

A. W. FOOTE.
MACHINE FOR BORING, DRILLING, AND THE LIKE.
APPLICATION FILED FEB. 5, 1910.

1,005,634.

Patented Oct. 10, 1911.

3 SHEETS-SHEET 1.

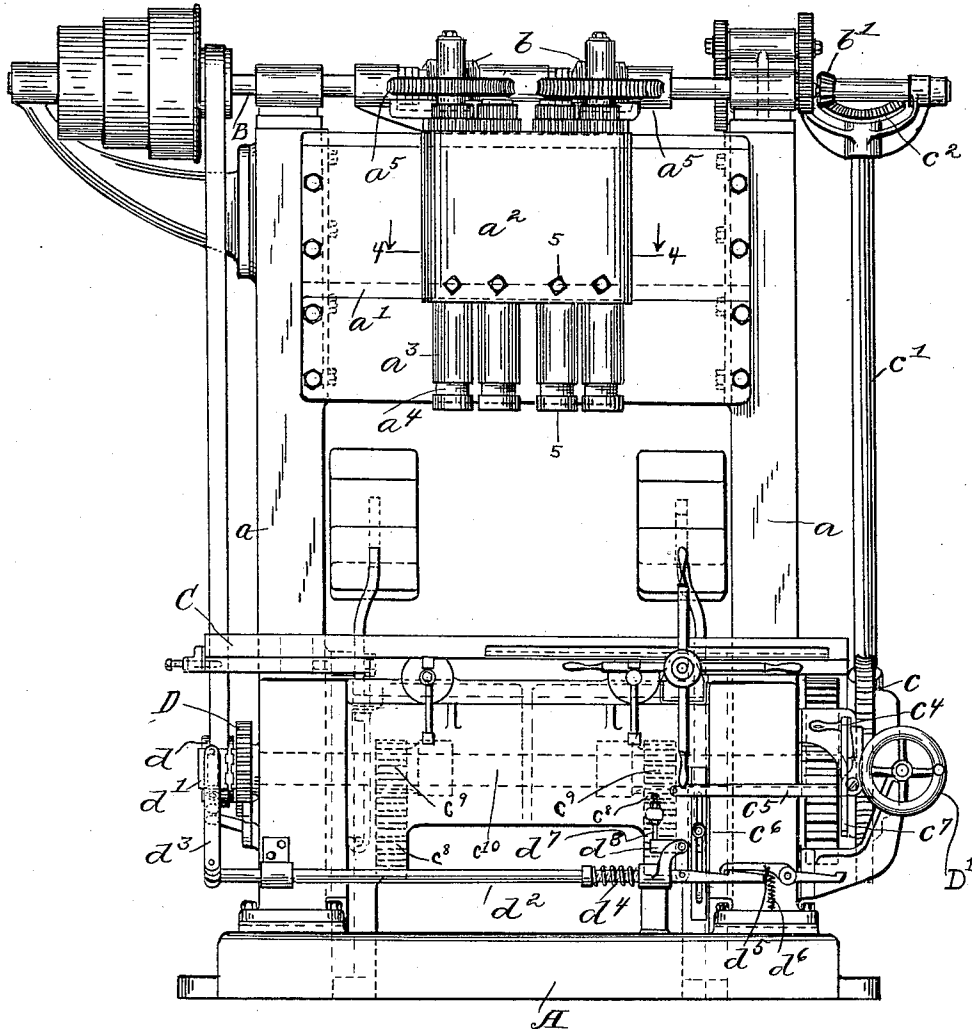


Fig. 1

Witnesses.
Robert M. See
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Andrew W. Foote
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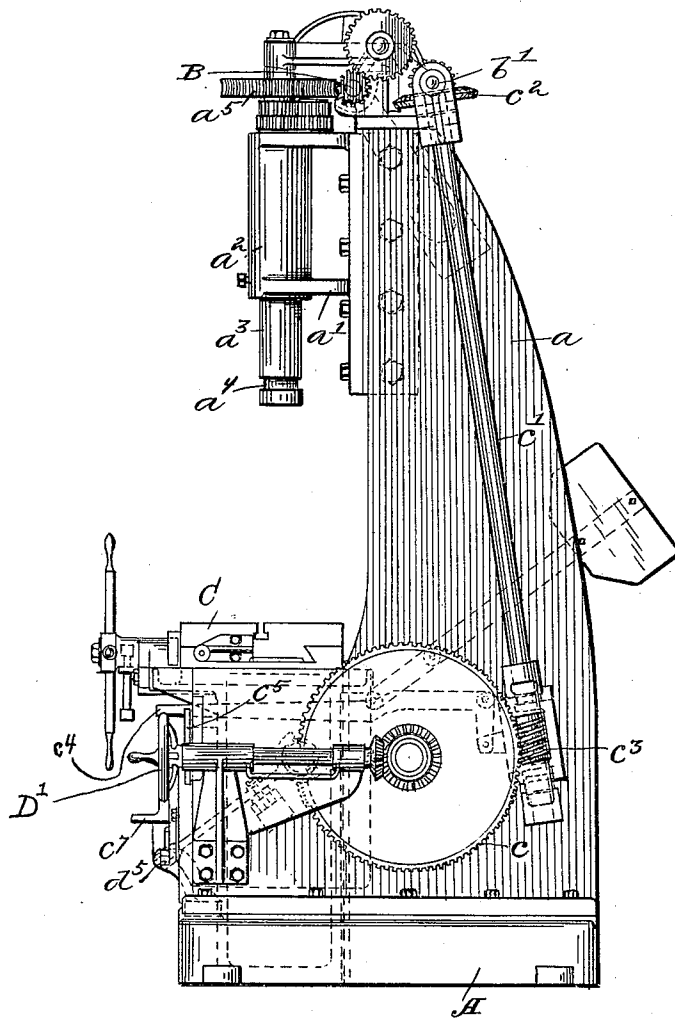


Fig. 2

Witnesses.
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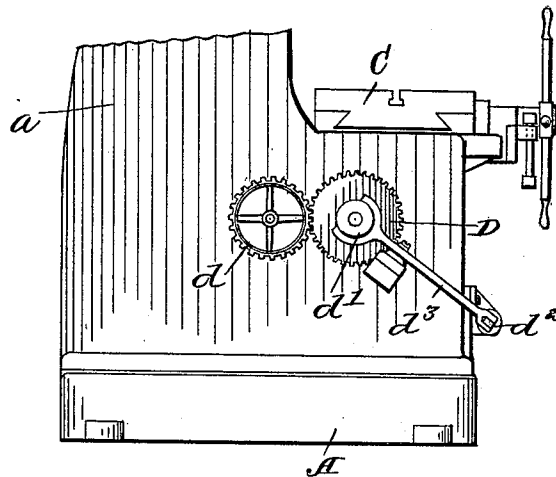


Fig. 3

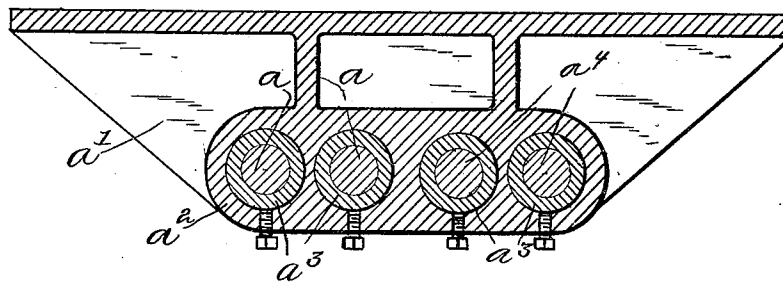


Fig. 4

Witnesses.
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UNITED STATES PATENT OFFICE.

ANDREW W. FOOTE, OF GATES MILLS, OHIO.

MACHINE FOR BORING, DRILLING, AND THE LIKE.

1,005,634.

Specification of Letters Patent.

Patented Oct. 10, 1911.

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To all whom it may concern:

Be it known that I, ANDREW W. FOOTE, a citizen of the United States, and a resident of Gates Mills, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Machines for Boring, Drilling, and the Like, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to boring machines, drilling machines, and to machines generally for performing operations analogous to those mentioned.

