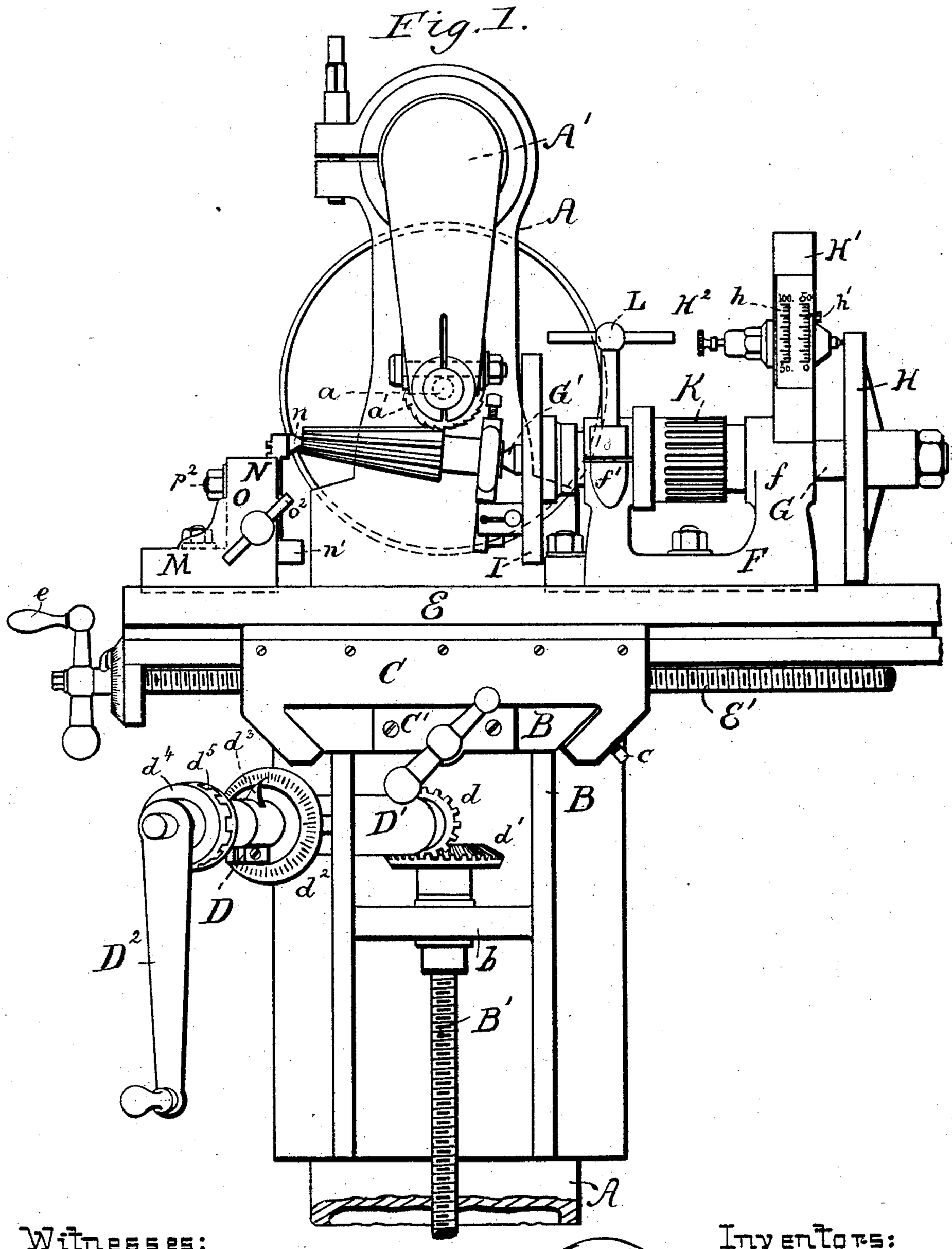
(No Model.) 4 Sheets—Sheet 1.

F. HOLZ & G. A. MUELLER.

MILLING MACHINE.

No. 362,082. Patented May 3, 1887.

Fig. 1.



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MILLING MACHINE.

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FIG. 2.

