E. E. WOOD.

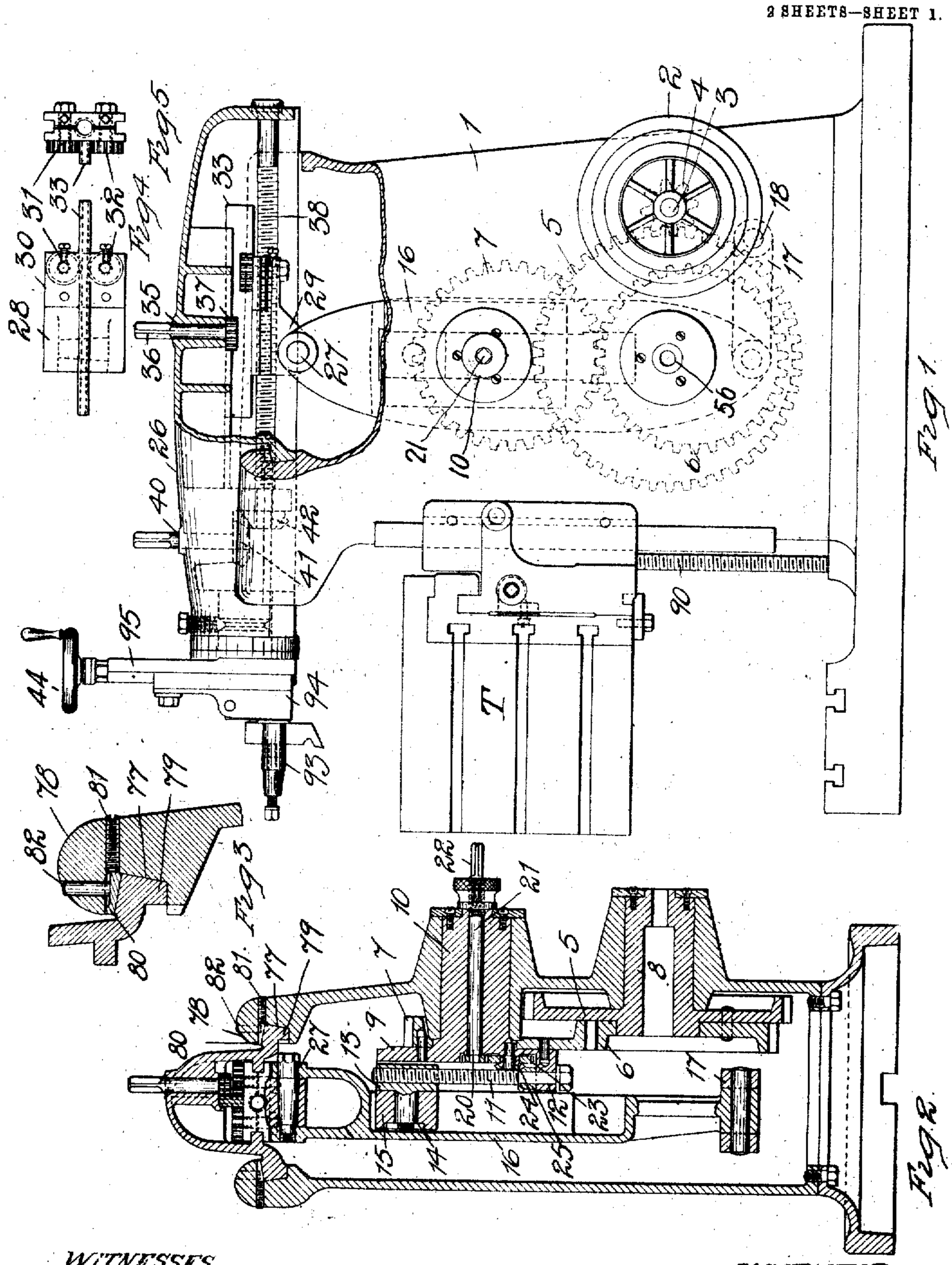
METAL WORKING MACHINE.

