

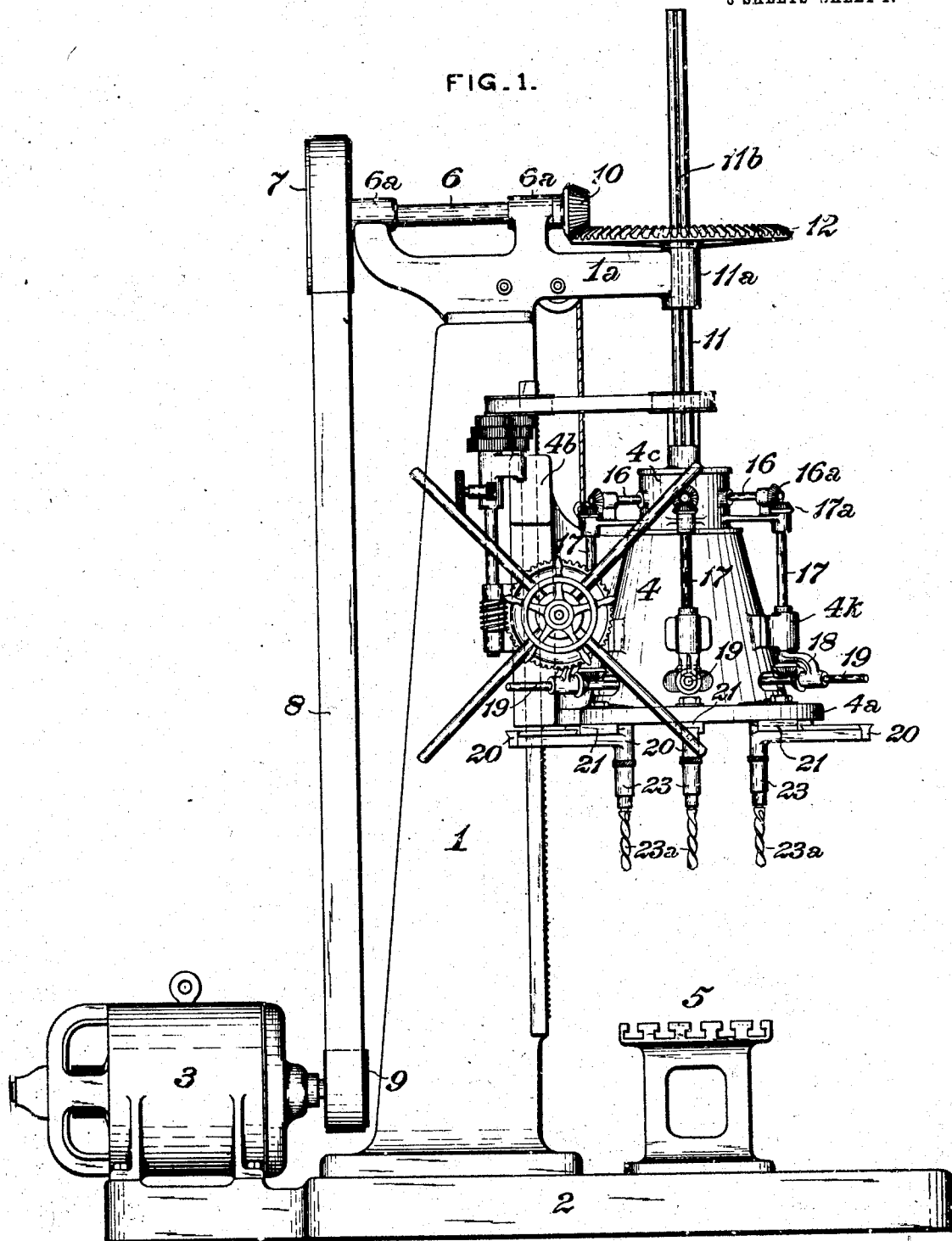
C. K. LASSITER & F. E. BOCORSELSKI.
 . MULTIPLE SPINDLE DRILL.
 APPLICATION FILED NOV. 23, 1910.

Patented May 21, 1912.

