(No Model.) 4 Sheets—Sheet 1.

L. COSGROVE.

UNIVERSAL MILLING MACHINE.

No. 282,704. Patented Aug. 7, 1883.

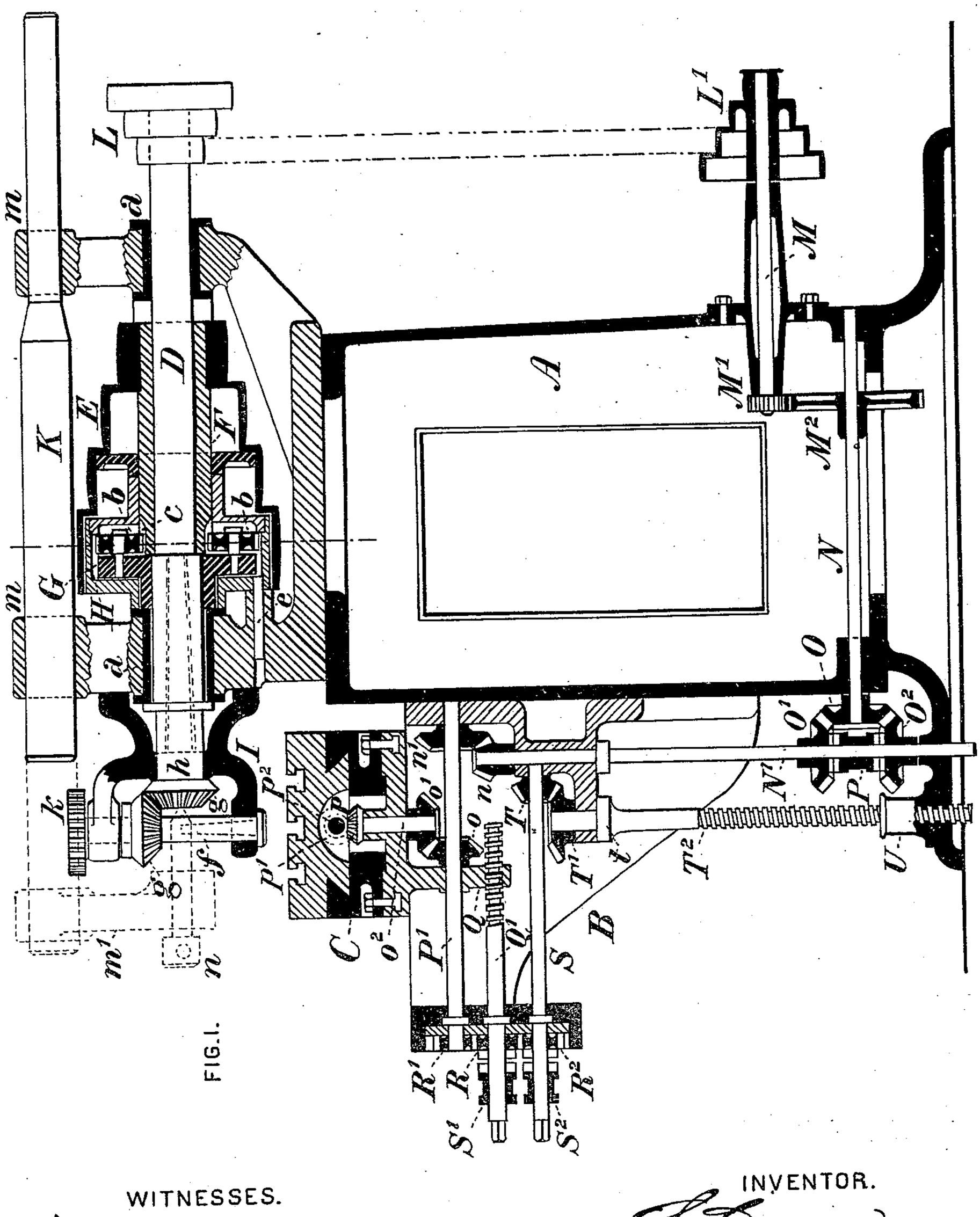

FIG. I.

WITNESSES.