APPLICATION FILED NOV. 27, 1907.

916,085.

Patented Mar. 23, 1909.

2 SHEETS—SHEET 1.



WITNESSES

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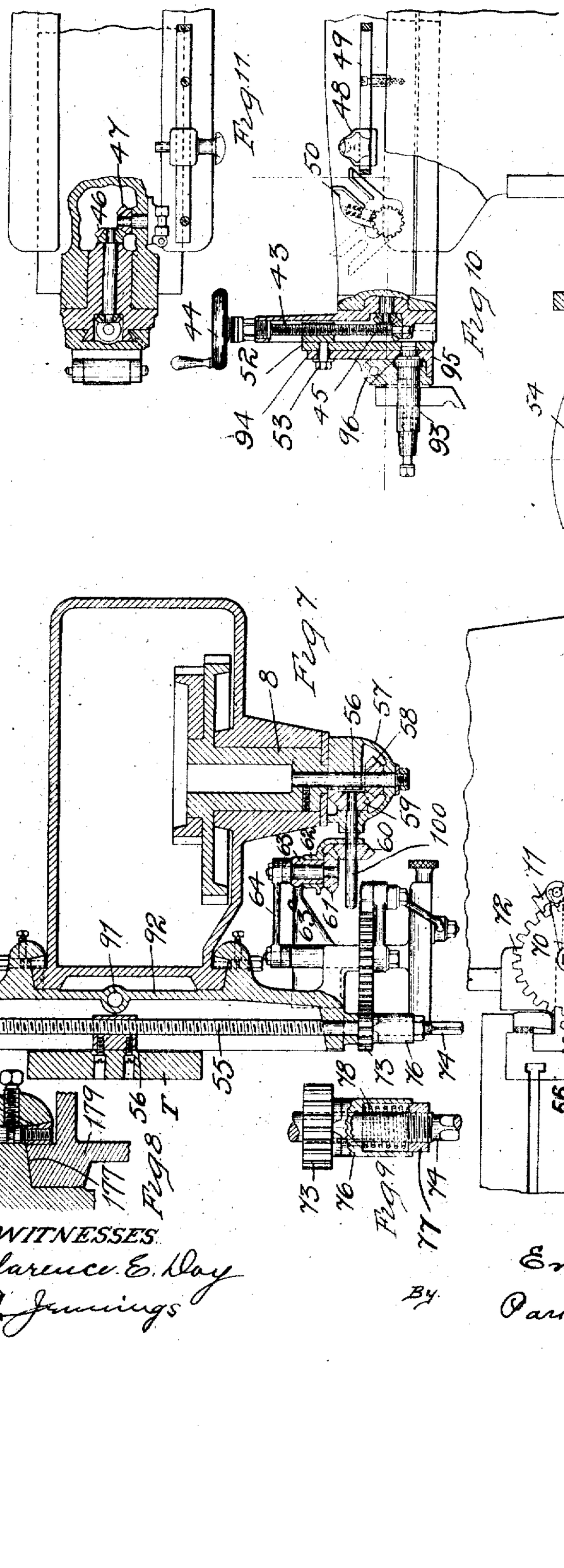

Fig. 11.

Fig. 10.

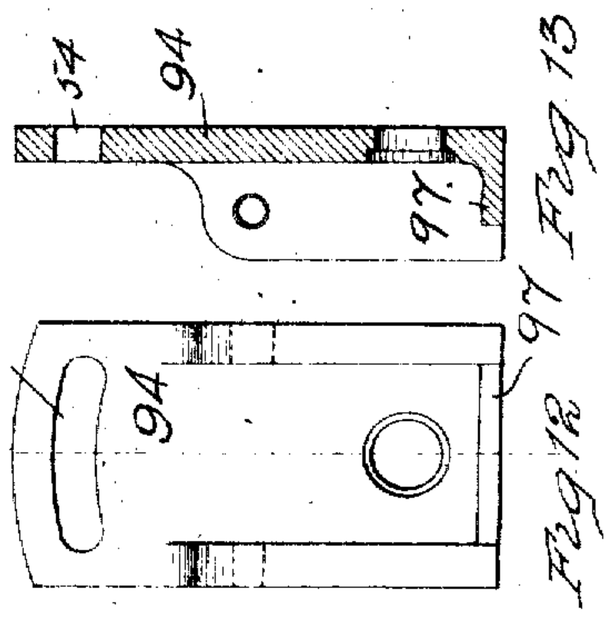

Fig. 13.

