

No. 657,905.

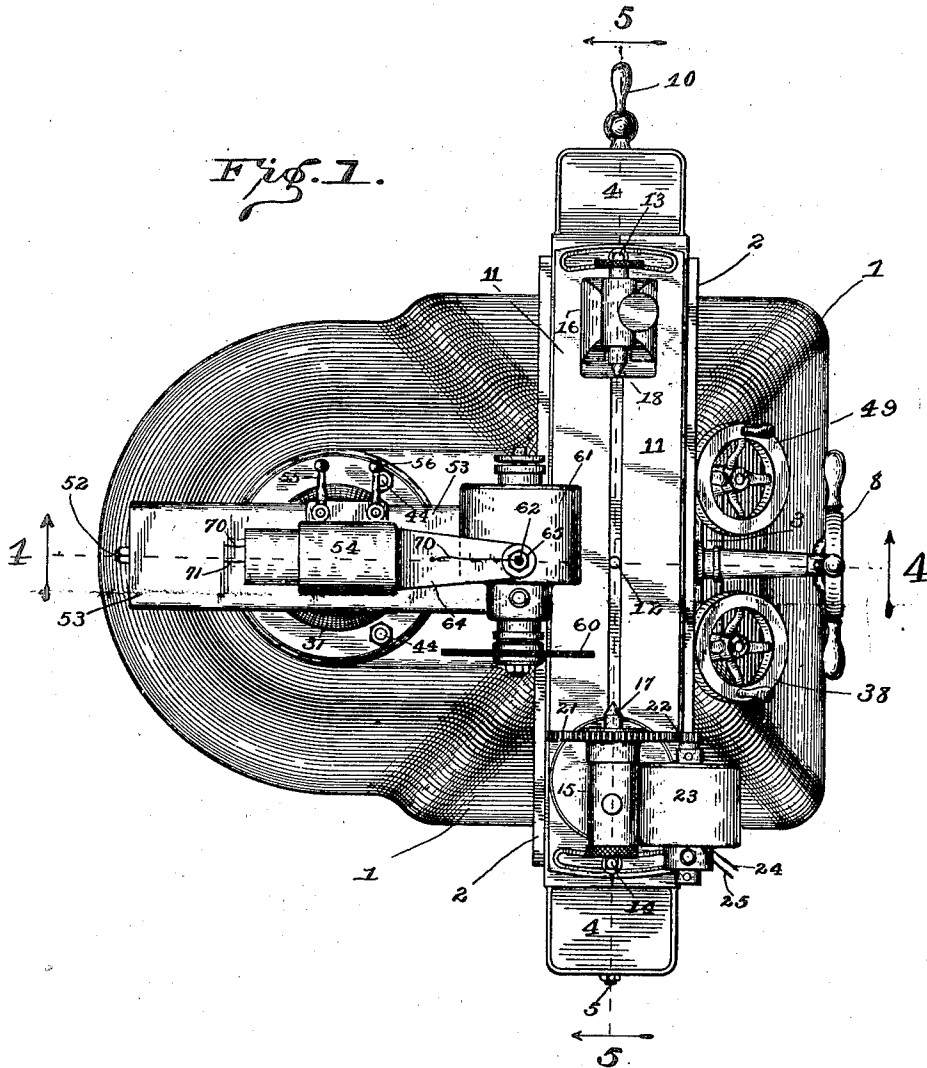
Patented Sept. 11, 1900.

E. S. LEA.
UNIVERSAL GRINDING MACHINE.

(Application filed Jan. 27, 1900.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES:

C. S. Pryor
Jaworski

INVENTOR

Edward S. Lea,
BY *Chester Prindle,*
ATTORNEY.

No. 657,905.