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by Collier & Bell

attys

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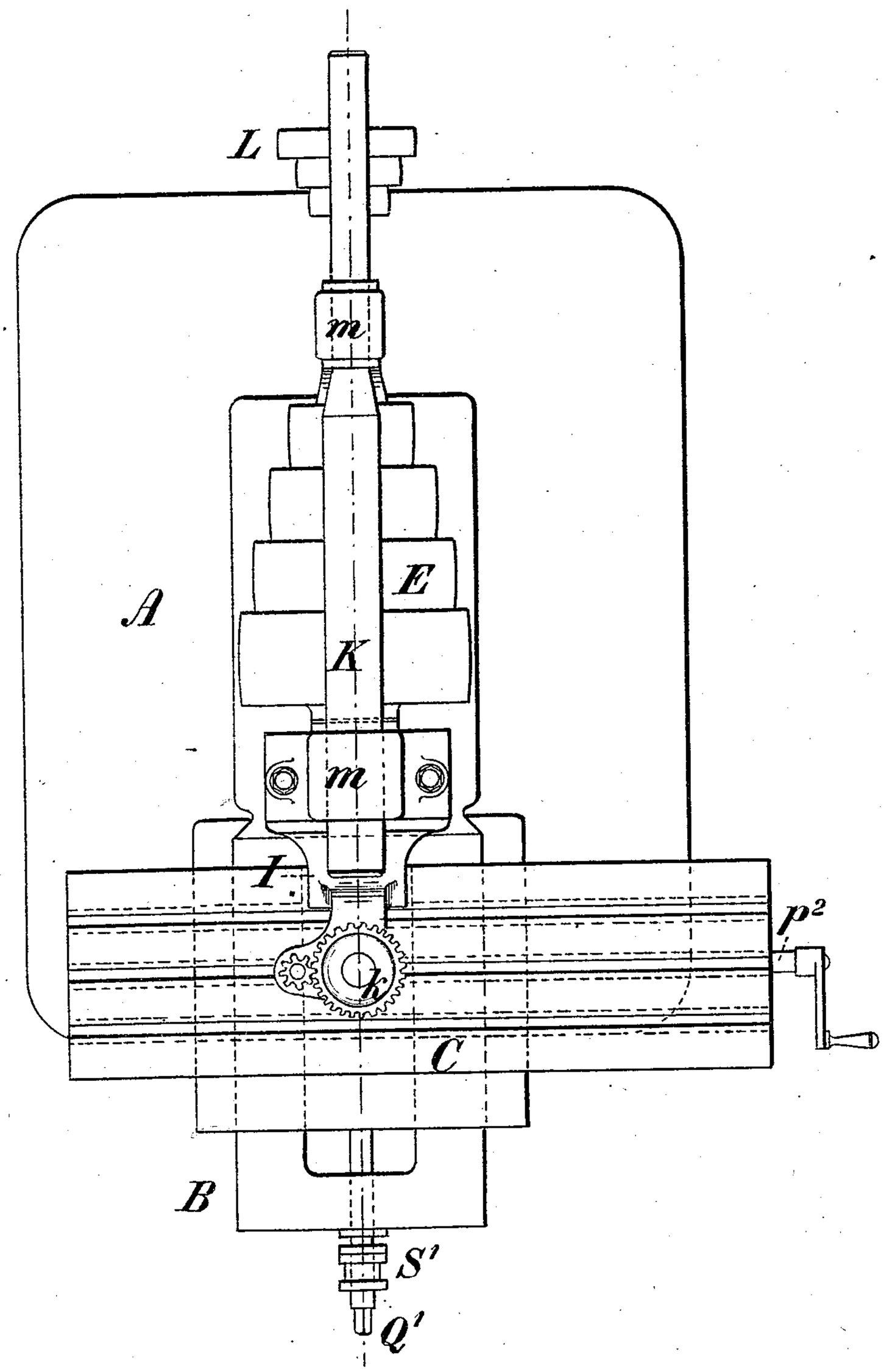
FIG. 2.



WITNESSES.

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(No Model.)