The invention provides a machine of this character having various improvements in the construction of parts, and forming a complete machine adapted to perform its work more efficiently and more economically than machines of this class heretofore in use.

The several improvements in the machine will appear from a detailed description.

To the accomplishment of these and related ends said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—Figure 1 is a front elevation of a machine embodying my invention; Fig. 2 is an end elevation of the machine viewed from the right in Fig. 1; Fig. 3 is a partial end elevation of the machine viewed from the left in Fig. 1; Fig. 4 is a cross-section on the line 4—4 in Fig. 1.

The machine is supported from a suitable bed A by the usual uprights a , and near the top of the uprights is secured a cross rail a' which supports the supporting head a^2 . Rigidly secured to the supporting head a^2 are a plurality of sleeves a^3 which are here shown as four in number, the machine illustrating the invention being adapted for simultaneously boring four cylinders. These sleeves a^3 depend from the supporting head a^2 and are of substantially the same diameter as the cylinder which is being bored, while spindles a^4 depend through, and have

a bearing in, the sleeves a^3 and extend slightly below the lower ends of the sleeves, and to such lower ends of the spindles a^4 are attached the desired tools. A horizontal drive shaft B is journaled at the top of the uprights a and may be driven by any suitable power, and two of the spindles a^4 are provided at their upper ends with worm gears a^5 which are driven by worms b on the drive-shaft B, these two spindles in turn driving the remaining two spindles. The gearing by which two of the spindles a^4 drive the other spindles is of spur gear construction adapted to provide an extremely steady drive.

The work being bored is bolted or otherwise secured to a table C disposed below the spindles a^4 . The table C is horizontally movable so that while one piece of work is being bored another piece may be attached to the outer end of the table, and when the piece being bored is completed, the table may be moved to bring the newly attached piece under the spindles. The table is also vertically reciprocable, and it is by this means that the work is advanced upon the tools, the tools not being capable of vertical movement. Any suitable means may be used for lowering and raising the table C, but this means will preferably consist of racks c^8 and pinion c^9 , the shaft c^{10} bearing the pinion which is adapted to raise the table being actuated through intermediate gearing by the worm gear c . At the corresponding end of the main drive shaft B suitable gearing connects with said drive shaft a bevel pinion b' , and pivotally mounted upon an axis alined with that of the pinion b' is a vertically disposed shaft c' which bears at its upper end a bevel gear c^2 meshing with the bevel pinion b' , and at its lower end a worm c^3 adapted to mesh with the worm gear c . In order to swing this vertical shaft c' on its pivotal axis so that the worm gear c and worm c^3 may be connected or disconnected as desired, a bell-crank lever c^4 is provided which is connected at the end of one of its arms with the lower end of the vertical shaft c' . The bell-crank lever c^4 , influenced by the weight of its free arm, tends always to have such free arm fall and to thus swing the vertical shaft c' on its axis and disconnect the worm c^3 from the worm gear c . The tendency of the outer arm of the lever c^4 to fall, however, is normally restrained by a

transverse lever c^5 which may be set as a latch to hold such outer arm in its raised position and so to hold the gear c and worm c^3 in mesh. An adjustable stop c^6 is provided on the outer face of the table which is adapted, during the upward movement of the table, to strike the lever c^5 and thereby release the outer arm of the bell-crank lever c^4 , which, upon falling, disconnects the gear and worm and stops the upward movement of the table.

