No. 789,860. PATENTED MAY 16, 1905.

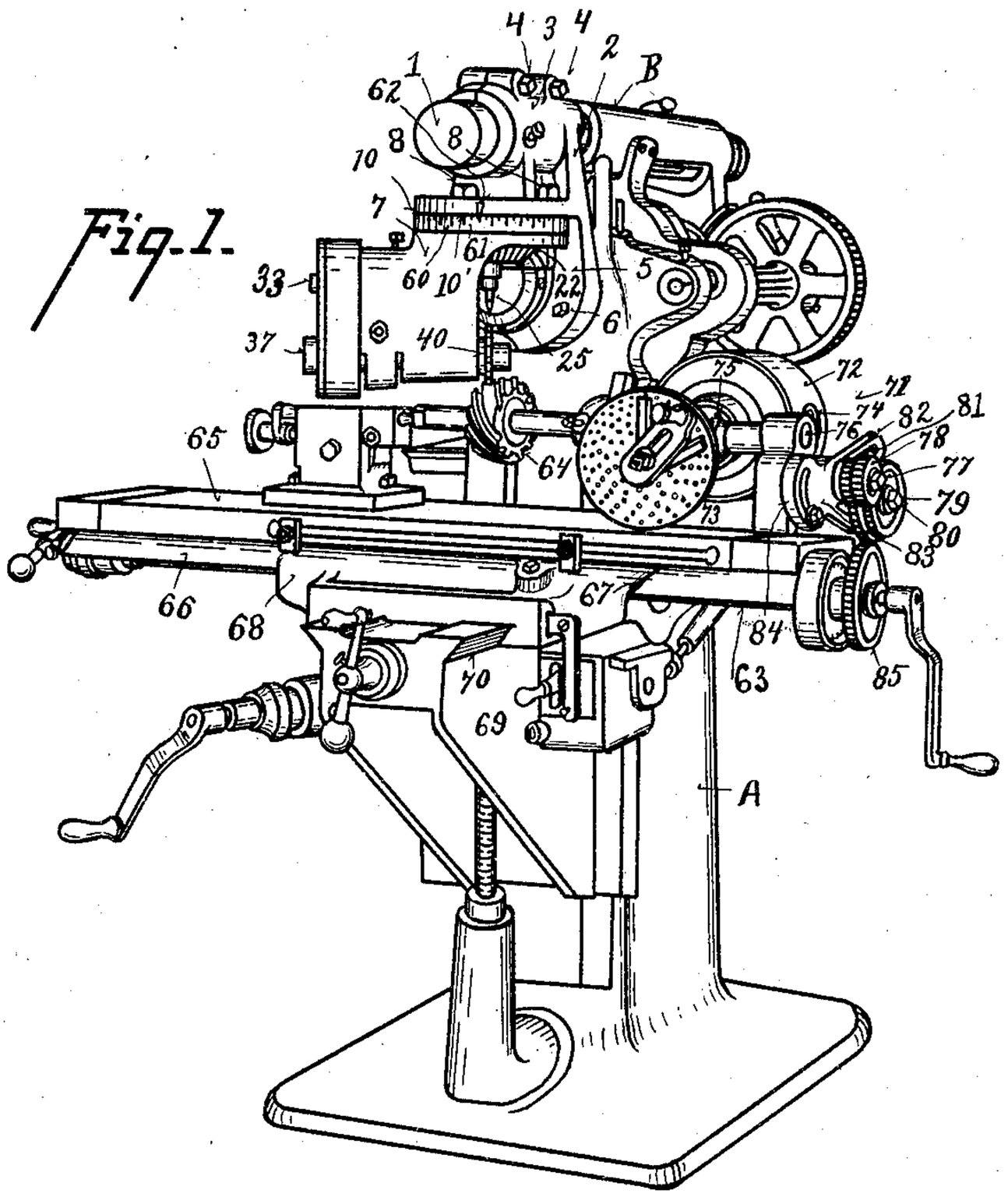
R. K. LE BLOND & W. F. GROENE.