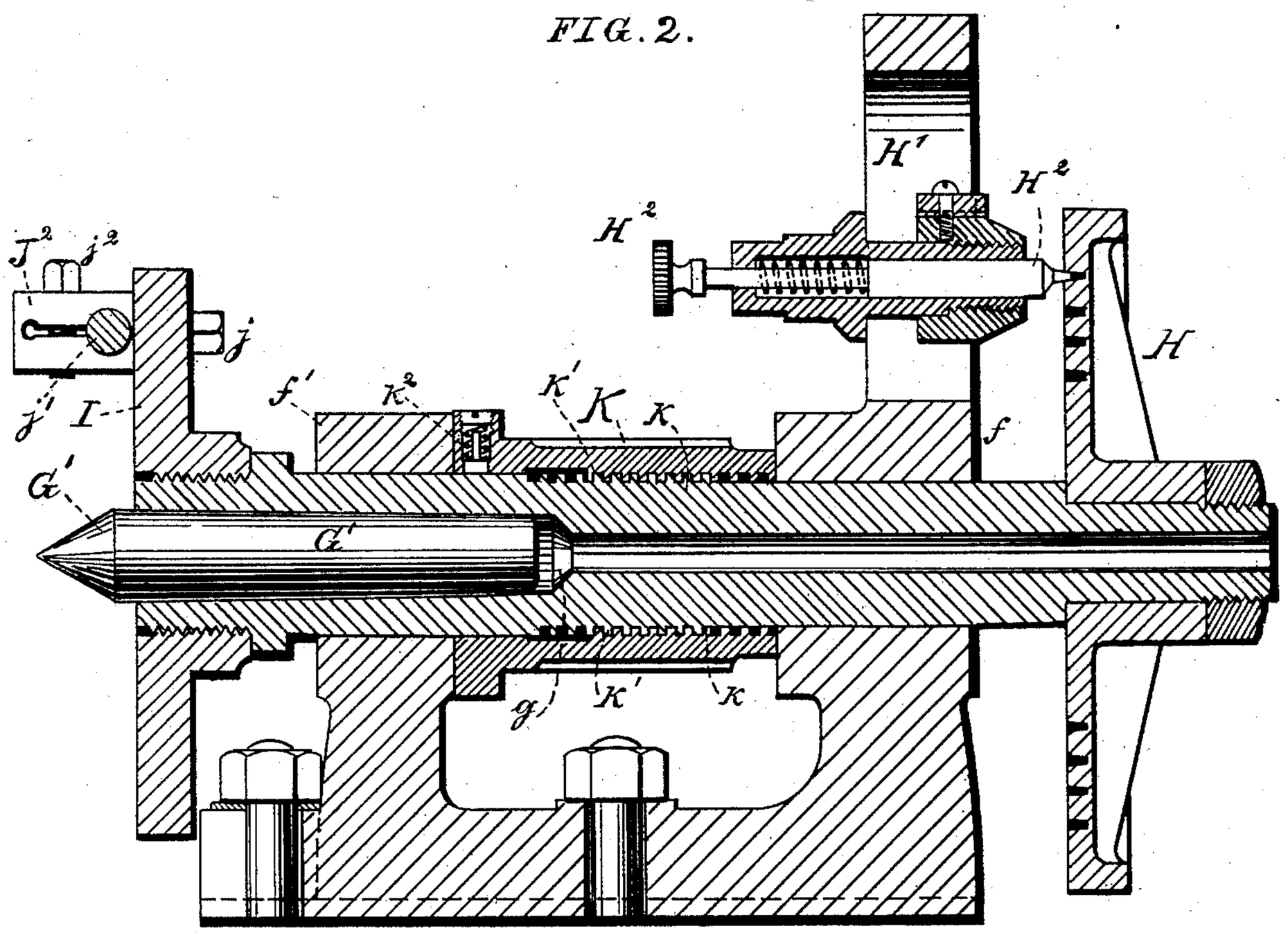
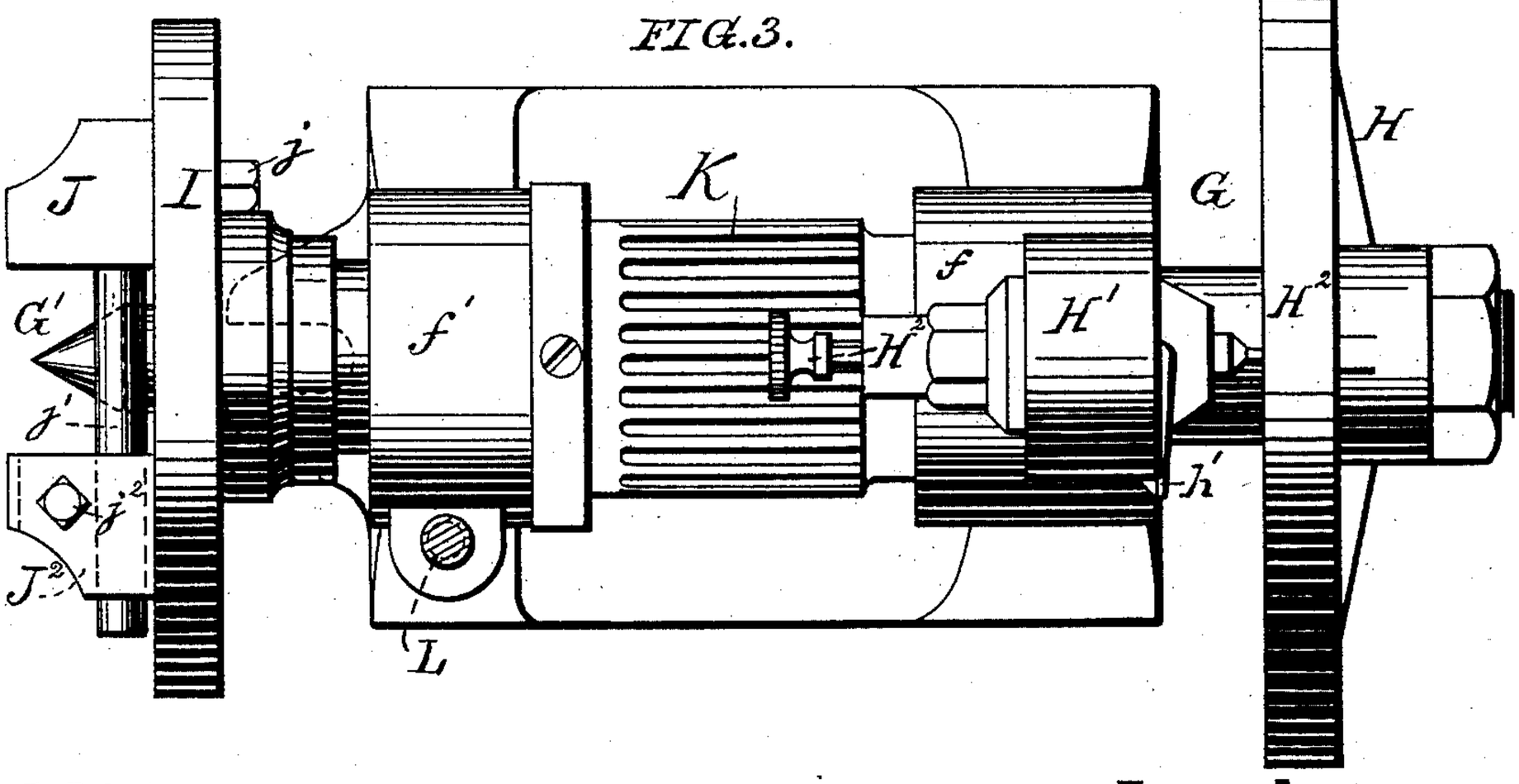


FIG. 3.



