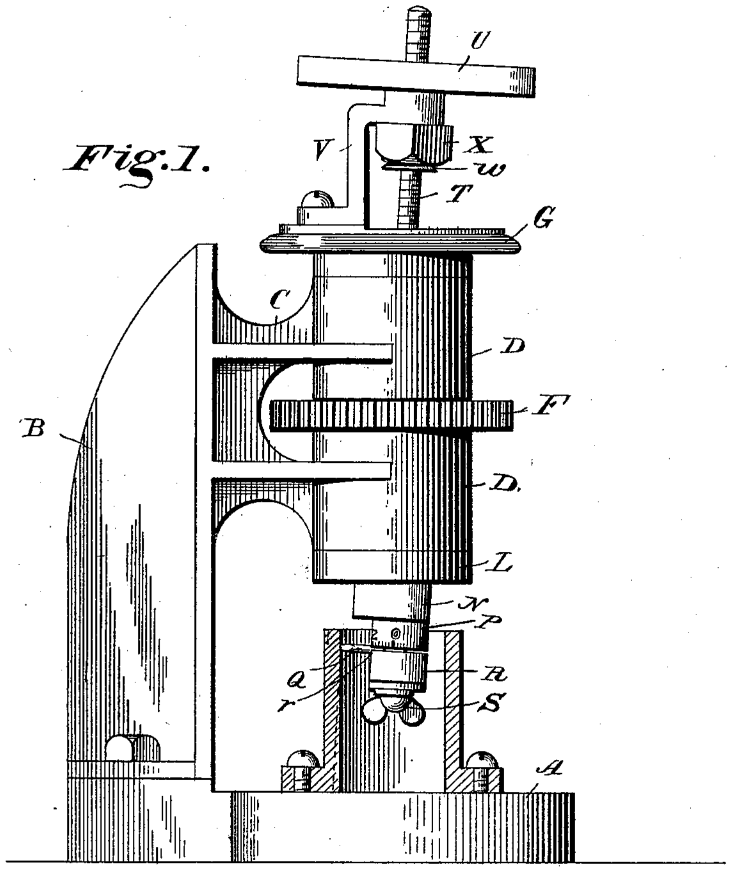


Fig. 4

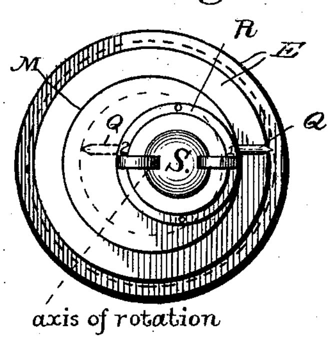
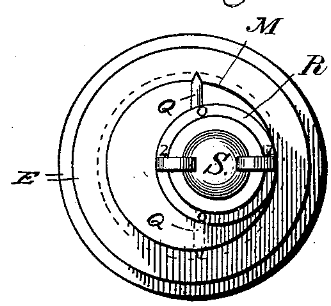


Fig. 5.



Inventor

David Stevenson,

Witnesses

Julius Ulke Jr.

A. P. Holhaupter.

By his Attorneys,

C. A. Snow & Co.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.)

2 Sheets—Sheet 2.

D. STEVENSON.

METAL BORING MACHINE.

No. 521,922.

Patented June 26, 1894.

Fig. 2.