4 Sheets—Sheet 3.

L. COSGROVE.

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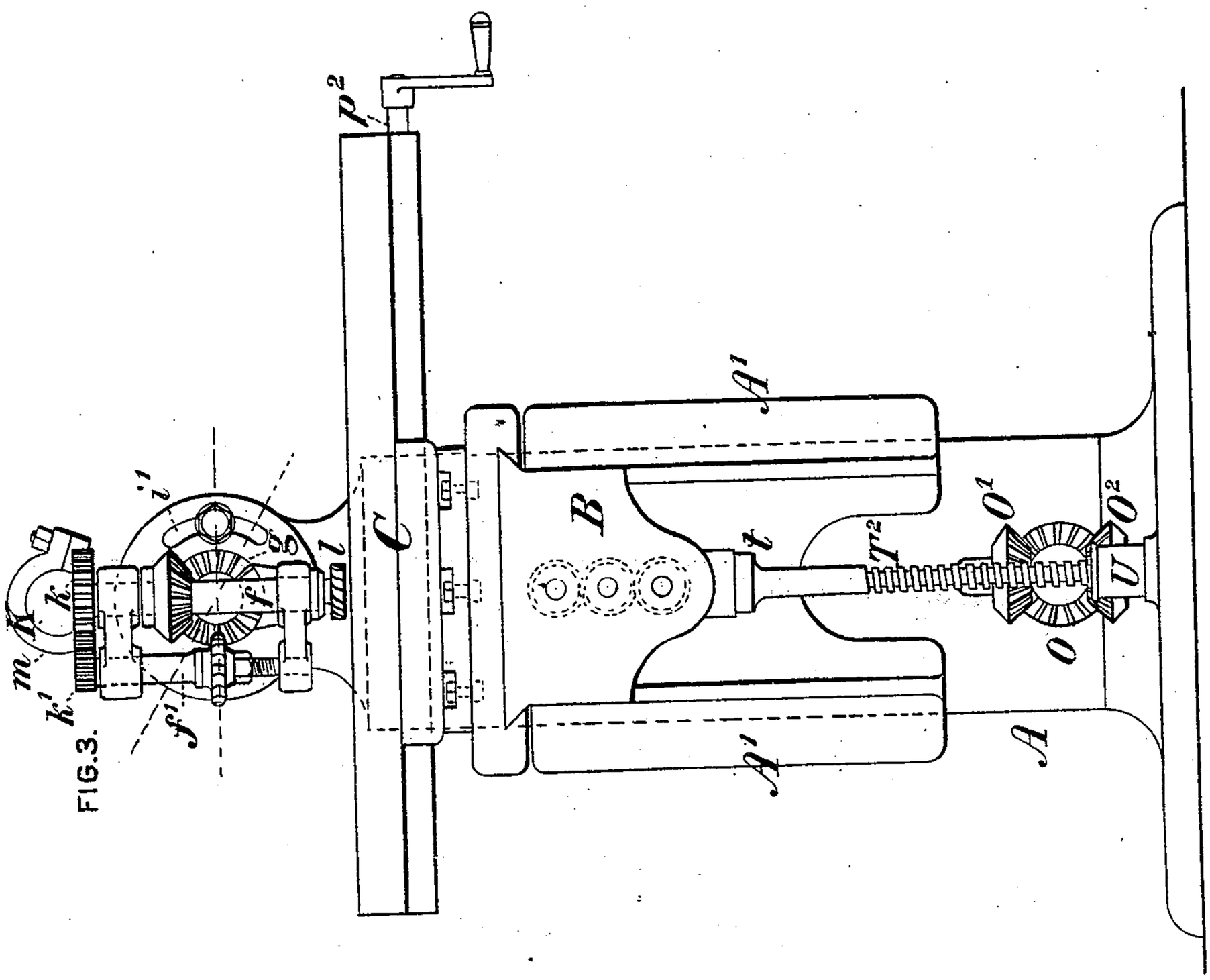

FIG.3.

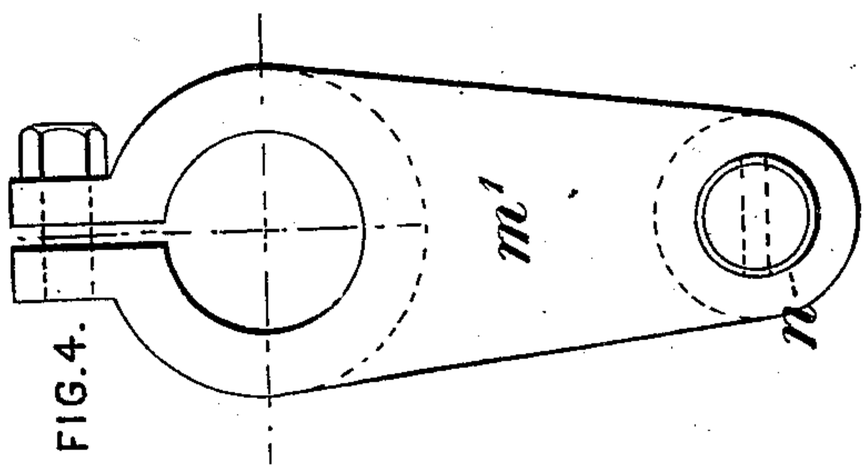

FIG.4.

