No. 626,436. Patented June 6, 1899.

E. MILLS.

GRINDING MACHINE.

(Application filed Nov. 30, 1898.)

(No Model.) 7 Sheets—Sheet 1.

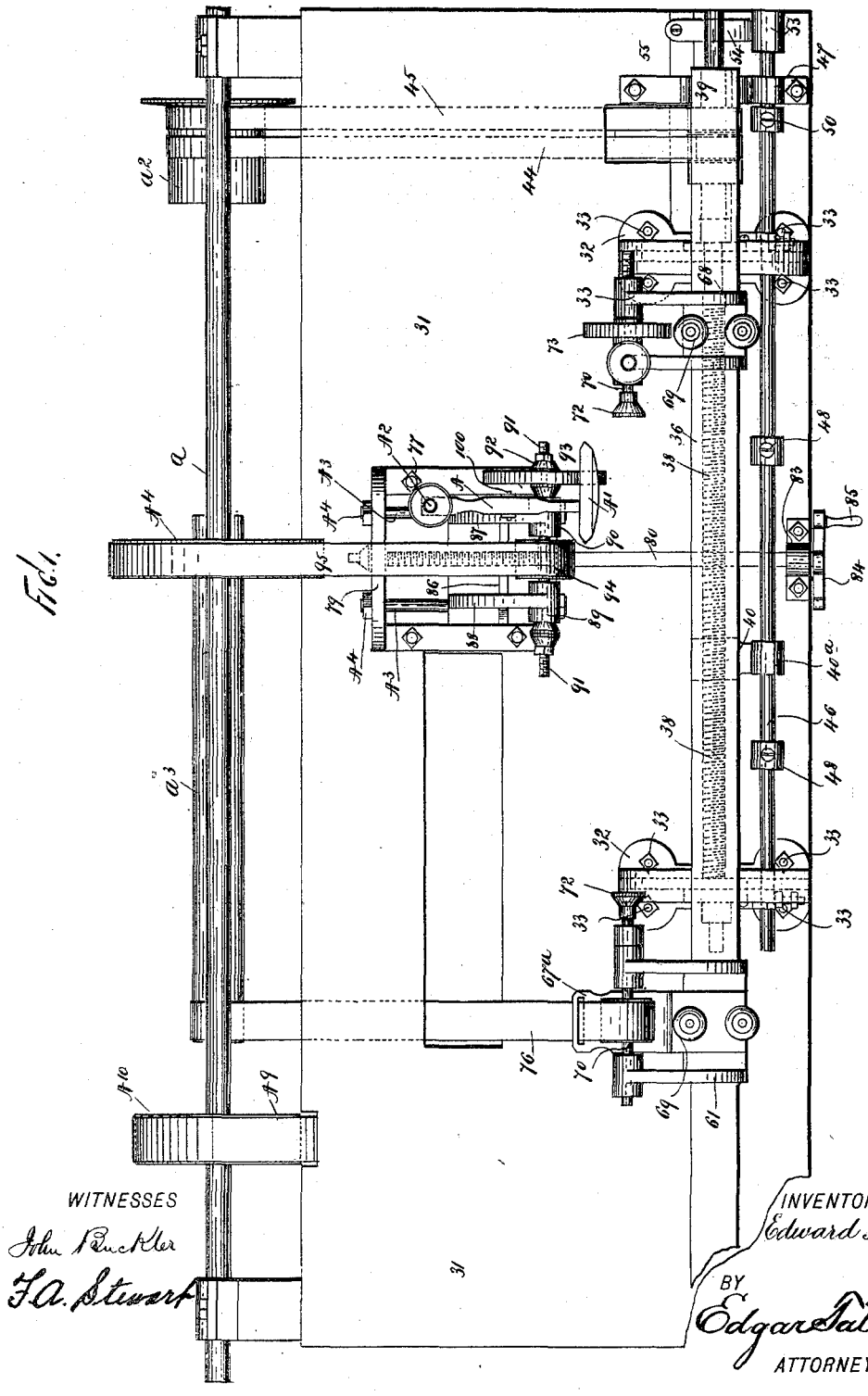

FIG. 1.