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MILLING MACHINE.

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FIG 4

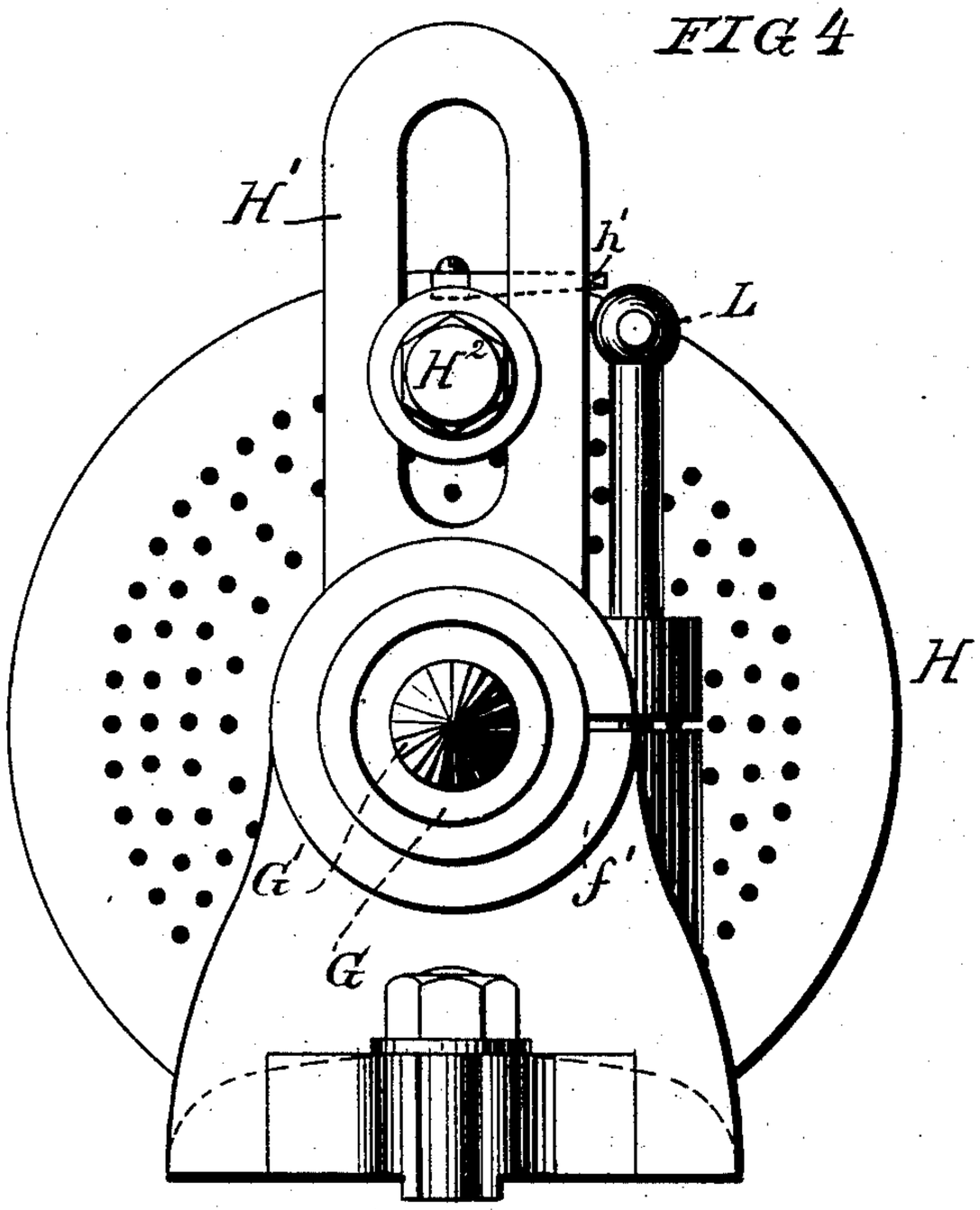


FIG. 5.