MILLING MACHINE.

APPLICATION FILED OCT. 4, 1902.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

A. Harveycutter.

Archibald Young

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2 SHEETS—SHEET 2.

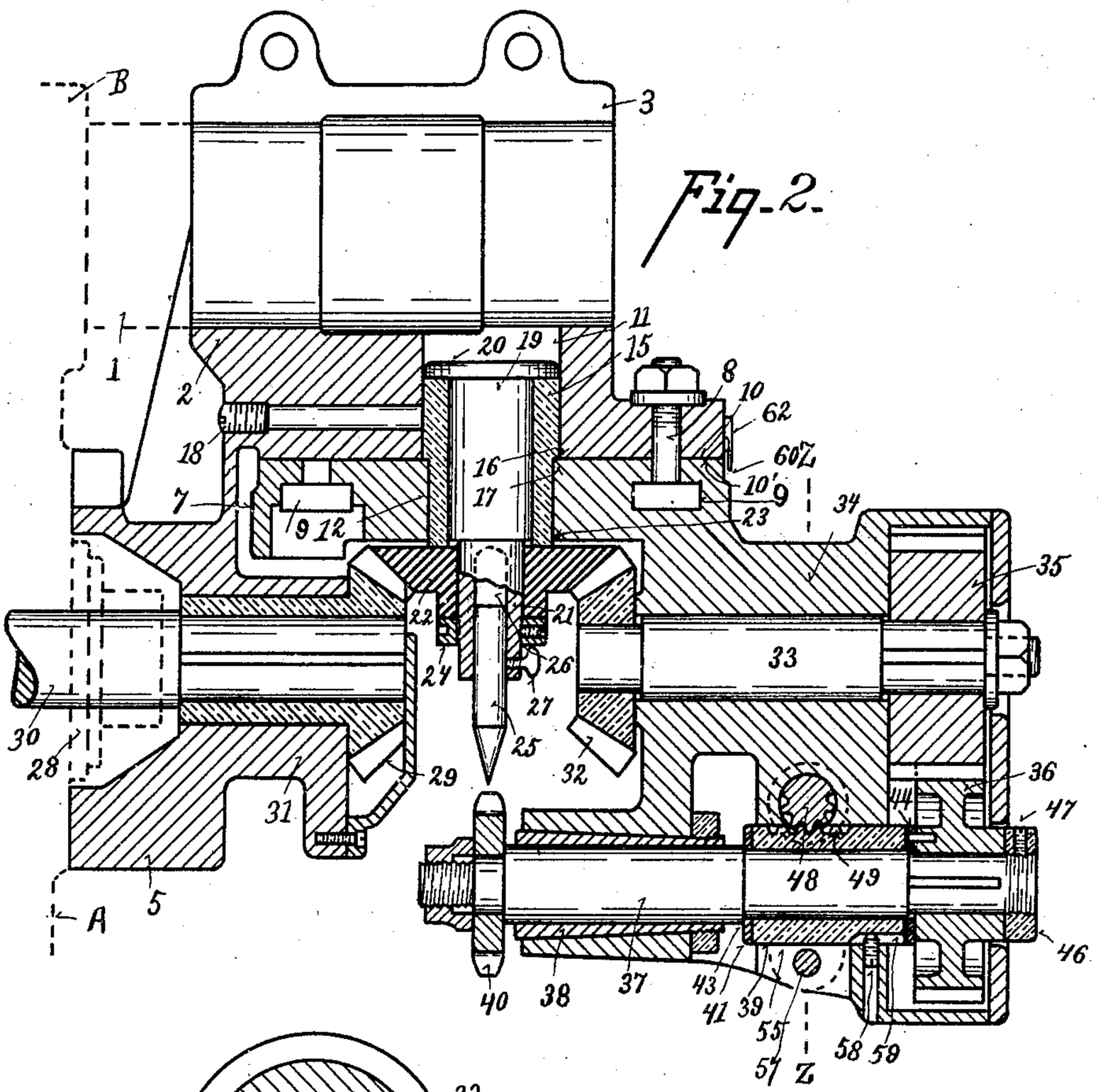

Fig. 2.