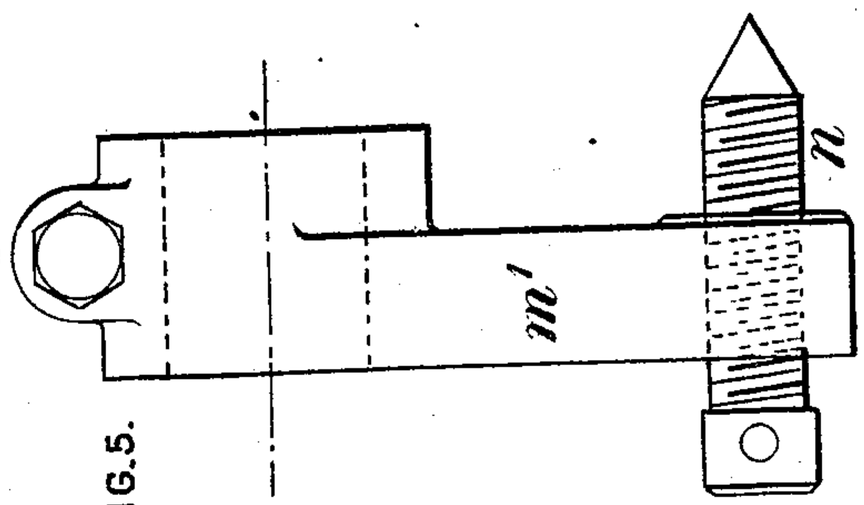

FIG.5.

WITNESSES.

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(No Model.) 4 Sheets—Sheet 4.

L. COSGROVE.

UNIVERSAL MILLING MACHINE.

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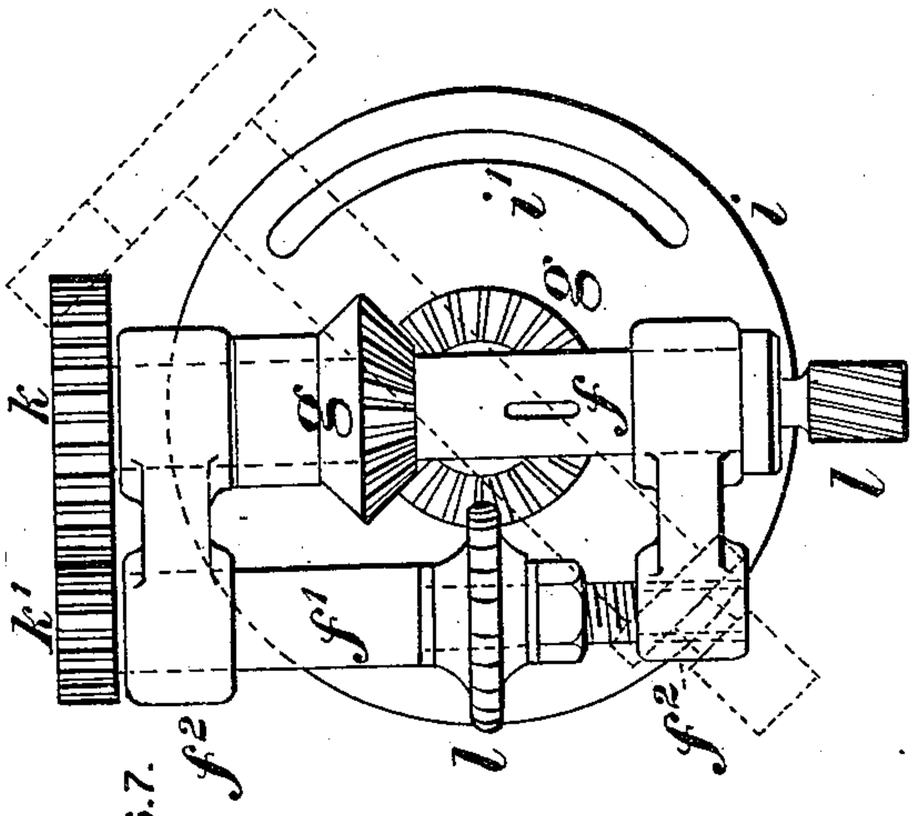

FIG. 7.