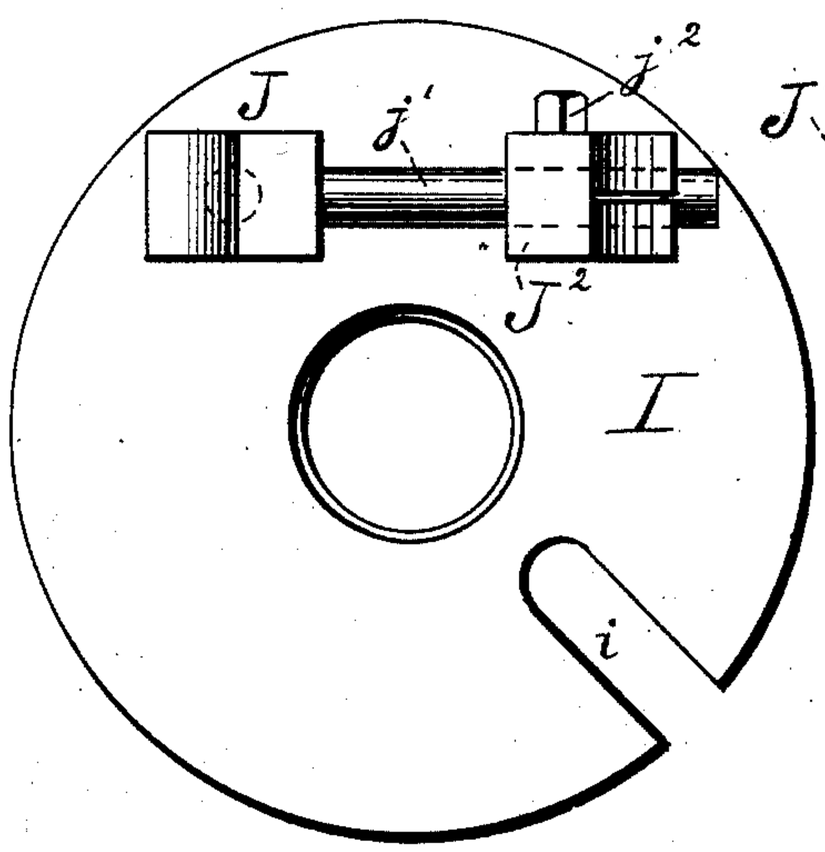
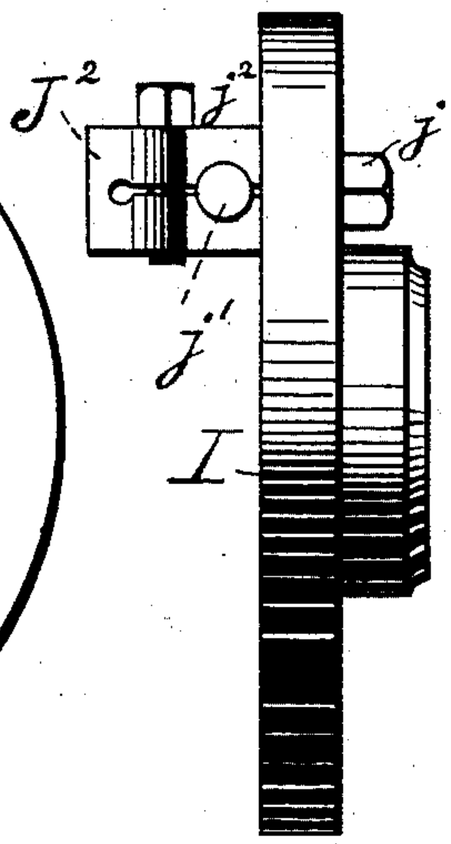


FIG. 6.



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MILLING MACHINE.

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FIG. 9.

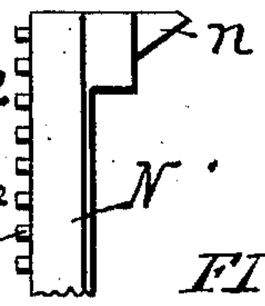


FIG. 7.

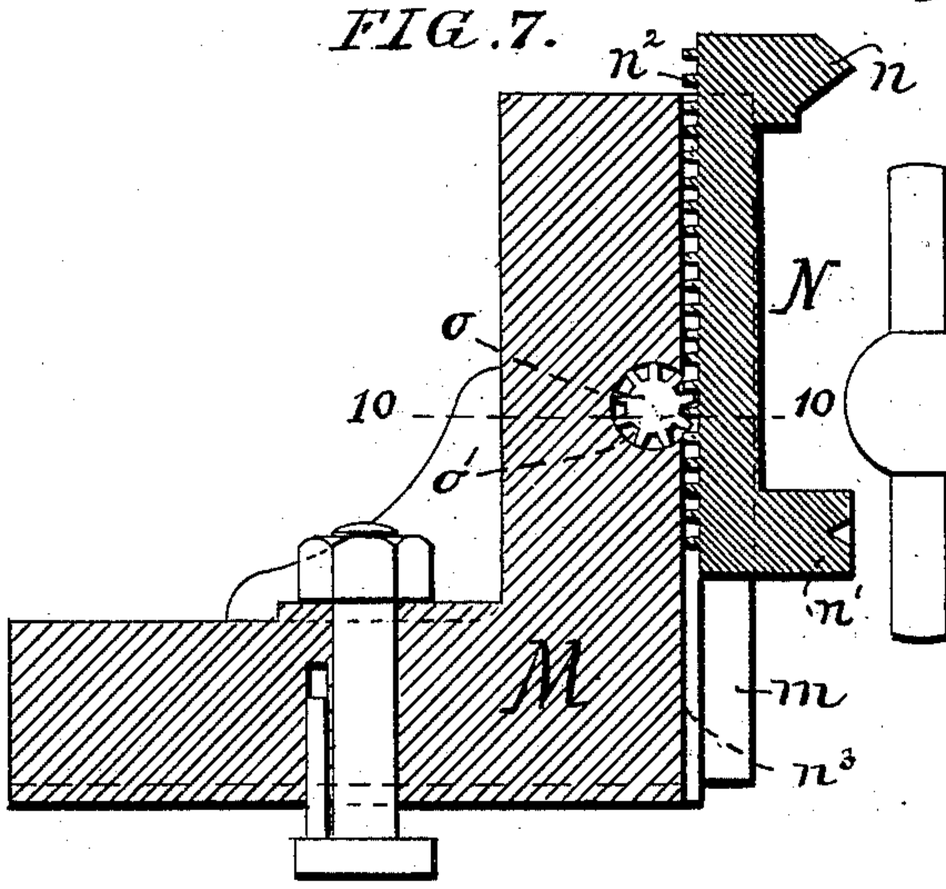


FIG. 8.