The mechanism for lowering the table operates through the same racks and pinions, the shaft c^{10} bearing the pinions being now actuated by a gear D loosely mounted thereon which is operated in turn through intermediate gearing by the pulley d . A clutch d' serves to connect or disconnect the gear with such shaft, and the clutch d' is operable by a horizontally reciprocable rod d^2 which is connected with the clutch d' by a lever d^3 . A spring d^4 continually tends to move the horizontal rod d^2 in such manner as to throw the clutch into engagement, but the rod is normally restrained from such movement by engagement therewith of a catch d^5 , a spring d^6 holding the catch in engagement with the rod. A rod c^7 depends from the outer arm of the bell-crank lever c^4 , and when such bell-crank lever drops, this rod c^7 strikes the catch d^5 and releases it and allows the horizontal rod d^2 to throw the clutch into engagement, and hence set in motion the mechanism for lowering the table. A projection d^7 on the outer face of the table, while the table descends, strikes a bell-crank lever d^8 and by means thereof returns the horizontal rod d^2 to its first position against the action of the spring d^4 , and thus disengages the clutch and again renders inoperative the mechanism for lowering the table. A device D' is provided by which the table C may be manually lowered if desired. Suitable weights will preferably be connected with the table in order to counterbalance the table during its vertical reciprocation.

The general mode of operation of my machine has been indicated in connection with the description of the details of the machine, but certain of the advantages embodied in the machine may be particularly noted. It is desired in a machine of this class that the tool carrying spindles shall not be required to perform their work at a point far distant from any bearing of the spindles, for the result in such case is weakness of the spindle and inaccuracy of its work. I obviate this difficulty by providing below the supporting head the bearing sleeves for the spindles which, during the operation of the machine, may enter the work being bored along with the tool and thus gives to the spindle a bearing and consequent lateral support very near to the end of the spindle which is

carrying the tool. The means by which the mechanism for raising the table is driven so that it may be easily and automatically disconnected when the table reaches a predetermined height, possess many obvious advantages which need not be mentioned in detail, while the return movement likewise is of simple and advantageous construction and is arranged to be automatically operated by the same device that disconnects the mechanism which has raised the table.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention—

1. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, a pivotally mounted shaft adapted to be driven at its pivoted end and adapted at its free end to drive said gear, a bell-crank lever having one arm connected with the free end of said shaft, said lever normally tending to disconnect said shaft from said gear, a lever adapted to restrain such tendency, and means for moving the table from said spindle.

2. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, a pivotally mounted shaft adapted to be driven at its pivoted end and adapted at its free end to drive said gear, a bell-crank lever having one arm connected with the free end of said shaft, said lever normally tending to disconnect said shaft from said gear, a lever adapted to restrain such tendency, an adjustable stop carried by said table and adapted to move said lever to release said bell-crank lever, and means for moving the table from said spindle.

3. In a machine of the class described, the combination of a support, a horizontal drive shaft, a vertically disposed rotatable spindle connected therewith, a vertically reciprocable shaft, a vertically disposed rotatable spindle means for raising the table, said means including a worm gear, a vertically disposed shaft provided at its upper end with a bevel gear in mesh with a bevel gear driven by the drive shaft, said shaft being pivoted on an axis alined with the axis of the last-named gear and having a worm at its free end adapted to mesh with said worm gear, a bell-crank lever having one arm connected

with the free end of said shaft and the other arm tending to fall to disconnect said worm and worm gear, a lever adapted to retain such other arm in raised position, an adjustable stop carried by said table and adapted to move said lever from such retaining position, and means for lowering the table.

4. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, means for driving said gear, means for disconnecting the driving means from said gear, and normally inoperative means for moving the table from said spindle, said disconnecting means being adapted to render the last-named means operative upon disconnecting said driving means from said gear.

5. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, means for driving said gear, means for disconnecting the driving means from said gear, normally inoperative means for moving the table from said spindle, and clutch mechanism for rendering operative said last-named means, said disconnecting means being adapted to actuate the clutch upon disconnecting said driving means from said gear.

6. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, means for driving said gear, means for disconnecting the driving means from said gear, normally inoperative means for moving the table from said spindle, clutch mechanism for rendering operative said last-named means, a reciprocable rod adapted to actuate said clutch, a spring tending to move said rod to actuate said clutch, and a catch restraining such movement of the rod, said disconnecting means being adapted to trip said catch upon disconnecting said driving means from said gear.

7. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, means for driving said gear, means for disconnecting the driving means from said gear, normally inoperative means for moving the table from said spindle, clutch mechanism for rendering operative said last-named means, a reciprocable rod adapted to actuate said clutch, a spring tending to move said rod to actuate said

clutch, a catch restraining such movement of the rod, said disconnecting means being adapted to trip said catch upon disconnecting said driving means from said gear, means operable by said table for returning said rod against the action of said spring, and a second spring tending to move said catch to engage said rod.

8. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, a pivotally mounted shaft adapted to be driven at its pivoted end and adapted at its free end to drive said gear, means for swinging said shaft on its pivotal axis, and normally inoperative means for moving the table from said spindle, said means for swinging the shaft being adapted to render the last-named means operative upon swinging said shaft.

9. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, a pivotally mounted shaft adapted to be driven at its pivoted end and adapted at its free end to drive said gear, a bell-crank lever having one arm connected with the free end of said shaft, and normally inoperative means for moving the table from said spindle, the free arm of the bell-crank lever being adapted to render said last-named means operative when so moved as to disconnect said shaft from said gear.

10. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, a pivotally mounted shaft adapted to be driven at its pivoted end and adapted at its free end to drive said gear, a bell-crank lever having one arm connected with the free end of said shaft, said lever normally tending to disconnect said shaft from said gear, a lever adapted to restrain such tendency, an adjustable stop carried by said table and adapted to move said lever to release said bell-crank lever, and normally inoperative means for moving the table from said spindle, the free arm of the bell-crank lever being adapted, upon its release, to render said last-named means operative.

11. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, a pivotally mounted shaft adapted to be driven at its pivoted end and

adapted at its free end to drive said gear, a bell-crank lever having one arm connected with the free end of said shaft, said lever normally tending to disconnect said shaft from said gear, a lever adapted to restrain such tendency, an adjustable stop carried by the table and adapted to move said lever to release said bell-crank lever, normally in-operative means for moving the table from said spindle, clutch mechanism for rendering operative said last-named means, a reciprocable rod adapted to actuate said clutch, a spring tending to move said rod to actuate said clutch, and a catch restraining such movement of the rod, said bell-crank lever being adapted, upon its release, to trip said catch.

12. In a machine of the class described, the combination of a support, a rotatable spindle, a table reciprocable toward and from said spindle, means for moving the table toward said spindle, said means including a gear, a pivotally mounted shaft adapted to be driven at its pivoted end and adapted at its free end to drive said gear, a bell-crank lever having one arm connected with the free end of said shaft, said lever normally tending to disconnect said shaft from said gear, a lever adapted to restrain such tendency, an adjustable stop carried by the table and adapted to move said lever to release said bell-crank lever, normally in-operative means for moving the table from said spindle, clutch mechanism for rendering operative said last-named means, a reciprocable rod adapted to actuate said clutch, a spring tending to move said rod to actuate said clutch, a catch restraining such movement of the rod, said bell-crank lever being adapted, upon its release, to trip said catch, means operable by said table for returning said rod against the action of

said spring, and a second spring tending to move said catch to engage said rod.

13. In a machine of the class described, the combination of a support, a horizontal drive shaft, a vertically disposed rotatable spindle connected therewith, a vertically reciprocable table disposed below said spindle, means for raising the table, said means including a worm gear, a vertically disposed shaft provided at its upper end with a bevel gear in mesh with a bevel gear driven by the drive shaft, said shaft being pivoted on an axis alined with the axis of the last-named gear and having a worm at its free end adapted to mesh with said worm gear, a bell-crank lever having one arm connected with the free end of said shaft and the other arm normally tending to fall to disconnect said worm and worm gear, a lever adapted to retain such other arm in raised position, an adjustable stop carried by said table and adapted to move said lever from such retaining position, normally in-operative means for lowering the table, clutch mechanism for rendering operative said last-named means, a reciprocable rod adapted to actuate said clutch, a spring tending to move said rod to actuate said clutch, a catch restraining such movement of the rod, said bell-crank lever being adapted, upon its release, to trip said catch, means operable by said table for returning said rod against the action of said spring, and a second spring tending to move said catch to engage said rod.

Signed by me this 3rd day of February, 1910.

ANDREW W. FOOTE.

Attested by—

A. M. KING,

JNO. F. OBERLIN.