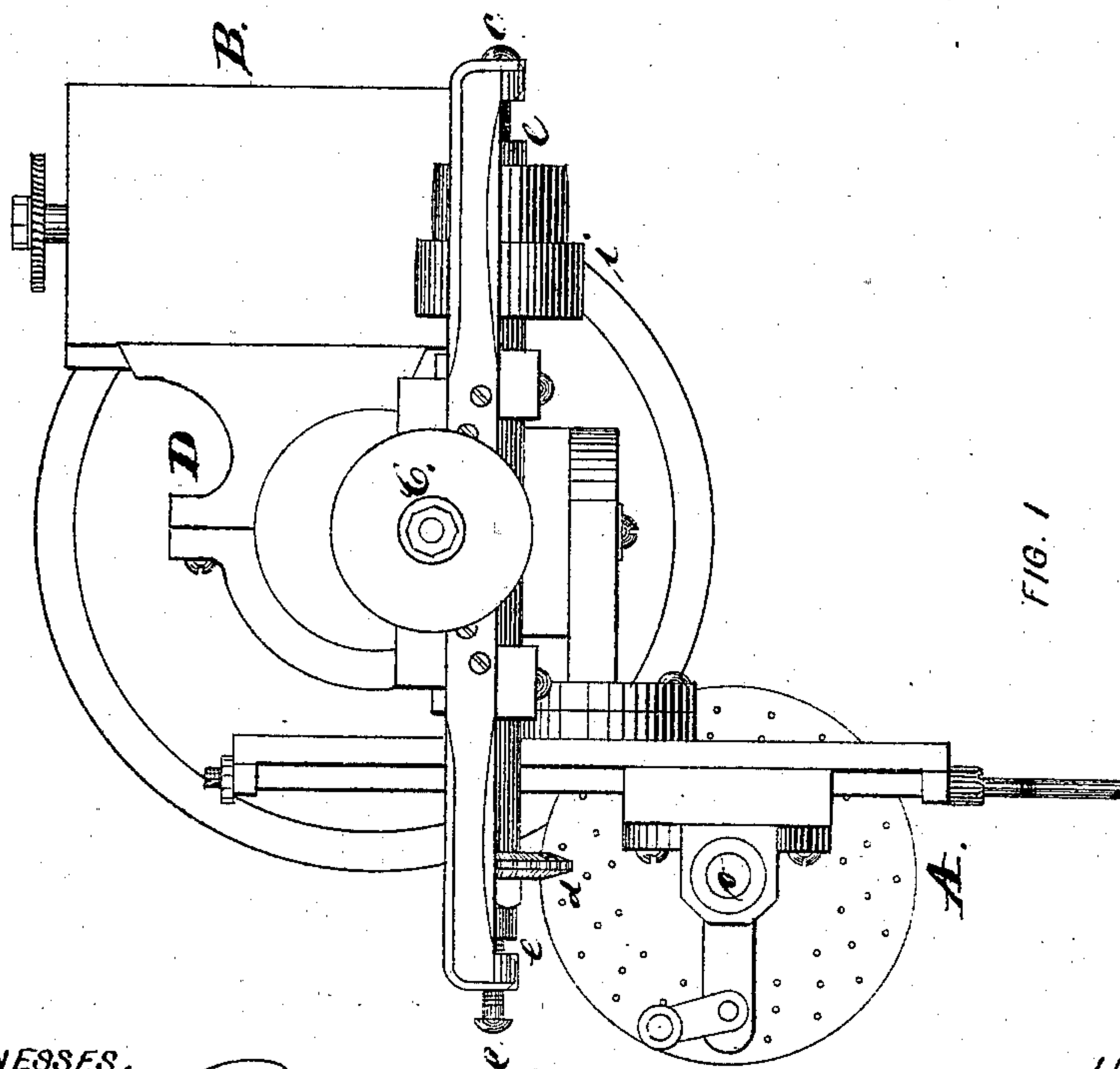