1,027,347.

3 SHEETS-SHEET 1.

FIG. 1.



WITNESSES

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MULTIPLE SPINDLE DRILL.

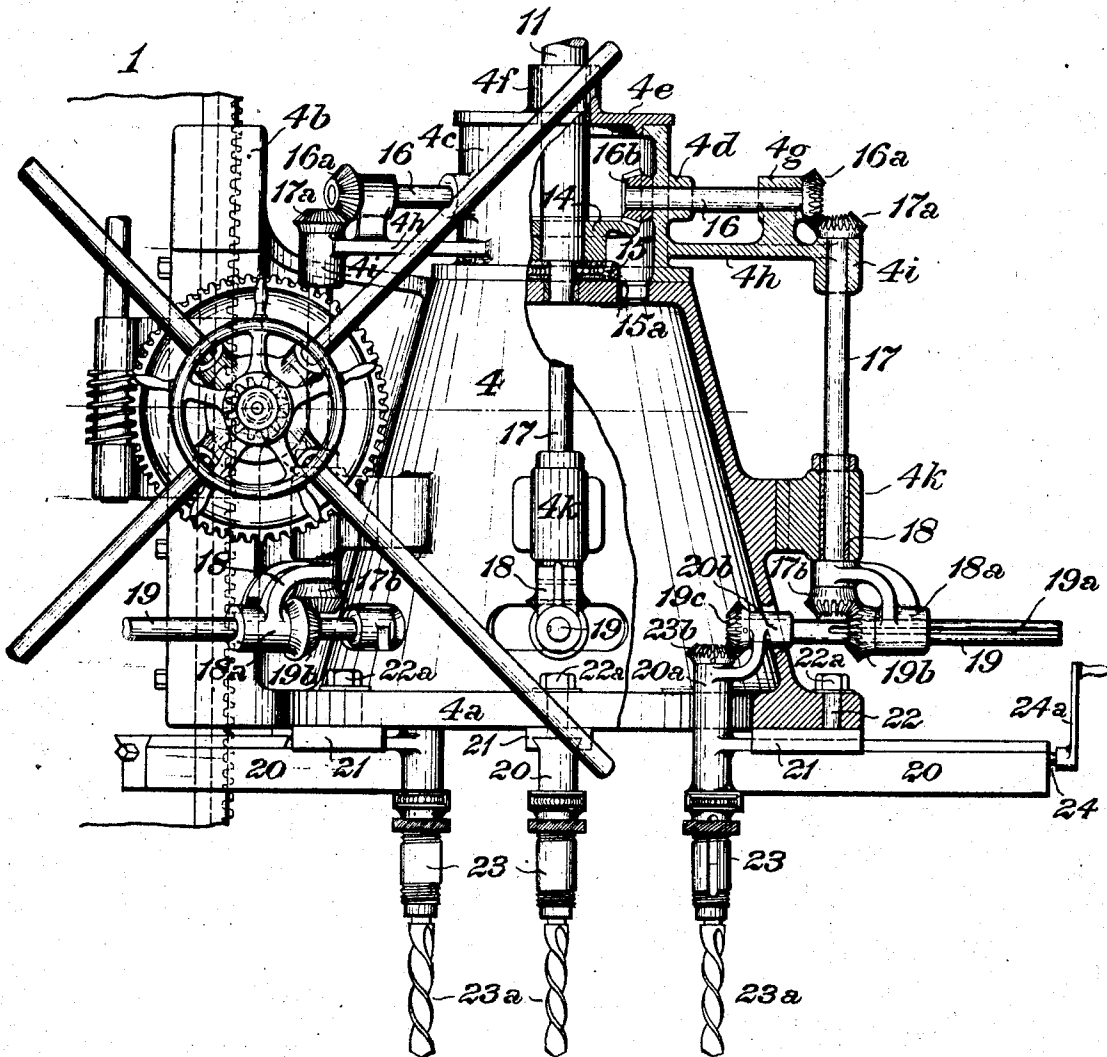
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3 SHEETS—SHEET 2.

FIG. 2.