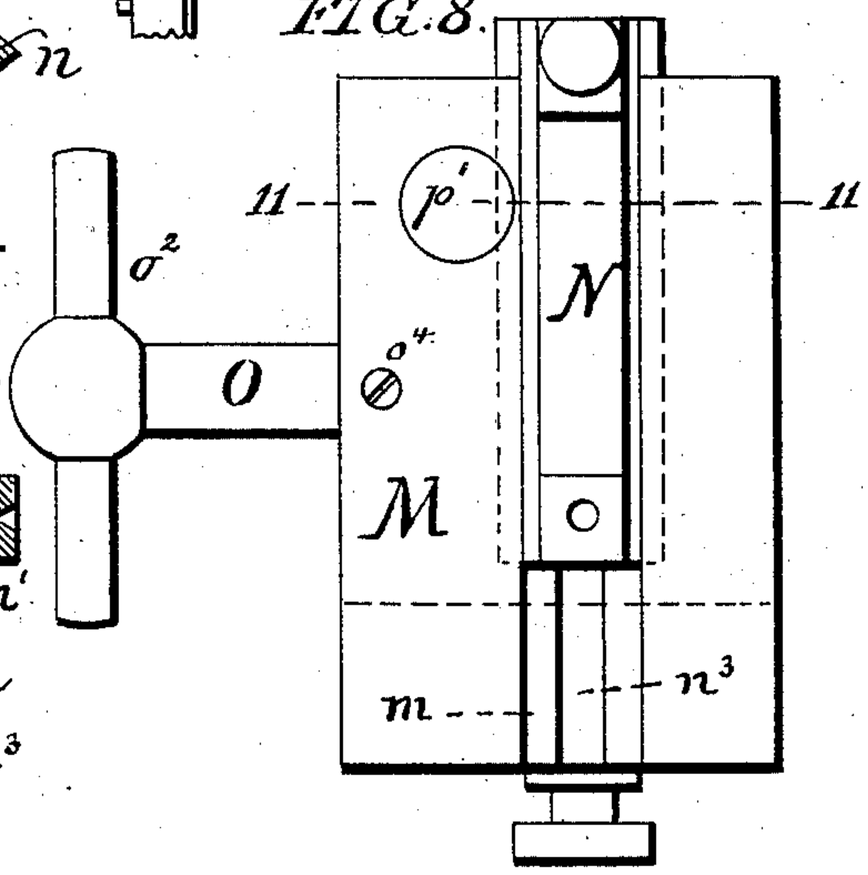


FIG. 10.

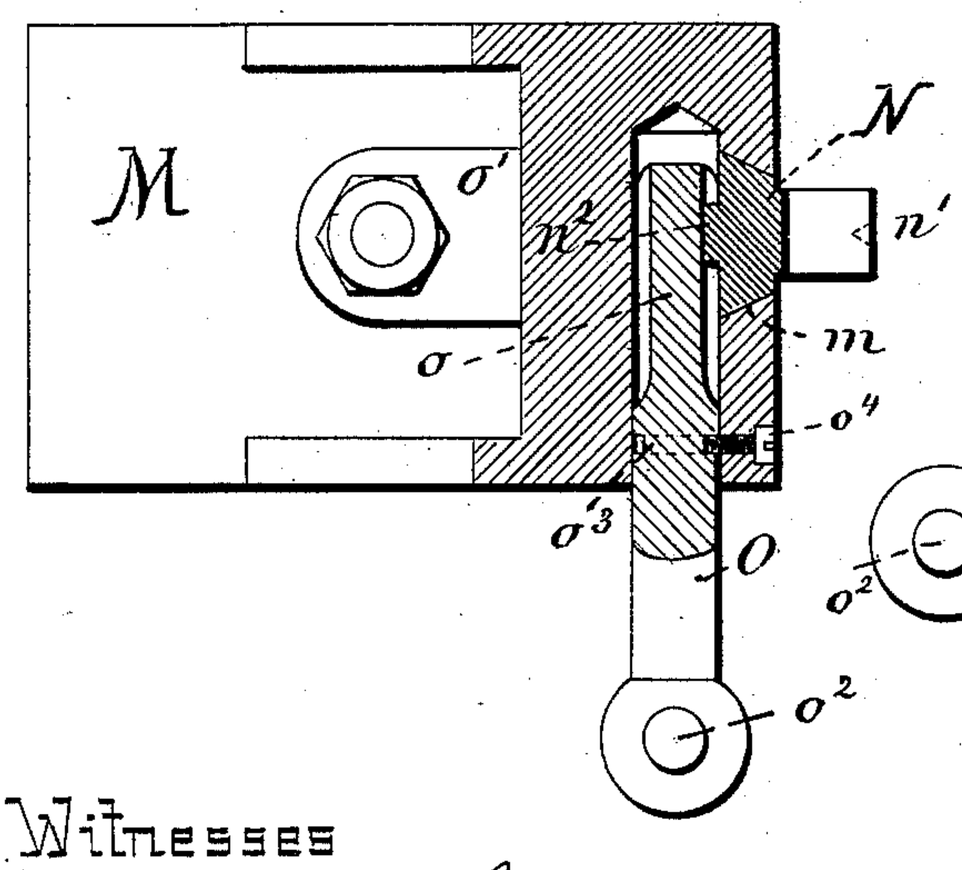
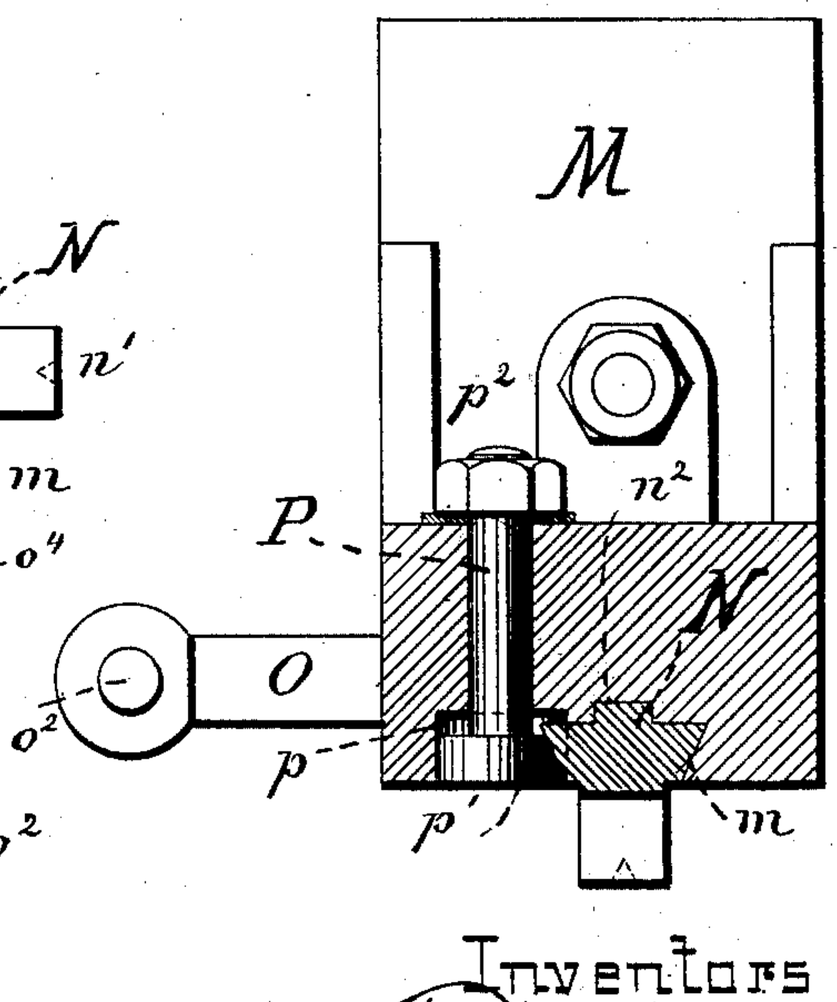


