J. G. DORNBIRER.

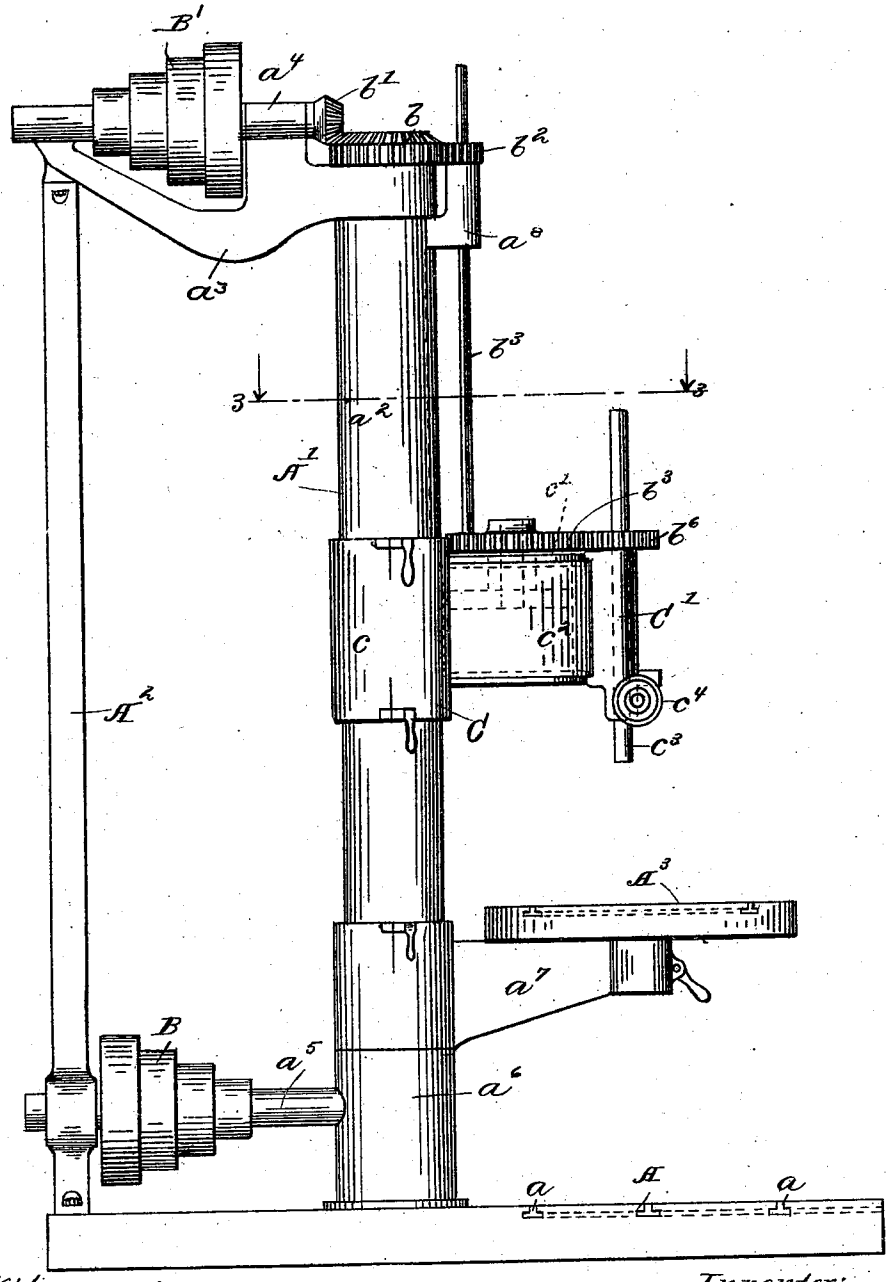
RADIAL DRILL.

APPLICATION FILED MAY 2, 1908.

979,749. Patented Dec. 27, 1910.

2 SHEETS—SHEET 1.

Fig. 1



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2 SHEETS—SHEET 2.