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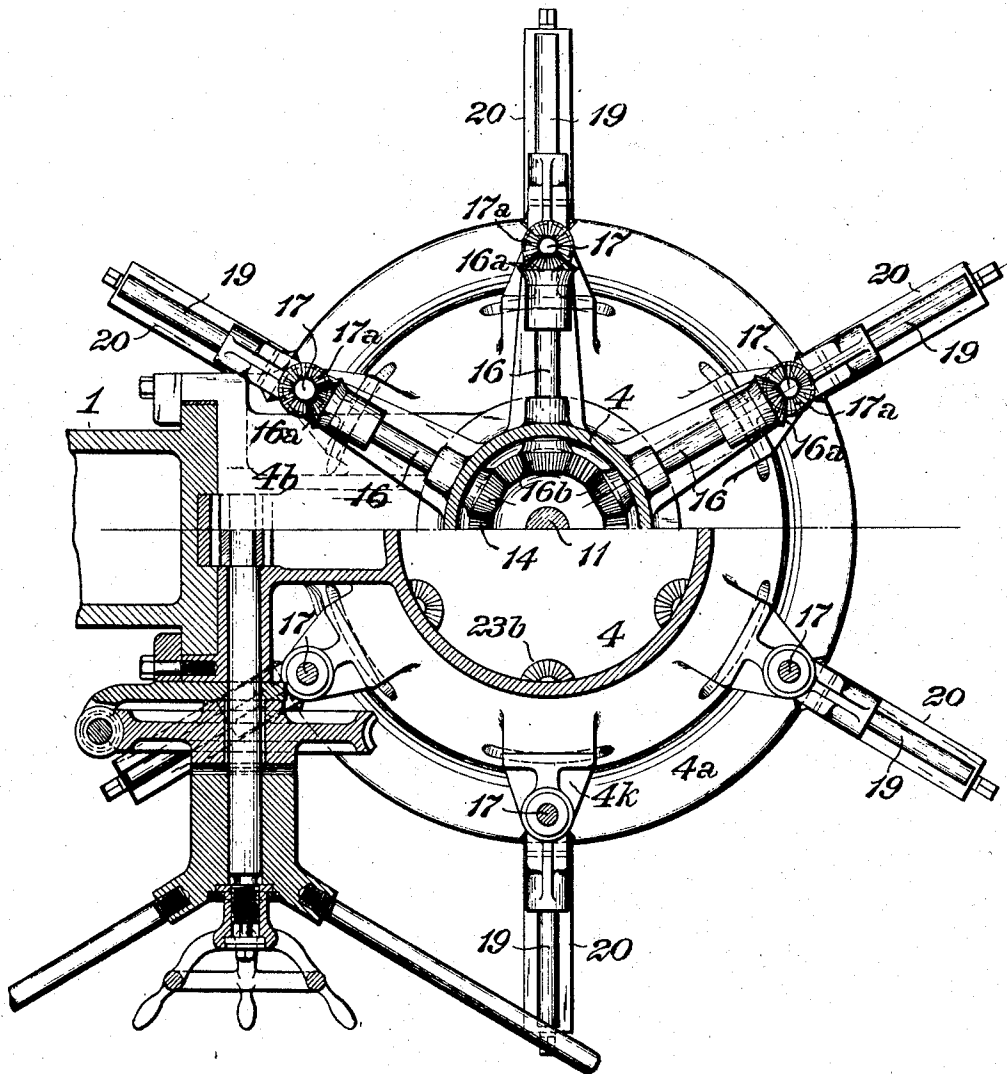
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3 SHEETS—SHEET 3.

FIG. 3.



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UNITED STATES PATENT OFFICE.

COLUMBUS K. LASSITER AND FRANK E. BOCORSELSKI, OF RICHMOND, VIRGINIA.

MULTIPLE-SPINDLE DRILL.

1,027,347.

Specification of Letters Patent.

Patented May 21, 1912.

Application filed November 23, 1910. Serial No. 593,777.

