J. S. BARNES.

DRILLING MACHINE.

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973,843.

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Fig. 1.

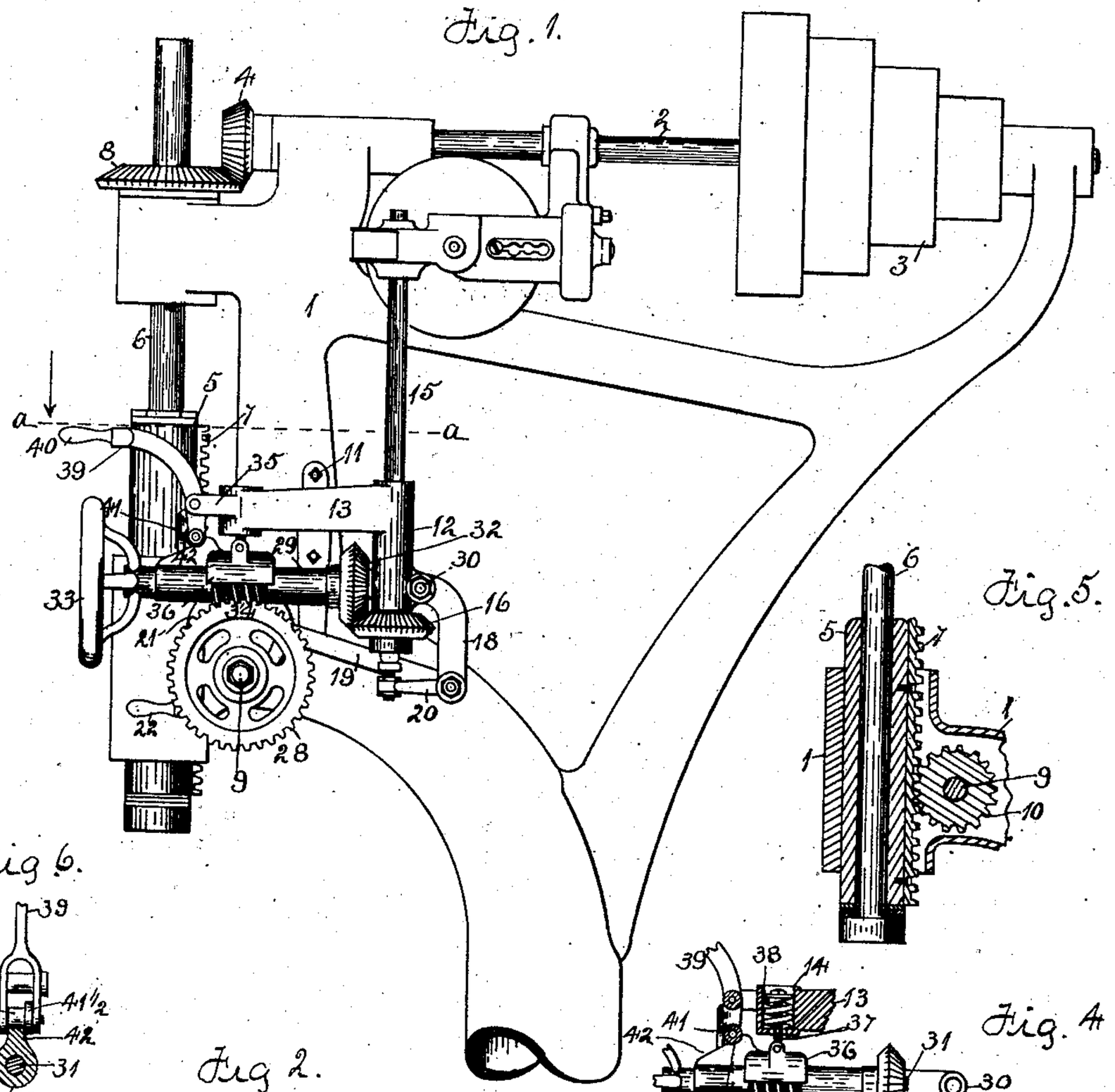


Fig. 5.

Fig 6.

Fig. 4

Fig 2.

