(No Model.)

3 Sheets—Sheet 1.

M. C. JOHNSON.

MILLING MACHINE.

No. 419,451. Patented Jan. 14, 1890.

Fig. 1

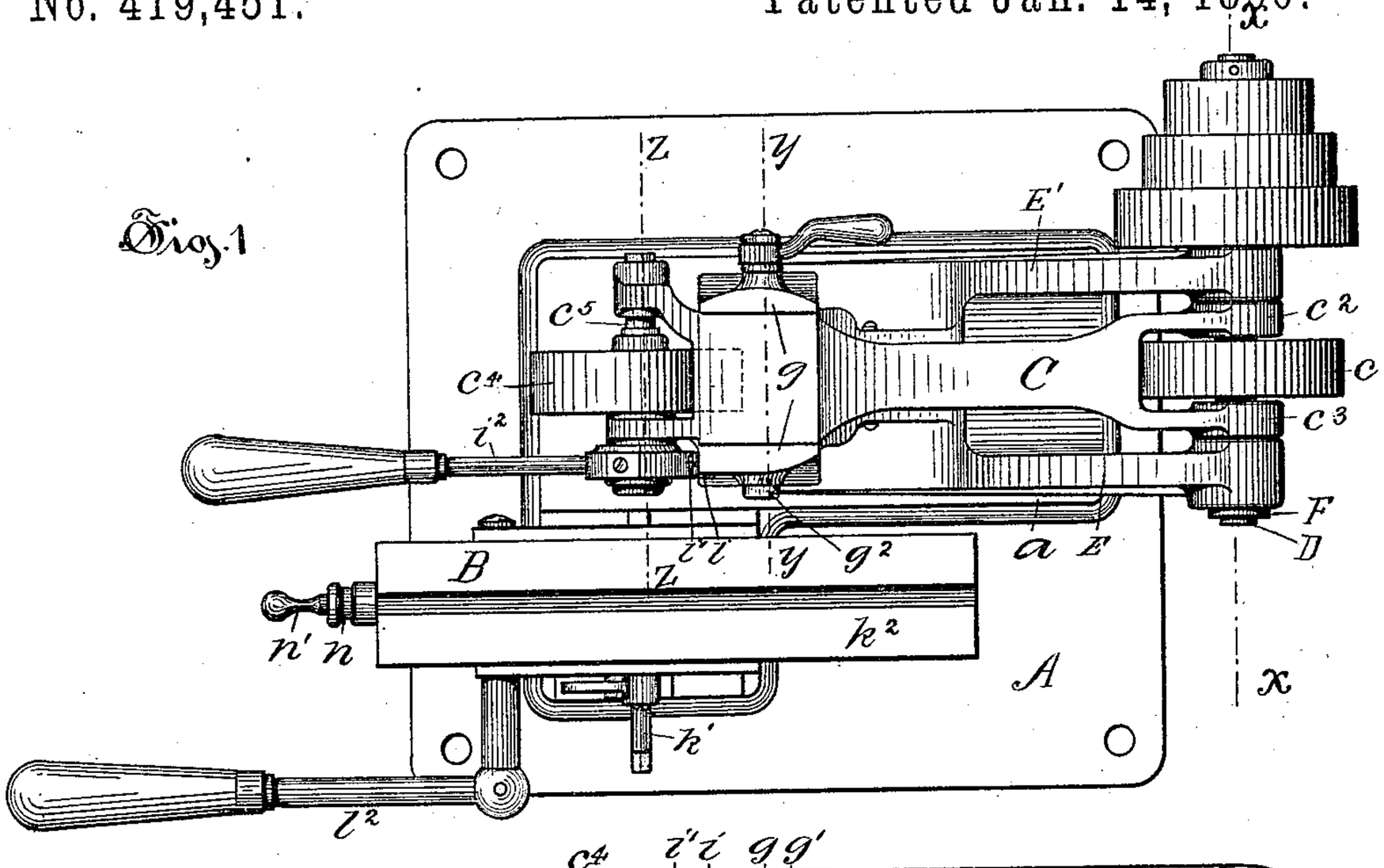
