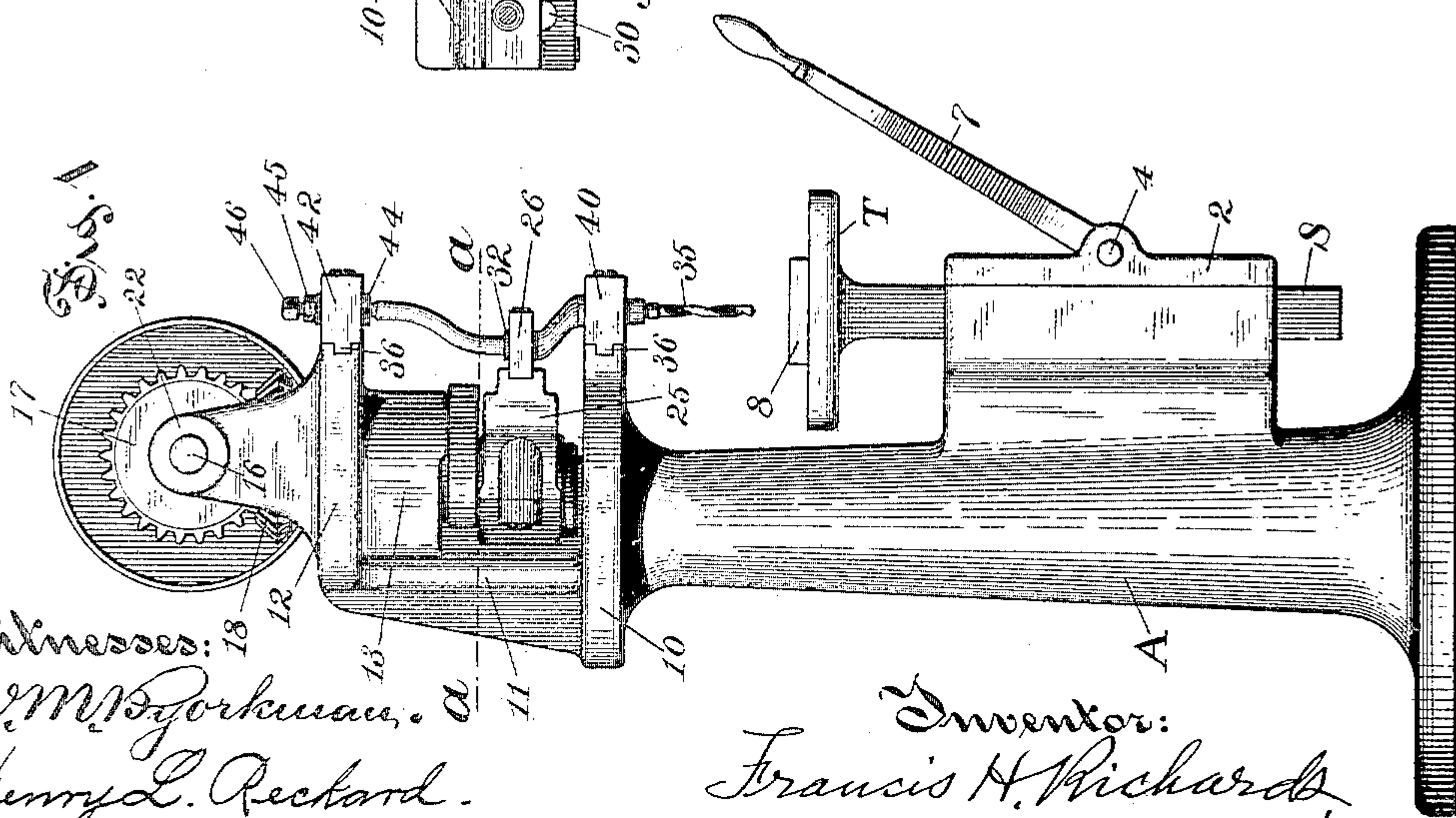