WITNESSES

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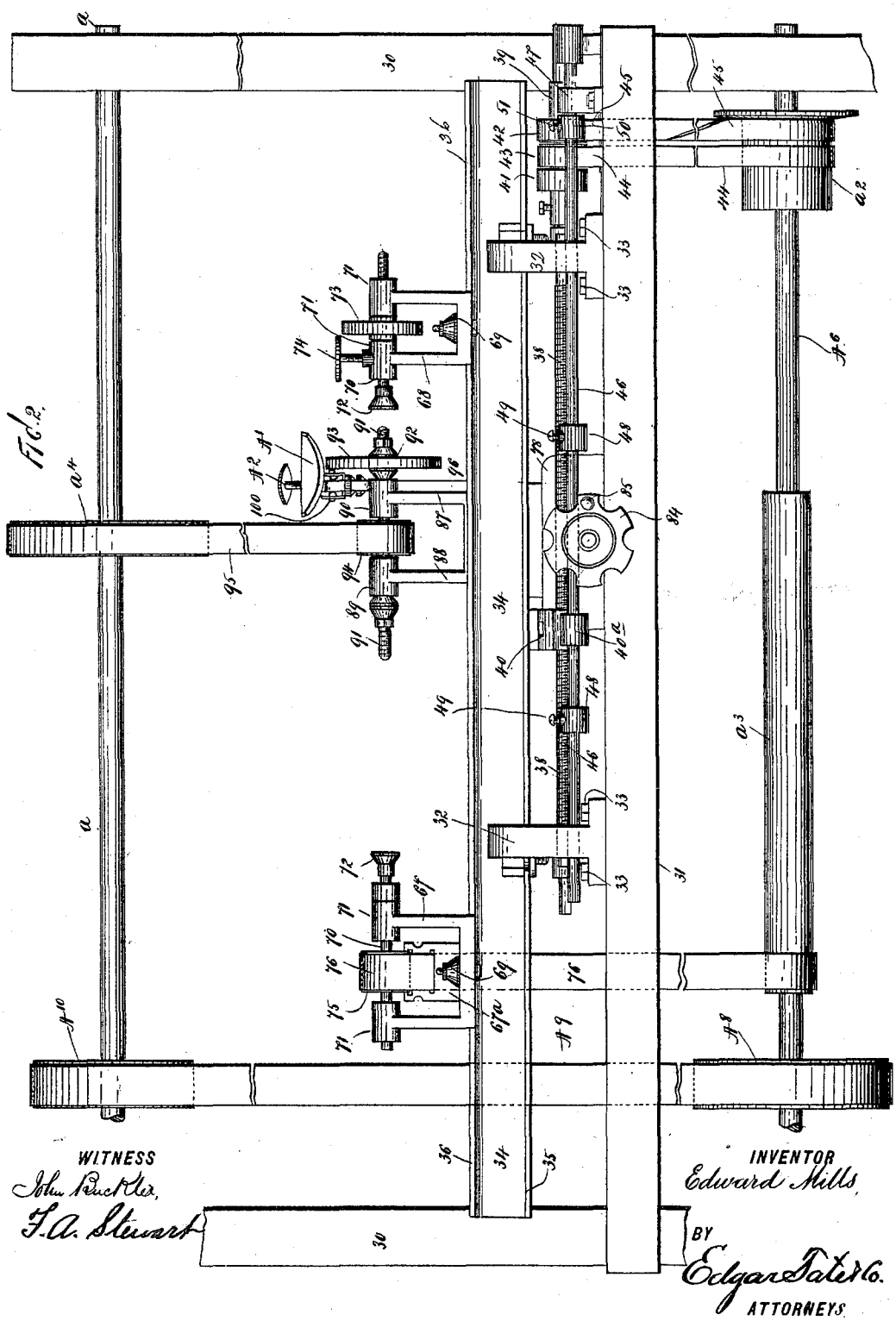

Fig. 2.

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Fig. 3.

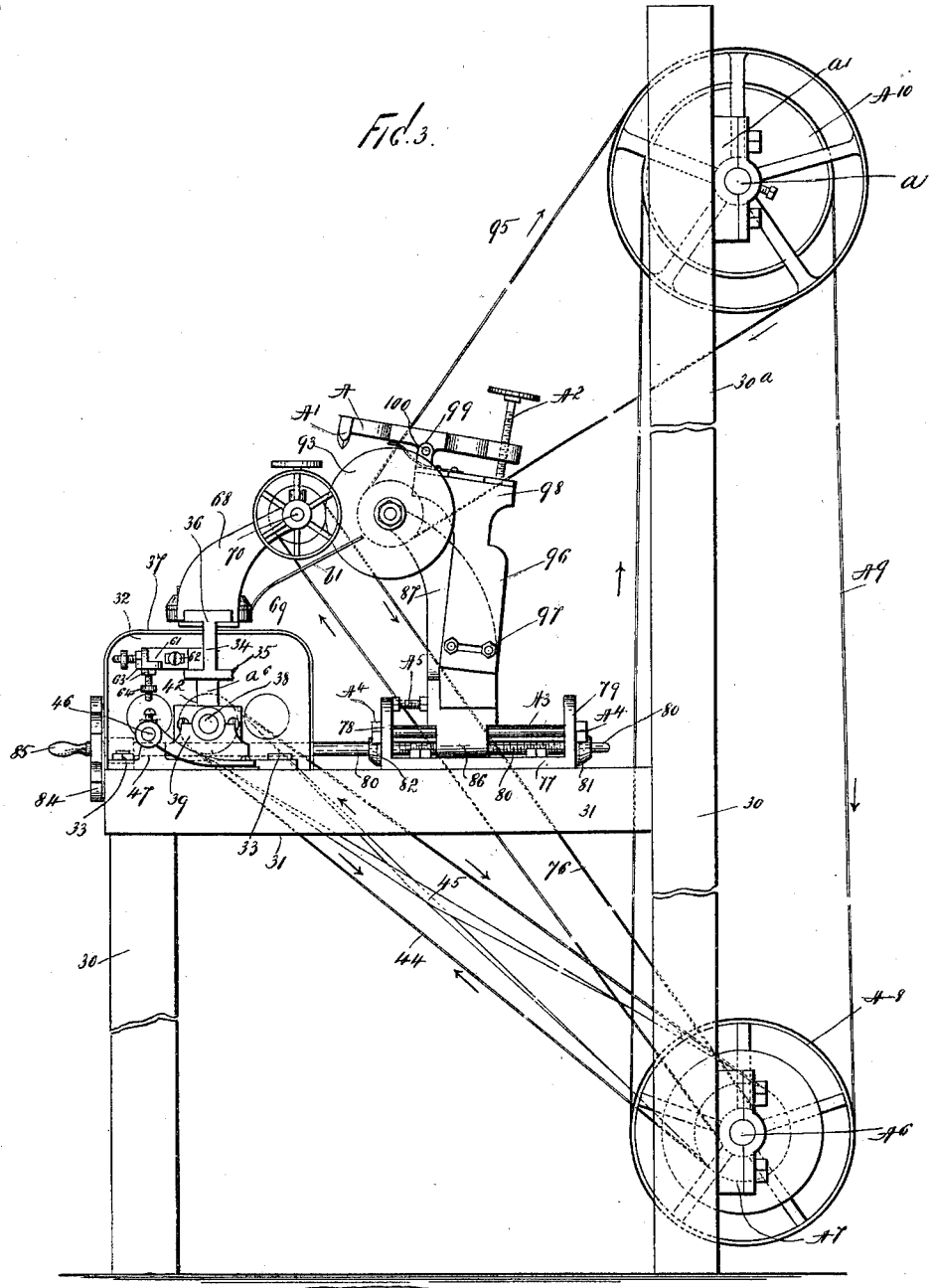
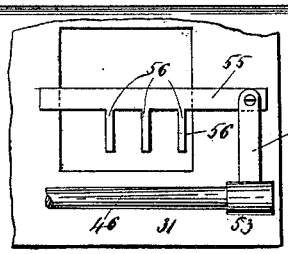


Fig. 4.