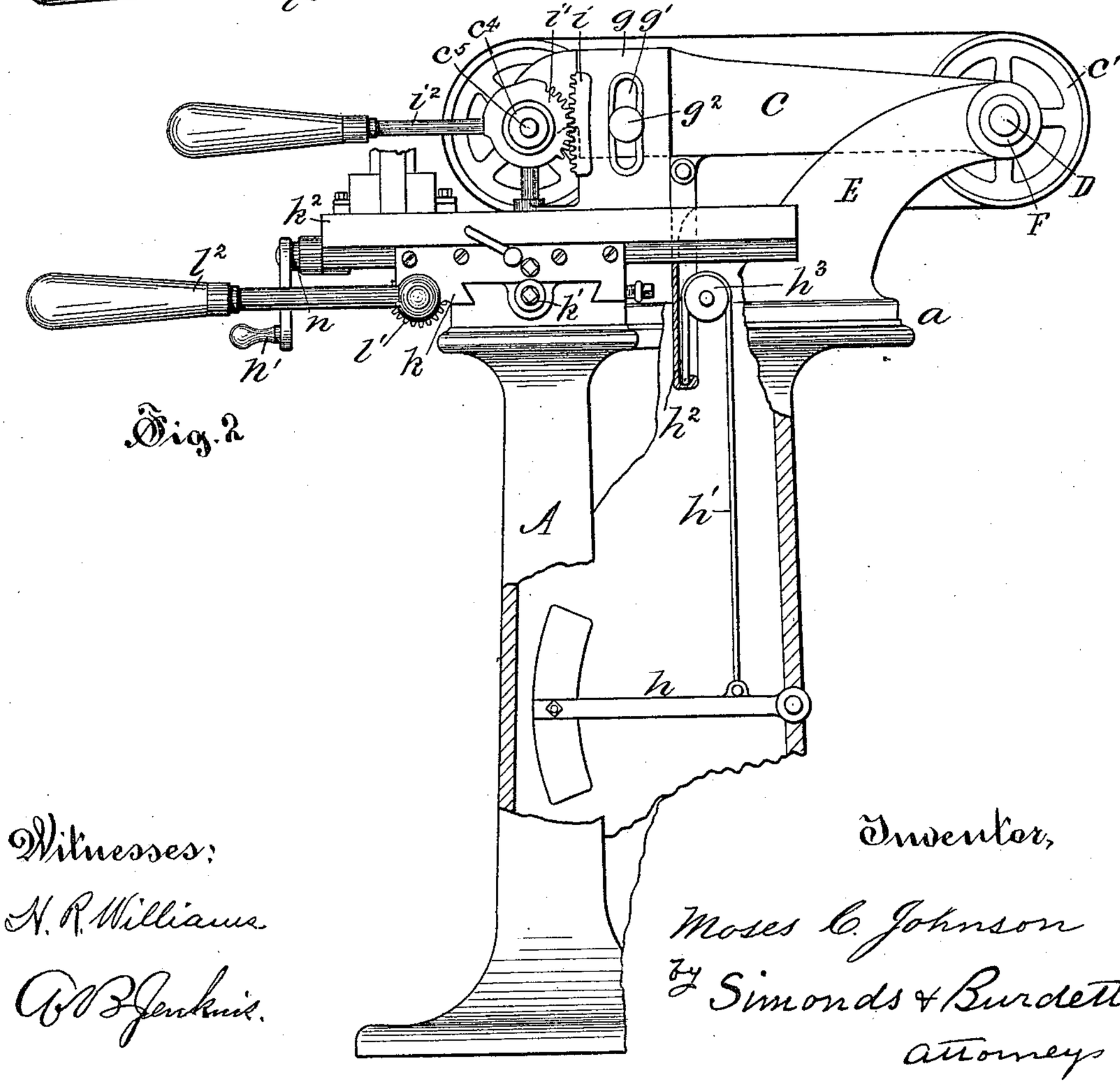


Fig. 2



Witnesses:

N. R. Williams.

A. B. Jenkins.

Inventor,

Moses C. Johnson

by Simonds & Burdett,

attorneys

(No Model.) 3 Sheets—Sheet 2.