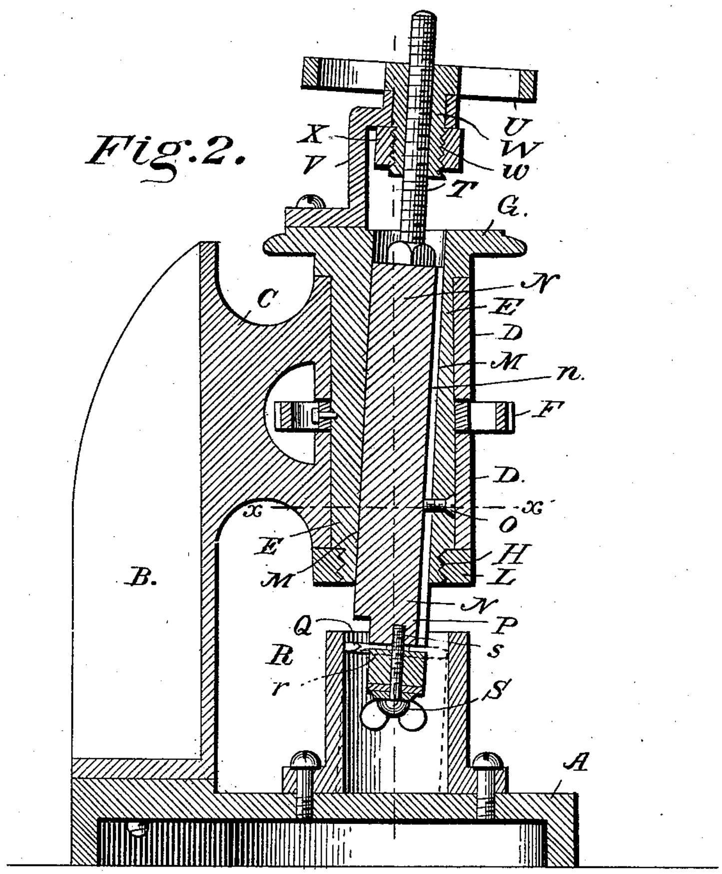
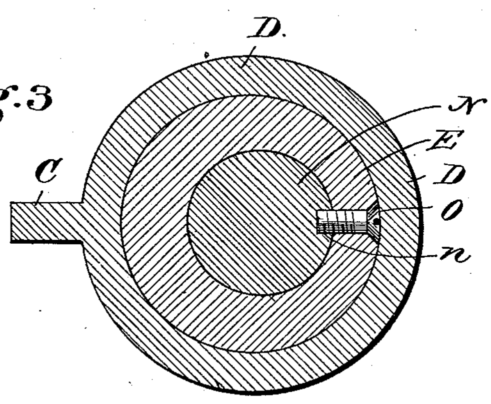


Fig. 3



Witnesses

Julius Ulke, Jr.

D. P. Wochaupter.

Inventor

David Stevenson,

By his Attorneys,

C. A. Snow & Co.

THE NATIONAL LITHOGRAPHING COMPANY, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

DAVID STEVENSON, OF COLD SPRING, NEW YORK.

METAL-BORING MACHINE.

SPECIFICATION forming part of Letters Patent No. 521,922, dated June 26, 1894.

Application filed January 30, 1894. Serial No. 498,508. (No model.)

To all whom it may concern:

Be it known that I, DAVID STEVENSON, a citizen of the United States, residing at Cold Spring, in the county of Putnam and State of New York, have invented a new and useful Metal-Boring Machine, of which the following is a specification.

This invention relates to boring machines; and it has for its object to provide certain improvements in machines of that character which are adapted to bore straight and taper holes in metal objects, such as cylinders, gun-bands, propeller wheel-hubs and the like.

To this end the main and primary object of this invention is to construct a machine or mill of this character wherein simple and efficient means shall be provided for quickly changing the cutting tool in positions for boring a straight hole and tapers running from large to small diameters, and vice versa.

With these and other objects in view which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

In the drawings:—Figure 1 is a side elevation of a boring machine or mill constructed in accordance with this invention. Fig. 2 is a central vertical sectional view thereof, showing a section of a cylinder arranged on the bed plate or table, and illustrating the position of the cutter or boring tool to bore taper holes in either direction. Fig. 3 is a horizontal sectional view on the line *x*—*x* of Fig. 2. Fig. 4 is a bottom end view of the turning spindle and boring bar carried thereby showing the cutter or boring tool in position projected at the farthest point from the center of the spindle, and also showing in dotted lines the tool projected from the boring bar at the point nearest the center of the spindle. Fig. 5 is a similar view showing the cutter arranged on a line coincident with the vertical center of the spindle and therefore in a position for boring straight holes as the boring bar is fed out of the spindle.

Referring to the accompanying drawings, A represents a suitable bed plate or table on which is adapted to be bolted or otherwise suitably secured the work in which the boring is to be accomplished, and in Fig. 2 of the drawings is illustrated a section of a cylinder which is shown for the purpose of illustrating the circle of movement of the cutter when attached in different positions to the lower end of the boring bar of the machine, but it will of course be understood that various objects may be operated upon with equal effect by the herein-described mill.