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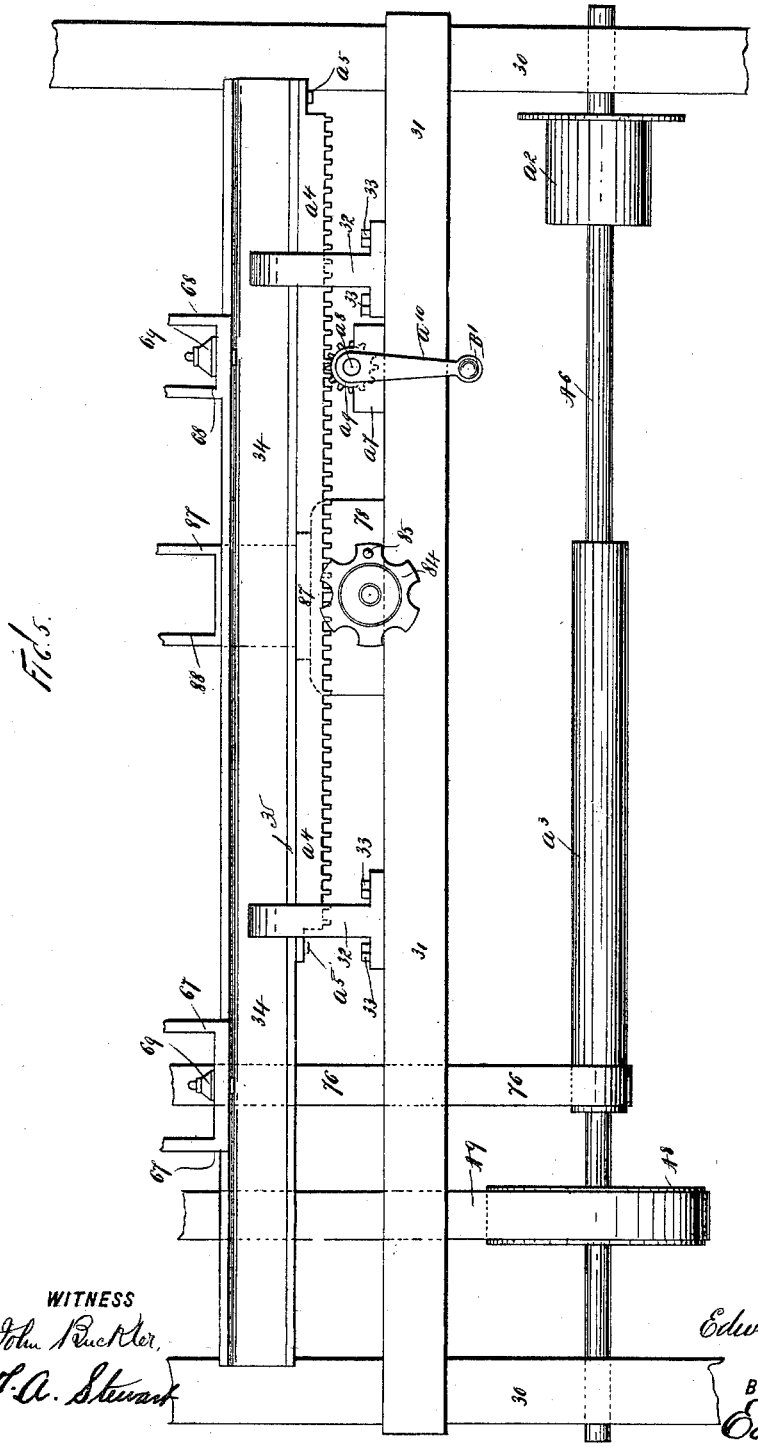

Fig. 5.

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Fig. 6.

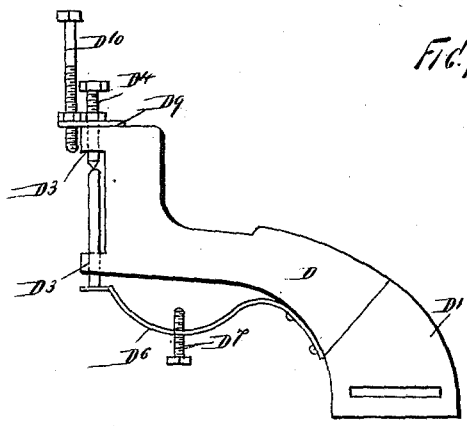


Fig. 7.

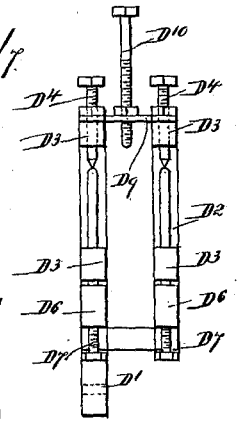


Fig. 8.

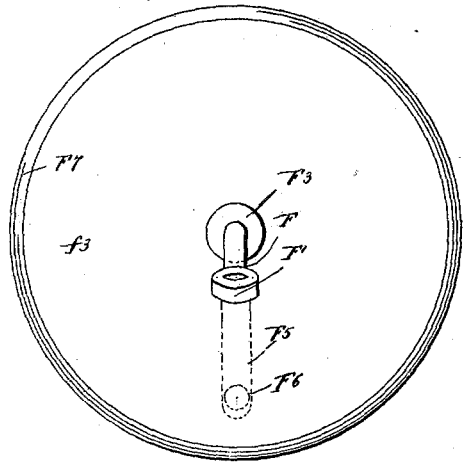


Fig. 9.