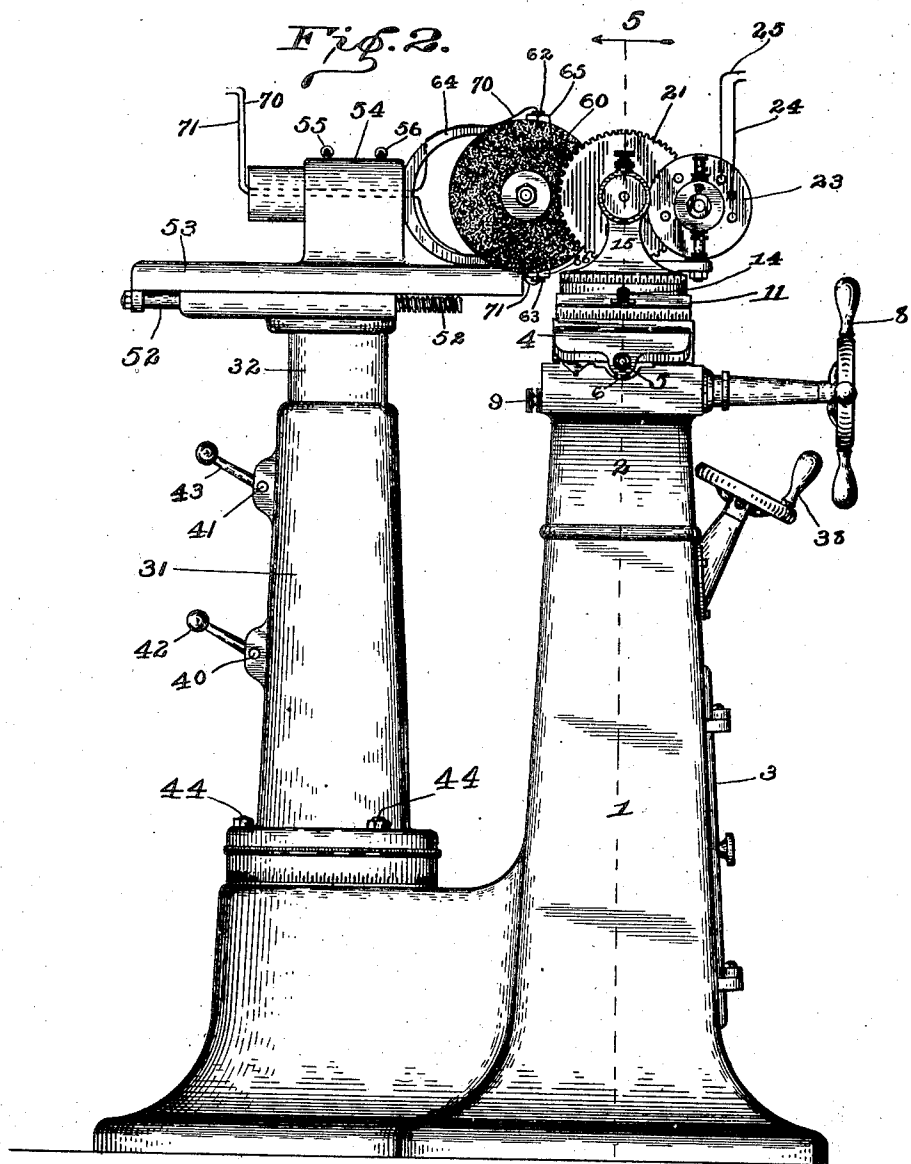
Patented Sept. 11, 1900.

E. S. LEA.
UNIVERSAL GRINDING MACHINE.

(Application filed Jan. 27, 1900.)

(No Model.)

5 Sheets—Sheet 2.



WITNESSES:

C. S. Frye
J. A. Walsh.

INVENTOR

Edward S. Lea,

BY
Chester Bradford,
ATTORNEY.

No. 657,905.