M. C. JOHNSON.

MILLING MACHINE.

No. 419,451. Patented Jan. 14, 1890.

Fig. 3

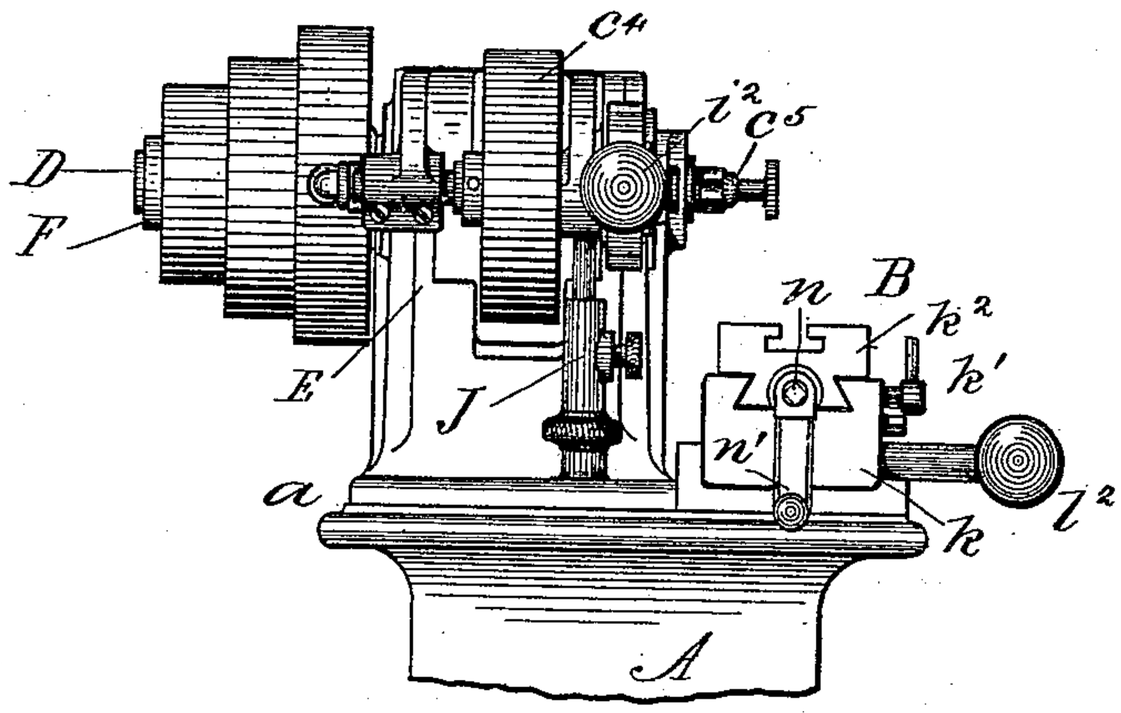


Fig. 4

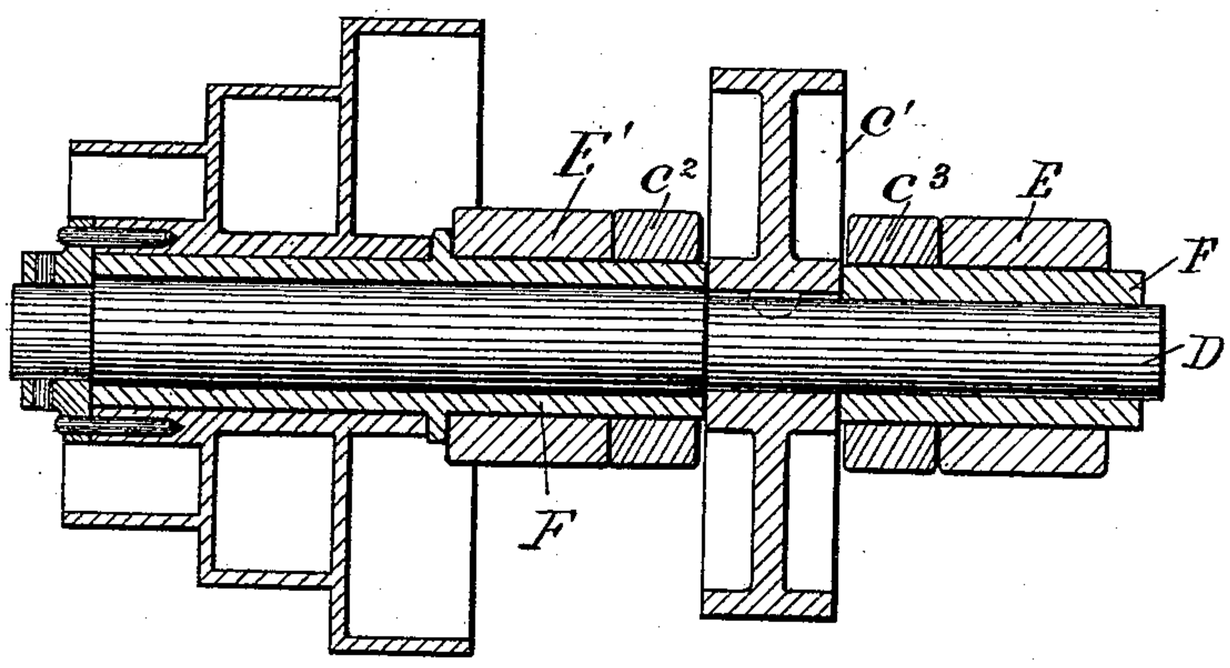
