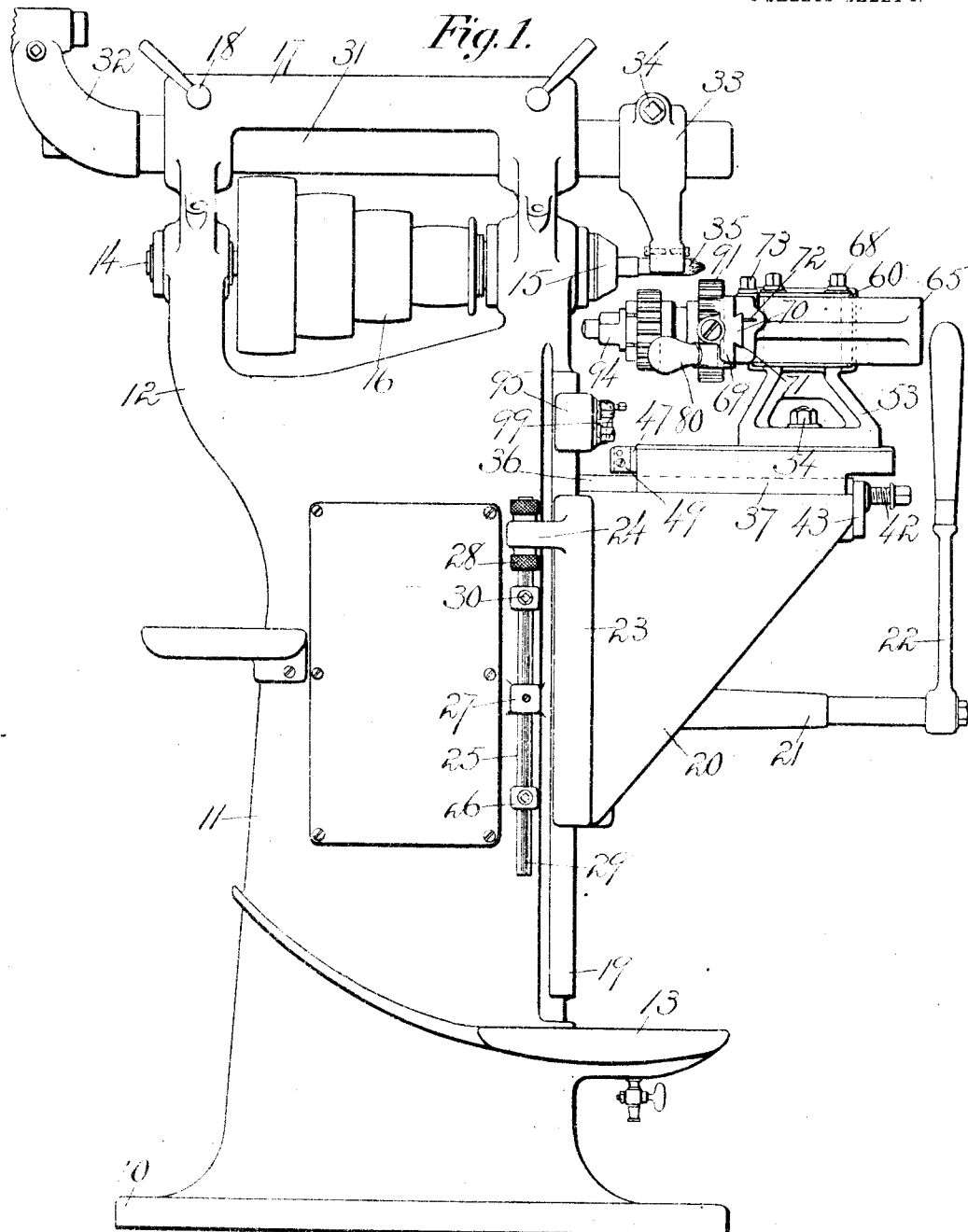


B. M. W. HANSON.
FORMING MACHINE.
APPLICATION FILED MAR. 12, 1908.

1,063,160.

Patented May 27, 1913.