Fig. 2

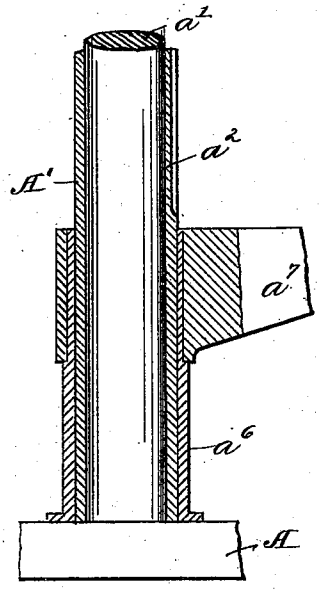


Fig. 3

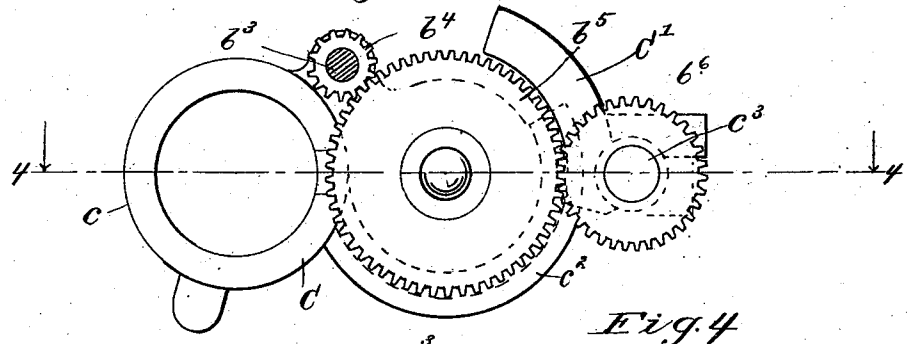
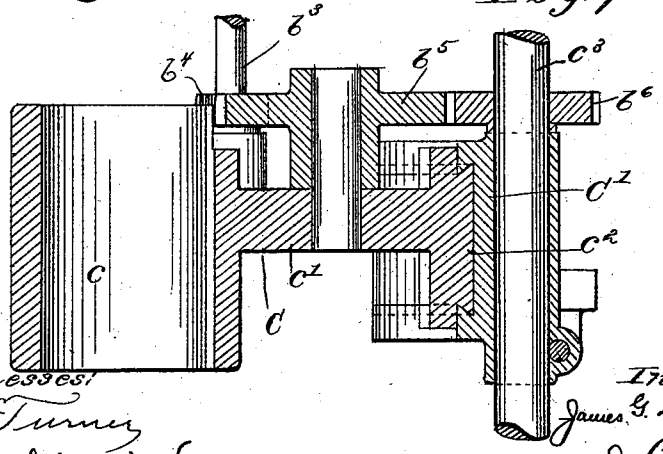


Fig. 4



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UNITED STATES PATENT OFFICE.

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RADIAL DRILL.

979,749. Specification of Letters Patent. **Patented Dec. 27, 1910.**

Application filed May 2, 1908. Serial No. 430,492.

To all whom it may concern:

Be it known that I, JAMES G. DORNBIRER, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Radial Drills, 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.

This invention relates to drilling machines and particularly to drilling machines of a type known commercially as radial drills, such drills being characterized by the provision of a vertical support in the form of a post or column upon which is mounted a radially projecting arm that bears the drilling mechanism proper. This drilling mechanism consists primarily of a rotatable spindle, and, in connection with the supporting column, or post, and radial arm, is provided suitable mechanism for communicating motion to such spindle. The bed of the machine ordinarily extends beneath the radial drill-bearing arm and is adapted to have secured thereto the larger and heavier pieces of work, while for smaller pieces a table, likewise supported from a radial arm, is provided at a higher elevation. Obviously, in order to drill holes at various separated points on an article affixed either to the bed or such table, it becomes necessary that the work be moved and reset for each successive drilling operation, or that the drill itself be susceptible of adjustment in a horizontal plane so that it may be brought over any such point as desired.

The object of the present invention is to provide an improved construction of radial arm for supporting the drill, and of driving connections for the drill borne by such arm, whereby this adjustment of the drill may be had in a much more easy and convenient manner, a further object being to attain economy both in the manufacture of the parts by reducing their number and simplifying the same, and also in the completed machine when in use by reducing the wear of parts.

To the accomplishment of the above 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 side elevation of a radial drill embodying my several improvements; Fig. 2 is a vertical central section through the base and lower portion of the post of such drill; Fig. 3 is a plan view of the radial arm whereby the drill and connected mechanism is supported; and Fig. 4 is a central vertical section taken through such radial arm and drill.

In such annexed drawings, then, A designates the bed or base of the machine which will be of familiar construction, being provided with the usual slots a for the securing of work thereto. Mounted upon such bed, Fig. 1, is a cylindrical column or post A′, the height and diameter of which will obviously vary with the character and size of the work for which the machine is designed, and the construction of which will more particularly appear from an inspection of Fig. 2. As there shown, it comprises an inner fixed core a', or post proper, upon which is mounted a rotatable sleeve a^2 that extends the full length of the same save for a portion of the top where the inner end of a bracket or supporting arm a^3 is secured to such inner post. The outer end of this arm a^3 is further sustained by a vertical support A^2 that rests on the rear end of the machine bed. Upon a suitable shaft a^4 journaled in such arm and upon another shaft a^5 mounted between such standard and the post are two cone pulleys B B′ through which power is transmitted to the driving mechanism proper of the drill, as will be noted more particularly presently.

Surrounding the lower portion of the rotatable sleeve a^2, just described as inclosing the inner post, or column, is a short tubular stub shaft or "stump" a^6, upon the upper end of which is rotatably mounted the arm a^7 that bears the work table A^3, the construction of which need not be further noted than to observe that such arm may be secured in any desired radial position with respect to the axis of the supporting column. Keyed to the sleeve a^2 so as to be movable up and down along the same and rotatable therewith is a second arm C that constitutes the support for the drill and connected parts. The construction of this arm,

to which attention is now directed, (more particularly shown in Figs. 3 and 4), consists of a short tubular part c that encompasses sleeve a^2 and is provided with a horizontally extending segmental rail c that terminates in a slide-way c^2 having its axis parallel to the supporting post. This slideway is illustrated in the drawing as of dovetail construction, but this is merely intended as an illustration of any of the well known gibbed forms of construction. Upon this slideway c^2 is mounted a second, tool-bearing, member or saddle C′ which will thus be seen to be concentrically movable with respect to said first member. The drill mounting provided in this second member need not be described in detail, nor is more of such drill shown than the spindle c^3, which is adapted to be vertically adjusted in the usual way, such adjustment being had by means of a hand-wheel c^4, or any other suitable mechanism.