To all whom it may concern:

Be it known that we, COLUMBUS K. LASSITER and FRANK E. BOCORSELSKI, both of Richmond, in the county of Henrico and State of Virginia, have jointly invented a certain new and useful Improvement in Multiple-Spindle Drills, of which improvement the following is a specification.

Our improvement relates to metal drilling machines of the general class or type which is set forth in Letters Patent of the United States No. 904,926, granted and issued to Frank E. Bocorselski aforesaid, under date of November 24, 1908, and its object is to provide a machine adapted for drilling a plurality of holes, without necessitating the use of flexible shaft connections or universal joints.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a side view, in elevation, of a multiple spindle drill embodying our invention; Fig. 2, a similar view, partly in elevation and partly in section, and on an enlarged scale, of the spindle carrying head and its accessories; and, Fig. 3, a view, partly in plan and partly in horizontal section, of the same.

The movable members of our improved multiple spindle drill are mounted and supported on a vertical post or standard, 1, fixed upon a bed plate, 2, which, in this instance, is also shown as supporting an electric motor, 3, by which the machine is operated. A spindle carrying head, 4, is fitted to traverse vertically on the post, 1, above a box table, 5, fixed to the bed plate, to the top of which table the material to be drilled is clamped in the ordinary manner. A horizontal countershaft, 6, is journaled in bearings, 6^a, on a horizontal arm, 1^a, secured to the top of the post, said countershaft carrying, on one end, a pulley, 7, which is rotated by a belt, 8, passing around a pulley, 9, on the shaft of the motor, 3, and on the other, a bevel pinion, 10. The vertical movements of the head, 4, toward and from the table, by which the drills which it carries are fed to and retracted from the work, may be effected by any suitable known means, and as these are familiar to those skilled in the art, and do not form any part of our present invention, they need not be herein described.

A vertical driving shaft, 11, is journaled in a bearing, 11^a, on one end of the arm, 1^a,

said shaft having a longitudinal groove or key way, 11^b, and a bevel gear, 12, having a key or projection in the bore of its hub which engages the keyway of the shaft, 11, is fitted on said shaft above the bearing 11^a. The gear, 12, meshes with the pinion, 10, of the countershaft, and, by reason of its engagement, as described, with the driving shaft, 11, imparts rotation thereto, without interfering with the longitudinal movement thereof.

The spindle carrying head, 4, is a hollow or tubular casting, of frusto-conical form, having a horizontal flange, 4^a, at its bottom, and a lateral extension, 4^b, which is fitted to slide on the adjoining face of the post, 1. The lower end of the driving shaft carries a bevel gear, 14, the lower end of which rests on ball bearings, 15, in a ball race, 15^a, on the top of the head, 4, said ball bearings supporting and receiving the end thrust of the driving shaft, 11. A cylindrical bearing box, 4^c, is secured to the top of the head, said box having bearings, 4^d, for a plurality of horizontal shafts, and a cap, 4^e, on the center of which is formed a lower bearing, 4^f, for the driving shaft. Horizontal shafts, 16, are journaled in the bearings, 4^d, and in bearings, 4^e, on brackets, 4^h, projecting laterally from the bearing box, 4^c, said shafts carrying, on their inner ends, bevel pinions, 16^b, which mesh with the bevel gear, 14, of the driving shaft, and, on their outer ends, similar pinions, 16^a.

Vertical shafts, 17, corresponding in number with the horizontal shafts, 16, are journaled in bearings, 4ⁱ, on the brackets, 4^h, said shafts having bevel pinions, 17^a, which mesh with the pinions, 16^a, of the horizontal shaft, 16, fixed on their upper ends, and similar pinions, 17^b, fixed on their lower ends. Swing yokes, 18, having horizontally bored bearings, 18^a, on their lower ends, are journaled on the shafts, 17, adjoining the pinions, 17^b, and are rotatable in brackets, 4^k, on the head. Horizontal shafts, 19, having longitudinal grooves or keyways, 19^a, are journaled in the bearings, 18^a, of the swing yokes, and a bevel pinion, 19^b, having a key or projection in the bore of its hub which engages the keyway, 19^a, is fitted, otherwise freely, on each of said shafts, said pinions meshing with the pinion, 17^b, of the vertical shafts, 17, and the shafts, 19, being, by reason of their engagement as described with the pinions, 19^b, capable of end movement,

without interference with their operative relation to said pinions.