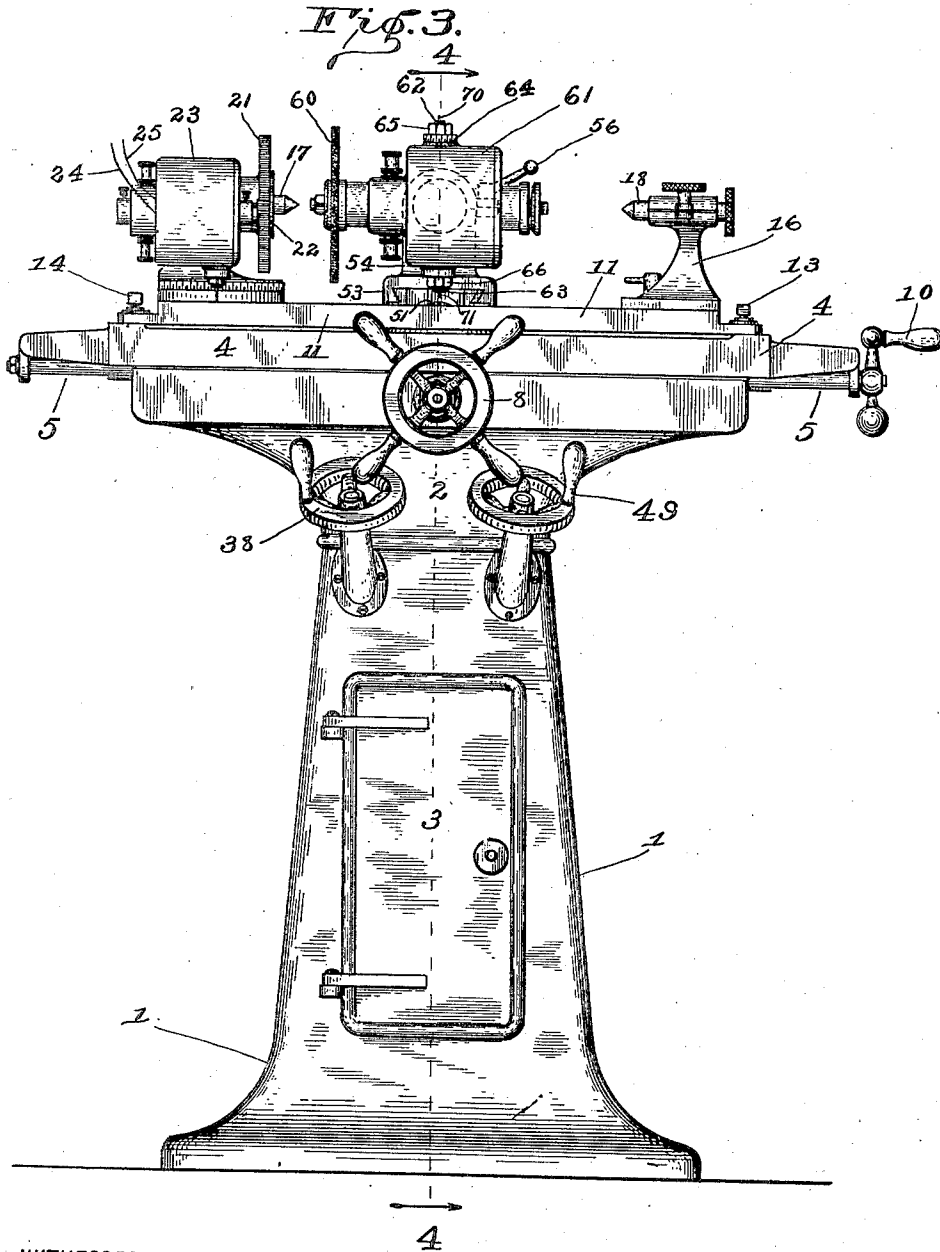
Patented Sept. 11, 1900.

E. S. LEA.
UNIVERSAL GRINDING MACHINE.

(Application filed Jan. 27, 1900.)

(No Model.)

5 Sheets—Sheet 3.



WITNESSES:

C. S. Prye
J. A. Walsh

INVENTOR

Edward S. Lea,

BY

Chester Bradford,
ATTORNEY.

No. 657,905.