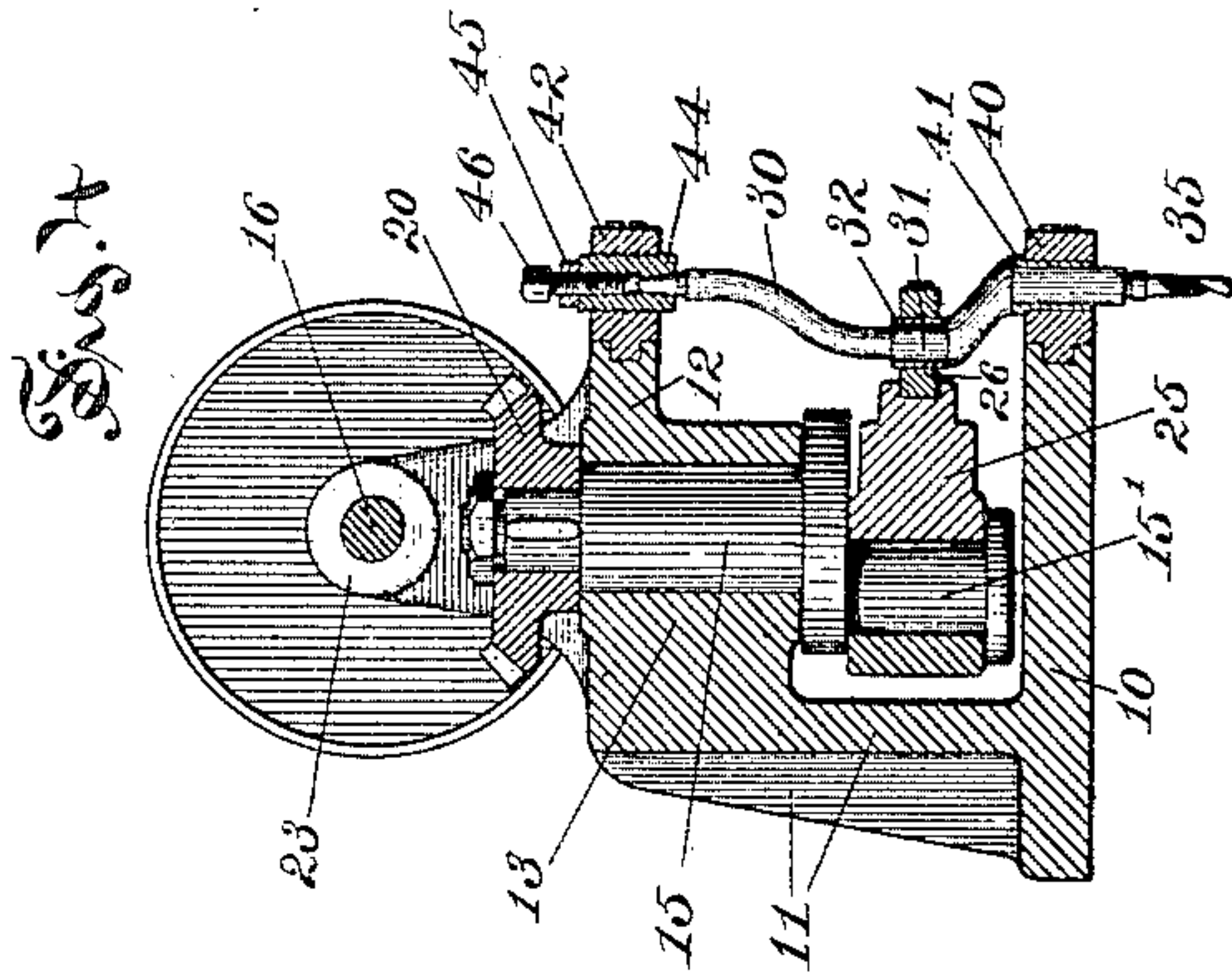
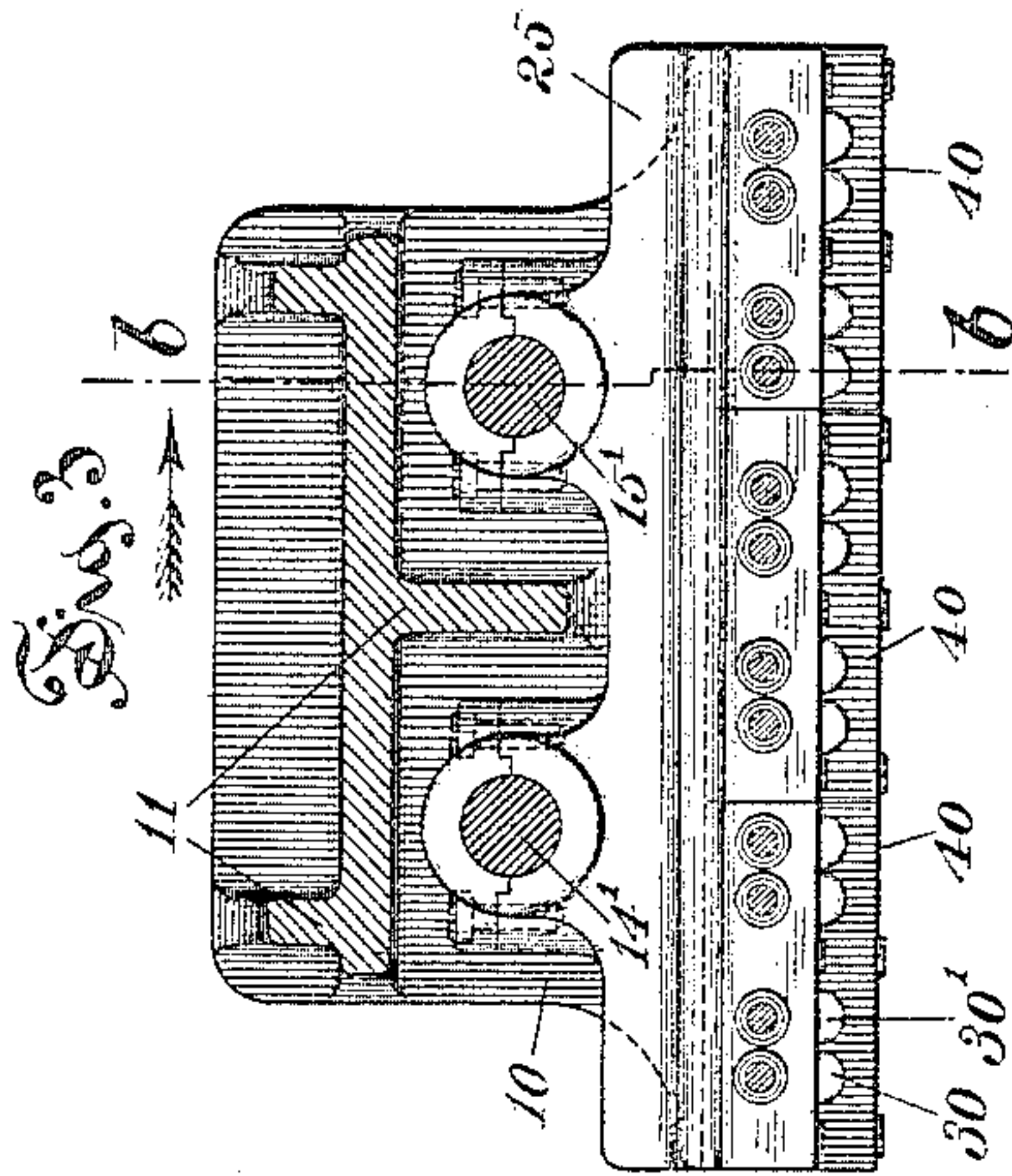
