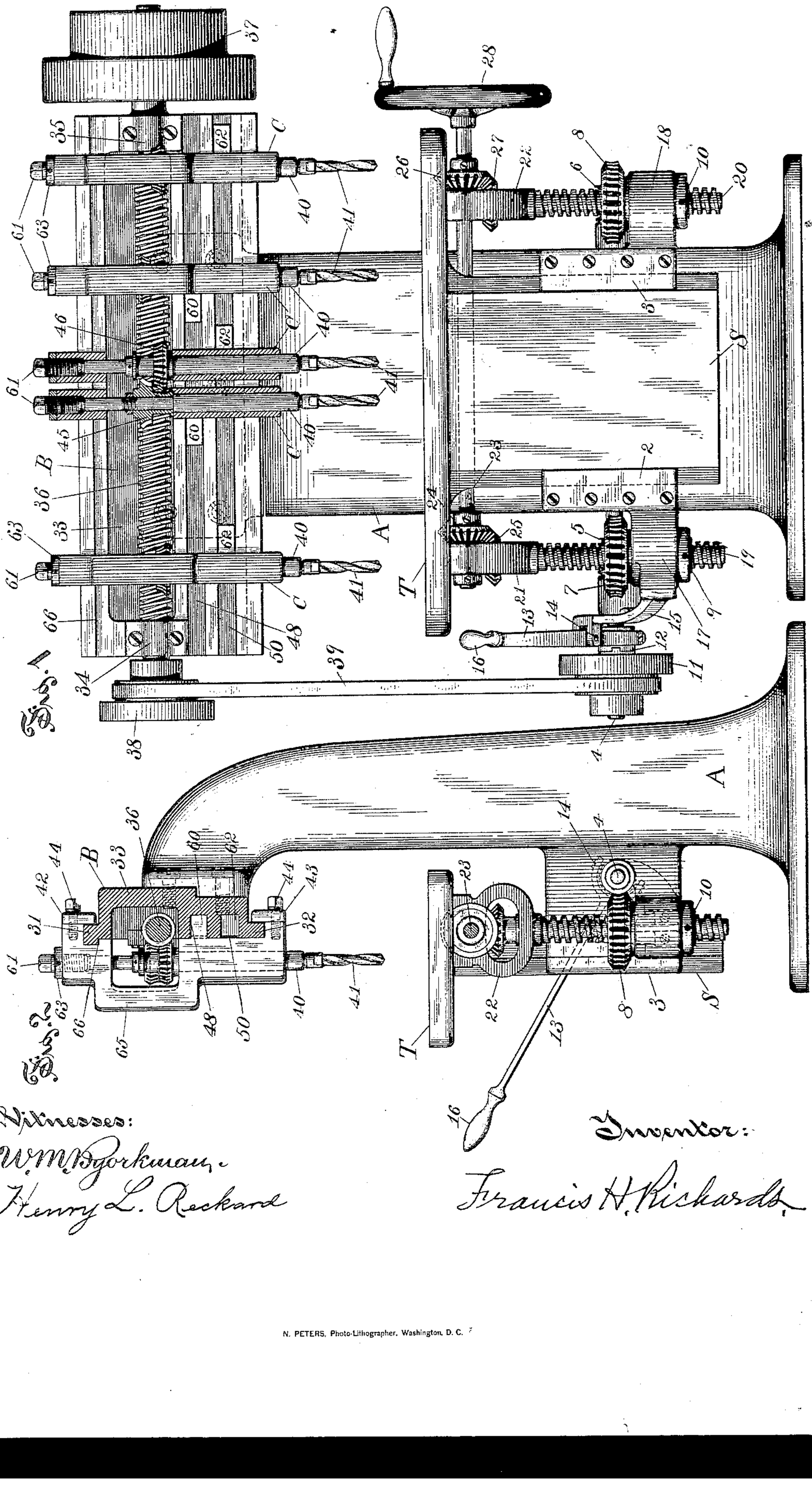
(No Model.)

F. H. RICHARDS.

DRILLING MACHINE.

No. 419,071. Patented Jan. 7, 1890.



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DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 419,071, dated January 7, 1890.

Application filed December 6, 1888. Serial No. 292,845. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification.

This invention relates to multiple drilling-machines, the object being to furnish a machine of that class especially adapted for simultaneously drilling a series of holes, some of which are in close proximity to others, and also to provide for the convenient and secure readjustment of the drills, together with their driving-spindles, for the drilling of holes at various distances apart.

In the drawings accompanying and forming a part of this specification, Figure 1 is a front elevation, partially in section, of a drilling-machine embodying my improvements. Fig. 2 is a side elevation, also partially in section, of the same.

Similar characters designate like parts in all the figures.