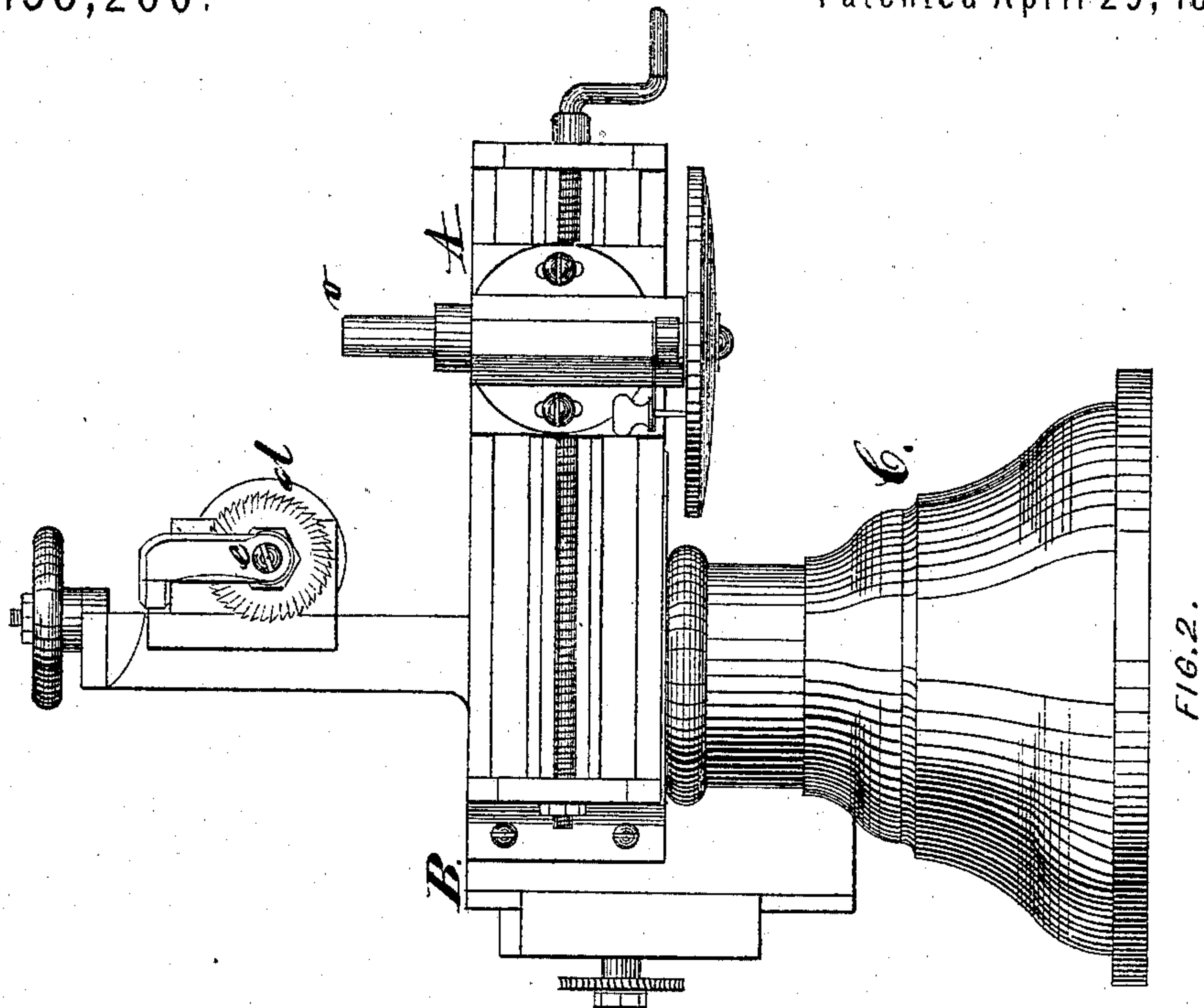


