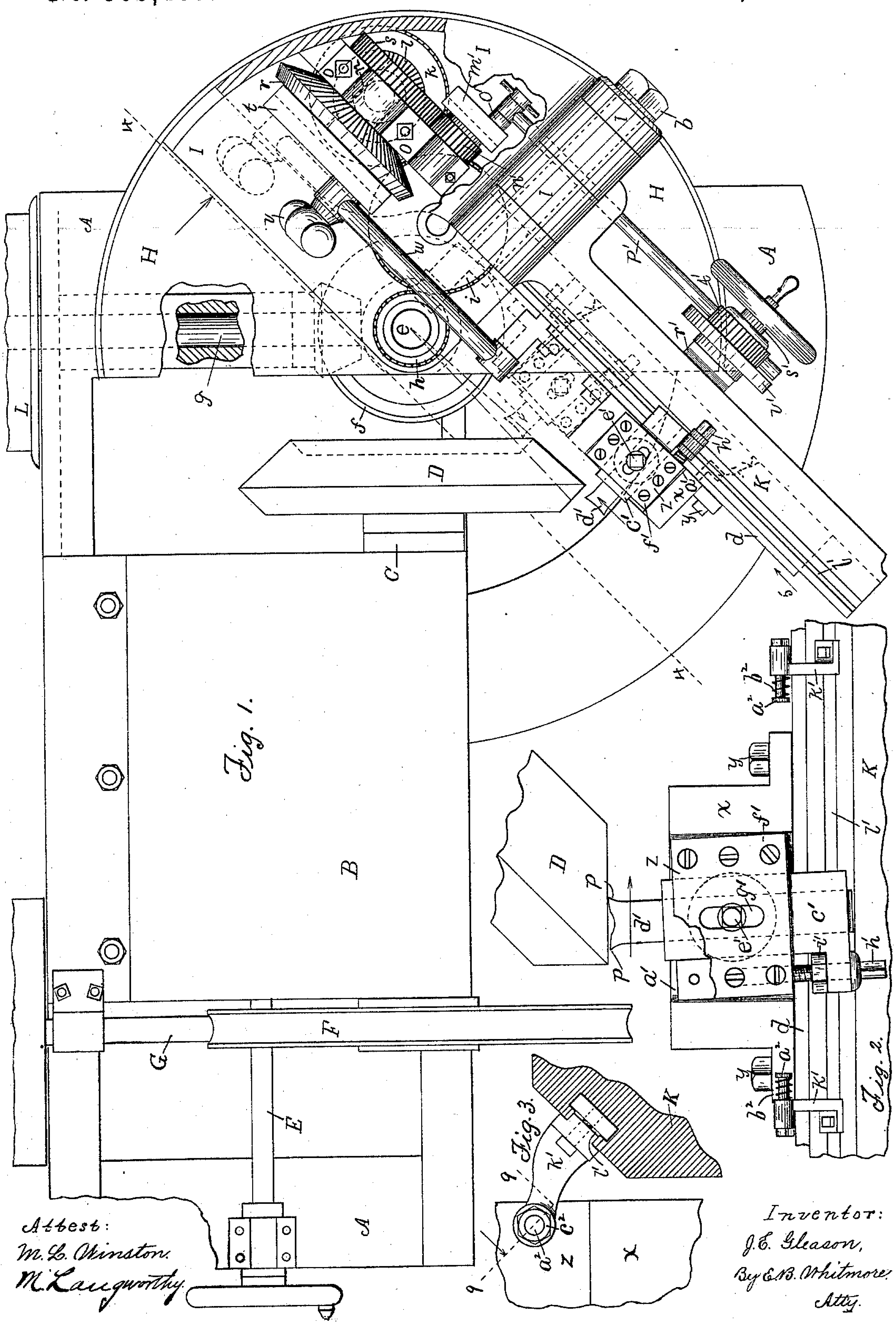
(No Model.) 2 Sheets—Sheet 1.

J. E. GLEASON.

TOOL CONTROLLING MECHANISM FOR GEAR PLANERS.

No. 509,467. Patented Nov. 28, 1893.