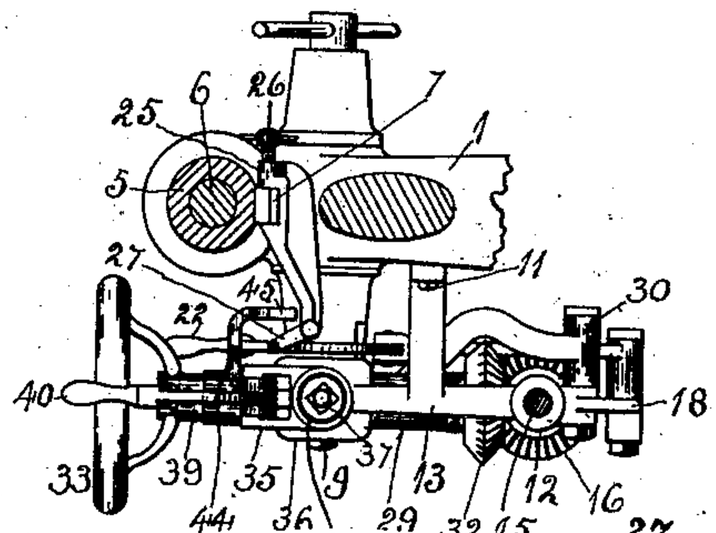


Fig. 3.

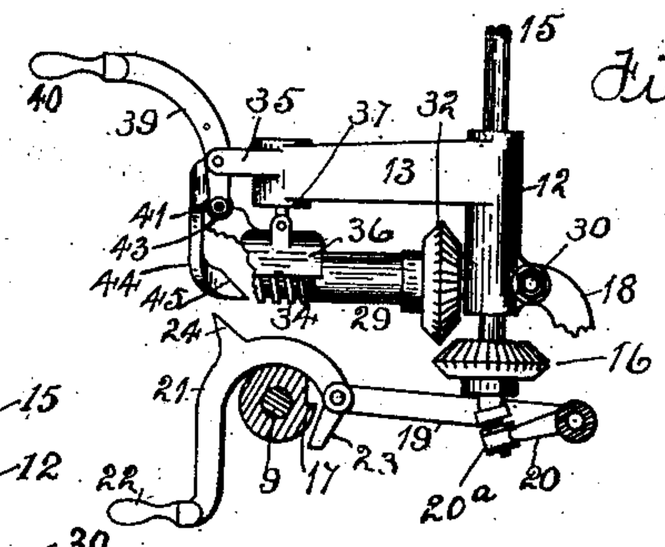
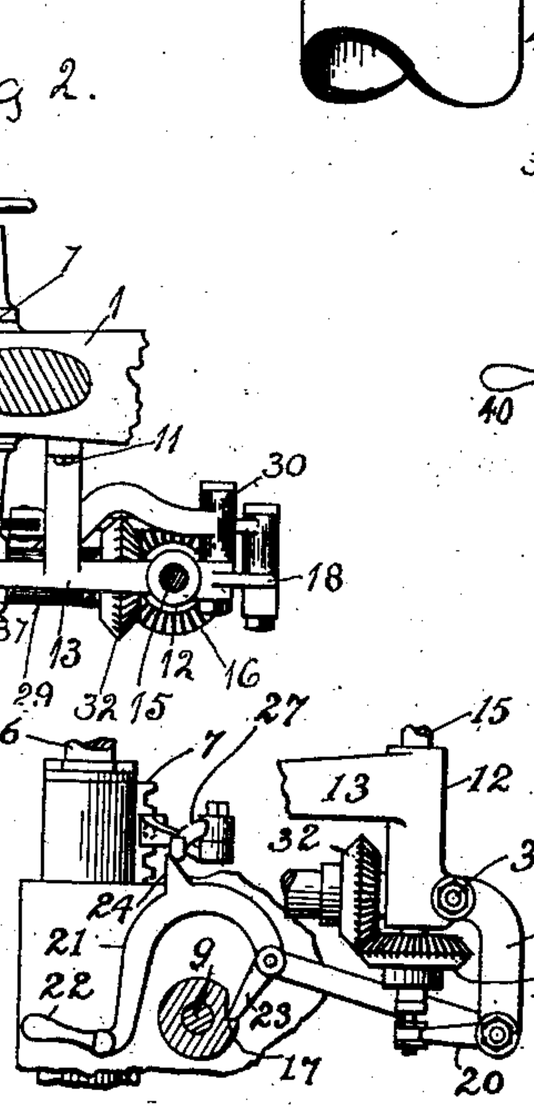


Fig. 7.



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UNITED STATES PATENT OFFICE.

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DRILLING-MACHINE.

973,843. Specification of Letters Patent. **Patented Oct. 25, 1910.**

Application filed April 27, 1909. Serial No. 492,591.