Driving of drill spindle c^3 is had from the shaft a^4 upon which upper cone pulley B′ is mounted, through suitable intermediate gearing as follows: Mounted upon the upper end of the inner post or column a' is a combined bevel and spur gear b. Bevel gear b meshes with a bevel pinion b' on the inner end of said shaft, while the spur gear drives a spur-pinion b^2 keyed on a vertical shaft b^3, the upper end of which is slidably and rotatably journaled in an arm a^3 projecting from the sleeve a^2, while its lower end is journaled in the rail c'. Upon such lower end is mounted a second pinion b^4 that serves to drive an idler b^5 mounted on rail c' on an axis coincident with the axis of the curved slideway c^2 upon which the saddle C′ is secured. A pinion b^6 keyed upon the drill spindle, it will accordingly be seen, will remain in mesh with such idler irrespective of the position of the second member about the first. By the foregoing driving connection, motion can obviously be communicated to this spindle from the upper driving shaft irrespective of the position of the main arm, either vertically or axially about the supporting post or column; and irrespective, furthermore, of the position of the second, or tool-bearing member proper, about such first member. The two movements of such members just described it will likewise be clear, are adapted to bring the drill spindle into position over any desired point within an annular area lying between the minimum and maximum radial distance that such spindle can assume with respect to the axis of the central supporting column. If such maximum radial distance be made to extend to the extreme outer edge of the table, any point on the latter can be thus covered without moving the table or the work supported thereon. In all this adjustment of the drill spindle there will be required no change in gear connections or adjustment of the same, such gears accommodating themselves to the movement of the drill spindle carrier without any attention to themselves being required.

By the particular type of joint which I employ to connect the tool-bearing member to the main arm, I not only am able to very rigidly support such spindle in all of its various positions, but am able to bring it much more closely to the main supporting post or column than is possible in any of the prevailing types of radial drill construction. Indeed, in these, so far as I am aware, a corresponding range of movement is attained only by providing a horizontal slide along which the drill carrier is movable and then connecting the drill spindle with the driving shaft through two sets of bevel gears.

While in the foregoing description I have referred to my invention as being embodied in a drill machine, it will of course be understood that it is not necessarily limited in its application to this particular type of machine alone, but that machines designed for other analogous operations, such as gear cutting, milling and planing, may likewise be much simplified by the incorporation therein of my several improvements.

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 one 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 post, a member supported by said post and provided exteriorly with a segmental way having its axis parallel with said post, a saddle formed on one side to slidably engage said way, and a tool spindle rotatable in said saddle.

2. In a machine of the class described, the combination of a post, a segmental rail rotatably mounted thereon and provided exteriorly with a way having its axis parallel with said post, a saddle formed on one side to slidably engage said way, and a tool spindle rotatable in said saddle.

3. In a machine of the class described, the combination of a post, a segmental rail rotatably mounted thereon and provided exteriorly with a dove-tail way having its axis parallel with said post, said rail being vertically adjustable on said post, a saddle having one side concave and formed to slidably engage said way, and a tool spindle rotatable in said saddle.

4. In a machine of the class described, the combination of a post, a segmental rail rotatably mounted thereon and provided ex-

teriorly with a dove-tail way having its axis parallel with said post, said rail being vertically adjustable on said post, a saddle having one side concave and formed to slidably engage said way, a tool spindle rotatable in said saddle, and driving mechanism for said tool spindle.

5. In a machine of the class described, the combination of a post, a segmental rail rotatably mounted thereon and provided exteriorly with a dove-tail slide-way having its axis parallel with said post, said rail being vertically adjustable on said post, a saddle having one side concave and formed to slidably engage said slide-way, a tool spindle rotatable in said saddle, and driving mechanism for said tool spindle, said mechanism including a gear mounted on said rail concentric with said slide-way and a pinion on said tool spindle meshing with said gear.

6. In a machine of the class described, the combination of a post, a member rotatably mounted thereon and provided with a slide-way formed on the arc of a circle having its axis parallel with said post, said member also being adjustable up and down said post, a second member mounted upon such slide-way, a tool-spindle borne by said second member likewise parallel with said post, and driving mechanism for said spindle, said mechanism including a gear mounted centrally upon said post, a gear on said first member similarly mounted with respect to the axis of movement of said second member, a shaft mounted so as to be rotatable with said first member, pinions on said shaft meshing with aforesaid gears respectively, and a pinion upon said tool-spindle meshing with the latter of said gears.

Signed by me this 29th day of April, 1908.

JAMES G. DORNBIRER.

Attested by—

D. T. DAVIES,

JNO. T. OBERLIN.