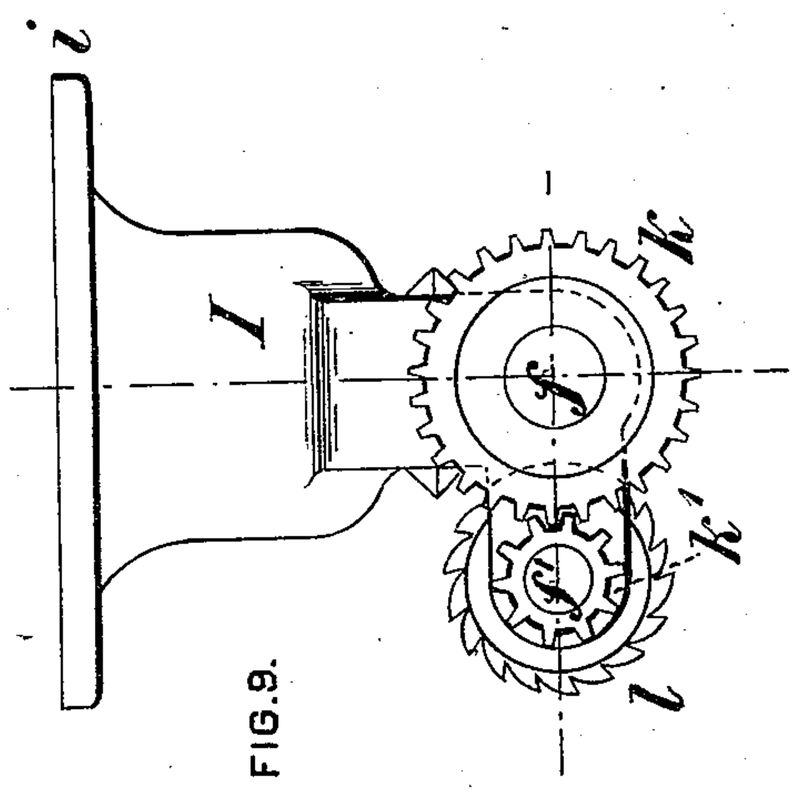

FIG. 9.

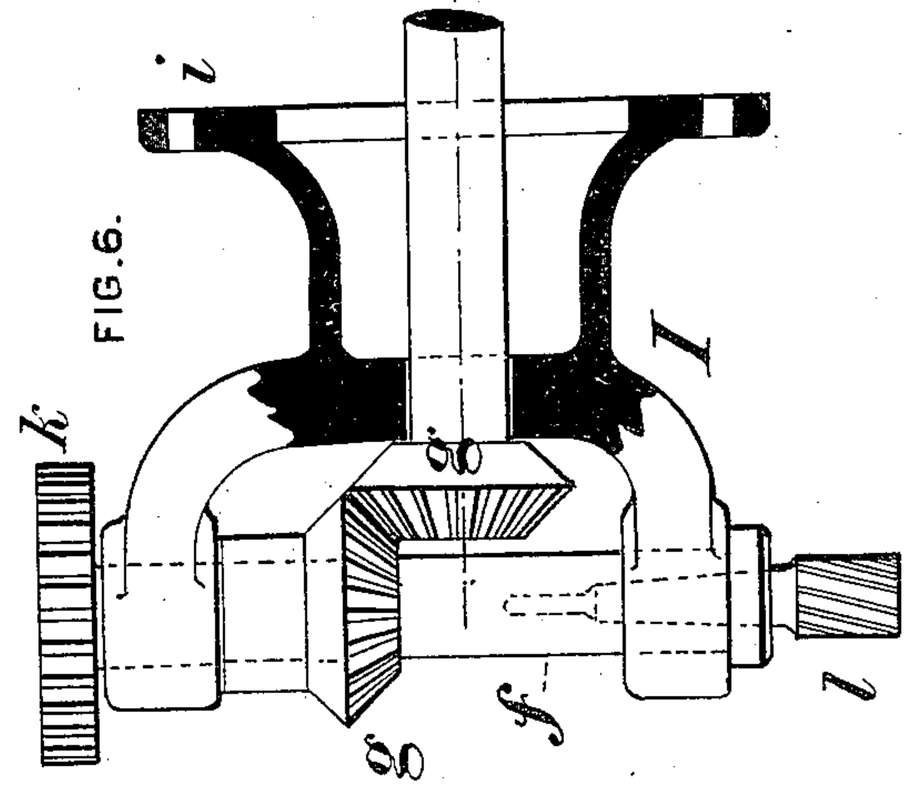

FIG. 6.