FIG. 11.



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UNITED STATES PATENT OFFICE.

FRED HOLZ AND GEORGE A. MUELLER, OF ANDERSON'S FERRY, ASSIGNORS TO THE CINCINNATI SCREW AND TAP COMPANY, OF CINCINNATI, OHIO.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 362,082, dated May 3, 1887.

Application filed January 5, 1885. Serial No. 151,987. (No model.)

To all whom it may concern:

Be it known that we, FRED HOLZ and GEORGE A. MUELLER, both of Anderson's Ferry, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Milling-Machines, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of a machine embodying our improvements, certain parts not necessary to the description being broken away. Fig. 2 is a vertical longitudinal section through the head-stock and the parts which it carries, showing the means for adjusting the spindle and face-plate thereon. Fig. 3 is a top plan view of said head-stock and mechanism carried thereby, and Fig. 4 an elevation from the inner end thereof; Figs. 5 and 6, respectively, details in side and edge elevation of the face-plate and the improved clamp or chuck mounted thereon; Figs. 7 and 8, sectional and face elevations of the tail-stock and its accessories, and Fig. 9 a detail in elevation of a center adapted to said stock; Figs. 10 and 11, horizontal sections of the tail-stock on the correspondingly-numbered lines in the two foregoing figures.

A is any usual and appropriate frame for the machine, supporting between its main portion and an overhung arm, A′, an arbor, *a*, which carries the cutter or cutters *a′*, said arbor, as customary, being mounted upon a live-spindle in the main frame and a center in the overhung arm, so as to be removable to interchange cutters. On the body part of the frame, beneath the overhung arm, we form suitable ways or guides, upon which slides a knee-piece, B, to support the clamp-bed and traversing carriage. An upright screw, B′, is threaded into a step at the foot of the frame and collared in a lug or cross-bar, *b*, from the knee-piece, so that whenever it is turned this knee-piece may be adjusted up and down toward or from the cutter, carrying with it all the parts which it ultimately supports.

Upon the top of the knee-piece is mounted a slide or clamp-bed, C, so connected therewith by suitable guides that it may be moved in and out horizontally toward and from the main frame in a line parallel with the axial line of the driving-spindle or live-spindle therein. An adjusting-screw, C′, collared in the knee-piece and threaded into a lug or ear from the clamp-bed, enables such adjustment to be effected at will, and a clamping-screw, *c*, or any other suitable clamping device, serves to hold the head rigidly upon the knee-piece and beneath the cutters in any given adjustment.

Heretofore the vertical screw which adjusts the knee-piece has been operated by means of a short shaft intermeshing, by bevel or worm gear, with its upper end and extending out parallel with the screw which adjusts the clamp-bed—that is to say, parallel with the live-spindle—and at its outer end having a crank or hand-hold. This we have found objectionable, since it frequently happened under some necessary adjustment of the machine that the hand-holds, respectively, of the horizontal adjusting-screw and of the horizontal shaft would interfere, so that time would be lost in shifting to any new position or completing the adjustment from the old, and also for the reason that either the shaft or the screw—properly the former, as the greatest labor is upon it—must be made of sufficient length in such an arrangement to ordinarily avoid interference of this nature, and will therefore be in the way of the attendant when inspecting the work or watching the action of the cutters. For these reasons we mount the shaft D, which, by means of the intermeshing bevel-gears *d d′* or equivalent device, turns the vertical adjusting-screw in a sleeve or bearing, D′, passing obliquely through one side of the knee-piece and having at its outer end the usual index-disk, d^2, along which plays the pointer d^3 upon the shaft, to indicate the vertical adjustment. This arrangement not only brings the crank or hand-hold D^2 out of the way of the attendant, but also brings it in such position that it will never interfere with the crank or hand-hold of the horizontal adjusting-screw for the clamp-bed.