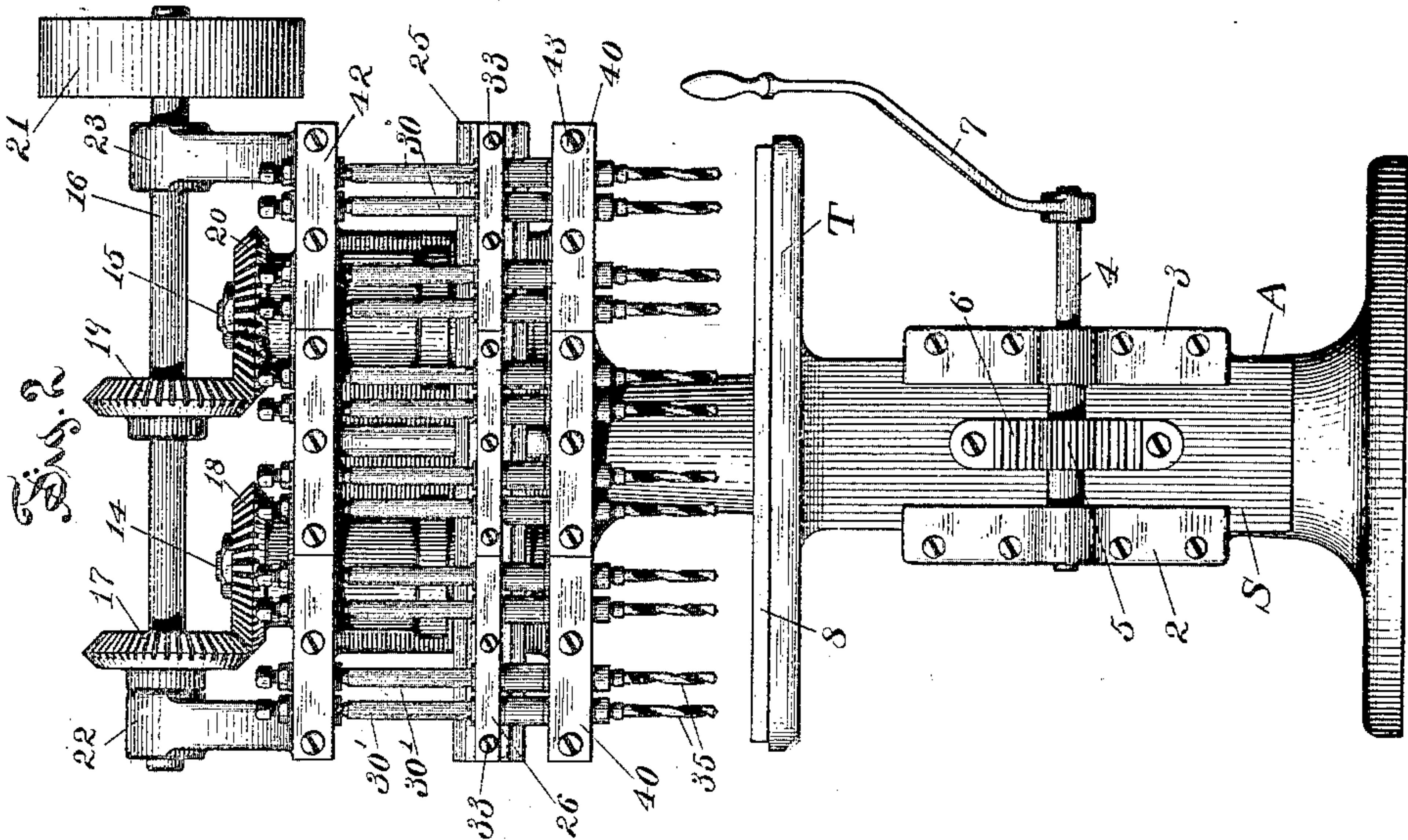