Fig. 12.

Fig. 8.

Fig. 9.

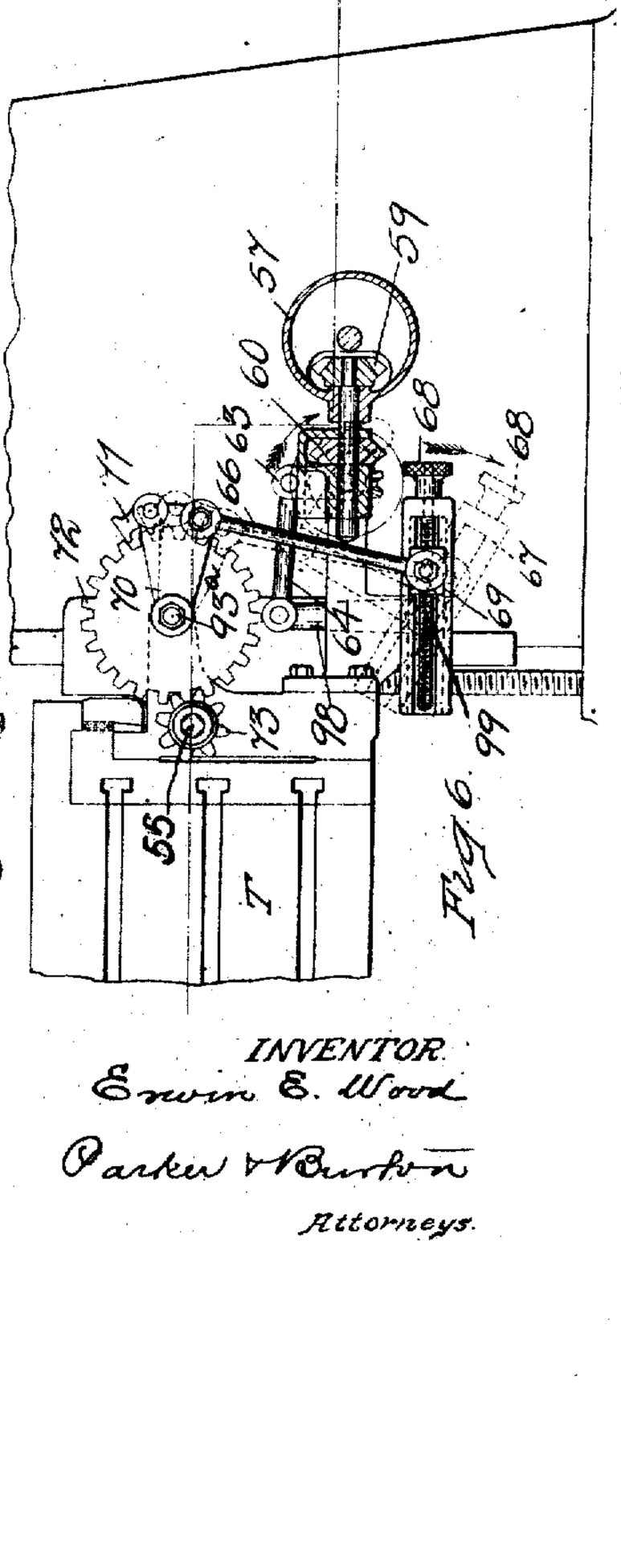

Fig. 6.

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UNITED STATES PATENT OFFICE.

ERWIN E. WOOD, OF JACKSON, MICHIGAN.