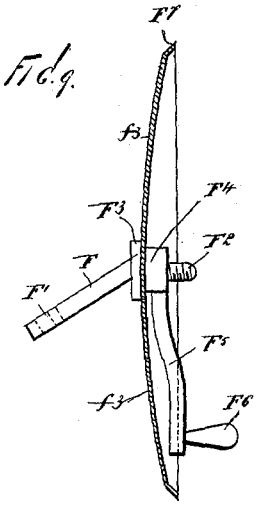
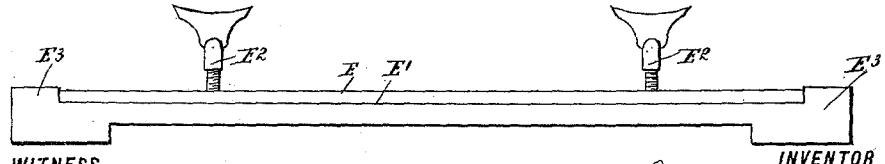


Fig. 10.



WITNESS

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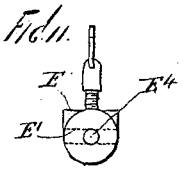
F. A. Stewart.

Fig. 11.



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GRINDING MACHINE.

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(No Model.) 7 Sheets—Sheet 6.

FIG. 12.

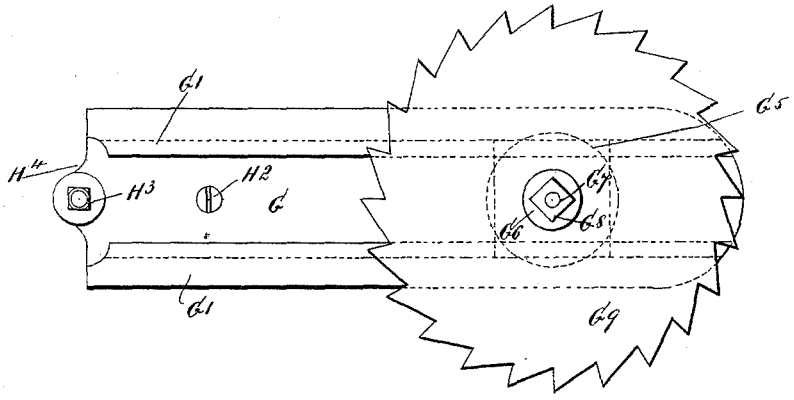

FIG. 13.

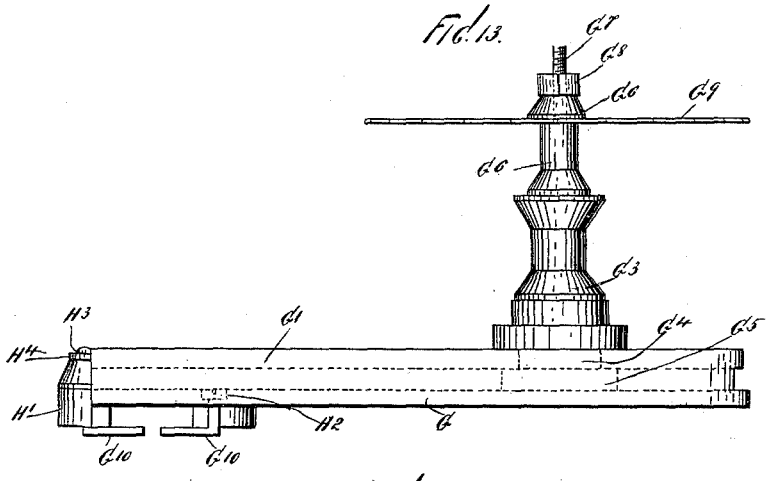

FIG. 14.

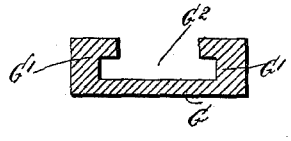

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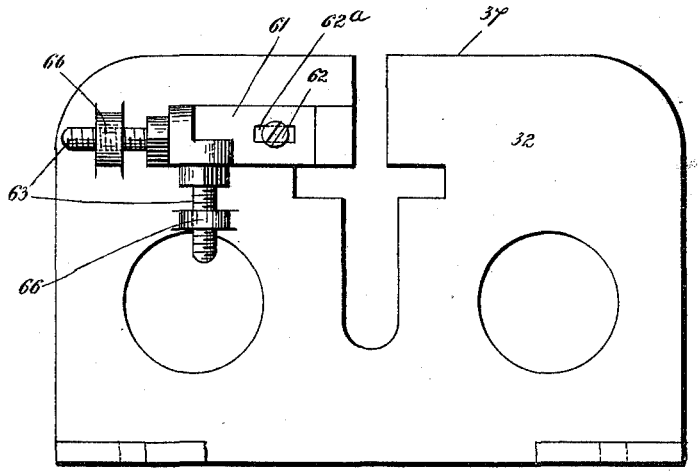
FIG. 15.



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UNITED STATES PATENT OFFICE.

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GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 626,436, dated June 6, 1899.

Application filed November 30, 1898. Serial No. 697,835. (No model.)

To all whom it may concern:

Be it known that I, EDWARD MILLS, a citizen of the United States, residing at Jacksonville, in the county of Morgan and State of Illinois, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a full and complete specification, such as will enable those skilled in the art to which it appertains to make and use the same.

This invention relates to grinding-machines, and has for its object to provide a machine of this class which shall automatically move the object to be ground toward the emery-wheel, and shall also embody means for holding or adjusting the object to be ground in proper position with respect to the emery-wheel, and shall also possess many other advantages over machines of this class as usually constructed; and with these and other objects in view the invention consists in the construction, combination, and arrangement of parts hereinafter described and claimed.