(No Model.)

F. H. RICHARDS.
DRILLING MACHINE.

No. 419,070.

Patented Jan. 7, 1890.



Witnesses:
W. M. Gorkman, &
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Inventor:
Francis H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO ECKLEY
B. COXE, OF DRIFTON, PENNSYLVANIA.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 419,070, dated January 7, 1890.

Application filed December 6, 1888. Serial No. 292,842. (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, of which some are in close proximity to others, and also to provide for the convenient substitution of one set of drills, together with their driving-spindles, for another such set constructed for drilling holes differently arranged.

In the drawings accompanying and forming a part of this invention, Figure 1 is a side elevation of a drilling-machine embodying my improvements. Fig. 2 is a front elevation of the same. Fig. 3 is a horizontal section in line *a a*, Fig. 1. Fig. 4 is a vertical section in line *b b*, Fig. 3.

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 are placed the pieces, as 8, to be drilled. These devices consist, as shown in the drawings, of vertical ways furnished with caps 2 and 3 for the slide S. In said caps the lever-shaft 4 has its bearings, and said shaft 4 has fixed thereon a gear 5, meshing with the rack 6, that is affixed to said slide in a well-known manner. The shaft 4 is provided with the usual handle or lever 7, for operating the shaft and slide. Stops or like well-known devices (not shown) may be employed to limit as required the vertical movement of the table, also to hold in place on said table the pieces to be drilled.

That part of the frame-work which immediately carries the drilling mechanism consists in a lower plate or beam 10, an upper beam 12, walls 11, connecting said beams, and bearings 13 for the driving-shafts. The principal driving-shafts are two upright and similar crank-shafts 14 15, and these are or may be similarly driven from one shaft 16 by means

of the similar pairs of gears 17 and 18 and 19 and 20. The gears 18 and 20 are fixed to the crank-shafts 14 and 15, respectively. A pulley 21 is provided to actuate shaft 16, which is carried in bearings 22 23 on beam 12.