METAL-WORKING MACHINE.

No. 916,085. Specification of Letters Patent. Patented March 23, 1909.

Application filed November 27, 1907. Serial No. 404,131.

To all whom it may concern:

Be it known that I, ERWIN E. WOOD, a citizen of the United States, residing at Jackson, county of Jackson, State of Michigan, have invented a certain new and useful Improvement in Metal-Working Machines; and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to metal working machines.

It has for its object improvements adapted to be applied to crank planers, shaping machines, or similar machines in which there is a work holding table that is adjustable vertically as well as horizontally, and which has a reciprocating ram that carries the tool employed to produce results on work held on the table.

The improvements relate especially to the means of holding the ram to its support, improvements which relate to the adjustment of the ram, and improvements which relate to the feed.

In the drawings:—Figure 1, is a side elevation partly broken away. Fig. 2, is a vertical cross-section. Fig. 3, is a detail showing a cross section of one of the rests or tracks upon which the ram slides. Fig. 4, is a plan view of the internal clamping device of the ram. Fig. 5, is an end view of the mechanism shown in Fig. 4. Fig. 6, is a side elevation of the mechanism used to produce the horizontal cross-feed of the work supporting table. Fig. 7, is a horizontal section showing in detail the same parts as Fig. 6. Fig. 8, is a detail cross-section of the vertical track. Fig. 9, is a detail of the safety device on the cross feed. Fig. 10, is a vertical view partly in section, showing the mechanism for vertical adjustment of the clapper box. Fig. 11, is a horizontal cross section of the same part. Fig. 12, is an elevation of the clapper box. Fig. 13, is a section, longitudinal of the machine, of same part.

The machine which embodies these several improvements is one in which a planing tool is carried at the end of a ram, which reciprocates on a support, carrying the tool over work which is held upon a table that is movable to feed the work across the path of travel of the tool, and is movable vertically to bring the work into approximation with the tool.

The ram slides on bearings which are provided with a substantially flat under-rest and with side bearings that incline to the horizontal and are closer to each other at their bottom lines next adjacent to the flat bearings than they are further up, widening gradually from below upward. The ram is provided with bearing faces that correspond to the flat and inclined surfaces just mentioned, and the ram is held in place by an inclined or wedge shaped gib that rests over its inclined upper surface, and this inclined gib is pressed inward against a bearing which forms part of the frame, and is an extension of the side walls in which the inclined surfaces previously mentioned are formed, the side walls and the over-hanging part of the same being made as an integral casting, thereby insuring great strength and stability, to this part of the framework. The engaging inclined surfaces of the ram and the frame, and of the ram and the gib over its bearing part insure a constant engagement of the ram and the guide in which it travels, which becomes even more close and intimate with wear, and is not thrown out of adjustment as a result of its constant and hard use.

The ram itself is large and heavy, and is of box form, being cross-ribbed from wall to wall at short intervals throughout its entire length, insuring great strength and rigidity that cannot be obtained in the usual form of ram, which has its upper surface broken by a long slot necessary to permit of binding the positioning nut to the ram. In the shape of the ram forming part of this invention, this long slot is obviated, as the device for binding the ram to the adjusting nut is contained entirely within the ram, and is actuated by a wrench stem that projects through a small bearing in the ram and does not materially diminish its strength and rigidity.

Mechanism is provided to produce a comparatively slow forward movement or working stroke of the ram, and a quick return movement, and other details will be brought out in the more particular description which follows:—