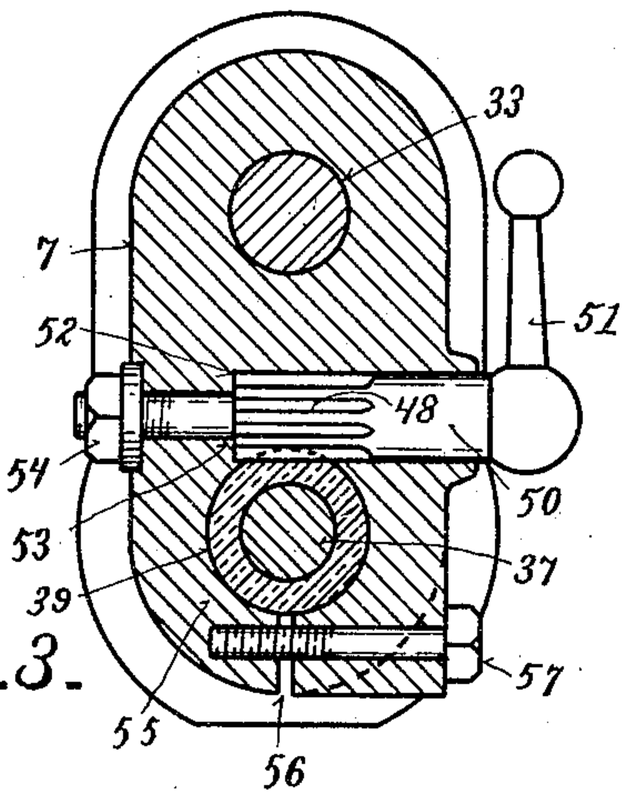

Fig. 3.

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No. 789,860. Patented May 16, 1905.

UNITED STATES PATENT OFFICE.

RICHARD K. LE BLOND AND WILLIAM F. GROENE, OF CINCINNATI, OHIO, ASSIGNORS TO THE R. K. LE BLOND MACHINE TOOL COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 789,860, dated May 16, 1905.

Application filed October 4, 1902. Serial No. 125,866.

To all whom it may concern:

Be it known that we, RICHARD K. LE BLOND and WILLIAM F. GROENE, citizens of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have jointly invented certain new and useful Improvements in Milling-Machines, of which the following is a specification.

Our invention relates to milling-machines, and has for its object the providing of a machine of that character which with a plain saddle and table is capable of performing universal work; and the invention consists in swingingly mounting the cutter in such manner that the axis of its swing is coincident with its vertical center, in providing a milling-machine having a plain saddle and table, with a spiral head and a cutter-shaft adjustable about the vertical center of the cutter position, for the purpose of permitting universal work to be done on a plain milling-machine, and in the parts and in the construction, arrangement, and combinations of parts hereinafter more fully described and claimed.

In the drawings, Figure 1 is a perspective view of our improved device. Fig. 2 is an axial vertical section showing the manner of mounting the cutter and its operating mechanism. Fig. 3 is a vertical cross-section taken on the line *z z* of Fig. 2, showing the means for shifting the cutter-shaft longitudinally.

A represents the frame of the machine, which has the usual overhanging-arm bearing B, which latter supports the overhanging arm 1. A bracket 2 has a clamp-bearing 3, by means of which it is clamped to the arm by bolts 4. The bracket has a depending side 5, secured against the machine-frame by bolts 6. A housing 7 is supported by the bracket by means of T-bolts 8, taking into an annular undercut groove 9 in the housing, the housing and bracket being clamped together at the faces 10 10′. The housing swings about an upright axis with relation to the bracket. The bracket and housing, respectively, have vertical bores 11 12 coincident with such upright axis, and a bushing 15 is inserted in these bores, having shoulder 16 resting upon an offset 17. A set-screw 18 takes through the bracket and secures the bushing rigidly with relation to the bracket. A stud 19 passes through the bushing. It has a head 20, which rests on the bushing. It also has a journal 21, upon which a gear 22 rotates, the gear being held against longitudinal movement by the lower extension 23 of the bushing and a collar 24, secured to the stud. A pointer 25 takes into a bore 26 in the stud, in which it is secured adjustably vertically, as by means of a set-screw 27, said pointer constituting means by which is indicated the operative position of the cutters of whatever thickness used. The vertical adjustment of said pointer admits of its use with cutters of various diameters.