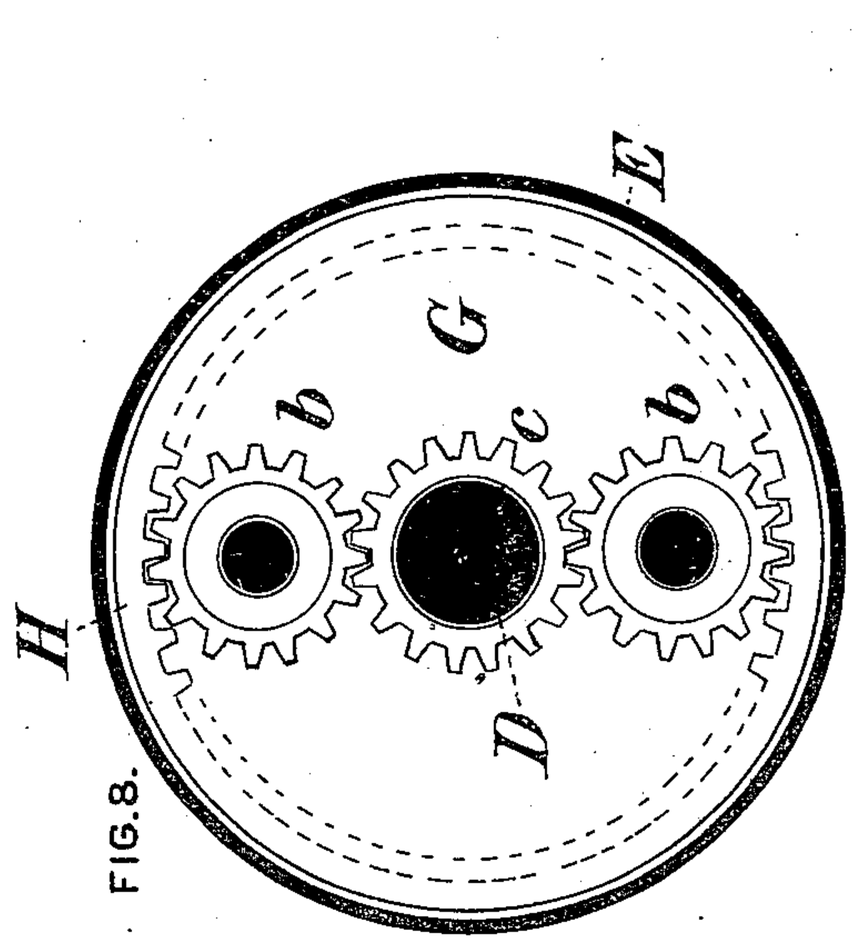

FIG. 8.

WITNESSES.

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Attys.

UNITED STATES PATENT OFFICE.

LAWRENCE COSGROVE, OF BALTIMORE, MARYLAND.

UNIVERSAL MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 282,704, dated August 7, 1883.

Application filed March 17, 1883. (No model.)

To all whom it may concern:

Be it known that I, LAWRENCE COSGROVE, of the city of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Universal Milling-Machines, of which improvements the following is a specification.

The objects of my invention are to provide in a milling-machine simple and effective means for rack-cutting, sawing up long stock or bars of any kind, profiling or die-sinking, and cutting regular or irregular outlines; also, to enable vertical, transverse, and longitudinal feeding movements to be effected, respectively, as desired, through a single belt-connection with a driving-shaft; also, to provide a convenient and compact arrangement of internal back gearing, and, also, to provide a suitable exterior support for cutters operated by the spindle.

To these ends my improvements consist in certain novel devices and combinations hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through a milling-machine embodying my invention; Fig. 2, a plan or top view of the same; Fig. 3, a front view, in elevation, of the same; and Figs. 4 to 9, inclusive, detailed views upon an enlarged scale.

The mechanism is mounted and supported upon a vertical frame, A, to one end of which is fitted a bracket, B, which sustains a work table or carriage, C, hereinafter set forth. The bracket B is adapted to slide vertically between guides A′ on the frame. The spindle D is supported in bearings *a*, secured upon the top of the frame A. A driving cone-pulley, E, to which rotation is imparted by a belt from any suitable prime mover, is secured upon a sleeve, F, adapted to turn freely upon the spindle D. A disk, G, keyed upon the spindle D, carries two pinions, *b*, each fitted to rotate upon a stud fixed in the disk, said pinions meshing with a spur-gear, *c*, upon the sleeve, and with the teeth of an internal gear, H, which is supported at one end by the hub of the disk G, and at the other by the sleeve F of the cone-pulleys E. A removable pin, *e*, Fig. 1, serves to connect the gear H to the frame A, and thereby prevent the rotation of the former, as may be required in the operation of the machine.