Reference is had to the accompanying drawings, forming part of this specification, in which like letters and numerals of reference refer to like parts, and in which—

Figure 1 is a plan view of the grinding-machine; Fig. 2, a front elevation thereof. Fig. 3 is a right end elevation thereof. Fig. 4 is a detail of the belt-shift. Fig. 5 is a front elevation of the grinding-machine, illustrating a substitute method of operating the lathe-bed of the machine by hand. Fig. 6 is a side elevation of an attachment termed an "adjustable beveler." Fig. 7 is a front end elevation thereof. Fig. 8 is an elevation of an attachment for holding disk harrows while grinding the same, showing the harrow in position. Fig. 9 is a side view thereof. Fig. 10 is a view of an attachment for holding sawblades while grinding the same; Fig. 11, an end view thereof. Fig. 12 is a plan view of an attachment for holding disk saws while grinding or gumming the same. Fig. 13 is an elevation thereof. Fig. 14 is a cross-sectional view of the supporting-arm thereof; and Fig. 15, a side elevation, on an enlarged scale, of a detail of the main construction.

Referring more particularly to the drawings, 30 is the frame of the grinding-machine, which has a bed-plate 31. Standards or rests 32 are secured to the bed-plate 31 by bolts 33, and said standards 32 are cut away to fit the cross-section of a T-rail-shaped lathe-bed 34, the flat base 35 of which rests horizontally therein and the flat upper flange or portion 36 of which lies above the upper surface 37 of the standard 32 and may bear operatively thereon, if desired. The lathe-bed 34 may be composed of a steel I-beam, which will be much cheaper than the ordinary lathe-bed. Mounted below the lathe-bed 34 is a screw-shaft 38, which is journaled in a suitable block 39, suitably secured to the bed-plate 31 at one end of the machine and at the other end in a standard 32 and passed through an opening in the other standard 32 and is preferably only threaded between said standards 32. A follower 40, mounted on the screw-shaft 38, is formed integral with or otherwise secured to the lathe-bed 34, and upon the revolution of the screw-shaft advances or returns the lathe-bed 34, according to the direction or revolution of the screw-shaft 38.

The screw-shaft 38 is provided with two loose pulleys 41 and 42, mounted on said screw-shaft 38, at the same end thereof as the journal-block 39 of the screw-shaft 38, and between said journal-block and the standard 32, adjacent and intermediate of said pulleys 41 and 42, is a fixed pulley 43, mounted in the same shaft and by which it is revolved. Two belts 44 and 45 run from a pulley on a main power-shaft A^6, hereinafter described, and pass over the fixed pulley 43 and the loose pulley 42, and said belt 45 is crossed reversely in its direction of motion in connection with its respective pulley on screw-shaft 38. The belts 44 and 45 pass through an opening in the bed-plate 31. It is evident that if the belts 44 and 45 are both moved inwardly on the machine, so as to bring the crossed belt 45 onto the fixed pulley 43 and the direct belt 44 onto the loose pulley 41, the direction of revolution of the screw-shaft 38 will be reversed. The belt-shift employed to operate these belts as above described is as follows:

Parallel to the screw-shaft 38, above the

bed-plate 31, is mounted a belt-shift rod 46, passing slidably through the standards 32 and the standard 47, properly secured to the bed-plate 31, so as to be capable of reciprocating longitudinally of the machine. The follower 40, which is secured to the lathe-bed 34 and through a threaded bore in which passes the screw-shaft 38, is provided with a cylindrical head 40^a, through which the belt-shift rod 46 passes approximately at the central portion of the machine. Collars 48 are mounted loosely upon the belt-shift rod 46 and have binding-screws 49, adapted to fix them to said belt-shift rod 46 at predetermined points intermediate of the standards 32, and the collars 48 operate as stops and are adjusted along the belt-shift rod 46 according to the amount of reciprocation it is desired that the lathe-bed 34 shall have.

A collar 50, similar to the collars 48, is mounted upon the belt-shift rod 46 between the standard 47 and the standard 32 in proximity thereto. The collar 50 is adapted to be adjusted along and secured to the belt-shift rod 46 similarly to the collar 48, and the object thereof is to lock the belt-shift rod 46 when in position of extreme reciprocation against one of said standards 47 and 32.

When the follower 40 strikes one of the collars 48, it moves the belt-shift rod 46 accordingly and shifts the belts 44 and 45 as follows: Upon the end of the belt-shift rod 46, at the end of the machine which supports the belts 44 and 45, is fixed a collar 53, which bears integrally an arm 54, extending rearwardly and engaging a sliding plate 55, mounted in the bed-plate 31, which is broken away to allow of the passage upward of the belts 44 and 45, and at said broken-away portion of the bed-plate the plate 55 is provided with the belt-guide rods 56, which surround the belts 44 and 45 in proximity to the pulleys 41, 42, and 43 and above the bed-plate 31 and shift the belts 44 and 45 on movement of the belt-shift rod 46, as described. This is shown in Fig. 4. A wedge 61 bears against the lathe-bed 34 at each end of the machine and adjacent to the standards 32, and said wedge-block is designed to adjust the lathe-bed in the standards 32 and is pivotally secured thereto by means of an adjusting-screw 62, which operates within an elongated slot 62^a in the said block 61. The latter block bears against the side and bottom flange 35 of the lathe-bed 34. Adjusting-screws 63, passing through threaded lugs on the standards 32 66, bear against the wedge-blocks 61. By means of these screws the lathe-bed may be adjusted vertically and laterally as the bearing-surface of the standards 32 wear away. A head-block $^a67$ and a tail-block 68 are secured to the upper flat portion 36 of the lathe-bed 34 by clamping screw-plates and screws 69 in any desired manner and project therefrom rearwardly and upwardly, and said head and tail blocks have the main shaft 70 journaled in the heads 71 thereof and bearing the bell-chucks 72, adapted to hold the shaft or other article to be ground and particularly adapted to holding shafts. The tail-block 68 has a hand-wheel 73 keyed to the shaft 70 thereof, the heads 71 being separated to receive the same. A set-screw 74 also passes through the upper portion of one of the heads 71 of the tail-block 68 and is intended to bind the shaft 70 thereof.