For further convenience we mount the crank D^2 loosely on the end of its shaft and provide it with the clutch-half d^4, which engages with an opposing clutch-half, d^5, on said shaft, whereby the crank may be pushed into engagement with such shaft when desired to turn

it, but slipped back out of engagement and allowed to hang idly out of the way and without exerting any leverage on the shaft when the latter is to be left at rest.

The clamp-bed supports a traversing carriage, E, which, by means of a screw, E′, may be moved horizontally at right angles to the permitted movement of the clamp-bed and to the axial line of the live-spindle, or in any other usual angle thereto. This traversing movement is automatically accomplished, in one direction at least, as a rule, by well-known mechanism, while in the other direction, or the idle movement, by a crank, *e*, on the end of the screw-shaft, and the carriage is longitudinally slotted to receive the head and tail stocks, which are secured thereto by clamping-screws in the usual manner.

The head-stock F supports in bearings *f f′* (the latter of which is split) a spindle, G, longitudinally bored to form a slightly-tapering seat, *g*, for the reception of the center G′, and beyond this a tube for the access of the ejecting-rod or drift-bolt whenever the center is to be removed. At the outer end is secured a perforated dial or index-plate, H, which, as in other milling-machines heretofore made, can be removed and replaced by others of different gage. A slotted standard, H′, rising from the adjacent bearing-bracket, or from any other suitable part of the stock, receives a spring-pin, H², which may be adjusted up and down the slot and clamped to the standard in any position indicated by the scale *h* on the side of the standard, and the finger *h′* from the block in which the pin is carried, so that its point may register and engage with the holes of any series on the dial, and thereby determine the length of rotation to be given to the spindle between each successive action of the cutters upon the work carried.

At the inner end the spindle carries a face-plate, I, securely fixed thereto, so as to turn therewith or hold the work rigid therewith. This face-plate may have the usual slot, *i*, to receive the bent tail-piece of the dog or driver, which is affixed to the work or mandrel to be carried; but it often happens that such tail-piece is broken so as not to engage with this slot, and frequently it is desirable to use a dog originally provided with a straight tail-piece or tang, which, from imperfection or long usage, has lost its straight or radial character, so as not to fit in between the jaws of a fixed clamp or chuck on the face-plate. We therefore pivot a block or cheek, J, near the perimeter of the face-plate, advisably placing a clamping-nut, *j*, upon its pivot-pin, so that it may be rigidly fixed against turning. From this cheek a short rod, *j′*, is carried parallel with the surface of the plate, and receives at its free end a split cheek, J², opposing the other, and capable of being clamped to said rod by means of the screw *j²*, so that this split cheek may be slid along the rod until the tang of the driver is suitably grasped, and then fixed thereto to hold said driver. It is evident that this construction enables us to swing the chuck or clamp upon its pivot into any position angular to the radii of the face-plate necessary to bring both cheeks evenly against, and to obtain a firm grasp upon, the tang of the driver.

It is our intention to obtain the angular adjustment of the work by raising and lowering the center on the tail-stock instead of the one borne in the head-stock, as has heretofore been customary. Having this in view, we find it desirable to adjust the spindle in the head-stock toward the work, in order that its center may clamp that work against the center on the tail-stock, and for this purpose we form the exterior of said spindle for a portion of its length between the two bearings in which it rests with screw-threads *k*, with which mesh the corresponding threads of a female screw, *k′*, within a sleeve, K, which embraces said spindle and extends between the two bearing-brackets, so as to be securely seated against and prevented from longitudinal play by contact with their opposing faces. The sleeve will be milled or roughened, so as to be easily turned by the grasp of the hand, and it is evident that when thus turned it will feed the spindle and the center back and forth according to the direction of its rotation. In order that it may not be accidentally moved and that it may turn with the spindle without affecting its adjustment whenever the index-plate is turned to fit the work for a fresh movement it is frictionally clamped to said spindle by means of a spring-pressed headed bolt, *k²*, secured within a seat upon the sleeve, and resting upon a cylindrical surface of the spindle. It has been mentioned that one of the bearings of this spindle is split, the purpose of this being that through this bearing may be fitted a clamping-screw, L, whereby the split portions can be brought toward each other or released to clamp the spindle firmly against movement in the intervals between adjustment, and to loosen it for the purpose of such adjustment.

As already suggested, the center carried by the tail-stock has heretofore been given a horizontal movement in order to clamp the work, or the mandrel on which that work is carried, and the opposite center—the one borne in the head-stock—has had a vertical or vibratory adjustment, whereby tapering blocks may be properly centered for a uniform cut from end to end, and other well-known objects attained, while in our present invention we make the latter center to move endwise for clamping, and obtain a vertical or vibratory adjustment from the center on the tail-stock.

The simplest mode of accomplishing the latter object is as follows: The tail-stock M has a vertical way or dovetailed groove, *m*, in its cheek, in which slides a bar, N, dovetailed in cross-section and enlarged at its upper end to provide the conical center *n*, or, since the construction permits it to be reversed, having at

one end such conical center, and at the other end a cupped or concave center, n', or any other suitable center for work differing from that intended to be grasped by the first. The slide-bar N has also on its inner face a rack or series of gear-teeth, n^2, for which a suitable channel, n^3, is cut in the back of the guide-way, and with this rack meshes a pinion, o, situated in a chamber, o', behind and opening into said guide-way, and in the present instance formed by a horizontal cylindrical bore through the outer wall of the tail-stock. This bore receives a spindle, O, with the inner end of which the pinion is integral or rigid, and on the outer end of which is a cross-piece, o^2, or other grasp or hand-hold. In its shank this spindle has a circumferential groove, o^3, into which enters a set-screw, o^4, permitting the spindle to be turned, but not to be retracted. Now, whenever the spindle O is rotated, it is evident that the center borne by the slide-bar will be either elevated or lowered, lifting or depressing the work at that end; but unless some clamping device is provided such adjustment will not be permanent under the enormous strain of the machine. Therefore we form a socket, p, in the cheek of the tail-stock to one side of and opening into the guideway, and from the bottom of this socket bore the stock through to the other face to receive a bolt, P, the head p' of which fits into the socket and is on one side slightly beveled to match the adjacent flaring edge of the sliding bar moving in said guideway. The rear end of the bolt is screw-threaded and receives a nut, p^2, by which it may be taken in or let out to cause its head to clamp the bar firmly in any given adjustment, or loosen it, that its position may be changed to a fresh adjustment.