The usual quill 28 of the milling-machine may have a bevel-gear 29 rigidly secured to it, as by having its stud 30 taking into the quill, which bevel-gear meshes with the aforesaid gear 22. The bevel-gear 29 may be journaled in a lug 31 on the bracket 2. The bevel-gear 22 in turn meshes with a bevel-gear 32, secured to a transmitting-shaft 33, journaled in a bearing 34 in the housing. The transmitting-shaft has a gear 35 secured to it, which gear meshes with a gear 36 on the cutter-shaft 37. The cutter-shaft 37 is journaled in a bearing 38 and a sleeve 39. It is adapted to support a cutter 40. We have mounted the cutter in such manner as to be in the axial line of the swing of the housing, so that the cutter may always be in that axial line irrespective of the position to which the housing may be adjusted. In practice cutters of different widths are employed, and we have provided means whereby the position of the middle of the cutter may be adjusted so that the middle of the cutter may be in the axial plane of the housing irrespective of the width of the cutter. For accomplishing this we have provided the sleeve 39, in which the cutter-shaft rotates and by which it is adjusted endwise, the cutter-shaft being held endwise, moving with the sleeve by having one end of the sleeve take against a collar 41, resting against a shoulder 43 on the shaft. The other end of the sleeve rests against a washer 44, which takes against the

gear 36, the gear being keyed to the shaft. A nut 46 screws on the end of the cutter-shaft and takes against the hub of the gear 36, the nut being further secured by a set-screw 47, if desired. The gear 36 is narrower than the gear 35, so as to permit movement of the former transversely of the face of the latter when the cutter-shaft is moved longitudinally. Longitudinal movement of the cutter-shaft is effected by a pinion 48 meshing in a rack 49 on the sleeve. The pinion 48 is on a shaft 50, journaled in the housing, and is turned by means of the handle 51, the shaft 50 having a shoulder 52, which may be held against an offset 53 in the housing by means of a nut 54. The bearing 55 for the sleeve may be split, as shown at 56, with a bolt 57 for rigidly securing the sleeve in its bearing when adjusted. A finger 58 may take from the housing into a longitudinal slot 59 in the sleeve as additional precaution for preventing the turning of the sleeve with relation to the housing.

We have preferred to show the cutter-mounting in such manner that it may be readily removed entirely from the machine. Thus the bracket and parts which it supports—the bevel-gear 29 and its stud 30, taking into the quill—may be removed entirely from the machine and the ordinary cutter-spindle and cutter secured in the quill in the ordinary manner, if desired. The face 60 of the housing adjacent to the bracket may be provided with a gage 61, the bracket having a finger 62 for indicating the number of degrees which the housing has been swung on the bracket.

The piece of work 64 is adapted to be placed under the cutter for operation thereon by the cutter between the usual centers on a table 65, having slides 66, sliding in ways 67 on a plain saddle 68 and operated by means of the ordinary feed-screw 63 from a source of power in the usual way. The saddle shown is what is known to the trade as a "plain" saddle—that is, an integral saddle—adjustable to and from the column on a bracket 69, adjustable on straight ways 70 on the column.