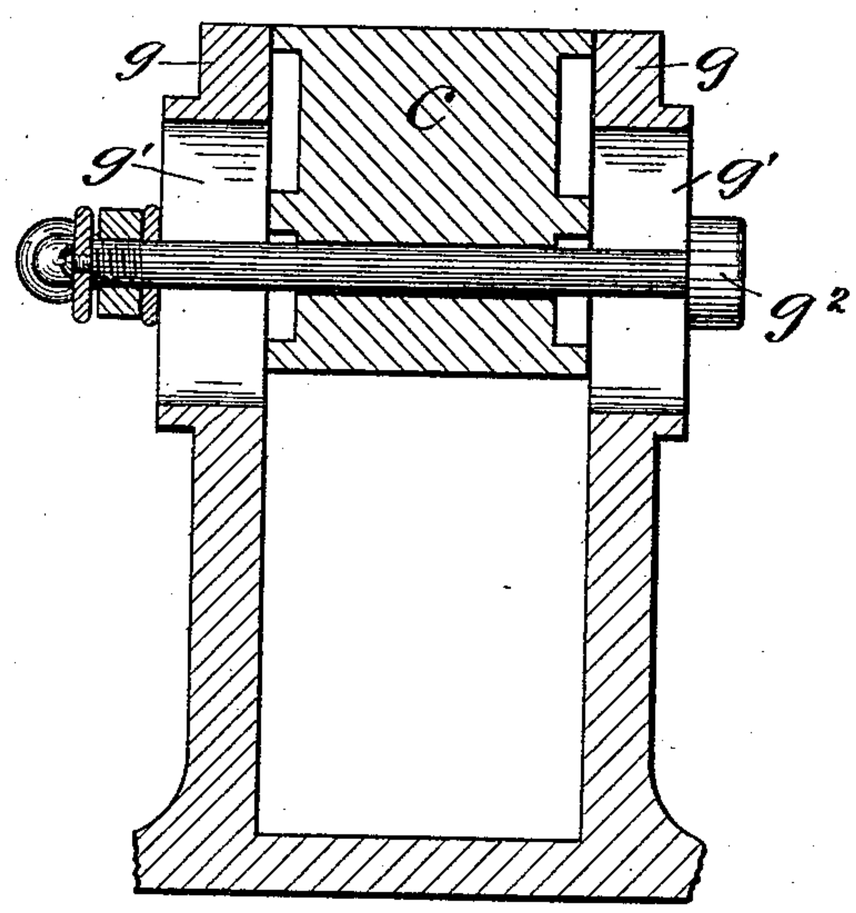


Fig. 5



Witnesses:

H. R. Williams.

O. B. Jenkins.

Inventor,

Moses C. Johnson

by

Simonds & Burdett,

Attorneys.