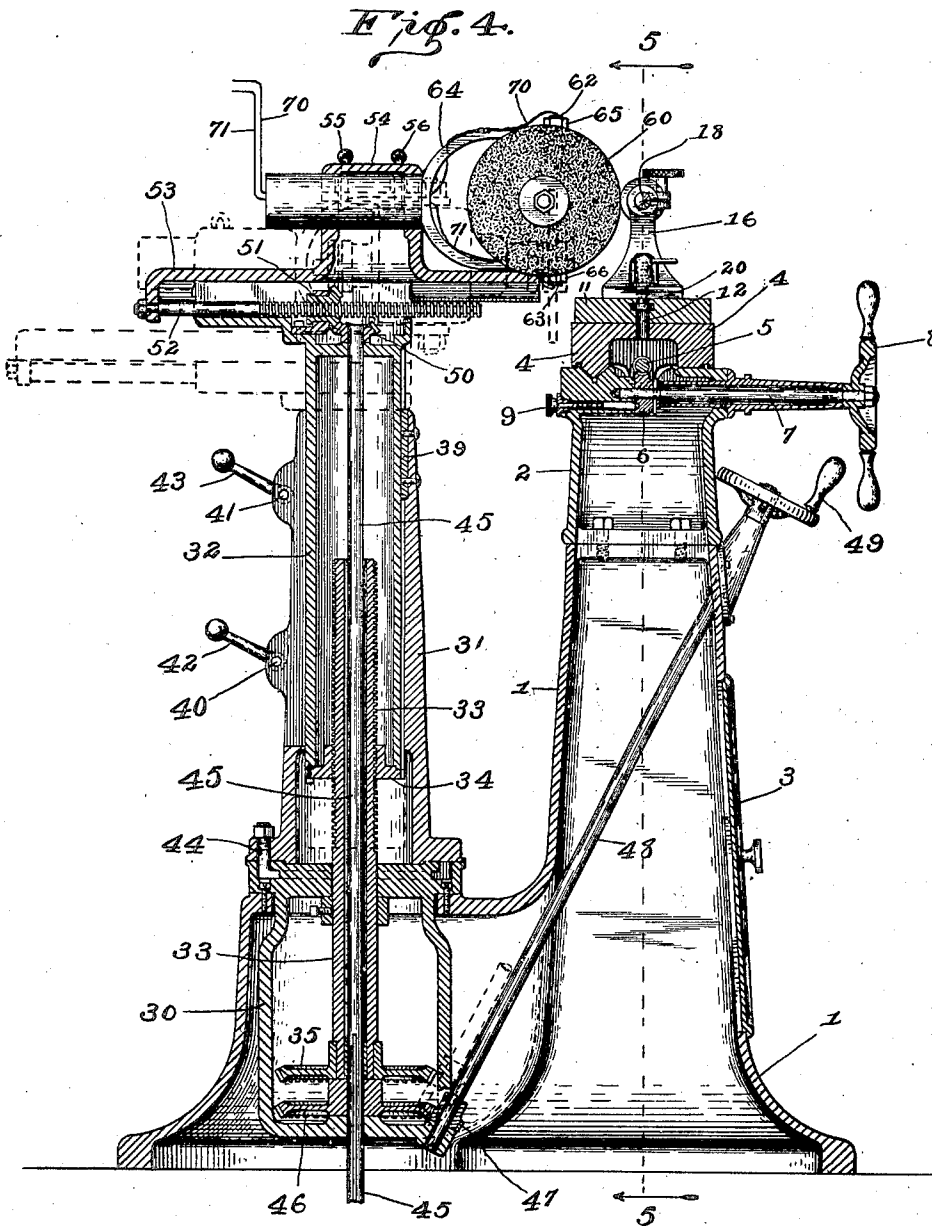
Patented Sept. 11, 1900.

E. S. LEA.
UNIVERSAL GRINDING MACHINE.

(Application filed Jan. 27, 1900.)

(No Model.)

5 Sheets—Sheet 4.



WITNESSES:

C. S. Prye.
J. A. Walsh.

INVENTOR

Edward S. Lea,
BY *Chester Bradford,*
ATTORNEY.

No. 657,905.