The head-block 67 bears a pulley 75, keyed to the shaft 70, the heads 71 thereof being separated to receive said pulley, and a belt 76 passes operatively about said pulley 75 through a guide-plate 67^a, secured to the head-block 67, and through an opening in the bed-plate 31 and is run by the main shaft A^6 of the machine, as hereinafter described. By the clamping screw-plate and screws 69 the blocks 67 and 68 may be secured in any desired relative position on the lathe-bed 31.

Rearwardly of the lathe-bed 34 is mounted upon the bed-plate 31 a frame 77, having a front member 78 and rear member 79, and through said front and rear members passes a screw-shaft 80, suitably journaled therein, as at 81 and 82, and extending above the bed-plate 31 to the front edge portion thereof, where it is again journaled in a block 83, as shown in Figs. 1 and 3, and the end thereof extends beyond the front edge portion of the bed-plate and bears an operating-wheel 84, having a suitable handle 85, and said screw-shaft is threaded only between the frame members 78 and 79.

A base-block 86, bored and threaded to fit the thread of the screw-shaft 80, is mounted in said frame 77, and the screw-shaft 80 passes through the threaded bore thereof. The base-block 86 supports two vertical standards 87 and 88, which are curved forwardly of the machine and have heads 89 and 90, through which passes a shaft 91, suitably journaled therein, and the shaft 91 is provided with an emery-wheel 93, having a hub 92.

The shaft 91 is provided at an end thereof intermediately of the standards 87 and 88 with a fixed pulley 94, about which passes operatively a belt 95, which is run by the main power-shaft, as hereinafter described.

Upon the outer side of the standard 87 is secured a bevel-tool standard 96, pivotally adjustable by means of adjusting-screws 97, which bind the lower end thereof to the standard 87 at the required angle, thus allowing of moving the upper end portion 98 of said standard 96 forward and backward, as desired, and a lug or projection 99 thereon is bored and fitted with a pin 100, to which the arm A is pivoted, and said arm A bears a beveled head A′, which is adapted to be swung into position adjacent to the emery-wheel 93 and guide the article which it is desired to bevel-grind.

An adjusting-screw A^2 passes through a threaded opening in the rear end portion of the arm A and the lower end thereof is swiveled in the upper portion 98 of the standard 96, and by turning the adjusting-screw A^2 the

head A′ of the arm A may be raised or depressed. The head A′ is preferably broad and knife-edged throughout the beveled portion. A stiff band-spring b' is secured to the lathe-bed 34 and also aids in holding the article to be ground to the emery-wheel.

Between the frame members 78 and 79 (best seen in Fig. 3) extend fixed rods or shafts A^3, secured to said frame member by nuts, as at A^4, and the shafts A^3 pass through the base-block 86 of the standards 87 and 88 and in a longitudinal plane above the screw-shaft 80, and the shafts A^3 are designed to guide the base-block 86 in its forward and rearward motions, caused by the revolution of the screw-shaft 80.

An adjusting-screw A^5 is adapted to be screwed into the base-block 86 and abuts against the frame member 78 on the forward movement of said base-block and may be adjusted to regulate the exact amount of forward movement of said base-block and emery-wheel to bring the arm A into the desired position with relation to the lathe-bed 34.

The driving-gear for this machine comprises a main shaft A^6, which may be actuated by any preferred source of power and which is journaled in blocks A^7 at either end of the frame 30 and at the rear thereof below the bed-plate 31 and extends from end to end of the machine. It bears a fixed pulley A^8 at the left-hand end of the machine, as shown in Fig. 2, and around the pulley A^8 passes a belt A^9, which revolves a fixed pulley A^{10}, mounted on an auxiliary shaft a parallel to and above the main shaft A^6 and similarly mounted, being journaled in blocks a', secured to the frame of the machine on upright members 30^a thereof at the rear of the bed-plate 31. The shaft A^6 bears at the right-hand end, as shown in Fig. 2, a broad fixed pulley a^2, and the belts 44 and 45 are passed about the pulley and operate the screw-shaft 38, as described. Another broad pulley a^3 is fixed to the shaft A^6 and is approximately as broad as the range of the path of reciprocation of a given point on the lathe-bed 34. The belt 76 passes around the pulley a^3 and drives the head-block shaft 70, as described, and the breadth of the pulley a^3 allows of the revolution of said shaft 70 during any stage of movement of the head-block 67. A pulley a^4 is fixed to the shaft a in the same vertical plane as the pulley 94 on the shaft 91, and around it passes the belt 95, operating said shaft 91, as described.

Any suitable belt-shifts desired may be included in the above-described driving-gear; but I have described such a construction as will provide for the operation of all of the moving parts upon the revolution of the main shaft A^6.

Fig. 5 shows an alternative means for operating the lathe-bed 34 to do away with the screw-shaft 38, the belt-shift apparatus, and the belts 44 and 45, and which allows of reciprocating the article to be ground by hand. A toothed rack a^4 is secured to the under flat portion 35 of the lathe-bed 34 by screws a^5 or any other desired device and is adapted to pass through slots a^6 in the standards 32. A block a^7 is secured to the bed-plate 31, and a crank-shaft a^8 is suitably journaled therein, extending rearwardly of the bed-plate 31 and at the front edge thereof at one side of the operating-wheel 84. The crank-shaft a^8 bears a pinion or gear-wheel a^9, fixed thereto adjacent of the block a^7, and the pinion a^9 operates in connection with the toothed rack a^4. The crank-shaft a^8 has a fixed crank a^{10} and handle B′ forward of the bed-plate 31 and adapted to turn the pinion a^9 to reciprocate the toothed rack a^4 and the lathe-bed 34.