During such time as the internal gear, H, is connected to the disk G, which may be done by a bolt or other suitable device, the pin *e* being withdrawn from the disk, the rotation of the cone-pulley E is communicated directly to the spindle D, or, in other words, the cone-pulley and spindle revolve together. By detaching the disk G from the gear H and securing said gear to the frame A by the pin *e*, so as to prevent the rotation above stated, the rotation of the cone-pulley and its toothed sleeve is communicated to the pinions *b*, meshing with the gear H, and said gear being locked, the disk G and spindle D are consequently rotated, and at a reduced rate of speed as compared with the direct rotation first described.

The cutter-spindle *f* is mounted in bearings in a removable head, I, secured adjustably to the frame, and is rotated from the spindle D through the medium of a pair of miter-gears, *g*, one of which is secured to a short spindle, *h*, having a tapering end fitting into a corresponding hole in the spindle D, and the other to the cutting-spindle *f*.

By reference to Fig. 7, which is a face view of the cutter-spindle head and connections, it will be seen that a segmental slot, *i′*, is formed in the end flange, *i*, of the head I, whereby the head may be turned upon its axis, and the cutter-spindle correspondingly moved from a vertical to a horizontal or an inclined position, as indicated in dotted lines.

A second and removable spindle, *f′*, is adapted to rotate in bearings f^2, formed in arms or brackets projecting laterally from the head I, and is rotated from the spindle *f* through spur-gears *k k′*. Milling-tools *l* of proper form are connected to the lower ends of the spindle *f* or the spindle *f′*, as the case may be. The object of this second spindle, *f′*, is to admit of cutting teeth in racks, which, when placed on the table, are fed longitudinally to space the teeth and transversely to cut them entirely across the bar or rack.

A bar, K, is supported and is movable longitudinally in bearings *m*, formed upon or secured to the frame A, above the bearings *a* of the spindle D, said bar serving to receive an

arm, *m'*. (Shown in dotted lines in Fig. 1 and on an enlarged scale in Figs. 4 and 5.) In ordinary milling operations the head I is removed and a cutting arbor or mandrel inserted in the spindle D, the outer end of said mandrel being supported by a set-screw, *n*, engaging the lower end of the arm *m'*. The bar K, when moved into desired longitudinal position, is clamped therein by means of the bearings *m*, which are open and provided with tightening-bolts for the purpose.

The several feed movements are effected as follows: A cone-pulley, L, secured upon one end of the spindle D, is connected by a belt with a similar cone-pulley, L', on a feed-shaft, M, mounted in bearings in the lower portion of the frame. A spur-pinion, M', on the shaft M, meshes with a similar gear, M^2, upon a second feed-shaft, N, carrying a bevel-gear, O, which meshes with one or the other of two similar gears, O' O^2, fitting loosely on a vertical shaft, N'. Either of the gears O' O^2 may be made fast, as desired, upon the shaft N' by a clutch, P, fitting a feather on the shaft N', which shaft will be rotated in one or in the other direction, respectively, in accordance with the gear engaged with it. Rotation is imparted from the shaft N' to a horizontal shaft, P', through bevel-gears *n' n'*, secured upon the respective shafts, and a bevel-gear, *o*, upon the shaft P' meshes with a similar gear, *o'*, upon the lower end of a shaft, o^2, which carries a bevel-gear, *p*, meshing with a similar gear, *p'*, which has an internal thread engaging a thread on a feed-spindle, p^2, fitting in bearings in the upper and sliding section of the carriage C, which section is adapted to move in guides on the lower section.

So far as described the feed mechanism effects a longitudinal movement only of the carriage, and the transverse and vertical feeds are effected as follows: A downwardly-projecting arm, Q, is formed upon the carriage C, and is internally threaded near its lower end, to engage a screw-thread formed upon a shaft, Q', mounted in a bearing on the bracket B of the frame. A spur-gear, R, upon the shaft Q' engages a similar gear, R', upon the shaft P', and also engages a gear, R^2, upon a shaft, S, the opposite end of which shaft carries a bevel-gear, T, which meshes with a bevel-gear, T', upon a vertical shaft, T^2. The gears R and R^2 are loose upon their respective shafts, which are fitted with clutches S' S^2, sliding on feathers, so that the gears may be made fast to their shafts, as required. A screw-thread is cut upon the shaft T^2, and engages a nut, U, fixed to the frame. The upper portion of the shaft S turns freely in a socketed projection formed upon the bracket B, said projection fitting between the gear T' and a collar, *t*, on the shaft.