**B. LAWRENCE.**  
**Milling-Machines.**

No. 138,260.

Patented April 29, 1873.



WITNESSES.

*D. Hall Rice*  
*W. H. Ramsdell*

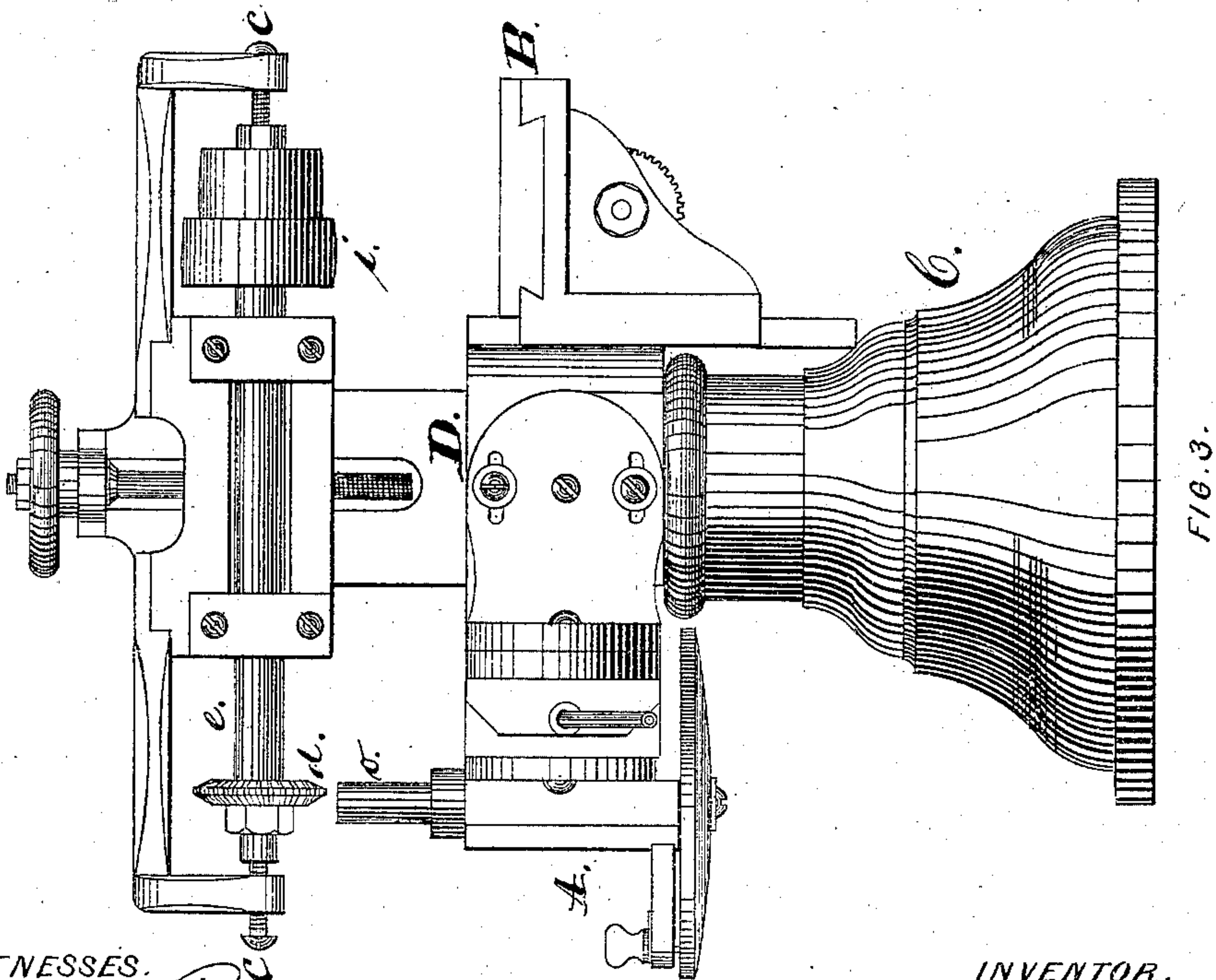
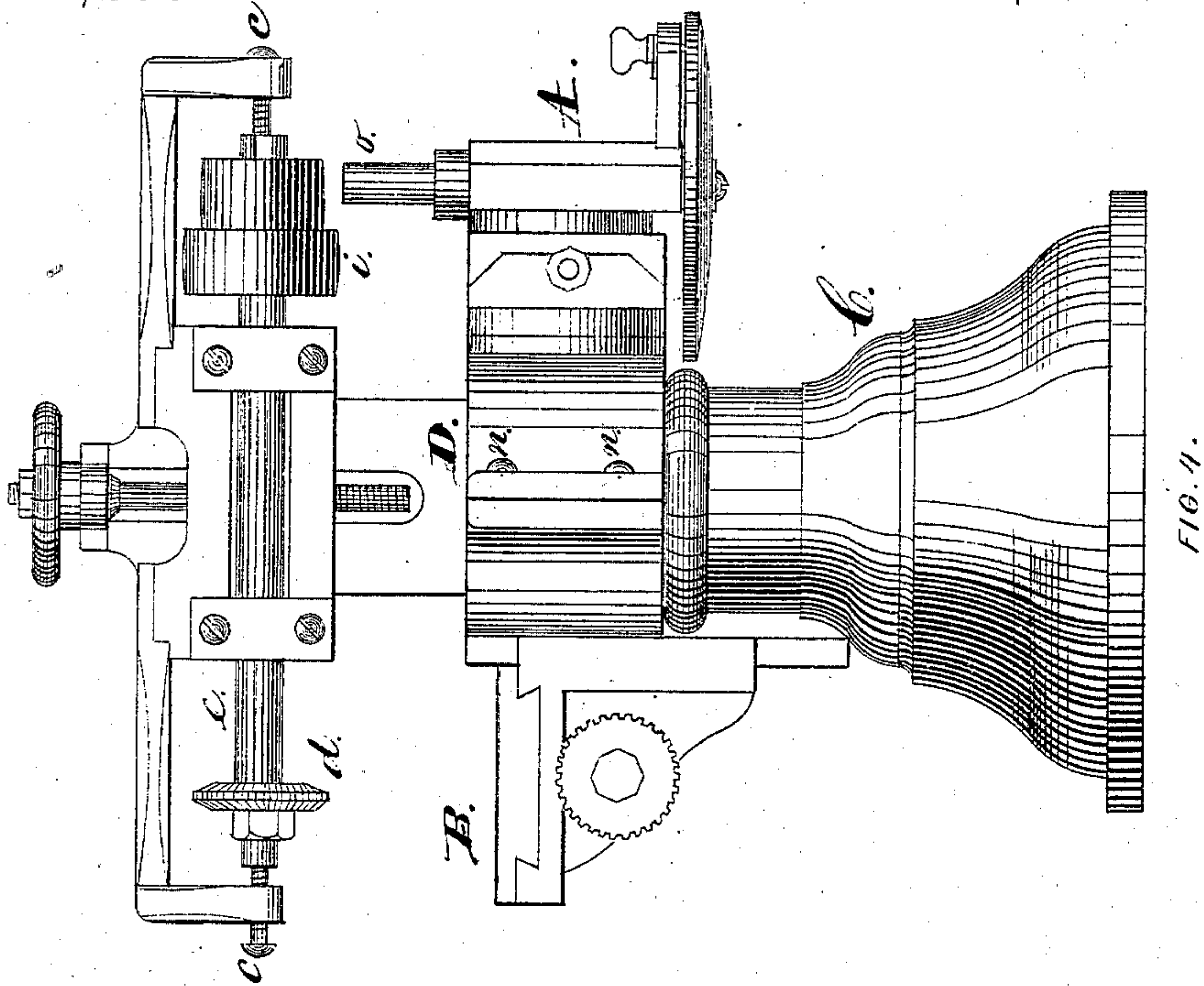
INVENTOR.