1, indicates the frame which, as in machines of this character at the present time, is in the form of a housing or hollow pillar. Suitably supported on the outside of the frame is a driving wheel 2, on whose shaft 3, is mounted a pinion 4 that meshes with a second or mas-

ter wheel 5. On the shaft with the master wheel is an eccentrically mounted pinion 6, which meshes with a second eccentrically mounted pinion 7, on hub 10. The master wheel 5 and the pinions 6 and 7 are inclosed within the housing. The master wheel 5 and the pinion 6, which are secured together on the same shaft 8, are intermediate between the main driving wheel 2 and the pinion 7, which latter pinion is secured to a plate 9, which terminates the inner end of the hub 10, which constitutes the shaft of pinion 7, and the face plate 9, which lies inside the pinion 7, but is secured to it. Across the face of the plate 9 extends a screw 11, one end of which is journaled in a bearing 12, that projects from the face of the plate 9, the other end passes through a running nut 13 that carries a stud 14, and upon the stud is pivoted a slide 15, that travels in a slot in the driving arm 16. The lower end of the driving arm 16 is connected by a link 17 to a bearing 18 in the housing. The nut 13 may be adjusted along the screw 11 by turning the screw in its bearing, which turning movement is effected by means of a hand driven pinion 20 on the end of a shaft 21, that projects centrally on the hub 10 and is provided external to the housing with a wrench hold 22. The pinion 20 meshes with pinion 23, carried on a stud which projects from the face plate 9 and on the same stud is a miter gear 24, which meshes with miter gear 25, concentric with the axis of the screw 11. The screw 11 turned by means of the shaft 21, adjusts the slide 14 along the slot, varying its eccentricity with respect to the center of the hub 10, and consequently varying the scope of oscillation of the driving arm 16. The driving arm 16, is pivoted indirectly to the ram 26 by a cone pivot 27. The indirect connection between the arm 16 and the ram 26 is shown in Figs. 1, 2, 4, and 5. It consists of the nut 28 which has suitable grooves in each side to fit the bands or ribs shown projecting inward horizontally from each side of the ram. On the back end this nut 28 has the top cut away so as to bear only on the bottom of the bands or ribs on the ram, and so as to leave the upper half of screw 38 exposed. Where the upper part of nut 38 is cut away, the clamping plate 30 is attached. This clamping plate 30 carries a pair of pinions 31 and 32, which engage on opposite sides of a rack 33 that is itself slidingly secured to the ram 26. Each of the pinions 31 and 32 is on the end of a screw which engages through the plate 30 and the nut 28, and each pinion serves as a nut to coact, with the screw bolt upon which it is mounted to clamp the two parts 28 and 30 together upon the bands or ribs projecting horizontally inward from the side walls of the ram. These pinions are actuated by means of a rack 33, which engages between the two pinion nuts 31 and 32, and the rack is actuated from without the shell of the ram by means of a key post 35, having an external wrench hold terminal 36 and an internal pinion terminal 37, which engages with the rack 33. Plate 30 is so arranged that it clamps on the ram 26 and upon the screw 38 at same time, thus fastening the ram very securely to the driving arm 16.

In the normal action of the ram, the rack travels with the ram, but if it be desired to adjust the point of connection between the arm 16 and the ram, it is done by turning the long screw 38, which passes through the nut 28, and then clamping the nut to the ram by turning the shaft 35. The long screw 38 is turned on its own axis by a miter gear connection between itself and the vertical key post 40, whose protruding end is provided with a wrench hold, the key post 40 being provided with a miter gear 41, which meshes with a miter gear 42 on the head of the long screw 38.

The adjustments just described make it possible to vary the throw of the ram, and make it possible to vary the point of attachment between the oscillating arm and the ram and thereby vary the points of change of movement or the dead point of oscillation of the ram, and this is all accomplished by mechanism that is entirely within the housing either of the base or of the ram, and is reached by means of small key posts which project through from the interior mechanism to the exterior thereof.

The front end of the ram carries a tool head 95 which can be swiveled about its axis and clamped to the ram at any desired angle. This tool head carries a slide 52, which can be adjusted vertically on the tool head by means of screw 43 and hand wheel 44. This slide carries the clapper box 94 and the tool post 93. The clapper box 94 is pivoted to the slide 52 and has an arched slot 54 in its upper end, through which a clamp screw engages with the slide so as to swivel the clapper box about its pivot and clamp it at an angle. To provide for relieving the cutting tool on the return stroke of the ram, the clapper block 96, which carries tool post 93, is pivotally connected to the clapper box 94. The side walls of the clapper box are connected at the lower end with a rib or bridge 97, which is an improvement over the usual form and greatly increases the strength and rigidity.