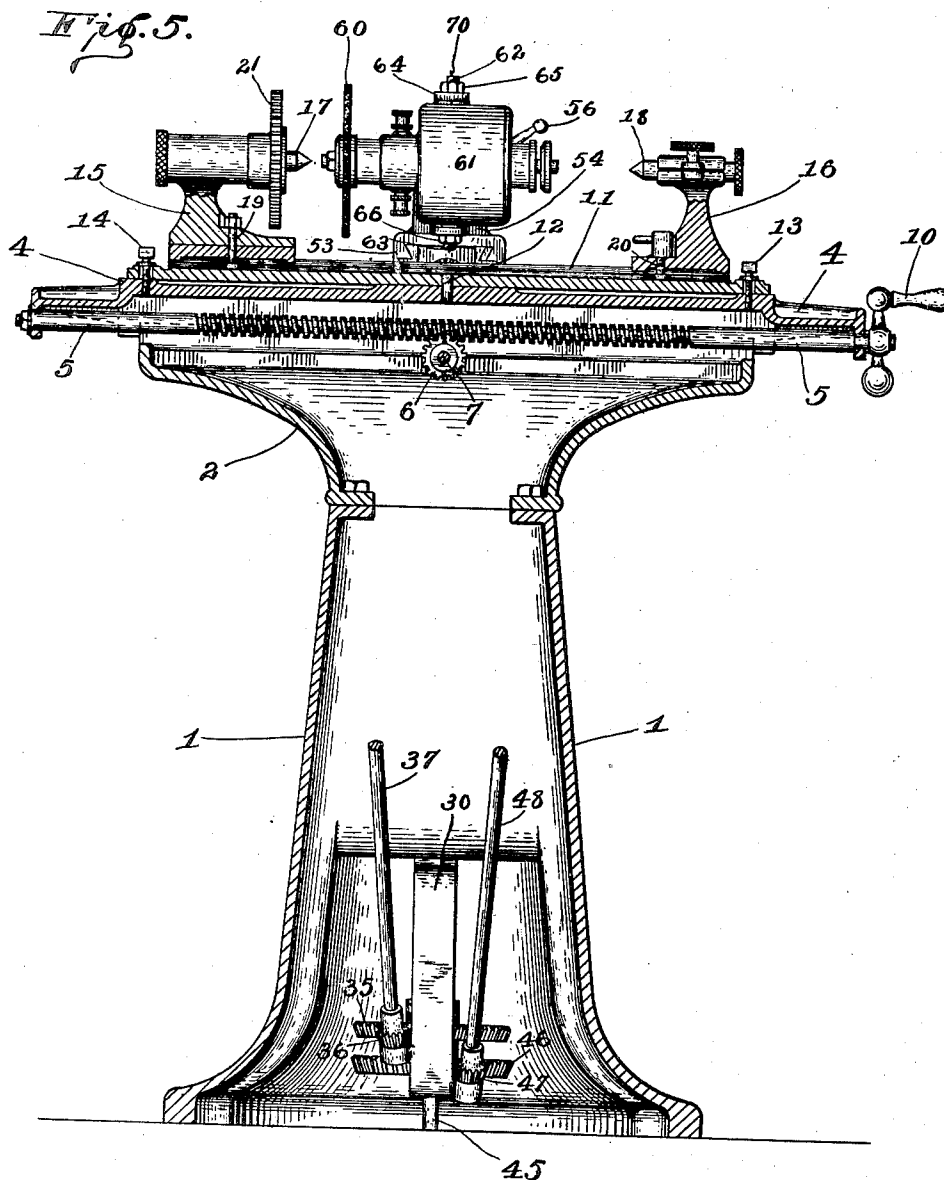
Patented Sept. 11, 1900.

E. S. LEA.
UNIVERSAL GRINDING MACHINE.

(Application filed Jan. 27, 1900.)

(No Model.)

5 Sheets—Sheet 5.



WITNESSES:

C. S. Frye
J. A. Walsh

INVENTOR

Edward S. Lea,

BY

Leicester Bradford,
ATTORNEY.

UNITED STATES PATENT OFFICE.

EDWARD S. LEA, OF ELWOOD, INDIANA, ASSIGNOR TO THE ANDERSON TOOL COMPANY, OF ANDERSON, INDIANA.

UNIVERSAL GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 657,905, dated September 11, 1900.

Application filed January 27, 1900. Serial No. 3,054. (No model.)