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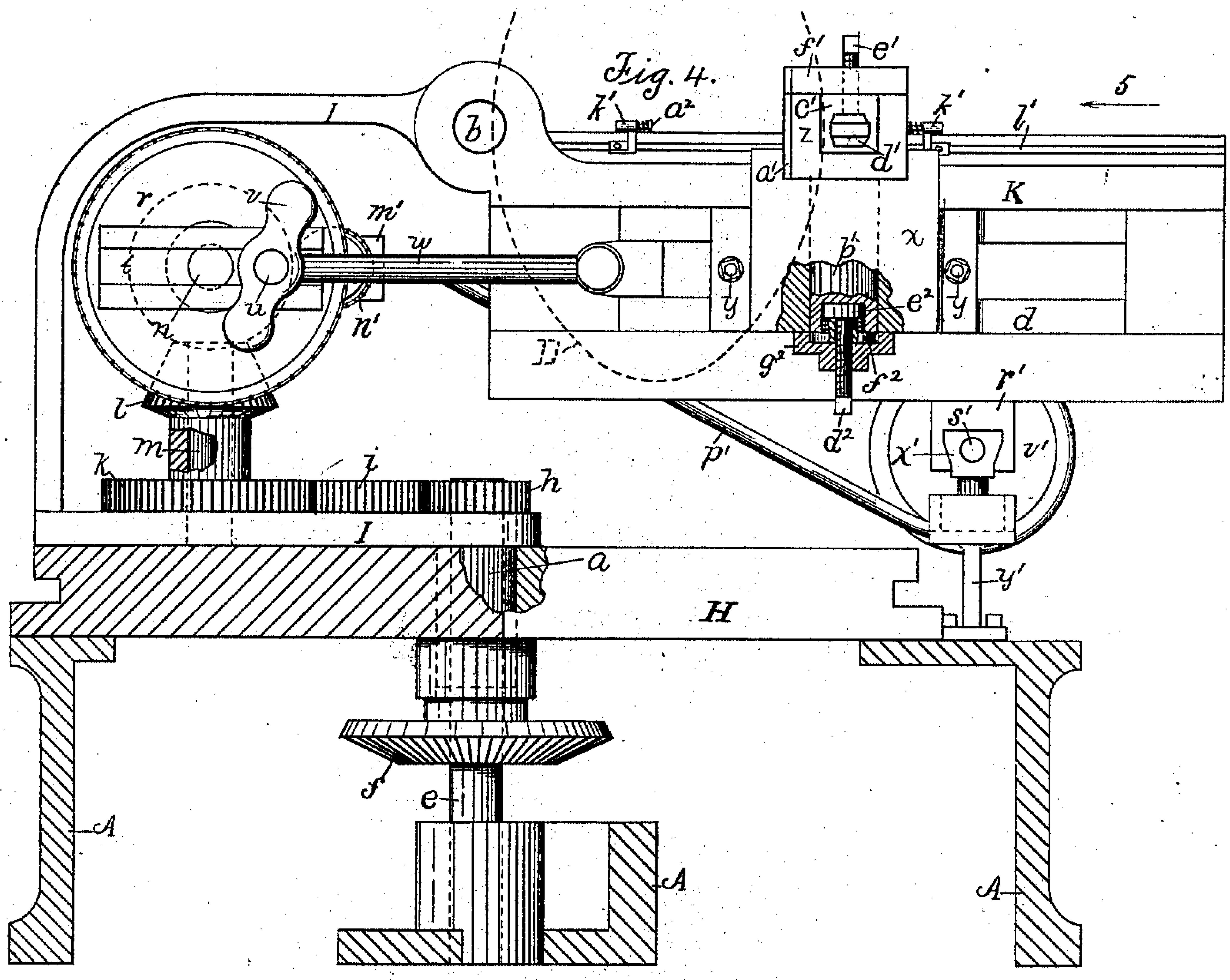

Fig. 4.