The vertical or angular feed is produced by means of a ratchet and ratchet lever 50, and an adjustable tappet 48, adjustable along a slide rail 49 mounted on the housing of the machine. Tappet 48 is provided with an arm or stud which engages in the slot in lever 50 once during each stroke of the ram. On the forward stroke tappet 48 throws lever 50 over in position for the ratchet to catch and actuate the feed of the tool, and on the return stroke of the ram the stud on tappet 48 engages the front side of slot in lever 50 and pro-

duces the feed of the tool, the amount of which feed is determined by the position of tappet 48 on slide rail 49. By the use of slotted lever 50 an improvement is made over the usual form where a spring or weight is used to return the ratchet lever to its initial position, for the slotted lever works positively in both directions. At any time when it may be desirable to use the instrument without vertical feed of the tool, the tappet 48 is moved to a position where it will not engage the ratchet lever 50, and this feed is thrown out of use.

The cross feed of the table T, is produced by means of a long screw 55, that engages a nut 56 which projects as a bracket from the table T. The screw is actuated by a wheel and pinion connection shown in Figs. 6 and 7, and a connection which reaches from the axis of the hub 8. Secured in the end of the hub 8 is the shaft 56, which carries on its outer end, but within a secondary housing or cap a miter gear 58, which meshes with a miter gear 59, which is on a shaft that projects through the side of the secondary housing 57, and carries a second miter gear 60, which meshes with miter gear 61 on a shaft which carries a crank arm 63, and the crank is connected by link 64 to lever 98 which is on shaft 99 carried in brackets 63ª. On the other end of the shaft 99 is fastened the rock-arm 67. In rock-arm 67 is an adjusting screw 68 and a trunnion nut 69. On nut 69 is pivoted one end of oscillating link 66, of which the other end is pivoted to ratchet lever 70. Ratchet lever 70 carries a reversible pawl 71 which engages an idler wheel 72, which meshes with the pinion 73 on the end of the screw 55. Each revolution of the main driving wheel produces an oscillation of the rock-arm 67, and actuates the screw 55, the amount of the actuation being determined by the position of the adjustment of the trunnion nut 69, on the rock lever 67; the adjustment can be changed at will while the device is moving. The connection between hub 8 and crank arm 63 being made by means of miter gears 58, 59, 60, 61, and the shaft 100, is an improvement over the usual form of connection as follows: Housing 57 is free to swivel on shaft 56 and accommodate itself to the position of shaft 100. Miter 60 is keyed to shaft 100, but is free to slide upon shaft 100 to accommodate the varying distance between bracket 63ª and hub 8, as the table is raised or lowered upon its vertical track on the front of main column 1. With this arrangement as shown in Figs. 6 and 7, the table can be raised or lowered when the machine is standing still, without turning the screw 55. Also after the rock-arm 67 has been set in such relation to main driving wheel 5 as to produce the cross feed of the table T during the return stroke of ram, the table can be raised or lowered without disturbing the adjustment between rock arm 67 and master wheel 5.

The connection of pinion 73 with screw 55 is provided with a safety device which enables the pinion 73 to slip on the shaft of the screw 55 if the table has traveled so far over that the screw cannot be turned. The safety device consists of a clutch cap 76, that engages the hub of the pinion 73 with a saw toothed clutch. The cap 76 is adapted to slip over the toothed clutch portion if the strain on the pinion 73 is sufficient to compress the spring 78; the cap is keyed to the shaft and rotates with it, but is capable of longitudinal movement as described.

For preliminary movement of the table across the face of the machine, the projecting end of the screw 55 is provided with a wrench hold 74, by means of which it may be turned manually. The entire table T may be adjusted vertically by means of screw 90 which engages through nut 91, on the vertically sliding part 92 of the table; the shaft 93ª of the idler 72 and the bearings of screw 55 are carried by the vertical sliding part 92.