The operation of the machine will be readily understood from the foregoing description when taken in connection with the accompanying drawings and the following statement thereof.

Referring to Figs. 2 and 3, the article to be ground is placed between the head-blocks 67 and tail-block 68, being supported by the chucks or other devices, bell-chucks 72 being shown in the drawings and adapted to hold lawn-mower shafts and other tools not having countersunk centers. The belt 76, which revolves the shaft 70 of the head-block 67, is only used when grinding shafts and other implements requiring revolution during the grinding. When the article to be ground is properly fixed between the head and tail blocks 67 and 68, said blocks having been relatively adjusted by the clamping screw-plates 69, the collars 48 on the belt-shift rod are adjusted along said rod to allow of the desired reciprocation of the lathe-bed 34, as described, and the bevel-head A′ (shown in Fig. 2) is brought down over the article to be ground, pressing it closely into contact with the emery-wheel 93. This latter operation is performed, as will be seen by reference to Fig. 3, by first adjusting the screw A^5 to move the base-block 86 to proper position in the frame 77, 78, and 79, and thus regulating the position of the emery-wheel 93 and the bevel-head A′ with respect to the article to be ground. The handle 85 on the screw-shaft 80 is also revolved to the same effect, and where it is necessary to move the emery-wheel 93 backwardly to fit the article in place to be ground the handle 85 is alone operated to that end. The adjusting-screw 97 is adjusted to swing the standard 96 forward or backward, as desired, and the adjusting-screw A^2 is adjusted through the arm A to bring the beveled head A′ tightly down upon the article to be ground. The main power-shaft A^6 is then put in motion by any clutch mechanism desired (not shown) and the belts and pulleys connected therewith start into operation as follows: The direct-running belt 44, passing over the fixed pulley 43, imparts motion to the screw-shaft 38, turning it in the direction indicated by the arrow in Fig. 3. The reverse-running belt 45 turns the loose

pulley 42 and does not affect the screw-shaft 38, the main power-shaft A^6 running in the direction indicated by the arrow on the pulley A^8 in Fig. 8, and arrows indicate in Fig. 3 the direction of motion of the other belts and pulleys. The screw-shaft revolving as indicated carries the follower 40 from right to left of the machine, as shown in Fig. 2, and carries the lathe-bed 34 and the head and tail blocks 67 and 68, secured thereto, in the same direction, moving the article to be ground before the emery-wheel 93. The emery-wheel 93 is revolved by the belt 95, and the shaft 70 of the head-blocks 67 may be revolved, if desired, by the belt 86, which will travel the broad pulley a^3 on the main shaft A^6. When the lathe-bed has traveled from right to left, as shown in Fig. 2, such a distance as will bring the head 40^a of the follower against the left-hand collar 48, the belt-shift rod 46 will be thrown to the left and the belt-guide rods 56 (shown in Fig. 4) will draw the belts 44 and 45 to the left, bringing them respectively about the pulleys 41 and 43, the direct-running belt 44 now turning the loose pulley 41 and the reverse-running belt 45 turning the fixed pulley 43. The direction of revolution of the screw-shaft 38 will then be reversed and the lathe-bed 34 will travel from left to right, as shown in Fig. 2, until the head 40^a of the follower 40 strikes the right-hand collar 48 and shifts the belts 44 and 45, as before described. The article to be ground will thus be reciprocated automatically before and in grinding contact with the revolving emery-wheel 93.

In Fig. 6 is shown an attachment D, which is termed an "adjustable beveler" and is secured to the emery-wheel standard 87 by the adjusting-screws 97 in the place of the bevel-grinder standard 96 as the latter is shown in Fig. 3. The adjustable beveler is designed to take the place of the bevel-tool, as hereinbefore described, and the construction of the standard D′ thereof is similar to that of the bevel-grinder standard 96, excepting that it bears at the upper forward end a supplemental member D^2, (shown in Fig. 7,) which, as well as the standard D′, is fitted with lugs or projections D^3 in the upper and lower portion of the upper forward end thereof, which are bored to receive adjusting-screws D^4 in the upper lugs D^3. The lower lugs D^3 of the standard D′ are smooth-bored and have adjusting-pins D^5 passed therethrough, as shown in Fig. 6, which are upwardly pressed by springs D^6, secured to the lower curves of the standards D′ and D^2 and having adjusting-screws D^7 passing therethrough and adapted to press against the standards D′ and D^2 to regulate the pressure of the springs D^6. The supplemental member D^2 is adapted to extend on one side of the emery-wheel 93 and the standard D′ on the other and is secured to the standard D′ by an arm D^8.

A plate D^9 (shown in Fig. 7) is secured to the tops of the standards D′ and D^2 by the adjusting-screws D^4, which pass operatively therethrough, and through the forward portion thereof passes an adjusting-screw D^{10} in the vertical plane of the emery-wheel 93.

The adjusting-screws D^4 and adjusting-pin D^5 are adapted to bind the article to be ground in fixed position against the emery-wheel 93, and the adjusting-screws D^4 press the same directly down upon the emery-wheel 93.

In Fig. 10 is shown an attachment for holding saw-blades while grinding the same, and it comprises a slotted rod E, the longitudinal slot E′ of which is adapted to receive the saw-blade, and binding-screws E^2 pass through the upper portion of said slotted rod E and are adapted to bind the saw-blade in the slot E′. The ends of the rod E are enlarged, as shown at E^3, and countersunk centrally, as shown at E^4, Fig. 11. The ends of the shaft 70 of the head and tail blocks 71 are adapted to fit said countersunk end portions E^3 and hold the saw-blade fixedly before and in grinding contact with the emery-wheel 93.