To all whom it may concern:

Be it known that I, EDWARD S. LEA, a citizen of the United States, residing at Elwood, in the county of Madison and State of Indiana, have invented certain new and useful improvements in Universal Grinding-Machines, of which the following is a specification.

The object of my invention is to produce a grinding-machine of simple construction adapted to a large variety of work and in which the usual driving-belts, together with the intricate and complicated counter-shaft mechanism incident thereto, shall be wholly dispensed with.

In carrying out my object I provide a machine in which the various parts are adjustable in relation to each other in numerous directions, and I employ as a driving force small independent motors, one of which drives the grinding-wheel and another the work-carrying spindles.

A machine embodying my said invention will be first fully described, and the novel features thereof then pointed out in the claims.

Referring to the accompanying drawings, which are made a part hereof, and on which similar reference characters indicate similar parts, Figure 1 is a top or plan view of a grinding-machine embodying my said invention; Fig. 2, a side elevation thereof; Fig. 3, a front elevation; Fig. 4, a central vertical sectional view as seen when looking in the direction indicated from the dotted lines 4 4 in Figs. 1 and 3; Fig. 5, a vertical central sectional view as seen when looking in the direction indicated by the arrows from the dotted lines 5 5 in Figs. 1, 2, and 4.

As in the case of many machine-tools, a desirable construction for the frame is that of a hollow casting. I therefore provide as the main frame a hollow cast base. The main portion 1 of this base is capable of carrying the other parts. Upon one member thereof is an upper portion 2, upon which the work-carrying devices are directly mounted. A door 3 provides access to the interior of said base. On the upper portion 2 I first mount a carriage 4, which is adapted to be driven longitudinally thereon by means of a long

screw 5, engaging with a screw-pinion 6, the latter of which is mounted on a shaft 7, operated by a hand-wheel 8. A spring locking-pin 9 is mounted in the base-portion 2 in such relation to the pinion 6 that it is adapted to enter a perforation in the side thereof and lock the same from revolving when desired. The long carriage-screw 5 has also a handle 10, by which it may be revolved when desired. By this means I am enabled to drive the carriage back and forth either slowly or rapidly, as I may desire. When the locking-pin 9 is withdrawn, then by rotating the shaft 7 (by means of the hand-wheel 8) the screw 5 and pin 6 become in effect a rack and pinion, and the rack is driven rapidly back and forth by the pinion. When, however, the pinion 6 is locked by means of the pin 9, then it becomes a screw-nut, with which the screw 5 engages, and when said screw is revolved (by means of its handle 10) a slow motion is imparted to the carriage. This adaptability to a fast or a slow motion at will is of great advantage in adapting the machine to various classes of work, as will be obvious to those skilled in the art.

Upon the carriage 4 is mounted a table 11, which is secured to the said carriage at a central point by a pivot-pin 12 and is also fastened to said carriage at the ends by bolts 13 and 14, which pass through segmental slots in said table and enter screw-threaded perforations in said carriage. As will be readily understood, the table when the bolts 13 and 14 are loosened may be shifted on its pivot-pin 12 to any position desired within the limit provided for by the segmental slots, and upon tightening down said bolts 13 and 14 the table will be as firmly secured in any one of its adjusted positions as in any other.

Mounted upon the table 11 are the head-stock 15 and the tail-stock 16, in which are work-carrying spindles 17 and 18, between which the article to be ground is usually secured. There is a T-shaped groove in the upper side of the table 11, extending throughout its length, in which the heads of T-headed bolts 19 and 20 are placed, which bolts pass up through suitable portions of the head-stock and tail-stock, respectively, and by means of which the same are secured in place on said

table. As will be readily understood, by loosening these bolts said head-stock and tail-stock may be moved toward or from each other to any part desired and there securely fastened by retightening said bolts. The head-stock 15 is also rotatable upon a vertical axis coincident with the bolt 19, so that when it is desired to present the work carried by the head-stock to the grinding-wheel at a different angle horizontally it may be done by swinging said head-stock to the desired position on the vertical axis-bolt 19. As indicated in Fig. 3, suitable graduations are provided on the base of the head-stock, by which the point of adjustment may be properly determined. The spindle 17 in the head-stock has a spur-gear 21, and this is driven by a spur-pinion 22 on the armature-shaft of an electric motor 23, which is mounted on the head-stock alongside said spindle. It will therefore be seen that the only driving means connected with anything outside the machine itself are ordinary electric line-wires 24 and 25, which do not need any complicated counter-shaft gearing for their accommodation, but are themselves capable of being easily bent in any direction sufficiently to accommodate the movements to which the head-stock spindle which the motor drives is subjected.