To all whom it may concern:

Be it known that I, JOHN S. BARNES, a citizen of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification.

The object of this invention is to form a new feed connection between the driving shaft and drill spindle.

In the accompanying drawings, Figure 1 is a side elevation of a drilling machine containing my improvements. Fig. 2 is a section on dotted line *a a* Fig. 1. Fig. 3 is a partial elevation and partial section. Fig. 4 is an elevation of the worm-shaft, and a section through some of the immediate parts associated therewith. Fig. 5 is a detail view of the connection between the sleeve of the drill-spindle and the cross-shaft. Fig. 6 is a vertical cross-section through the roller 41, the lever 39 and the bearing 29. Fig. 7 is a detail view, showing how the lever 21 is tripped by the finger 27.

The drilling machine in the main is of an old construction to which the improvements have been applied.

The frame 1 supports the main driving-shaft 2 which is rotated by a belt connection with the cone-pulley 3. A bevel-pinion 4 is fixedly connected to this driving-shaft. A sleeve 5 for the drill-spindle 6 is supported by the main frame and is provided with a toothed-rack 7. A bevel-gear 8 has a splined connection with the drill-spindle which also meshes with the bevel-pinion 4. A cross-shaft 9 is supported by the main-frame, and to which is fixedly connected a spur-pinion 10 which meshes with the toothed-rack 7. By rotating this cross-shaft, the sleeve 5, and drill-spindle 6 connected thereto is raised or lowered which will raise or lower the drill carried by the spindle.

A bracket is secured to the frame by the bolts 11, and comprises the vertically arranged tubular sleeve 12, and the horizontally extending portion 13, the free end of which has a circular recess 14. A shaft 15 is supported in this tubular sleeve 12 in a manner to rotate therein. The upper end of this shaft has a gear connection with the driving-shaft 2 in any suitable manner, and I have not deemed it necessary to illustrate any particular gearing. To the lower end of this shaft 15 is fixedly connected a bevel-gear 16. This shaft and bevel-gear 16 are adapted to be rotated by the gear connection with the driving-shaft, and said shaft and gear are mounted to be moved vertically to occupy are operative or an in-operative position. The main-frame surrounding the cross-shaft is formed with a cut-away portion 17, Fig. 3.

From the tubular sleeve 12 depends an arm 18, and to the lower end of this arm is pivoted a bar 19. A lever 20 has a fixed connection with the bar and moves therewith. The lower rounded end of the shaft 15 rests on the cup-bearing 20^a carried by the free end of the lever 20. To the free end of the bar 19 is pivoted a lever 21 supporting a handle 22 at one end, and the other end 23 extends some distance beyond the pivot point of the bar 19. When the bar is raised by means of the handle, the end 23 of the lever 21 will rest on the bottom of the cut-away portion 17 which will hold the shaft 15 and beveled-gear 16 in the position shown at Fig. 1. From the upper portion of the lever 21 extends an inclined projection 24. The lever 21 is curved so that it will rest on the main-frame 1 surrounding the cross-shaft as shown at Fig. 3, thereby limiting the downward movement of the shaft 15 and bevel-gear 16 connected thereto.

To the toothed rack 7 of the drill-spindle is adjustably connected a bracket 25 by the clamping screw 26. To the free end of the bracket 25 is pivoted a finger 27 adapted to swing in a horizontal plane, and it may be swung over and above the inclined projection 24. As the sleeve 5 carrying the toothed-rack 7 is moved downward during the drilling process, and after it has descended the proper distance, the finger 27 will contact with the inclined projection 24 of the lever 21 thereby rocking it on its pivotal connection with the bar 19, and move the end 23 free of the cut-away portion 17 and allow the lever 21 to drop, and the bar 19 and arm 20 to swing downwardly on their pivotal support, which will allow the shaft 15 and bevel-gear 16 to descend from the position shown at Fig. 1, into the position shown at Fig. 3. The reason for dropping the shaft 15 and bevel-gear 16 will presently be explained.

To the cross-shaft 9 is fixedly connected a worm wheel 28. A bearing 29 has a pivotal

connection at the point 30 with the tubular sleeve 12. A shaft 31 Fig. 4, is supported in this bearing, and to one end thereof is fixedly connected a bevel-gear 32 which is adapted to mesh with the bevel-gear 16. To the other end of this shaft 31 is fixedly connected a hand wheel 33, and intermediate the ends of this shaft is fixedly connected a worm 34 which overlies the worm-wheel 28, and is adapted to mesh therewith. To the part 36 of the bearing 29 that is disposed over the worm 34, is pivoted a screw-threaded rod 37 which passes through a coiled spring 38 in the circular recess 14, and a washer and nut serve to support the bolt in connection with the spring. The action of this spring 38 is to hold the worm 34 elevated free of the worm-wheel 28.