Arising from the bed plate or table A, at one edge thereof is the bearing upright B, from which is projected near the upper end thereof the off-standing bracket arm C, which supports directly over the plate or table A, the vertically aligned cylindrical bearings D. The said vertically aligned cylindrical bearings D, are disposed at direct right angles to the horizontal plane of the plate or table A, and are designed to support for rotation the revolving boring bar spindle E. The bar spindle E, is truly cylindrical and is designed to freely rotate in the vertically aligned bearings D, and preferably has attached thereto, at an intermediate point between the vertically aligned bearings, a large gear wheel F, which is adapted to be geared with any suitable gearing, similar to ordinary lathe gearing, which will insure the constant rotation of the spindle during the operation of the mill. The spindle E, is provided with an upper flanged end G turning on the upper edge of the uppermost bearing, and is further provided with an exteriorly threaded lower end H, which is removably engaged by the screw-ring L, working thereon and fitting over the lower edge of the lowermost bearing to hold the spindle steady and provide for the removal thereof when necessary. The spindle E, is further provided with a longitudinal bore M, which is disposed at an angle and crosses the central vertical axis of the spindle, so that the lower end of said bore or opening will have a circle of movement concentric with the vertical axis of the spindle, and arranged for longitudinal adjustment in the longitudinal bore or opening M, is the cylindrical boring bar N. The cylindrical boring bar N, is provided at one side with a longitudinal groove *n*, which is adapted to receive the inner projecting end of the set-screw O, fitted in one side of the spindle E, for the purpose of permitting the boring bar to be longitudinally adjusted at an angle in the spindle,

while at the same time causing said boring bar to turn with the spindle in its rotation. The boring bar N, is necessarily disposed at an angle and thrown off at one side of the vertical axis of the spindle E, by reason of the disposition of the bore or opening M, and the lower end of said boring bar therefore has a circular swing or movement about the vertical center of the spindle which carries the same. The lower end of the boring bar N, is provided with a projected cutter head P, which is disposed eccentric to the longitudinal center of the boring bar for convenience in applying a gage thereto in marking off the graduations thereon. The said projected cutter head P, is marked off with graduations by any suitable gage, and in Figs. 4 and 5 of the drawings, the position of the principal graduations is clearly shown, the zero marks being located at diametrically opposite points at equal distances from the vertical center of the spindle and arranged on a line coincident with said vertical center of the spindle so that when the cutter or boring tool Q, is projected from either one of the zero marks, the same will bore a perfectly straight hole. The other principal marks, 1 and 2, are located at diametrically opposite points between the zero marks, the mark 1, being adapted to indicate the point where the projection of the tool Q, will be the farthest from the center of the spindle, so as to bore a taper hole from a small diameter to a large diameter as clearly shown in Fig. 2, of the drawings, while the opposite mark 2, indicates the point where, with the same projection of tool, such tool will be nearest to the center of the spindle and therefore bore a taper hole from a large diameter to a small diameter, as the boring bar is fed down, this position being also shown in Fig. 2, of the drawings in dotted lines.

The cutting or boring tool is properly adjusted on the projected cutter head P, and clamped tightly thereagainst by the adjustable clamp disk or washer R. The clamp disk or washer R, is provided in its top face with a tool groove *r*, to receive the tool Q, and is adjusted and clamped in position on the thumb screw S, passing therethrough and engaging a threaded opening *s*, in the lower end of the boring bar. When the boring bar has been adjusted to bring its lower end above the object being operated on, it is simply necessary to loosen said thumb screw and turn the clamp disk or washer together with the tool to any desired graduation on the cutter head, at which point the tool may be again tightened in position by tightening up the thumb screw, and it will of course be understood that between the main subdivisions of the graduations already noted, further graduations may be added so that the degree of taper which the tool is to bore will be indicated on the cutter head, and thereby insure the accurate adjustment of the tool.

The boring bar N, has suitably fitted to the upper end thereof the lower end of the adjusting screw T. The adjusting screw T, is preferably engaged by the threaded adjusting wheel U, mounted in the bearing bracket V, suitably attached to the top of the rotating spindle E. The said adjusting wheel U, is provided with a projected hub W, working in the bearing V, and exteriorly threaded at its lower end as at *w*, to receive a nut X, holding the wheel in position. The adjusting wheel U, may be geared with any suitable gearing which shall serve the purpose of feeding the boring bar downward as the bar spindle E, is rotated, so as to complete the operation of boring the object through the entire width or length thereof, and it will of course be understood that the feeding connection described may be varied to suit the particular machinery in connection with which the mill is used. Now from the foregoing it is thought that the construction and operation of the herein-described boring mill will be apparent to those skilled in the art.