The drill-spindles 30 are cranked spindles, and the crank is about midway of (that is, between) the bearings of the drill-spindle. The series of spindles are carried in lower and upper bearing-blocks 40 and 42, affixed to the lower and upper beams, respectively. In the lower bearing-block a thin bushing 41 may be inserted to provide a suitable bearing-surface when the material of the block itself is not suitable therefor. Screws 43 serve to secure this lower bearing-block to the lower beam. In the upper bearing-block 42 adjustable steps 44 may be provided to furnish a suitable upper bearing for the drill-spindle, and to take up the wear thereof. The step 44 is represented as screwed into the said block, so as to be capable of vertical adjustment, being held in position when adjusted by a check-nut 45, and as having the ordinary stop-screw 46. The several drill-spindles being substantially duplicates of each other, they may be placed very close together, as shown—as, for instance, the contiguous spindles 30 and 30'. It should be noted here that I refer to the spindles without choice as "spindle 30" or "spindles 30," and to other duplicated details in like manner.

For actuating the several drill-spindles, the cranks 31 thereof are fitted (either with or without the bushing or roller 32) into a driving-block 26, that corresponds to the upper and lower bearing-blocks. Thus the said driving-block is (in a sense) carried by the spindles and these by the bearing-blocks, so that the three blocks constitute a removable set of spindle supporting and actuating devices, which set may be put in place in the machine or taken therefrom altogether. The block 26 is secured by screws 33 (with or without the tongue and groove 36) to the gyratory driving-bar 25, which is carried on the cranks 14' and 15' of the aforesaid driving-shafts. In all the figures this bar is shown standing in its rearward position; but this appears the more clearly from Figs. 1, 3, and 4. The rotation of the cranks imparts a

gyratory movement to the bar 25, and thus carries the driving-blocks in circular movement corresponding to the radius of the drill-spindle cranks, which is equal to that of the driving-cranks. This turns all of the spindles 30 simultaneously.

In preparing to use the machine for the drilling of any particular article—as, for instance, the bed-plate of a sewing-machine, a mowing-machine cutter-bar, or other article requiring several holes to be drilled therein—it is of course necessary to provide a suitable set of driving and bearing blocks in which the distances and arrangement of the spindle-bearings shall properly correspond to the required arrangement of holes in the said article.

By means of the construction herein set forth the several spindles may be placed in the utmost proximity to each other without interfering with the operating of the same. The use of the pressure-resisting steps at the upper end of the spindle secures ample wearing-surface for that purpose and obviates the necessity for collars below the lower bearing, which collars would obviously require the spindles to be placed farther apart, and thus render the machine unusable on some kinds of work otherwise within its capacity.

For securing the several drills 35 into their respective spindle-sockets, I prefer the construction described in my concurrent application, Serial No. 292,841; but when the distance between the adjacent drill-spindles is sufficient any of the well-known forms of drill-holding chucks may be substituted for my said other improvement.

Having thus described my invention, I claim—

1. In a drilling-machine, a lower beam, an upper beam, a gyratory driving-bar intermediate to said beams, a bearing-block on the lower beam, a step-bearing block on the upper beam, cranked spindles carried by said

blocks, and a driving-block fitting on the cranks of said spindles and carried by said driving-bar, said blocks being removably secured in place and constituting a set of corresponding bearings, all substantially as described.

2. In a drilling-machine, the combination, with the frame-work, of the removable upper and lower bearing-blocks having bearings for drill-spindles, the crank-shafts, the gyratory driving-bar mounted on and connecting said shafts, the removable spindle-driving block mounted on said bar, and the intermediate-cranked spindles journaled in said bearing-blocks and passing through said driving-block, substantially as and for the purpose shown.

3. In a drilling-machine, the combination, with the frame-work, of the several sets of removable upper and lower bearing-blocks, the crank-shafts journaled in the frame-work, the gyratory driving-bar mounted on and connecting said shafts, the several sets of removable spindle-driving blocks, similar in number to the sets of bearing-blocks, and the several sets of cranked spindles, substantially as and for the purpose set forth.

4. In a drilling-machine, the combination, with the frame-work having upper and lower bearings for a series of spindles, of the series of spindles journaled at upper and lower ends in several removable bearing-blocks, said spindles being cranked intermediate said bearing-blocks, a gyratory driving-bar, and several gyratory driving-blocks mounted on said spindle-cranks and removably connecting them with said driving-bar, substantially as and for the purpose described.

FRANCIS H. RICHARDS.

Witnesses:

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