To the horizontally extending portion 35 is pivoted a lever 39 provided with a handle 40. A roller 41 is supported by the lever 39 and is adapted to move against the inclined face 42 of the bearing 29, and to be seated in the recess 43 formed in said face. This roller 41 has an enlarged head $41\frac{1}{2}$ against which the side of the inclined face 42 rests. From the lever 39 depends a projection 44 having a laterally extending inclined lower end 45. When the lever 39 is in the position shown in the drawings, the roller 41 is in the recess 43 which will hold the worm in mesh with the worm-wheel 28 against the action of the spiral spring 38. The finger 27 of the bracket 25 may be moved over the inclined end 45 of the lever 39, and when this finger contacts with this inclined end 45, the lever 39 will be rocked, thereby moving the roller 41 out of the recess 43, and permitting the spring 38 to raise the worm 34 out of mesh with the worm-wheel 28.

When the drill is in operation, the worm will be in mesh with the worm-wheel, and the bevel-gears 16 and 32 will be in mesh. The drill spindle is rotated by its gear connection with the driving-shaft 2 and the shaft 15 is also rotated through its connection with the driving-shaft. The sleeve of the drill-spindle will be lowered during the drilling process through the gears 16 and 32, shaft 31, worm 34, worm-wheel 28, cross-shaft 9, spur-pinion 10 and toothed-rack 7. As the bracket 25 is connected to the toothed-rack 7, it will also descend during the drilling process. In ordinary drilling where the hole goes through the material, the finger 27 is moved over the inclined projection 45 of the lever 39, and when it contacts therewith, the worm 34 will, through the action of the spring be disengaged from the worm-wheel, thereby stopping the downward feed movement of the drill-spindle. The drill is then raised clear of the work, new work placed in position and the worm 34 forced into mesh with the worm-wheel 28 by a downward movement of the handle 39. In drilling to a given depth, or in facing, the finger 27 is moved over the inclined projection 24, and when the finger contacts with this projection, the lever 21 will be disengaged from the recess 17 which will allow the bevel-gear 16 to drop and break connection with the bevel-gear 32, which will stop the downward feeding movement of the drill-spindle. As the worm 34 remains in mesh with the worm-wheel 28, the cross-shaft 9 will be held against rotation which will hold the drill or facing tool from further downward movement, and as the drill or facing tool continues to rotate, a smooth bottom or face will be given the material operated upon. As the tendency of the worm 34, when in engagement with the worm-wheel 28 is to move laterally, and as the bearing 29 is supported at one end only, the enlarged head $41\frac{1}{2}$ of the wheel 41 will receive the side thrust of the side of the inclined face 42, thereby holding the worm in proper mesh with the worm-wheel.

I claim as my invention.

1. In a machine of the character set forth, the combination with a supporting frame, of a longitudinally movable tool spindle therein, means for moving said tool spindle, including a shaft geared thereto and having a worm wheel, a worm movable into and out of mesh with the worm wheel, a swinging support for the worm, a bracket carried by the supporting frame and located over the worm, a spring mounted on the bracket, means connected to the support for the worm and engaging the spring for normally holding said worm out of mesh with the worm wheel, and a lever fulcrumed on the bracket and having a movable bearing on the worm support for holding the worm in mesh with the worm wheel against the action of the spring.

2. In a machine of the character set forth, the combination with a supporting frame, of a longitudinally movable tool spindle therein, means for moving said tool spindle, including a shaft geared thereto and having a worm wheel, a worm movable into and out of mesh with the worm wheel, a swinging support for the worm, a bracket carried by the supporting frame and located over the worm, a spring mounted on the bracket, means connected to the support for the worm, and engaging the spring for normally holding said worm out of mesh with the worm wheel, a lever fulcrumed on the bracket and having a movable bearing on the worm support for holding the worm in mesh with the worm wheel against the action of the spring, and a device movable with the spindle and adapted to operate on the lever to move the same to a position to permit the spring to act and disengage the worm from the worm wheel.