The table supports a spiral head 71 of suitable construction for turning the work mounted on the table under the cutter. As shown, it has a shell 72, mounted on a support 73 on the end of the table and preferably adjustable on the support on an axis at right angles to the table. The shell carries a quill 74, in which the center or other work-supporting device may be held. The quill is rotated in the shell through a bevel-gear 75 in train with a worm and worm-wheel in usual manner. The bevel-gear 75 is secured to a shaft 76, which through intermeshing gearing is rotated by a shaft 77, having a bearing on the shell-support. The shaft 77 has change-gears 78 at its outer end driven by change-gears 79, mounted on a stud 80. One or more series of change-gears 79 and studs may be provided for driving the quill in direct or reverse direction. The studs are adjustably secured in slots, one of which is shown at 81 in a swinging arm 82, swinging about the bearing of shaft 77, the swinging arm being held in position by a bolt 83, passing through a slot 84 in the swinging arm into the support 73. The change-gears 79 are driven by change-gear 85 on the end of the feed-screw. As the work is turned by the spiral head it is operated on by the cutter, which has been adjusted to suitable angle above the work, so that the angle of the cutter and the spiral feed of the spiral head may correspond.

By means of our improved construction universal work is performed on a plain milling-machine, and our improved construction is such as to permit a milling-machine originally constructed for plain work only to be fitted up by the addition of a spiral head and our improved construction of cutter-mounting to do universal work.

We claim—

1. In a milling-machine, the combination of a frame, a housing arranged to swing about a vertical axis, said frame and housing having provided therein vertical bores, a bushing arranged in the said bores, and a stud mounted within the said bushing and forming the axis of rotation of said housing, the said stud having its lower end extending from without the said bushing, the said extended portion having provided therein a bore, and a pointer mounted within the said bore, a cutter mounted on a cutter-shaft journaled in the said housing and said cutter-shaft and pointer being in the same plane but disposed substantially at right angles to each other and means for adjusting said shaft axially.

2. In a milling-machine the combination of a frame, a housing arranged to swing on a vertical axis, a cutter mounted on a cutter-shaft journaled in said housing, a bushing mounted in vertical bores, provided therefor in said frame and housing, a stud arranged within the said bushing and having its lower end extending without the said bushing and a pointer mounted in said extended portion, means mounted on said extended portion of said stud for engaging transmission-gears for operating said cutter, said cutter being mounted on a cutter-shaft journaled in the aforesaid housing and said stud and pointer being in the cutting plane of said cutter, the said cutter-shaft being disposed at substantially a right angle to said pointer and stud, and means for adjusting said cutter-shaft axially.

3. In a milling-machine the combination of a frame, a housing arranged to swing on a vertical axis, a cutter mounted on a cutter-shaft journaled in said housing, a bushing mounted in vertical bores provided therefor in said frame and housing, a stud arranged within the said bushing and having its lower end extending without the said bushing, the said extended portion having provided therein a bore,

a pointer mounted within said bore perpendicular to the cutter-shaft and in line with the axis of adjustment of the housing, a transmission-gear mounted on said extended portion of said stud and engaging transmission-gears for operating the cutter, and means for adjusting the cutter-shaft axially.

4. In a milling-machine, the combination of a frame, a housing arranged to swing about a vertical axis, said frame and housing provided with vertical bores to receive a bushing, a stud mounted within the said bushing and comprising the axis of rotation of said housing, the said stud having formed on the top a head which overlies the top of said bushing, a gear mounted on the lower extended portion of the said stud, means for retaining said gear in position and to prevent longitudinal movement of said stud, said stud having mounted therein a pointer, the said gear engaging transmission-gears arranged on the transmission-shaft mounted in the said frame, a transmission-shaft journaled in said housing and having disposed thereon at one end a transmission-gear and on the opposite end a pinion, the said latter-named gear engaging the gear mounted on the extended portion of said stud, a cutter-shaft mounted in the said housing below the said transmission-shaft and having a pinion mounted on one end to engage the pinion on the transmission-shaft, and a cutter arranged at the opposite end of said shaft and operated through the intermediacy of the said gears and pinions, said pointer being disposed in the cutting plane of said cutter and substantially at right angles to the cutter-shaft and means for axially adjusting said cutter-shaft.

In testimony whereof we have signed our names hereto in the presence of two subscribing witnesses.

RICHARD K. LE BLOND.
WILLIAM F. GROENE.

Witnesses:
MASON P. PRITCHARD,
AUGUST F. HERBSLET.