*Benjamin Lawrence*

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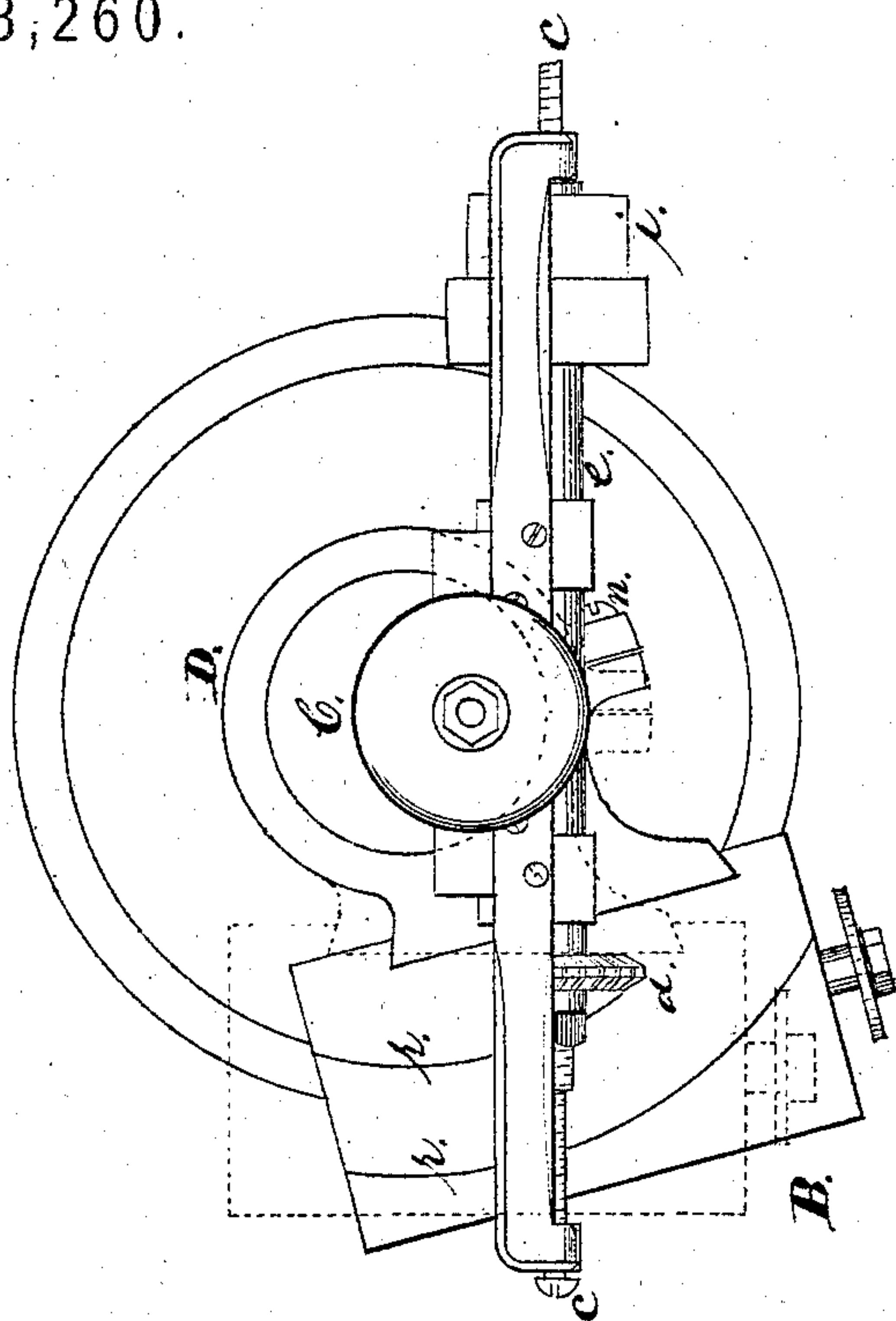


FIG. 6.