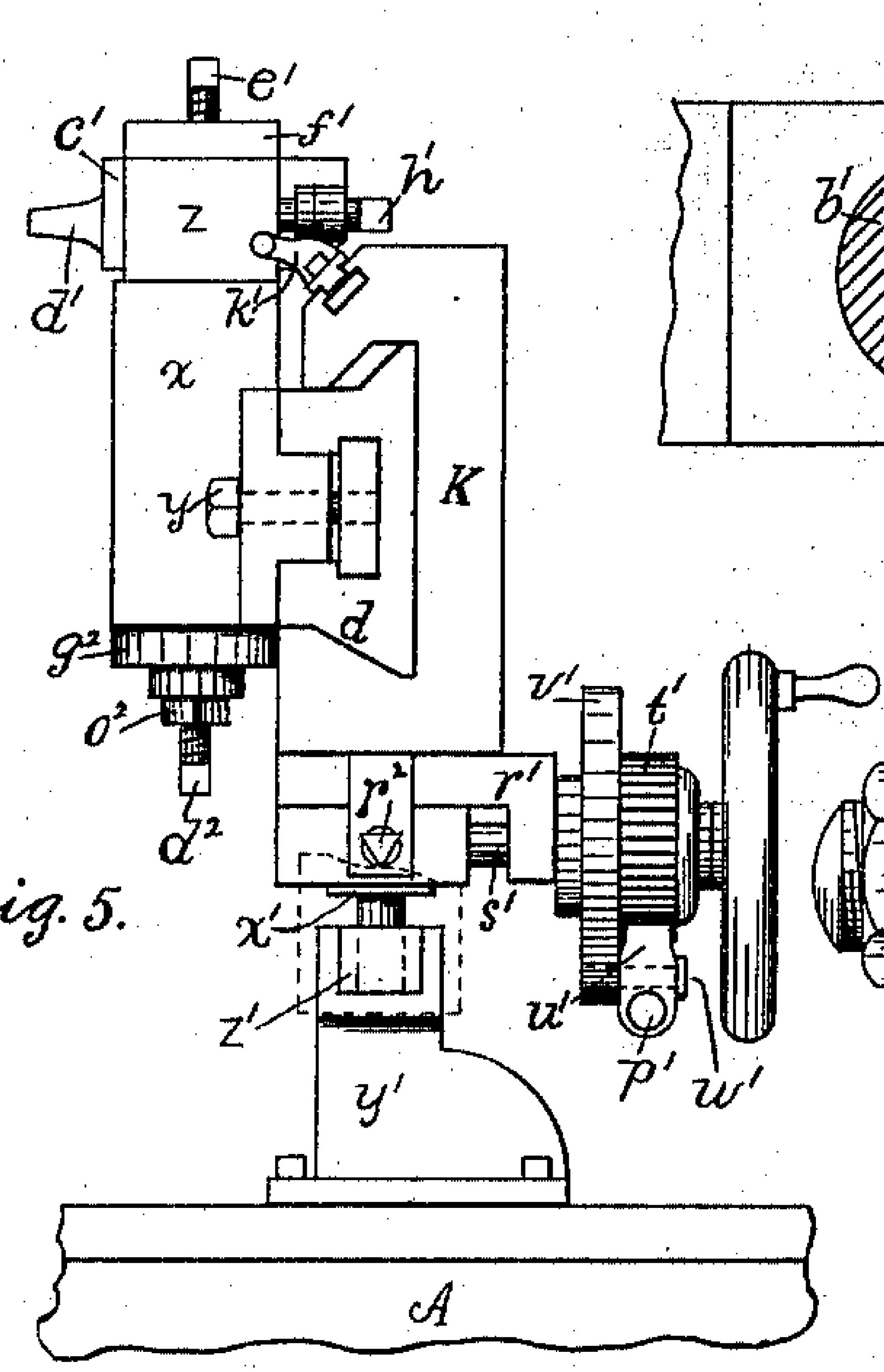

Fig. 5.

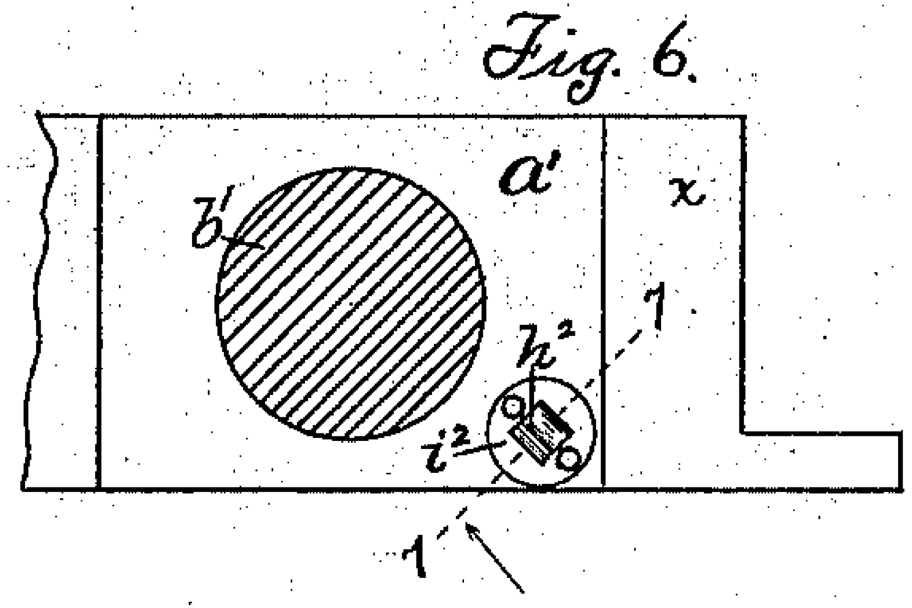

Fig. 6.