The frame-work of my improved drilling-machine consists of some suitable column A, which carries the drilling mechanism and has devices for supporting the table T, on which to place the pieces to be drilled. These devices consist, as shown in the drawings, of vertical ways on the frame-work and furnished with caps 2 and 3 for the slide S. In said ways the feed-shaft 4 has its bearings, and said shaft 4 has fixed thereon worms 5 and 6, meshing with the worm-wheels 7 and 8, that are affixed to the revolving nuts 9 and 10 in some well-known manner. The shaft 4 is driven by a clutch-pulley 11, and an ordinary sliding clutch 12, splined on said shaft, is provided with the usual handle or lever 13 for operating the same. This lever is or may be carried by a pivot 14 on the bracket 15, projecting from the frame-work. By throwing the handle 16 of lever 13 toward the right hand in Fig. 1 the pulley 11 is engaged through said clutch to turn the shaft 4, and through this shaft and the gearing described to revolve the nuts 9 and 10, which are carried in the bearings 17 18, respectively, on the frame-work. The feed-screws 19 and 20 are fitted to said nuts, and at their upper ends are journaled in the brackets 21 and 22, respectively, which are affixed to the under side of the table T. A coupling-shaft 23 is also journaled in bearings in said brackets, and is geared to the feed-screws 19 and 20 by the similar pairs of gears 24 25 and 26 27, respectively. Said shaft 23 also has a hand-wheel 28, whereby to turn the feed-screws by hand. By means of this organization of feed mechanism the table may be moved vertically either by hand or by power. When the nuts are not revolving, the operator may by means of the hand-wheel turn the screws in either direction to raise or to lower the table, and when the shaft 23 is not revolving (and it may be clamped by a clamp-screw, not shown, if this is necessary or desirable) the feed-nuts 9 and 10 may be revolved, as described, to feed up the table. This being fed up far enough, the clutch is then disengaged and the table lowered by hand. Stops or like well-known devices (not shown) may be employed to hold in place on said table the piece to be drilled.

That part of the frame-work which immediately carries the drilling mechanism consists in a cross-beam B, carried on the column, and having the upper and lower ribs 31 32, respectively connected by the vertical wall or back plate 33 of said beam, and also having bearing 34 35 for the worm-shaft 36. This principal driving-shaft has, as shown in the drawings, a pulley 37, whereby it is driven, and a pulley 38, for carrying the feed-belt 39, for driving the lower feed-pulley 11. It will be obvious, however, that these pulleys may be replaced by others or by different devices for like purposes without thereby modifying my invention.

The spindle-heads C, each carrying one drill-spindle 40, which is provided with a suitable drill 41, are adjustably secured upon the front of the said beam B by some well-known means—as, for instance, the straps 42 43 and clamp-screws 44. The worm 36 meshes with a worm-wheel on each spindle. These worm-wheels are what I call "half-wheels," being the ordinary form of worm-wheel divided in the center at right angles to the spindle-axis. The said wheels are placed on

the spindles alternately above and below the center line of worm 36, so that the upper wheels 45 can overlap the lower wheels 46, and thus permit the spindles to be set more closely together than otherwise on the beam B. This feature is especially well shown in that part of Fig. 1 in which the two heads C (shown in section) are set in close proximity to each other and with the wheels one extending over the other.

The heads C, being narrow and of considerable height, require some guide to keep them vertical in addition to their short contact upon the upper and lower edges of the beam B. Accordingly I make in said beam two grooves or channels 48 50 and construct each of said heads C with a guide-bar fitted to slide in one or the other of said grooves, each alternate head having its guide-bar 60 in the upper groove 48, and the intermediate heads having their guide-bars 62 in the lower groove 50. These guide-bars, being in comparatively narrow grooves (vertically) and being much longer than the width of said heads, furnish a firm guide to maintain the heads in proper vertical alignment, and the projecting part of the guide-bars being wholly within the said grooves, such part on one head can pass under the next adjoining head, and thus does not interfere with the setting of the heads on the beam one contiguous to another.

The upper bearing for the spindle has a step 61, which is retained by a check-nut 63 and takes the upward thrust of the spindle. This thrust tends strongly to spring the head C, which cannot in practice be conveniently made rigid enough in its curved part 65, Fig. 2, to resist that thrust without flexure. To obviate this objection and preserve the well-known advantages of a step-bearing, I make a ledge or notch 66, under which the head C is constructed to engage, so that the thrust on step 61 is directly transmitted to the beam at said point 66.

To adjust the head C to any required position on the beam, it is only necessary to slacken the screws 44, Fig. 2, when the head may be slid along, the worm-wheel rolling in the worm 36 as a gear in a rack The screws being then retightened, the spindle thus adjusted is ready for use.

Having thus described my invention, I claim—

1. In a drilling-machine, the combination, with a spindle-supporting beam, of spindle-heads having upper and lower bearings on said beam and the auxiliary guides intermediate such upper and lower bearings, substantially as and for the purpose specified.

2. In a drilling-machine, the combination, with a spindle-supporting beam, of spindle-heads having engagement with the upper and lower sides of said beam, the auxiliary guides intermediate such upper and lower sides, a worm located for driving the spindles in said heads, and half-wheels on said spindles arranged alternately above and below each other, substantially as and for the purpose shown.

3. In a drilling-machine, the combination, with a spindle-supporting beam provided in its face with the auxiliary guideways or channels, of the spindle-heads having blocks in engagement with such guideways, substantially as and for the purpose set forth.

4. In a drilling-machine, the combination of the beam having two guide-bar channels, substantially as described, and heads adjustable lengthwise of said beam over said channels, one of said heads having a guide-bar lying in one channel and adapted to extend therein under a contiguous head, all substantially as described.

5. In a drilling-machine, the combination, with the beam having the ledge 66, of the spindle-head adjustable on said beam in engagement with said ledge and having the step 61, substantially as described.

6. In a drilling-machine, the combination of a frame-work, the table carried on a slide, the feed-screws, one on either side of said slide and both journaled in bearings on said table, a coupling-shaft and gearing, substantially as described, carried on the table and operatively connecting said screws, (whereby the screws may be turned by hand,) a pair of revolving feed-nuts carried by the frame-work and engaging said screws, and a feed-shaft and gearing, substantially as described, operatively connecting said nuts, whereby the table may be fed up by power, substantially as described.

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