An important improvement is found in the means provided for holding the ram firmly on the top of the pillar, while still allowing it to reciprocate, and the means provided for holding the vertically sliding part of the table firmly to the front of the pillar and still allow it to travel vertically thereon. To accomplish the result in connecting the ram with the pillar the side walls of the housing are carried up integral, and each side wall is provided with a channel 77, the bottom face of which is horizontal, and the more nearly vertical face of which is inclined with the top of the inclined surface more distant from the vertical axis of the pillar than is the bottom of the inclined surface. The inclined surface is parallel with the longitudinal axis of the ram. The overhanging part 78 is finished with an under surface that is substantially horizontal. That part of the ram which engages against the under horizontal surface of the channel is plane, and when the ram is in place is also horizontal. That face of the ram which engages against the inclined surface is correspondingly inclined, making the distance across the ram greater at the top of this inclined face than is the distance across the ram at any other part. The upper surface of the rib-like projection on which these surfaces of the ram are formed, is inclined with the inner edge of the incline higher than the outer edge and the vertical distance through this rib-like projection 79 is somewhat less than the vertical distance between the under and upper surfaces of the channel. The space between the rib-like projection and the upper surface of the channel is filled with a long wedge-shaped gib 80, crowded into place by screws

81, which are driven horizontally from the outer surface of the housing and abut against the edge of the wedge shaped gib 80; the gib itself is held from longitudinal movement by stop pins 82. The shape given to the way or track thus produced, and the rib which forms a runner on the track, tends to cause the wear incident to the use of the machine to produce an even more accurate fit and engagement between the parts than that which is produced in the original construction of them, and this part of the machine continues serviceable after long use.

The integral metal form of the track surrounding the channel, in which the runner reciprocates, makes the structure exceedingly strong and unyielding and durable. The similar vertical bearing is shown in Fig. 8. The vertical rib 179 engages in the vertical groove 177 in front of gib 180, and this latter is held in place by draw screw 181; this is held in place by holding screw 182.

What I claim is:—

1. In a machine of the class specified, in combination with a pillar provided with complementary channels for the engagement therein of the runner of a ram, each being constituted by an integral portion of the body of the pillar having a substantially horizontal resting surface, an inwardly inclined guiding surface, and an overhanging part adapted to retain the runner in place, a ram member provided with runners of complementary contour to said channels, adapted to engage therein, wedge shaped gib members engaging between the overhanging parts and the upper surfaces of the runner, and adjustable stop members, whereby the gib members may be caused to engage as closely against the bearing surfaces of the runner as is consistent with the unimpeded slide thereof along said channels, substantially as described.

2. In a machine of the class specified, in combination with a ram provided with runners, a post provided at its summit with runner channels of complementary contour there being integral parts of said post adjacent to the channel portions adapted to overhang the runner portions of said ram, and adjustable means adapted to engage between the runners and said overhanging portions for holding the runners closely though slidably against the supporting bottom portions of said channels, substantially as described.

3. In a machine of the class described, in combination with a post provided with channels having sides slanting inwardly from the top toward the bottom and overhanging parts integral with said post, a ram provided with runners adapted to engage in said channels being of complementary contour therewith, a wedge shaped gib, and means for forcing the wedge shaped gib into close engagement with said runners and against the upper side thereof, substantially as described.

4. In a machine of the class described, in combination with a supporting post having its top portion fashioned into parallel runner channels, each having oblique side walls and integral parts of the post overhanging the channel, a traveling member provided with runners adapted to slidably engage in said channels, wedge shaped gibs adapted to engage between said overhanging parts and the adjacent runner portion of the traveling member, and means engaging transversely of the possible path of travel of said traveling member for regulating the degree of pressure on the runners exerted thereby, substantially as described.

In testimony whereof, I sign this specification in the presence of two witnesses.

ERWIN E. WOOD.

Witnesses:
WALTER S. WILSON,
M. ELIZABETH HAMMOND.