It will thus be seen that the bracket B and carriage C will be raised or lowered by the rotation of the shaft T^2 in one or the other direction. The shafts S and Q' are provided with squared ends, to which cranks may be applied to effect the rotation of said shafts by hand.

It will be seen by reference to Fig. 1 that all the feeding movements are obtained primarily from the shafts M and N, which are constantly in rotation, and that any or all of said movements may be started and stopped by means of the proper clutch or clutches. Thus an article to be operated upon being secured to the carriage C and the spindle D rotated, the longitudinal feed is started by moving the clutch P into contact with one or the other of the gears O' O^2, as the direction of feed may require. If the work is to be fed transversely, the clutch S' is engaged with the gear R, and to impart a vertical movement to the work the clutch S^2 is connected to the gear R^2, the shafts S and T^2 being then rotated through the intermediation of the gear R, whether said gear be fast or loose upon the shaft.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, substantially as set forth, of a cutter-head, a main cutter-spindle fitting bearings on the said head, a supplemental cutter-spindle parallel with the main one, also supported on the head, and connected by gearing with the said main spindle.

2. The combination, substantially as set forth, of a frame, a driving-spindle, a feed-shaft receiving rotation therefrom, a supporting-bracket adapted to be moved vertically between guides upon the frame, a work table or carriage having the capacity of movement both longitudinally and transversely upon said bracket, and a series of intermediate shafts and gearing actuated primarily by the feed-shaft, and serving to impart motion to the carriage longitudinally, transversely, and vertically relatively to the frame.

3. The combination, substantially as set forth, of a frame, a supporting-bracket movable vertically thereon, a feed-shaft mounted in bearings in the frame, a vertical threaded spindle engaging a nut in the frame and rotating in a bearing in the bracket, without having end motion therein, and intermediate shafts and gearing for transmitting rotation from the feed-shaft to the threaded spindle.

4. The combination, substantially as set forth, of a frame, a supporting-bracket connected thereto, a feed-shaft mounted in bearings therein, a work-carriage adapted to be moved upon the bracket toward and from the frame, a horizontal threaded shaft engaging a nut upon the carriage and fitting a bearing on the bracket, and intermediate shafts and gearing for imparting rotation to the threaded shaft from the feed-shaft.

5. The combination, substantially as set forth, of a frame, a driving-spindle, a feed-shaft receiving rotation therefrom, a supporting-bracket adapted to be moved vertically between guides upon the frame, a work-carriage having the capacity of movement both longitudinally and transversely upon said bracket, a threaded shaft engaging a nut upon the carriage and fitting a bearing upon the brack-

et, a threaded shaft engaging a nut upon the frame, and fitting a socket or bearing on the bracket, without having end motion therein, a threaded feed-spindle engaging a nut on the carriage, and intermediate shafts connected by gearing and clutches with the feed-shaft, these members being combined for joint operation to impart either longitudinal, transverse, or vertical movements to the work-carriage, substantially as described.

6. The combination, substantially as set forth, of a driving-spindle, a cone-pulley secured upon a toothed sleeve fitting loosely upon said spindle, a disk fixed upon said spindle, and interposed planetary gearing by which the rotation of the cone-pulley may be imparted, either directly or intermediately, to the disk and spindle.

7. The combination, substantially as set forth, of a driving-spindle, a spur-toothed sleeve fitting loosely thereon, a disk secured thereon and carrying two spur-pinions meshing with the teeth of the sleeve, an internal gear fitting loosely on the sleeve or spindle and meshing with the spur-pinions, and mechanism for connecting said internal gear either with the disk of the spur-pinions or with a fixed abutment at pleasure.

8. The combination, substantially as set forth, of a frame, a driving-spindle mounted in bearings therein, a bar supported and adapted to be moved longitudinally in bearings in the frame, and an arm or bracket connected to said bar and acting as an outer support for a cutting arbor or mandrel rotated by the driving-spindle.

LAWRENCE COSGROVE.

Witnesses:
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JOHN WILLIAMS.