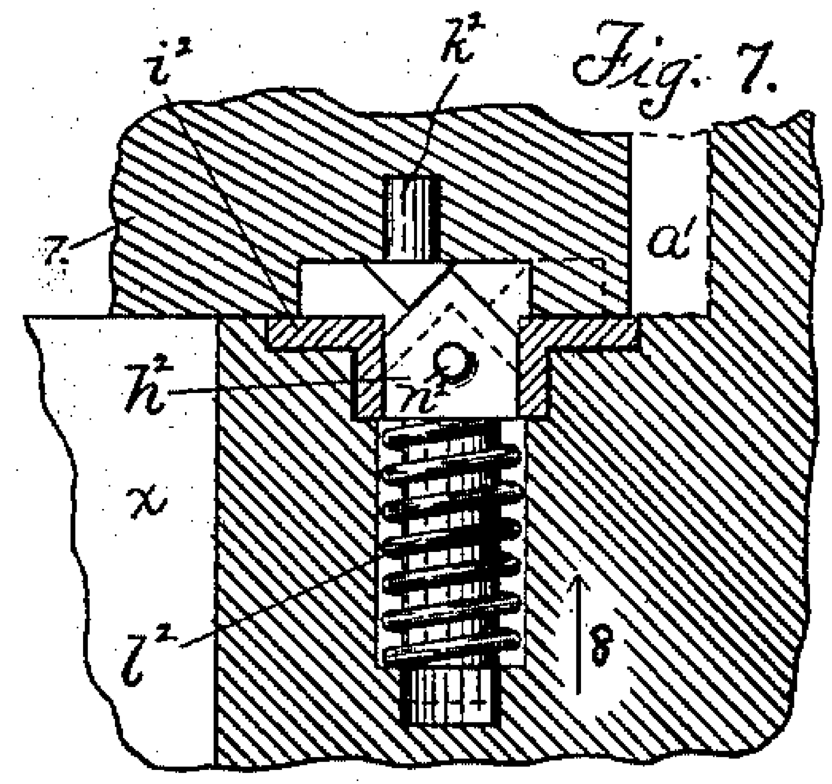

Fig. 7.