On an offset portion of the base 1 I mount first a gear-carrying case 30 and upon this a hollow standard 31, within which in turn I mount a hollow sleeve 32, the upper end of which develops into a base for the grinder-frame and the mechanism which operates said grinder. Within the gear-case 30 is a hollow shaft 33, the upper portion of which is screw-threaded and engages with a nut 34 on the bottom of the hollow sleeve 32, thus operating to elevate or lower said sleeve 32 and the grinder and other parts carried thereby. Said hollow shaft has upon its lower end a bevel gear-wheel 35, with which a bevel-pinion 36 engages, which pinion is on a shaft 37, which leads up diagonally through the base of the machine to the outside thereof, where it is provided with a hand-wheel 38 within convenient reach of the operator. The hollow standard 31 is provided with a spline 39, which enters a corresponding groove in the other side of the hollow sleeve 32, by which said sleeve is prevented from rotating in said standard. One side of said standard is divided, and through ears alongside of the dividing-slit are clamp-bolts 40 and 41, having suitable handles 42 and 43. By this means the hollow sleeve (when raised or lowered to the desired position) can be clamped rigidly in the standard containing it, so that the two are in effect substantially integral. The standard 31 is held onto the part by which it is carried by clamp-bolts 44, the heads of which enter suitable slots to receive and hold them. By loosening said clamp-bolts 44 said standard may be swiveled around on its vertical axis, thus presenting the grinder mech-

anism at any angle desired. The adjacent edges of the parts held together by these clamp-bolts are provided with suitable graduations, as shown in Fig. 2, whereby the relative positions may be adjustably determined.

Within the hollow shaft 33 is a vertical shaft 45, the lower end of which is key-seated for a considerable distance, and on the beveled gear-wheel 46, through which said shaft passes, is a spine which engages with said key-seat. A pinion 47 engages with the spur gear-wheel 46, and its shaft 48, like the shaft 37, passes up diagonally through the base of the machine to the outside, where it is provided with a handle 49, by which the operator can manipulate it. The splined connection between the shaft 45 and the hub of the gear-wheel 46 permits said shaft to be moved up and down as the hollow sleeve 32 is moved up and down without disengagement. Upon the upper end of the shaft 45 is a bevel-pinion 50, which engages with a bevel-pinion face of a nut 51, mounted on bearings in the grinder-base on the upper end of the hollow sleeve 32. Extending through this nut 51 is a screw 52, which drives the carriage 53, on which the grinder is directly mounted. The operator then by revolving the handle 49 is enabled to move the grinder-carriage and the grinder carried thereby back and forth toward or from himself, as desired, while by revolving the handle 38 he is also enabled to raise or lower the grinder-carriage and grinder.

The grinding or cutting wheel 60 is or may be any ordinary grinder or cutter. It is driven by and preferably mounted directly on the armature-shaft of a suitable motor 61, which in turn is mounted on trunnions 62 and 63 in the arms of a fork-shaped frame 64, and is thus capable of being swung on said trunnions to any angle in relation to its support, that may be desired. The outer ends of said trunnions are screw-threaded and carry nuts 65 and 66, and the forward end of one of the arms of the frame 64 is suitably formed and bears graduation-marks, as shown in Fig. 3, so that the adjustment may be accurately predetermined. The body of the fork-like frame 64 is cylindrical in form and passes through a corresponding perforation in the pillar 54 on the table 53 and is adapted to be clamped therein by clamp-bolts 55 and 56. Said fork-like frame therefore is capable of rotation on a horizontal axis, thus throwing the grinding-wheel into any of numerous other angular positions and adapting it to a multitude of situations and a great variety of work. The line-wires 70 and 71 to this motor pass in through the hollow or cylindrical portion of the fork-like frame and then pass out to suitable connections to the motor at the trunnion supports thereof, as shown especially in Fig. 2, so that said wires do not prevent or interfere with the free movement of said motor in any and every direction desired.