(No Model.) 3 Sheets—Sheet 3.

M. C. JOHNSON.

MILLING MACHINE.

No. 419,451. Patented Jan. 14, 1890.

Fig. 6

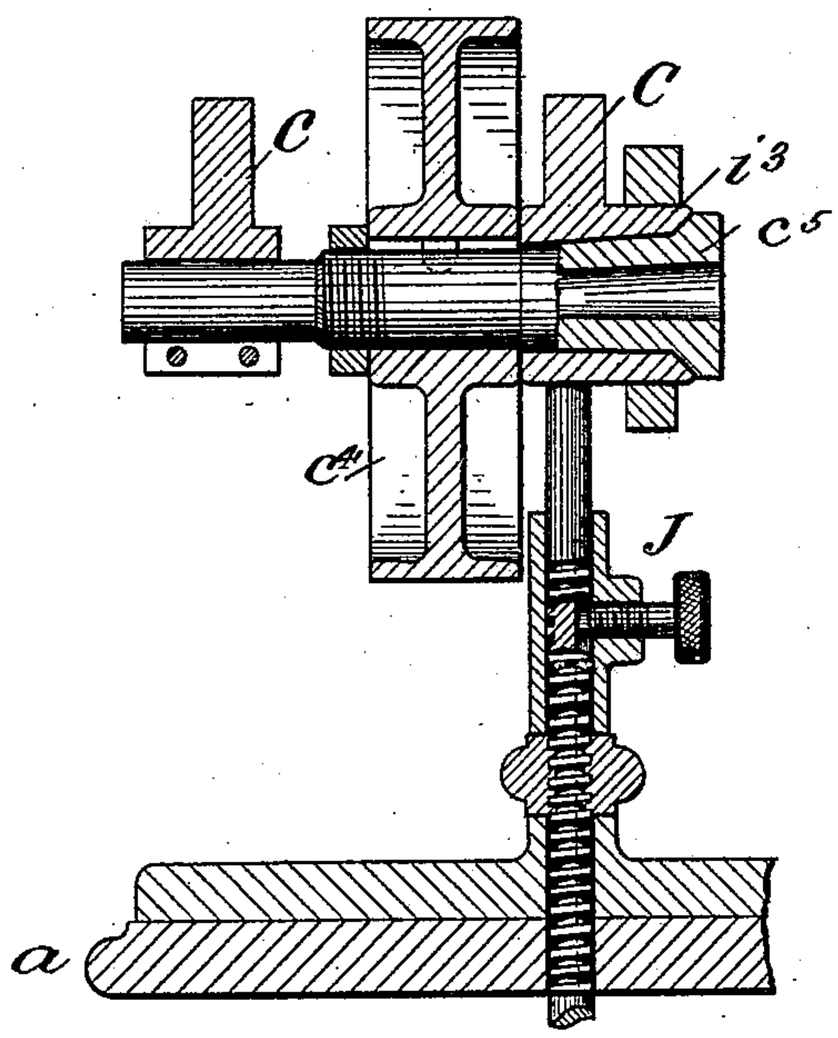


Fig. 7

Fig. 8

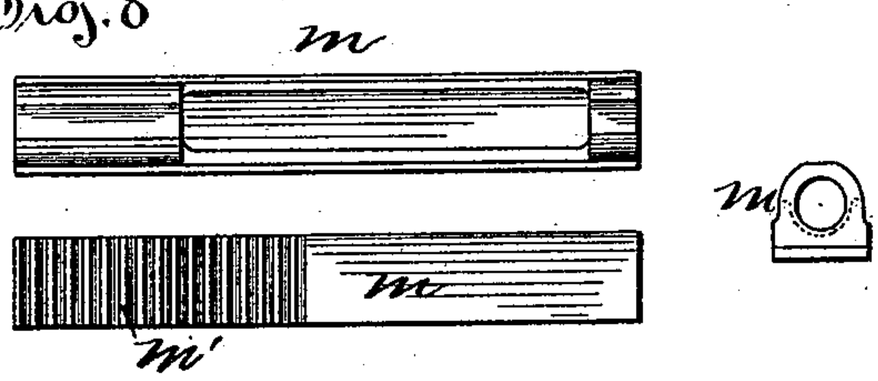
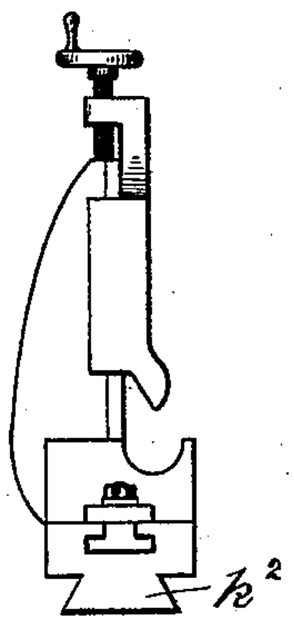


Fig. 9



Witnesses:

A. R. Williams.

A. B. Jenkins.

Inventor,

Moses C. Johnson

by Simonds & Burdett,
attorneys

UNITED STATES PATENT OFFICE.

MOSES C. JOHNSON, OF HARTFORD, CONNECTICUT, ASSIGNOR TO WILLIAM N. WOODRUFF, OF SAME PLACE.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 419,451, dated January 14, 1890.

Application filed December 19, 1888. Serial No. 294,119. (No model.)

To all whom it may concern:

Be it known that I, MOSES C. JOHNSON, of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Milling-Machines, of which the following is a full, clear, and exact description, whereby any one skilled in the art can make and use the same.

The object of my invention is to provide a milling-machine in which the work shall be firmly supported, and in which the action of the cutter shall be indicated at once to the workman in using the machine.

My invention consists in the combination of a swinging cutter-arm pivoted on the same center as the driving-spindle, and a stop device which limits the extent of the downward movement of the cutter-arm.

It further consists in the combination, with the cutter-spindle, of the work-holding carriage having a compound feed.

It further consists in the combination, in a metal-working tool, of a cutting-tool and a work-holding carriage having a positive or screw feed and an independent rack-feed, that may be used together or individually; and it further consists in the combination of the several parts making up the machine, and in details of said parts, as more particularly hereinafter described, and pointed out in the claims.

Referring to the drawings, Figure 1 is a top or plan view of my improved milling-machine. Fig. 2 is a side view, in elevation, of said machine. Fig. 3 is a detail end view of the same. Fig. 4 is a detail view, on enlarged scale, in vertical section through the driving-spindle on plane denoted by line *x x* of Fig. 1. Fig. 5 is a detail view, on enlarged scale, in vertical section through the cutter arm and guides on plane denoted by line *y y* of Fig. 1. Fig. 6 is a detail view, on enlarged scale, in cross-section of the cutter-head on plane denoted by the broken line *z z* in Fig. 1. Fig. 7 is a detail view, on enlarged scale, in vertical lengthwise section of the slide feed device. Fig. 8 is a detail bottom, top, and end view of the sleeve of the feed device. Fig. 9 is a detail view, in elevation, of the tool-holder.