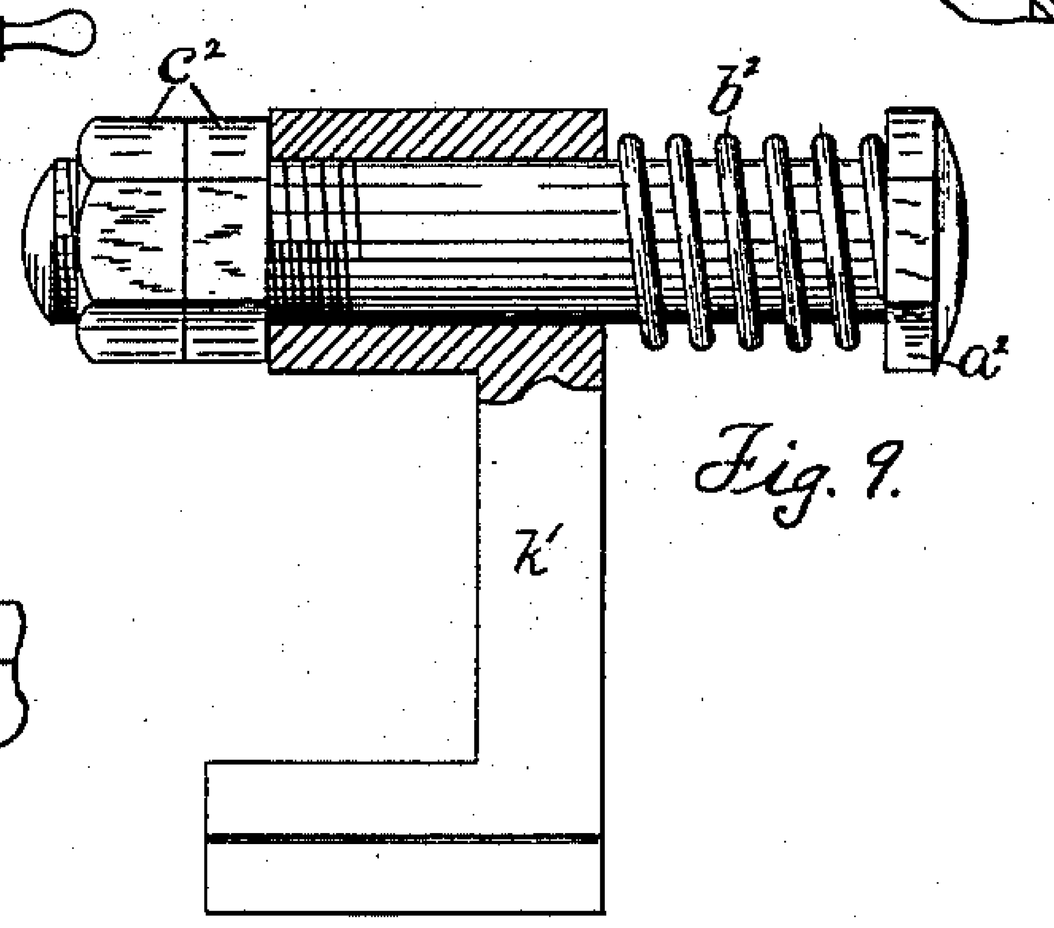

Fig. 9.

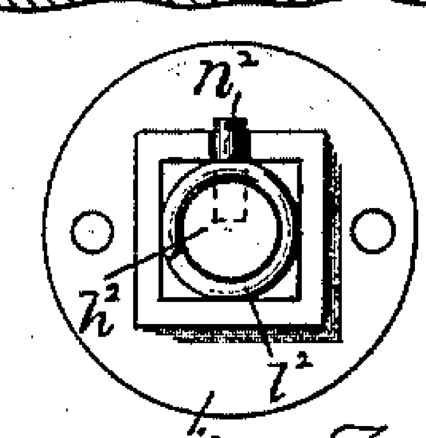

Fig. 8.

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UNITED STATES PATENT OFFICE.

JAMES E. GLEASON, OF ROCHESTER, NEW YORK.

TOOL-CONTROLLING MECHANISM FOR GEAR-PLANERS.

SPECIFICATION forming part of Letters Patent No. 509,467, dated November 28, 1893.

Application filed March 17, 1893. Serial No. 466,499. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. GLEASON, of Rochester, in the county of Monroe and State of New York, have invented a new and useful Improvement in Tool-Controlling Mechanism for Gear-Planers, which improvement is fully set forth in the following specification and shown in the accompanying drawings.

My invention relates to a machine for forming the teeth of metal gears by means of planing, and the object of the invention is to provide new and improved means for adjusting, shifting and controlling the cutting tool of such a machine whereby the rate at which the work is done is materially increased and much time saved.

The invention is hereinafter fully described and more particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a plan of a gear-planing machine to which my improvements are applied, parts being broken away and other parts shown in two positions by full and dotted lines. Fig. 2 is a plan of the tool-stock with associated parts. Fig. 3 is a cross-section of a portion of the tangential arm showing a shifter for the tool-stock. Fig. 4 is a sectional elevation taken on the dotted line 4 4 in Fig. 1 and viewed as indicated by the arrow pointed thereon, parts being broken away. Fig. 5 is an end view of the tangential arm seen as indicated by arrow 5 in Figs. 1 and 4. Fig. 6 is a plan of the carrying-head for the tool-stock. Fig. 7 is a cross-section on the dotted line 7 7 in Fig. 6 and viewed as indicated by the arrow pointed thereon, showing the detent. Fig. 8 is a view of the detent seen as indicated by arrow 8 in Fig. 7. Fig. 9 is a side sectional elevation of a shifter for the tool-stock, sectioned on the dotted line 9 9 in Fig. 3, and seen as indicated by the arrow pointed thereon. Figs. 2, 3, 7, 8 and 9 are drawn to various scales larger than that of the scale of the remaining figures.

Referring to the parts shown, A is the main frame of the gear planer, upon which is mounted a head-stock, B, Fig. 1, carrying a horizontal spindle, C, to which is secured the gear D, to be cut.

E is a screw for moving the head-stock longitudinally upon the frame, and F is a worm gear rigid with the spindle C, which is actuated by a transverse shaft, G, provided with a worm to co-act with the worm gear for indexing the gear D in the usual manner. All these parts are common to this class of machinery, and in Fig. 1 are shown only in outline.

H, Figs. 1 and 4, is a semi-circular base piece secured rigidly to the frame at one end, upon which is mounted the swinging turret I, which carries, mainly, the operating parts of the machine. The base of the turret or part contiguous with the base piece H, is provided with a circular centering piece or hub *a*, Fig. 4, passing downward through an opening at the center of the base piece, which forms a center bearing upon which the turret with its incumbent parts, turns.