3. In a machine of the character set forth, the combination with a longitudinally movable spindle, of means for operating the same, including intermeshing gear elements that constitute a lock for holding the spindle against longitudinal movement when at a standstill and other coacting driving and driven toothed gears connected to the worm gearing, one of the latter gear elements being movable into and out of mesh with the coacting element, a support for holding the latter gear in mesh with the coacting gear, and automatic mechanism controlled by the spindle for effecting the movement of the support and causing the gear to move out of mesh without effecting the relation of the locking gears.

4. In a machine of the character set forth, the combination with a longitudinally movable tool spindle, of moving mechanism therefor, including a set of coacting gear elements relatively movable into and out of mesh and constituting holding means for the tool spindle when in mesh and at a standstill and another set of coacting gear elements that are also movable into and out of mesh, and mechanism automatically operating with the spindle to effect the relative movement of either set of gear elements independently of the other set to cause the same to move out of mesh and thereby stop the longitudinal movement of the tool spindle.

5. In a machine of the character set forth, the combination with a frame, of a longitudinally movable tool spindle mounted thereon, means for moving the spindle, including coacting gears, one of which is movable into and out of mesh with the other, a movable arm for supporting the gear in mesh, and a holding device for the arm movably mounted thereon and detachably engaging the frame.

6. In a machine of the character set forth, the combination with a supporting frame, of a longitudinally movable tool spindle, means for moving the same, including coacting gears, one of which is movable into and out of mesh with the other, an arm pivoted to the frame and having a portion for supporting the gear in mesh, and a holding device for the arm pivoted thereto and having a detachable engagement with the frame for supporting the gear in mesh.

7. In a machine of the character set forth, the combination with a supporting frame, of a longitudinally movable tool spindle therein, means for moving the tool spindle, including angularly disposed shafts, and cooperating gears carried thereby, one of said shafts being longitudinally movable to carry its gear into and out of mesh with the gear of the other shaft, a swinging supporting arm pivoted on the frame and engaging the shaft for holding it against longitudinal movement with the gears in mesh, and a lever pivoted to the arm and engaging a portion of the frame for preventing the swinging movement of the arm.

8. In a machine of the character set forth, the combination with a longitudinally movable tool spindle, of moving mechanism therefor including a set of coacting gear elements relatively movable into and out of mesh and constituting holding means for the tool spindle, when in mesh and at a standstill, and another set of coacting gear elements that are also movable into and out of mesh, separate means for respectively effecting the relative movements of the elements of the different sets to positions out of mesh, and a device movable with the spindle and adjustable to positions to effect the operation of either of said movement-effecting means.

9. In a drilling machine, the combination of a drill spindle, a cross shaft, a connection between the spindle and cross shaft, a worm wheel fixedly connected with the cross shaft, a vertically arranged feed shaft capable of a lengthwise movement, a horizontally arranged shaft, a gear connection between the vertical and horizontal shafts, a worm connected to the horizontal shaft and adapted to mesh with the worm wheel, a spring tending to hold the worm out of mesh with the worm wheel, independent levers for holding the worm in mesh with the worm wheel and the gear on the vertical shaft in mesh with the gear on the horizontal shaft, and a finger connected with the drill spindle and adjustable to trip the levers independently.

10. In a drilling machine, the combination of a drill spindle, a cross shaft, a connection between the spindle and cross shaft, a worm wheel fixedly connected with the cross-shaft, a vertically arranged feed shaft capable of a lengthwise movement, a horizontally arranged shaft, a gear connection between the vertical and horizontal shafts, a worm connected to the horizontal shaft and adapted to mesh with the worm wheel, a spring tending to hold the worm out of mesh with the worm wheel, independent levers for holding the worm in mesh with the worm wheel and the gear on the vertical shaft in mesh with the gear on the horizontal shaft, and a finger swingingly connected with the drill spindle and adjustable to trip the levers independently.

11. In a drilling machine, the combination of a drill spindle, a cross shaft, a connection between the spindle and cross shaft, a worm wheel fixedly connected with the cross shaft, a vertically arranged feed shaft, a horizontally arranged shaft located over the worm wheel, a driving connection between the vertical and horizontal shafts, a worm connected to the horizontal shaft, and adapted to move in and out of mesh with the worm wheel, a spring tending to hold the worm out of

mesh with the worm wheel, a lever, and a roller supported by the lever and having an enlarged head, the roller contacting with the face of the bearing supporting the worm, and the enlarged head receiving the side pressure of said bearing.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN S. BARNES.

Witnesses:
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A. O. BEHEL.