The attachment shown in Figs. 8 and 9 is an arbor and set-screw by which disk harrows may be ground. F is the arbor, which is adapted to be secured to the shaft 70 of the head-block 67 by means of a collar F′, integral with said arbor. The arbor F bears a stud-screw F^2 at the end thereof and at an angle therewith and a flange F^3 at right angles with said stud-screw at the base thereof. The stud-screw F^2 is passed through the disk harrow f^3 at its central opening, and a set-nut F^4 is screwed firmly down against the inner surface of the disk harrow to bind the latter firmly against the flange F^3. This is done by means of a crank F^5, integral with the set-nut F^4 and having a handle F^6. When the arbor F is secured to the shaft 70, as described, the beveled edge portion F^7 of the disk harrow f^3 will be parallel with the line of extension of the arbor F and at right angles to the shaft 70 and will hence bear against the side of the emery-wheel 93 and be revolved by the belt 76 of the head-block 67 and ground against said emery-wheel, the lathe 34 being held stationary for this purpose by cutting out its actuating-belting by any belt shift or shifts desired.

Referring to Figs. 12, 13, and 14, G is the supporting-arm of an attachment for grinding or "gumming" saws and bears upon its upper surface flanges G′, upwardly and inwardly extending, forming a groove G^2. A standard G^3, having a reduced base portion G^4 (shown in dotted lines in Fig. 13) and surmounting a flanged base G^5, fits the groove G^2, and the standard G^3 is adjustable along the arm G and comprises a plurality of sections or members G^6, through registering bores in which passes a bolt G^7, fixed in the base portion G^4, and a nut G^8 is adapted to be screwed onto the bolt G^7 above the upper standard member G^6 and bind the members G^6 rigidly together, securing in place the saw blade or disk G^9, which is secured in place on

the bolt G^7, which passes through the slot or perforation centrally thereof, and the saw blade or disk G^9 is bound in place by two of the standard members G^6, between which it is placed, as shown in Fig. 13. The supporting-arm G is secured to the upper flange 36 of the lathe-bed 34 by jaws G^{10}, which surround said flange 36, and a binding-nut H', similar to the nut or screw shown at 69 in Fig. 2, binds the jaws G^{10} to said flange 36, and the pins G^{10} are pivotally connected to the supporting-arm G by a screw H^3 and a bolt H^3, passing through the lathe through a lip H^4 on the inner extremity thereof. When the arm G is secured in place, as described, the saw blade or disk G^9 is brought into contact with the emery-wheel 93, which is revolved, as described, and the lathe-bed 34 remains preferably stationary during the grinding or gumming of the saw, any suitable belt shift or shifts being used to cut out the running-gear of the parts of the machine, as described.

Having fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A grinding-machine, comprising a main frame, a revoluble grinding-wheel adjustably mounted therein upon a suitable support, a bevel-tool adjustably mounted upon the support of said grinding-wheel, standards mounted in said frame, a lathe-bed slidably mounted in said standards in proximity to said grinding-wheel, devices secured to said lathe-bed for holding an article to be ground, a screw-shaft mounted parallel to said lathe-bed, and operated by reversely-running belts one of which is in operative connection therewith, a follower rigidly secured to said lathe-bed and operated by said screw-shaft, a belt-shift mounted in said frame and consisting of a slidably-mounted belt-shift rod parallel to said screw-shaft, adjustable stops slidably mounted on said belt-shift rod with which a collar is secured to said traveler and slidably surrounding said belt-shift rod is adapted to engage, and belt-shift arms engaging said belts and secured to said belt-shift rod and adapted to shift said reversely-running belts to reverse the motion of said screw-shaft and said lathe-bed, substantially as shown and described.

2. In a grinding-machine, a grinding-wheel frame having side and bottom members, a grinding-standard having a base-block adjustably mounted in said frame, guide-rods passing through bores in said base-block and secured in said side members of said grinding-frame, a screw-shaft passing through a threaded bore in said base-block and journaled in said frame members, and adapted to adjust said base-block in said frame, substantially as shown and described.

3. In a grinding-machine, a grinding-wheel frame having side and bottom members, a grinding-wheel standard having a base-block adjustably mounted in said frame, guide-rods passing through said bores in said base-block and secured in said side members of said grinding-wheel frame, a screw-shaft passing through a threaded bore in said base-block and journaled in said side members and adapted to adjust said base-block in said frame, and an adjusting-screw secured to said base-block and adapted to be adjusted to regulate the adjustable movement of said base-block in said frame, substantially as shown and described.

4. In a grinding-machine, a revoluble grinding-wheel mounted on an adjustably-mounted grinding-wheel standard, a supplemental standard adjustably secured to said grinding-wheel standard, and a bevel-tool secured to said supplemental standard, and comprising a lever-arm pivotally mounted approximately centrally, and bearing at one end a bevel-edged head and adapted to engage the article to be ground and hold it in the desired contact with said grinding-wheel and an adjusting-screw passing through the other end thereof, and engaging the upper portion of said supplemental standard to adjust the vertical position of said bevel-edged head, substantially as shown and described.

5. In a grinding-machine, a grinding-wheel mounted in a suitable support, a supplemental support adjustably secured to said grinding-wheel support, and a bevel-tool secured to said supplemental support and comprising a lever-arm pivotally connected therewith and provided at one end with a bevel-edged head adapted to engage the article to be ground, and means for adjusting said lever-arm, substantially as shown and described.

6. In a grinding-machine, a bevel-tool, comprising a pivotally-mounted lever-arm provided with a bevel-edged head, and means for adjusting said lever-arm, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of the subscribing witnesses, this 25th day of November, 1898.

EDWARD MILLS.

Witnesses:
H. J. HENDERSON,
C. L. DE PEW.