K is a tangential arm adapted to turn vertically upon a horizontal pintle, *b*, held by the turret, the axis of the pintle intersecting at right-angles the axis of motions of the turret upon the base piece H, and also intersecting the axis of the spindle C. This tangential arm is formed with a dove-tailed longitudinal race, *c*, in which is fitted a reciprocating slide, *d*, for carrying the tool-stock and tool. The slide *d* is reciprocated by the following means: *e* is a vertical shaft passing through the hub *a* of the turret and resting at its lower end in a bearing in the frame A, Fig. 4. This shaft is provided with a bevel gear, *f*, which is turned by means of a horizontal driving shaft, *g*, Fig. 1, provided with a bevel pinion at its inner end to engage the gear, and cone pulleys, L, outside the frame, a manner which is common. The upper end of the shaft *e* is provided with a spur pinion, *h*, which, by means of an intermediate *i*, turns a gear *k*, having at its upper end a bevel pinion *l*, both turning on a vertical stud *m* rigid in the base of the turret. A short horizontal shaft *n*, is held in a bearing *o*, rigid with the turret and provided with a bevel gear *r*, co-acting with the pinion *l*. Rigid with the gear *r* is a slotted crank-arm, *t*, which carries a stud, *u*, provided with a clamping handle, *v*, this combination of parts being common in machinery of this class. The stud *u* holds one end of a connecting rod w, the other end of which is attached to the slide d. By these means the revolving of the cone pulleys L reciprocates the slide d, and by locating the axis of the shaft n in the same horizontal plane with the point of attachment of the end of the pitman with the slide d, the opposite end of the pitman is but slightly out of a direct line with the point of attachment with the slide, even when at the extreme outer end of the crank arm t, and therefore it exerts a substantially direct pull or push upon the slide whichever way the tool is moving.

By operating the machine so that the top of the gear r will move to the right in Fig. 1, when the tool is moving outward, the pressure from the pitman will come obliquely downward upon the slide which will press the arm K down onto its rest or support instead of raising it off it, as has been the case with machines heretofore constructed in which the entire pitman was below its point of attachment with the slide, at all times. When the tool moves in the opposite direction the pitman has passed below the shaft n, and the drawing motion of it is exerted in a downward direction which will hold the arm K upon its seat. In this manner the tool may be made to cut when moving in both directions while the arm K is retained upon its seat and is permitted to have a slight vertical movement when following the contour of the conformator in giving the proper shape or curve to the face of the tooth. By locating the shaft n, eccentrically to the shaft e, and connecting them by a train of gearing, the slide d and the gear D can be located very close to the end of the machine, and yet there will be plenty of room for the movement of the pitman, which can thus be made long enough to prevent too great an inclination of it when the end of it is secured to the extreme outer end of the crank arm t in making a long stroke.

A carrying-head x, shown in Figs. 1, 2, 4 and 5, is secured to the slide d by clamping bolts y, upon which head is mounted a swivel or shiftable tool-stock z. The tool-stock rests in a rectangular cavity a', in the upper side of the carrying-head and it is provided with a spindle b', reaching vertically down through the head, (see Figs. 4 and 6,) by means of which it is enabled to turn horizontally in the head. The cavity a' is slightly larger than the base of the tool-stock, which admits of the shifting of the latter and at the same time limits the distance through which it may turn. The tool-stock is made hollow or formed with a horizontal rectangular cavity in which a core-block c', is fitted to slide. Within the core-block the cutting tool, d', is inserted, it being snugly fitted therein but longitudinally adjustable, and removable therefrom. The tool is held rigidly in place by a vertical set-screw e', threaded in the core-block. The tool-stock is formed with a removable cap f', over the core-block, which cap is slotted, at g', to avoid the screw e' and allow of a longitudinal motion of the core-block. The core-block is controlled as to its longitudinal motions by a horizontal screw h', Fig. 2, passing through a lateral projection of the core-block and threaded in the body of the tool-stock. A set-nut, i', upon the screw and pressing against the core block, serves to hold the screw and the core-block securely in the different positions of adjustment of the latter.

This improvement of gear planers contemplates among other things the cutting both ways of the tool, whether "roughing out" the work or finishing the faces of the teeth.