In milling work of sufficient diameter the center will be nearly or quite a true cone, as in Fig. 7; but where the diameter is very slight the top of the sliding bar will be planed off until the center assumes the form shown in Fig. 9, thus enabling us, without appreciable sacrifice of strength, to bring the cutter close to the axis of such center. Of course this is impracticable where the center is made to revolve, as in the old construction, since the planed face would never twice in succession be right opposite the cutter, and herein lies one advantage of our improvement and one object we have in view in making provision for a laterally-adjustable non-rotatable center.

We claim—

1. The combination, substantially as herein-before set forth, of the horizontal shaft provided with a clutch-half at one end and at the other end operating an adjusting-screw, and the crank loosely mounted on said shaft to slide back and forth thereon, and having on its hub a clutch-half for engagement with the other.

2. The combination, substantially as herein-before set forth, with the head-stock, of the center-carrying spindle journaled therein, the index-plate attached directly to said spindle, and the index-pin sliding in a slot or way afforded by a standard from the head-stock.

3. The combination, substantially as herein-before set forth, with the head-stock, of the center-carrying spindle journaled therein, the index plate or dial attached directly to said spindle at the outer end, the face-plate attached to the spindle at its inner end, and the index-pin sliding in a way afforded by a standard from the head-stock.

4. The combination, substantially as herein-before set forth, with the head-stock, of the center-carrying spindle journaled therein and adjustable back and forth, and the split bearing and its clampling-screw, whereby the spindle may be locked against endwise or rotary movement.

5. The combination, substantially as herein-before set forth, with the head-stock, of the center-carrying spindle journaled therein and screw-threaded between two of the bearing-standards, the adjusting-sleeve embracing the spindle between said bearings and engaging with its thread, and the split bearing and its clamping-screw for locking the spindle against movement.

6. The combination, substantially as herein-before set forth, with the head-stock, of the center-carrying spindle journaled therein and screw-threaded between two of the bearing-brackets, the adjusting-sleeve embracing and engaging with the spindle between said brackets, the friction-clasp between said sleeve and spindle, the index-dial fixed directly to said sleeve, and the index-finger which locks the dial and spindle against movement.

7. The combination, substantially as herein-before set forth, with the head-stock, of the center-carrying spindle journaled therein and screw-threaded between two of the bearing-brackets, the adjusting-sleeve embracing and engaging with said spindle between said brackets, the index-dial affixed directly to the outer end of the spindle, the index-finger sliding in a way in an adjacent standard, and the face-plate affixed to the inner end of the spindle.

8. The combination, substantially as herein-before set forth, with the head-stock, of the center-carrying spindle journaled therein and screw-threaded between two of the bearing-brackets, the adjusting-sleeve embracing and engaging with said spindle between said brackets, the index-dial affixed directly to the outer end of the spindle, the index-finger sliding on an adjacent standard, the face-plate affixed to the inner end of the spindle, the split bearing and its set-screw, whereby said spindle is clamped in its adjusted position.

9. The combination, substantially as herein-before set forth, with the face-plate, of a clamp or chuck for the tang of the driving-dog, said clamp or chuck being pivoted near the perimeter of the plate, whereby it may be swung to adjust its jaws to the tang of said dog.

10. The combination, substantially as here-inbefore set forth, with the face-plate, of a

clutch-cheek pivoted thereto near the perimeter, a rod extending therefrom parallel with the face of said plate, a second cheek supported by and adjustable along the rod, and means whereby it may be clamped to the rod.

11. The combination, substantially as hereinbefore set forth, with the face-plate, of a clutch-cheek pivoted thereto near the perimeter, a rod extending from said cheek parallel with the face of the plate, an opposing cheek having a split bearing to take over said rod and permit adjustment therealong, and a clamping-screw arranged to compress the bearing upon the rod.

12. The combination, substantially as hereinbefore set forth, with the face-plate, of a clutch-cheek pivoted thereto near the perimeter, a clamping-nut upon its pivot-pin to lock it against movement, a rod leading from the cheek parallel with the face of the plate, and a second cheek adjustable along said rod.

13. The combination, substantially as hereinbefore set forth, with the tail-stock, of the slide-bar moving vertically therein, the center carried at the upper end of said slide-bar, and means whereby said bar may be adjusted and fixed in position.

14. The combination, substantially as hereinbefore set forth, of the tail-stock having a vertical guideway in its face, the rack-bar sliding in said way and carrying a center at its upper end, and the spindle and its pinion engaging with the rack to elevate and depress the bar.

15. The combination, substantially as hereinbefore set forth, of the tail-stock having a vertical guideway in its face, the rack-bar sliding in said way and carrying a center at its upper end, the spindle and its pinion engaging with the rack to elevate and depress the bar, and the clamping-bolt whereby the bar is locked in position.

16. The combination, substantially as hereinbefore set forth, with the tail-stock and its guideway, of the reversible bar adjustable along said way, and having centers at each end for varying work.

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