By referring to Figs. 2 and 4 of the drawings, it will be clearly seen that with the tool Q, adjusted to the position 1 on the cutter head, such tool will be farthest from the vertical axis of the rotating spindle, and, as the boring bar is fed down, will describe a circle increasing in diameter so as to bore a taper hole from small to large diameter, while with the same projection of the tool at the point 2, on the cutter head, the reverse taper will be bored, which is well illustrated in Fig. 2 of the drawings. By adjusting the cutting tool toward the zero marks, the size of taper may be increased or diminished according as the tool is turned from the mark 1 or 2, while with the tool projected from the cutter head at either of the points zero, a perfectly straight hole will be bored.

Changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention, and at this point it may be well to further observe that the manner of mounting the spindle and the longitudinally adjustable boring bar therein may be changed without departing from the principle of the invention, for it will be apparent that by bolting the upper flanged end of the spindle to the face plate of a lathe the herein-described apparatus may be employed in connection with such lathe for boring straight and taper holes in work.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a boring machine, the combination with suitable bearings, of a rotating bar spindle mounted for a fixed rotation in said bearings and having a longitudinal oblique bore crossing the central longitudinal axis thereof, a boring bar mounted for a longitudinal movement in the oblique bore of said spindle and adapted to turn therewith, means for adjusting the boring bar longitudinally in the

spindle and for feeding the same beyond the spindle and into the work, and a tool axially adjustable on the lower projected end of said boring bar, substantially as set forth.

2. In a boring machine, the combination with a vertically arranged bearing; of a bar spindle journaled for a fixed rotation in said bearing and having a longitudinal oblique opening therein crossing its central axis, a longitudinally adjustable boring bar mounted to slide in said oblique opening and to be projected at one end out of said opening and beyond the spindle, and an adjustable tool clamped to the outer end of said boring bar, and having a complete circular adjustment thereon, substantially as set forth.

3. In a boring machine, the combination of the upright having an off-standing vertically disposed cylindrical bearing, a cylindrical bar spindle mounted for a fixed rotation in said vertically disposed bearing and having a longitudinal opening disposed at an angle to its central axis, a boring bar mounted to slide longitudinally in the opening of said spindle and having a longitudinal groove at one side, and extending from end to end, a set screw working through one side of the spindle and adapted to project into the groove of the boring bar, to hold the same to the spindle for rotation therewith, means for adjusting the boring bar within the opening of the spindle to project one end of the bar beyond the spindle, and an adjustable tool clamped to the lower projected end of the boring bar, and having a complete circular adjustment thereon, substantially as set forth.

4. In a boring machine, the combination with a vertically arranged bearing; of a bar spindle journaled for a fixed rotation in the bearing and having a longitudinal oblique opening therein crossing its central axis, a longitudinally adjustable boring bar mounted to slide in said oblique opening and to rotate with the spindle, said boring bar being provided at its lower end below the spindle with a projected graduated cutter head, the boring tool, a thumb screw adapted to engage a threaded opening in the cutter head, and a circularly-adjustable clamp disk or washer supported on said screw and having in its upper face a tool groove to receive the tool, said disk or washer having a complete circular adjustment to provide for holding the tool projected from any point of the cutter head, substantially as set forth.

5. In a boring machine, the combination with the bed plate or table for the work, of the bearing upright having an off-standing vertically disposed cylindrical bearing, a spindle removably mounted for a fixed rotation in said bearing and having an upper flanged end, an exteriorly threaded lower end projecting below the cylindrical bearing, and an oblique opening extending longitudinally therethrough, a gear wheel attached to said spindle at a convenient point intermediate of its ends, a screw-ring removably engaging the lower exteriorly threaded end of the spindle, and fitting against the lower end of the cylindrical bearing, a boring bar mounted for longitudinal movement in the opening of the spindle and carrying a tool at its lower projected end, beyond the spindle, and a feeding screw connected to the upper end of the boring bar and geared with suitable operating means, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

DAVID STEVENSON.

Witnesses:
W. J. BROWN,
W. STEVENSON.