The tools employed with this machine are of various forms according to the work they are required to do. The one, d', shown in the drawings is a roughing tool designed to cut channels through the face of the blank gear that ultimately become the spaces between the finished teeth. As clearly shown in Fig. 2 the tool has two cutting faces or edges p p, one at the right and one at the left, which are in all respects alike but are turned in opposite directions. This being the nature of the tool the latter is adapted to cut in both directions, that is to say, it is adapted to cut one way and then the other as it is reciprocated across the face of the blank-gear; but to cut in the different directions the tool has to be slightly swung or shifted in a horizontal plane so as to cause the edge that is to do the cutting in any given operation, to project beyond the other edge so that the latter shall not drag. To effect this the tool-stock is constructed to have a swivel motion, as above described. To shift the tool-stock and tool one way or the other for this purpose, I employ two movable or adjustable shifters k' k', Figs. 2, 3 and 9, occupying a longitudinal groove l', formed in the tangential arm, and adapted to be made fast to the latter. These shifters are each provided with a buffing bolt a^2, adapted to slide longitudinally in the head of the shifter. The bolt is much longer than the head of the shifter and provided with a buffing spring b^2, under its head, bearing against the head of the shifter. At its opposite end the bolt is provided with jam-nuts c^2, which prevent the bolt from being thrown out of the head of the shifter by the spring which pushes against the under surface of the head of the bolt. By means of the jam-nuts any desired tension may be given to the spring. The function of the spring is to give to the bolt a yielding pressure against the tool-stock when struck by the latter. The shifters are placed so that their heads stand in the way of the tool-stock as the latter is reciprocated by the connecting rod w, and are placed respectively so that the tool-stock will encounter one of them at each end of its stroke and thus be turned upon its spindle b'. That is to say, regarding Fig. 2, when the carrying-head x, with the tool-stock, is carried to the left the tool-stock will encounter the left-hand shifter and be thrown to the position shown in said figure. In this position the tool is adapted to cut when moved toward the right. This position is also shown in full lines in Fig. 1. When the tool has completed its stroke or trip to the right the tool-stock will encounter the right-hand shifter and be thrown to the position shown by dotted lines in Fig. 1. It is then in position to cut when moved toward the left. Thus the tool is shifted one way and the other alternately as successive cuts are taken across the face of the blank gear, and the amount of the work done by the machine in any given time is practically doubled. In these shiftings of the tool-stock it encounters the rigid side walls of the cavity a', which form stops for its motions. It is understood, of course, that the tool is fed forward toward its work as the cutting proceeds. Care is taken in setting the tool to have the lines of the motions of its cutting point always radial with the "cone center" or the apex of the cone of the gear, which is the point where the axes of the spindle C, the shaft e, and the pintle b, meet in common.

The feeding of the tool is done by swinging the tangential arm, with the tool-carrying mechanism and the turret with all of its incumbent parts, upon the hub a, as above described, which is effected by the following means: s, Figs. 1 and 4, is a spur gear rigid with the shaft n, which engages a pinion n', held upon a shaft resting in the bearing or hanger o, or held by some other convenient means. Secured to this latter shaft and adjacent to the pinion, is a slotted crank arm m', similar to the crank arm t. A shiftable stud o', secured to the crank arm m', holds a feed rod p' which is caused to reciprocate as the crank arm revolves. Now, regarding Figs. 1 and 5, r' is a hanger secured transversely to the under side by the arm K, which carries a feed screw s'. This screw is provided with a ratchet t'; and pawl u', adjustably secured to the feed rod, is employed to turn the ratchet and the feed screw intermittingly as the feed rod is reciprocated. A disk v', is provided to turn freely on the feed screw, the function of which is to hold a pivot w', upon which the pawl turns. These parts thus combined are common in this class of machinery. The hanger r' is formed with a longitudinal slot in which a nut x', for the feed screw is adapted to slide. This nut is connected indirectly, by means of a bracket y' and block z', with the circular portion of the frame A, Fig. 1, beneath the tangential arm. By turning the feed screw one way or the other the tangential arm will be slightly swung toward or from the blank gear and thus cause the cutting tool to be fed toward the blank or be withdrawn therefrom as the case may be. It will be observed that the pinion n' is one-half the diameter of the gear s, Fig. 1, so that there are two feed motions made for the tool to each revolution of the crank arm t. This causes the tool to be fed forward each time it passes across the blank gear. The feeding device is arranged to feed the tool forward immediately after it clears the blank at each end of its stroke.

The tool is adjusted vertically by means of a headed screw d^2, Fig. 4, engaging the lower end of the spindle b' of the tool-stock. The head, e^2, of this screw occupies a concentric cavity in the end of the spindle, as shown, a thimble f^2 being threaded into the cavity to bear against the under side of said head. The screw is threaded in a cap plate g^2, secured rigidly to the carrying head. By turning the screw one way or the other the tool post with the tool will be moved upward or downward. This screw and the screw h', Fig. 1, above referred to, enable the operator to adjust the tool so that its cutting edge will move in lines radial with the cone center, as above described.