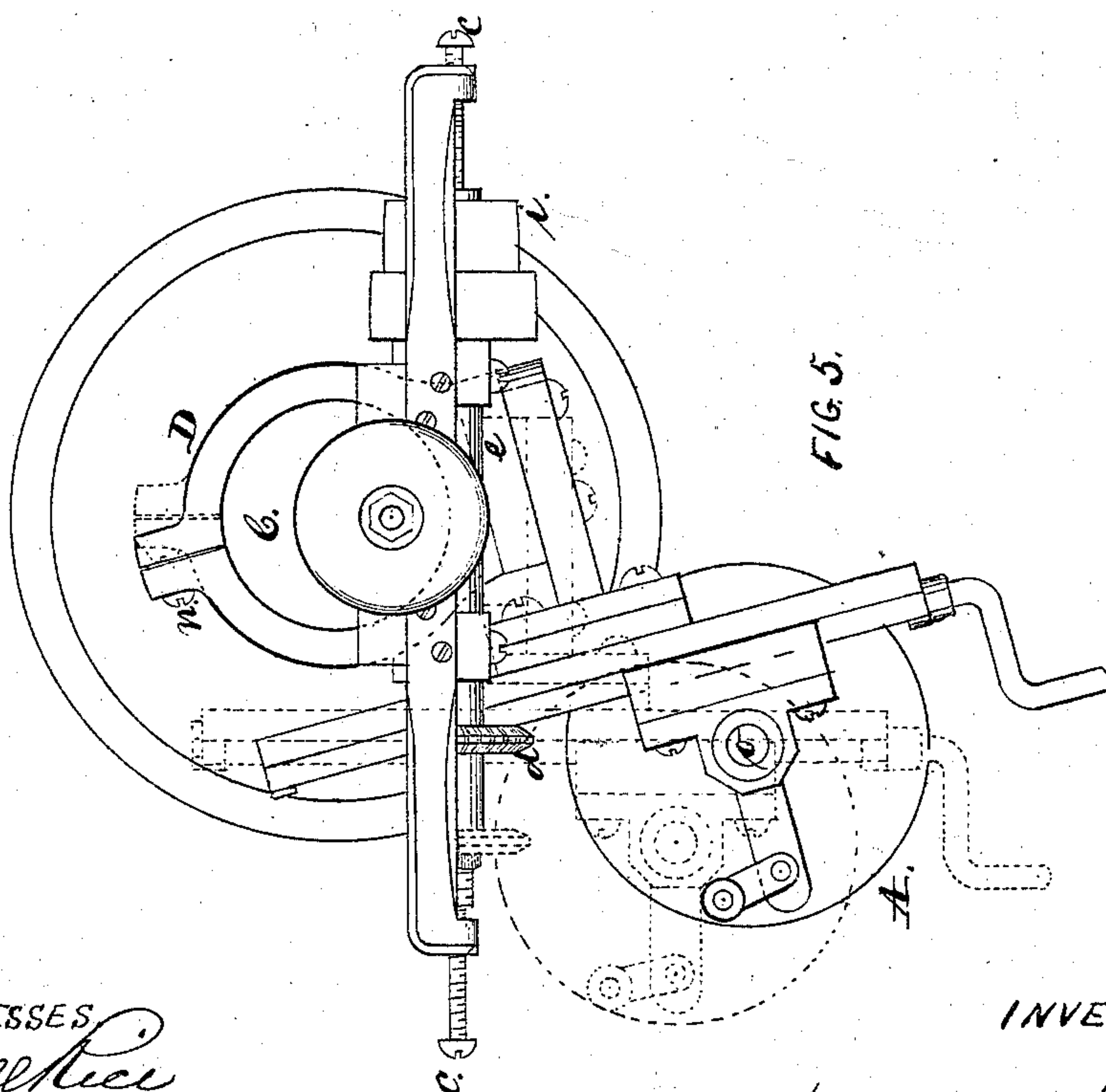


FIG. 5.

WITNESSES

*W. H. Ramsdell*  
*W. H. Ramsdell*

INVENTOR.

*Benjamin Lawrence*



# UNITED STATES PATENT OFFICE.

BENJAMIN LAWRENCE, OF LOWELL, MASSACHUSETTS.

## IMPROVEMENT IN MILLING-MACHINES.

Specification forming part of Letters Patent No. **138,260**, dated April 29, 1873; application filed March 3, 1873.

*To all whom it may concern:*

Be it known that I, BENJAMIN LAWRENCE, of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Milling-Machines, of which the following is a specification:

My invention consists, first, in a new method of combining the ordinary milling-tool, with shaft and pulley for driving it at the upper end of an upright stand, with an index milling-machine and a plain milling-machine, connected on opposite sides of the stand to a sleeve which surrounds the stand and is capable of rotating about it in a horizontal plane beneath the cutting-tool, so that either milling-machine may, by the rotation of the sleeve, be brought under the cutting-tool in a position suitable for working, while the other milling-machine is withdrawn from operation, as hereinafter described; the object of this part of my invention being to combine in a single device, in a simple and effective manner, both an index milling-machine and a plain milling-machine, so that either may be instantly adjusted to or withdrawn from operation with the same shaft and cutting-tools, and the expense and space heretofore necessary with separate machines for milling be saved; second, in combining a milling-tool and shaft, adjustable longitudinally upon its stand, with an index milling-machine attached to a sleeve beneath the tool and rotating in a horizontal plane about the stand, whereby the center of the pinion-wheel to be milled may be adjusted easily and quickly to a greater or less distance from the milling-tool, according to its size; the object of this part of my invention being to mill a larger pinion-wheel upon the machine than would be possible if the tool and milling-machine were not made adjustable to each other, as described; third, to combining, with a milling-tool, a plain milling-machine attached to a sleeve rotating about the stand which supports the tool and beneath the latter, so that the milling-machine may be rotated about the stand while the tool is in operation and the path cut by the tool be in the arc of a circle; and also to combining, with such rotating milling-machine, a milling-tool and shaft adjustable longitudinally so as to cause the tool to traverse the arc of a smaller or larger circle in the manner described, at pleasure;

the object of this part of my invention being to mill the work in a circle or circles of greater or less diameter by a simple and easy adjustment and operation of the machine.

Figure 1 is a top plan of the machine, showing the index milling-machine adjusted for operation with the cutter, and the plain milling-machine on the opposite side of the supporting-stand. Fig. 2 is a front elevation of the same. Fig. 3 is a side elevation, showing the index milling machine and tool adjusted to, and the plain milling-machine out of, operation. Fig. 4 is a side elevation, showing the plain milling machine and tool adjusted to, and the index milling-machine out of, operation. Fig. 5 is a top-plan view, showing the index milling-machine and the tool adjusted to mill larger pinion-wheels than in Fig. 1. Fig. 6 is a top-plan view, showing the plain milling-machine and adjustable tool arranged to mill in arcs of circles.

A is the index milling-machine. B is the plain milling-machine. C is the upright stand of the machine. *d* is the milling-tool, and *e* is the shaft supporting it, which has on its opposite end the pulley *i* to give it motion. D is a sleeve surrounding the stand C and rotating in a horizontal plane around it. The plain and index machines A and B are firmly secured to the sleeve D on opposite sides of the stand C, and rotate around the latter with the sleeve. Either milling-machine can thus be instantly brought beneath the tool in position for operation, while the other is, by the same movement, carried out of the way to the opposite side of the stand C. The sleeve D is formed with a slot dividing it perpendicularly on one side, and a pair of ears attached to it, one on each side of the slot, are held together by the set-screws *n n*, so that when the screws are tightened up the sleeve will be compressed about the stand and become immovable. This enables the operator to secure the milling-machines and sleeve firmly to the stand C in any desired position. The tool *d* and shaft *e* are adjustable longitudinally by means of the screws *c*, on which the shaft is pivoted at each end. *o* is the center of the index-machine A, on which the pinion-wheel is placed to mill its gears; and the greater the distance between this center and the shaft *e* the larger the pin-



ion-wheel which may be milled upon the machine, provided the plane of the tool  $d$  passes through the center  $o$ .

By swinging the index milling-machine and sleeve D about the stand C the index-machine is brought from the position shown in Fig. 1 to that shown in Fig. 5, both positions being shown, the one in dotted and the other in plain lines on the latter figure. The tool  $d$  is then adjusted, by means of the screws  $c$   $c$ , so that its plane passes through the center  $o$ ; and the machine is then capable of milling larger pinion-wheels than would be possible if these adjustments could not be made.

When the milling-machine B is being used it may be swung around with the sleeve D while the tool  $d$  is in operation, thus causing the latter to cut in the arc of a circle on the face of the work, as shown at  $r$ , Fig. 6.

By adjusting the tool  $d$  with the screws  $c$  arcs  $r$  of greater or less diameter may be cut, as desired.

What I claim as new and my invention is—

1. The combination of the index-miller A and the plain milling-machine B with the stand C and tool  $d$  by means of the sleeve D, substantially as described.

2. The combination of the adjustable tool  $d$  and index milling-machine A, constructed to swing away from the tool and its shaft, substantially as described.

3. The combination of the plain milling-machine B, rotating about the stand C, with the tool  $d$ , substantially as described.

BENJAMIN LAWRENCE.

Witnesses:

D. HALL RICE,

W. H. RAMSDELL.