In the accompanying drawings, the letter A denotes the standard of the machine, that is preferably of cast metal made hollow, and thus providing space within the column for the reception of the cutter-head counterpoise. On the top of this standard is supported the work-holding carriage B and the swinging cutter-arm C. This cutter-arm is pivoted at the outer end on the driving-spindle D, that is supported in bearings in the upper ends of the arms E E′, that rise from the bed-plate *a* that forms the top of the standard. The outer end of the cutter-arm C is forked, so as to provide space for the pulley *c′*, that is keyed to the driving-spindle D, that passes through the center of the tubular sleeve F that surrounds this spindle, the forked ends c^2 c^3 of the cutter-arm pivoting on the outer surface of the sleeve and not directly on the driving-spindle D. This sleeve F is in two parts, as shown in Fig. 4 of the drawings, the pulley *c* being keyed to the spindle D, between two parts of the sleeve, that, however, inclose the shaft in the bearings E′. The pulley *c′* is arranged in the plane of the center of the cutter-arm, the other end of which is also forked and supports the pulley c^4 fast to the cutter-spindle c^5, the pulley c^4 being also located in the central plane of the cutter-arm and in what may be termed the "cutter-head," that is broadened and is adapted to slide vertically between the guides or cheek-pieces *g*, that are provided with slots *g′*, through which a clamping-bolt g^2 extends after passing through the cutter-head.

The above-described arrangement of the cutter-arm, driving-spindle, and cutter-spindles allows a considerable movement or play of the cutter toward and from the work without changing the tension on the driving-belt, and the cutter-arm is counterbalanced by means of a weighted lever *h*, pivoted within the standard connected by the chain or band *h′* to an arm h^2, that extends downward from the cutter-arm, the belt or band passing over a pulley h^3, so that the downward pull of the weighted lever will counterbalance the weight of the cutter-arm and the mechanism supported on the cutter-head. On the front edge of one of the guide-pieces *g* is secured a rack *i*, the teeth of which are engaged by

the segmental gear i', borne on the inner end of the lever i^2, that is mounted on a hub i^3, that projects from the side of the cutter-head. By means of the lever i^2 the cutter-head may be lowered and raised, so as to bring the cutter into contact with the work or lifted out of contact. An adjustable stop J is located directly below the cutter-head, in position to be encountered by it in its downward movement, and by this means the extent of downward play of the head is determined.

The work-holding carriage is supported directly on the bed on the top of the standard, and it is made up of a slide k, dovetailed upon the base in the usual manner and supporting a feed-screw k' in the one part, and having a threaded portion passing through a nut in the slide, so as to move the parts supported on the base toward and from the cutter in line with the spindle. The slide k supports another slide k^2, that is dovetailed to slide k, and has a movement across the slide in the plane of the cutter and at right angles to the plane of movement of the slide k. This movement of the slide k^2 on slide k is accomplished by means of a peculiar compound feed device so arranged as to be used as a hand or lever feed, and also as a screw-feed, these two forms of feed devices being capable of use separately or in combination. The details of this feed device are illustrated in Figs. 7 and 8.

The slide k supports the short shaft l, to which is secured a cog-wheel l' and a feed-lever l^2, the teeth of the wheel meshing into a rack m', cut on the under side of the nut m, that slides in a socket that is movable lengthwise along a socket in the upper surface of the slide k. This constitutes the lever-feed, that is one of the two making up what I have called the "compound feed device." The feed-screw n is secured to the carriage k^2 in a manner that allows it to be rotated, but prevents lengthwise movement, and this screw extends underneath the slide and through the nut m. By means of the feed-screw, that may be turned by the handle n', the carriage k^2 is fed back and forth across the top of the slide k, while by means of the lever l^2 the carriage k^2 is given a quicker feed movement in addition to or distinct from the screw-feed. In no instance, however, in the within-described machine-tool, is the work-holding carriage capable of any depthwise movement with relation to the bed of the machine.

The piece to be operated upon by the machine is clamped in any suitable holder that is secured to the slide k^2, and is preferably adjustable along its upper surface, being held in the dovetailed groove, (see Figs. 1 and 7,) and the work, of whatever weight, is firmly held while the cutter is moved to and from the work by means of the feed-lever handle attached to the cutter-head. In this regard the machine sharply differs from prior milling or slotting machines, as in the latter the cutter is held against anything but rotary movement while the work is moved toward and from the cutter or across its path. One advantage of my improvement in this regard is that the operation of the cutter or milling tool can be closely watched and gaged by the operative.