Having thus fully described my said inven-

tion, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a grinding-machine, of a suitable frame, an adjustable work-holding mechanism carried thereon, an independent motor for actuating said work-holding mechanism, mounted on the same frame and adjustable with said work-holding mechanism, an adjustable operating mechanism, and an independent motor for driving said operating mechanism.

2. The combination, in a grinding-machine, with the operating-tool, of a work-carrying apparatus including a longitudinally-movable table, a carriage-driving screw mounted in bearings in said carriage, a shaft arranged transversely to said carriage-driving screw and bearing a worm-pinion, suitable handles on said carriage-driving screw and said shaft, and a locking-pin mounted in the frame and adapted to engage with said pinion, whereby, by means of the same apparatus, either a fast or a slow movement of said carriage may be secured, substantially as shown and described.

3. The combination, in a grinding-machine, with the work-holding mechanism, of a grinder mounted on the shaft of an independent motor, and said motor carrying said grinder mounted to be adjusted on the grinder-supporting frame, substantially as set forth.

4. The combination, in a grinding-machine, with the work-holding mechanism, of a grinding mechanism, an independent electric motor, mounted and capable of being adjustably moved on trunnions and a grinder mounted upon and driven by the armature-shaft of said motor.

5. The combination, in a grinding-machine, with the work-holding mechanism, of a grinding mechanism comprising a carriage, a fork-shaped frame adjustably mounted in said carriage, an electric motor adjustably mounted in said fork-shaped frame, and a grinder driven from the armature-shaft of said motor.

6. The combination, in a grinding-machine, with adjustable work-holding mechanism, of adjustable grinding mechanism comprising a carriage, means for adjusting said carriage horizontally, means for adjusting said carriage vertically, a fork-shaped motor-carrying frame horizontally and revolvably mounted on said carriage, and a motor pivotally

mounted in said fork-shaped frame, and a grinder driven from the shaft of said motor.

7. The combination, in a grinder, of a grinding-mechanism carriage, and means for elevating and lowering the same comprising a hollow standard, a hollow sleeve vertically adjustable in said standard, a hollow screw-shaft for adjusting said sleeve vertically, a gear-wheel on the lower end of said hollow screw-shaft, a pinion engaging with said wheel, a shaft to said pinion running to the front of the machine where it is provided with a handle, a central shaft passing up through said hollow screw-shaft, means for revolving the same, and a connection between said central shaft and the grinder-carrier table whereby the same may be adjusted.

8. The combination, in a grinding-machine, of the main frame, a grinder-carrying frame mounted thereon, adjustable connections between said main frame and the standard on said grinder-carrying frame, and means for rotatably adjusting said standard on said main frame whereby the direction of the grinder may be shifted on a vertical axis, substantially as set forth.

9. The combination, in a grinder, of a main frame, a grinder-table-carrying frame adjustably mounted thereon, means for elevating and lowering the same, and a central shaft passing up through the structure of said grinder-table-carrying frame, a pinion on the upper end of said shaft, a screw-nut mounted in the table and having a toothed face engaging with said pinion, a carriage-driving screw operated by said nut, a gear-wheel near the lower end of the vertical shaft and connected thereto by a spline entering a long keyway in said shaft, a pinion engaging with said wheel, and a shaft running thence to the front of the machine where it is provided with a handle, whereby the grinder-carrier table may be adjusted horizontally by the same mechanism irrespective of the vertical adjustment, substantially as set forth.

In witness whereof I have hereunto set my hand and seal, at Elwood, Indiana, this 20th day of January, A. D. 1900.

EDWARD S. LEA. [L. S.]

Witnesses:

JACOB LOOMIS,
ALBERT L. HOPPER.