It is sometimes desirable to have a detent for the tool-stock to hold the latter in place each time after being shifted as above described, and before the tool commences to cut. The detent may be made in the form shown in Figs. 6 and 7 in which a bolt h^2, formed with a **V**-head, is inserted vertically in a cavity in the carrying-head x. A circular plate, i^2 Fig. 8, is let flush into the carrying head beneath the tool-stock, which has a square opening to receive the square head of the bolt to keep the latter from turning. A spiral spring l^2, is placed upon the bolt to urge it upward, and a simple stop-pin n^2, projecting from the bolt into a slot in the plate, prevents the bolt from being thrown out by the spring. The head of the bolt co-acts with a reversed hardened **V**-piece k^2, rigid in the tool-stock. When the tool-stock is shifted from side to side, as above described, the **V**-piece k^2 pushes the bolt down as it passes over it; and when the **V**-piece has passed, the bolt presses upward against the other side of the **V**-piece and so holds the tool-stock with moderate firmness in either position to which it may be thrown by the shifters. Space is left both sides of the **V**-piece to avoid the head of the bolt; and the two **V**'s are arranged to lap by each other sufficiently to operate equally well in case the tool-stock be moderately lifted off the carrying head by the screw d^2 in adjusting the tool to place.

A copying form for the tooth is used in this machine, shown in dotted lines in Fig. 5, a rider r^2, being employed with the form. The gear cut may be a blank casting, or one in which the teeth are cast in form, needing only to be planed over by the machine.

What I claim as my invention is—

1. In a gear cutter, in combination, a bed plate, one end of which is provided with a semi-circular base piece, the center of which is provided with an opening, a turret upon the base piece, the base of which is provided with a hollow hub which projects through the opening in the semi-circular base piece, a shaft through the hollow hub, an arm pivotally secured upon the turret, a reciprocatory tool holder upon the arm, a shaft journaled

in the turret eccentric to the axis of the hub and connected with the tool holder and a train of gearing to connect said shaft with the shaft through the hub, and means for holding the gear being operated upon, and for feeding the tool forward at each stroke of the pitman, substantially as set forth.

2. In a gear cutter, in combination, a bed plate, a swinging turret secured thereto, a tangential arm pivotally secured to the turret, a reciprocatory tool holder on the arm, a shaft journaled in a plane above and parallel with the base of the turret, one end of which is provided with a crank arm, a pitman for connecting the crank arm with the tool holder, and means for holding the gear being operated upon, and for feeding the tool forward at each stroke of the pitman, substantially as set forth.

3. In a gear cutter, in combination, a bed plate, a swinging turret secured thereto, an arm upon the turret, a reciprocatory head, the upper side of which is provided with a cavity, a hollow tool stock pivotally secured in the cavity, a core block adjustably secured within the tool stock and adapted to carry the operating tool, and means for holding the gear being operated upon and for reciprocating the head, substantially as set forth.

4. In a gear cutter, in combination, a bed plate, a turret secured thereto, an arm upon the turret, a reciprocatory carrying head upon the arm, the upper side of which is provided with a cavity, a hollow tool stock provided with a spindle pivotally secured in the cavity, a cap plate below the end of the spindle, a screw through the plate to bear against the end of the spindle and adjust the tool, and means for holding the gear being operated upon and for reciprocating the tool holder, substantially as set forth.

5. In a gear cutter, in combination, a bed plate, adapted to hold the gear being operated, and provided with a swinging turret, an arm upon the turret, a tool holder upon the arm, a core block provided with a lateral projection, a screw through the projection and engaging with the body of the tool holder, a slotted cap upon the tool holder, a screw through the slot in the cap, and means for reciprocating the tool holder, substantially as set forth.

6. In a gear cutter, in combination, a bed plate adapted to hold the gear being operated upon, and provided with a swinging turret, an arm upon the turret, a carrying head upon the arm provided with a recess, a spring actuated detent in the recess, a plate for holding the detent with its head above the surface of the carrying head, a tool stock pivotally secured to the carrying head and having its under surface provided with a V shaped piece adapted to be engaged by the detent, and means for reciprocating the head, and for swinging the tool stock upon its pivot, substantially as set forth.

In witness whereof I have hereunto set my hand, this 11th day of March, 1893, in the presence of two subscribing witnesses.

JAMES E. GLEASON.

Witnesses:
ENOS B. WHITMORE,
M. L. WINSTON.