Drill carrying arms, 20, are fitted to slide horizontally toward and from the axial line of the head, 4, in dovetailed grooves formed in supporting blocks, 21, which are pivotally connected to the lower flange, 4^a, of the head, by bolts, 22, and nuts, 22^a, the central planes of said arms being in the same vertical planes as the axes of the shafts, 19. A bearing, 20^a, is formed on the inner end of each of the drill carrying arms, 20, for a vertical drill spindle, 23, in the lower end of which a drill, 23^a, is secured, as in the patent of F. E. Bocorselski, No. 945,368, dated January 4, 1910, or in any other preferred manner, said drill spindle having fixed upon its upper end, a bevel pinion, 23^b, which meshes with a corresponding pinion, 19^c, on the inner end of the horizontal shaft, 19, located above the central plane of the arm, 20, said shaft rotating in a bearing, 20^b, fixed to the bearing, 20^a. The drill carrying arms may be moved inwardly and outwardly on the blocks, 21, in any suitable known manner, as by screw shafts, 24, journaled in the arms and rotated by hand cranks, 24^a, said screw shafts engaging nuts on the blocks, 21, substantially as set forth in Patent No. 904,926 aforesaid.

It will be obvious to those skilled in the art, that under our invention as above described, the drill spindles may, by reason of the capability of end movement of their carrying arms toward and from the central driving shaft, and the pivotal connection of the supporting blocks of said carrying arms to the stationary head, be adjusted in any desired relative positions, and will be equally operative in all adjusted positions, by reason of the maintenance of their actuating gearing in normal engagement permitted by the swing yokes and the capacity of end movement of the lower horizontal shafts. It will be further obvious that the strength and durability of the machine, as well as the range of adjustment of the drills, are increased to a substantial extent, by the elimination of all universal joints and flexible connections from the driving mechanism, and the operation of the drills through shafts which are directly geared together.

We claim as our invention and desire to secure by Letters Patent:

1. In a multiple spindle drill, the combination of a support, a spindle carrying head

movable longitudinally thereon, a driving shaft journaled in said head, a supporting block pivoted adjustably to the outer portion of said head, a drill carrying arm fitted to slide in said block toward and from the driving shaft, a drill spindle mounted in said drill carrying arm and rotatable about an axis parallel with the axis of the driving shaft, a shaft journaled on the drill carrying arm at right angles to the drill spindle, bevel gears connecting said shaft with the drill spindle, a bevel gear fitted on said shaft, with the capacity of end movement through it of said shaft, a swing hanger in which said shaft is journaled, and which is itself journaled on a second shaft parallel with the driving shaft, a bevel gear on said second named shaft engaging with the bevel gear of the shaft on the drill carrying arm, a third shaft journaled on the head at right angles to the driving shaft, and pairs of bevel gears connecting said second and third named shafts, and said third named shaft and the driving shaft.

2. In a multiple drill, the combination with the standard, of a drill head carried thereby, guide blocks pivotally secured to the lower end of said head, drill-carrying arms slidably mounted in said blocks, a drill spindle journaled in each of said arms, a driving shaft centrally journaled in said head, and geared connections between said shaft and spindles, operative to drive the latter in all their positions of adjustment.

3. In a multiple drill, the combination with the standard, of an annular drill-head adjustable vertically thereon, a series of blocks pivoted to the base of said head, a drill-carrying arm slidably mounted in each of said blocks, a drill spindle journaled in each of said arms, a driving shaft journaled axially in said head, a horizontal shaft, geared to each drill-spindle, a journal bearing for each of said horizontal shafts pivotally mounted on the head so as to swing around a vertical axis, a second journal-bearing for each of said horizontal shafts carried by the corresponding drill-carrying arm, horizontal shafts geared to said driving shaft and a vertical shaft geared to each pair of horizontal shafts.

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