In the operation of the machine the cutter-head may be left free to swing over the full length of the slots in the guides between which the cutter-head moves, or it may be secured at any level by means of the clamp device, and in the latter case the cutter will then make a cut of uniform depth along any piece of work borne on the carriage or slide. The nut m may be left free to move lengthwise in its socket in slide k, except for its engagement with the teeth of the gear-wheel l', or it may be clamped to the slide k, and the screw-feed alone can then be used to move the carriage k^2.

The cutter-spindle has a tapered socket in the end adjacent to the work-holding carriage, so that the cutters may be readily inserted or removed, they being borne on tapered shanks that are adapted to fit the socket in the spindle.

In the form of my invention herein described, and as illustrated in the accompanying drawings, the cutter-arm is mounted so as to swing in a vertical plane; but I do not limit myself to this precise location of the cutter-arm or construction of its movement with reference to the bed of the machine, as the main features of my invention in this regard may be embodied in other forms in machines having a swinging cutter-head moving horizontally or at an angle, and I do not limit myself to the special construction or form of the machine herein described.

I claim as my invention—

1. In combination with a work-holding carriage fixed against vertical movement, a swinging cutter-arm pivoted on the driving-spindle at one end and bearing on the outer end a transverse cutter-spindle, and the within-described cutter-feed device, all substantially as described.

2. In combination with a work-holding carriage or slide fixed against vertical movement, a swinging cutter-arm pivoted on the driving-spindle, a pulley borne on the driving-spindle, a pulley borne on the cutter-spindle in the cutter-head, and the cutter-arm feed device, all substantially as described.

3. In combination with a work-holding carriage or slide fixed against vertical movement, a swinging cutter-arm pivoted on the driving-spindle, a pulley borne on the driving-spindle in the cutter-head, the cutter-arm feed device, and the cutter-arm clamp adapted to hold the latter against swinging movement, all substantially as described.

4. In combination with a work-holding carriage or slide fixed against vertical movement, a swinging cutter-arm pivoted on the

driving-spindle, a pulley borne on the driving-spindle in the cutter-head, the cutter-arm feed device, the cutter-arm clamp adapted to hold the latter against swinging movement, and the stop device, all substantially as described.

5. In combination with a work-holding carriage or slide fixed against vertical movement, a swinging cutter-arm pivoted on the driving-spindle, a pulley borne on the driving-spindle in the cutter-head, the cutter-arm feed device, the cutter-arm clamp adapted to hold the latter against swinging movement, and the adjustable stop, all substantially as described.

6. In combination with the swinging cutter-arm pivoted at one end, the cutter-head bearing the cutter-spindle, the counterpoise connected to the cutter-arm, and the work-holding carriage, all substantially as described.

7. In combination with the work-holding carriage fixed against vertical movement, the within-described lever or hand-feed device, the screw-feed device, the swinging cutter-arm pivoted on the driving-spindle, the counterpoise connected to the cutter-arm, the cutter-head movably held between the guides borne on the base, the cutter-spindle borne in the cutter-head and bearing the pulley, and the cutter-arm feed device, all substantially as described.

8. In combination with the slide k, the shaft l, with cog-wheel l' and feed-lever l^2, the nut-socket across the face of the slide, the nut m, having the rack m', the carriage k^2, mounted on slide k, and the feed-screw n, borne on the carriage, and with its threaded end engaging the nut m, all substantially as described.

9. In a machine-tool of the within-described class, the compound feed device, composed of a part having a socket for a sliding nut and bearing a rotary cog-wheel in mesh with a rack formed on the lower part of the nut, the sliding nut fitting said socket and having lengthwise movement therein, and having the rack in mesh with said wheel, the feed-screw fitting the threaded socket in the nut and held against lengthwise movement in the sliding carriage, supported on the part bearing the segmental nut, all substantially as described.

MOSES C. JOHNSON.

Witnesses:
CHAS. L. BURDETT,
ARTHUR B. JENKINS.