3 SHEETS-SHEET 1.



Witnesses:
J. H. Ellett
J. H. Ellett

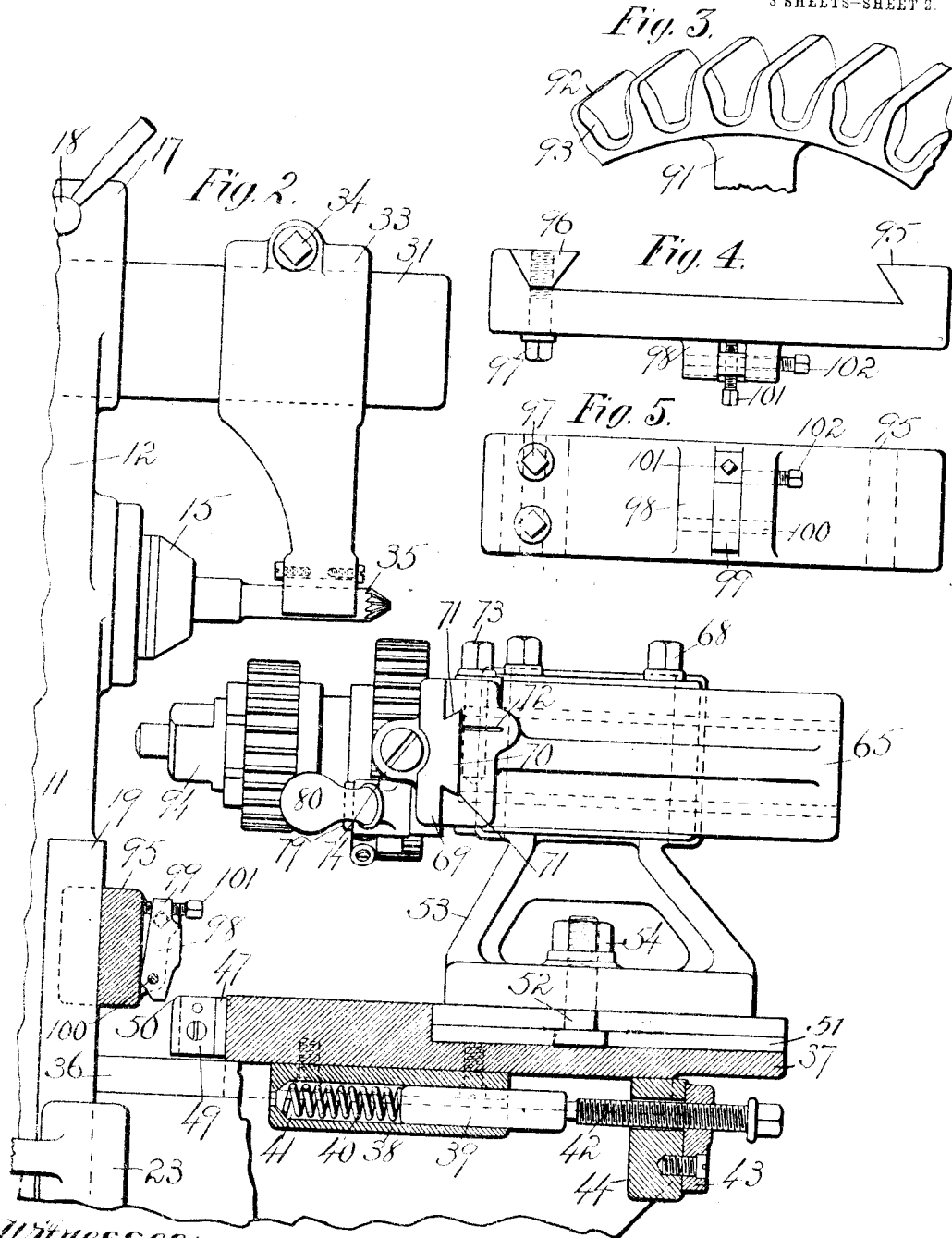
Inventor:
Bert M. W. Hanson
By Arthur B. Jenkins
Attorney

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3 SHEETS-SHEET 2.



Witnesses:

J. H. Elliott.
Attest

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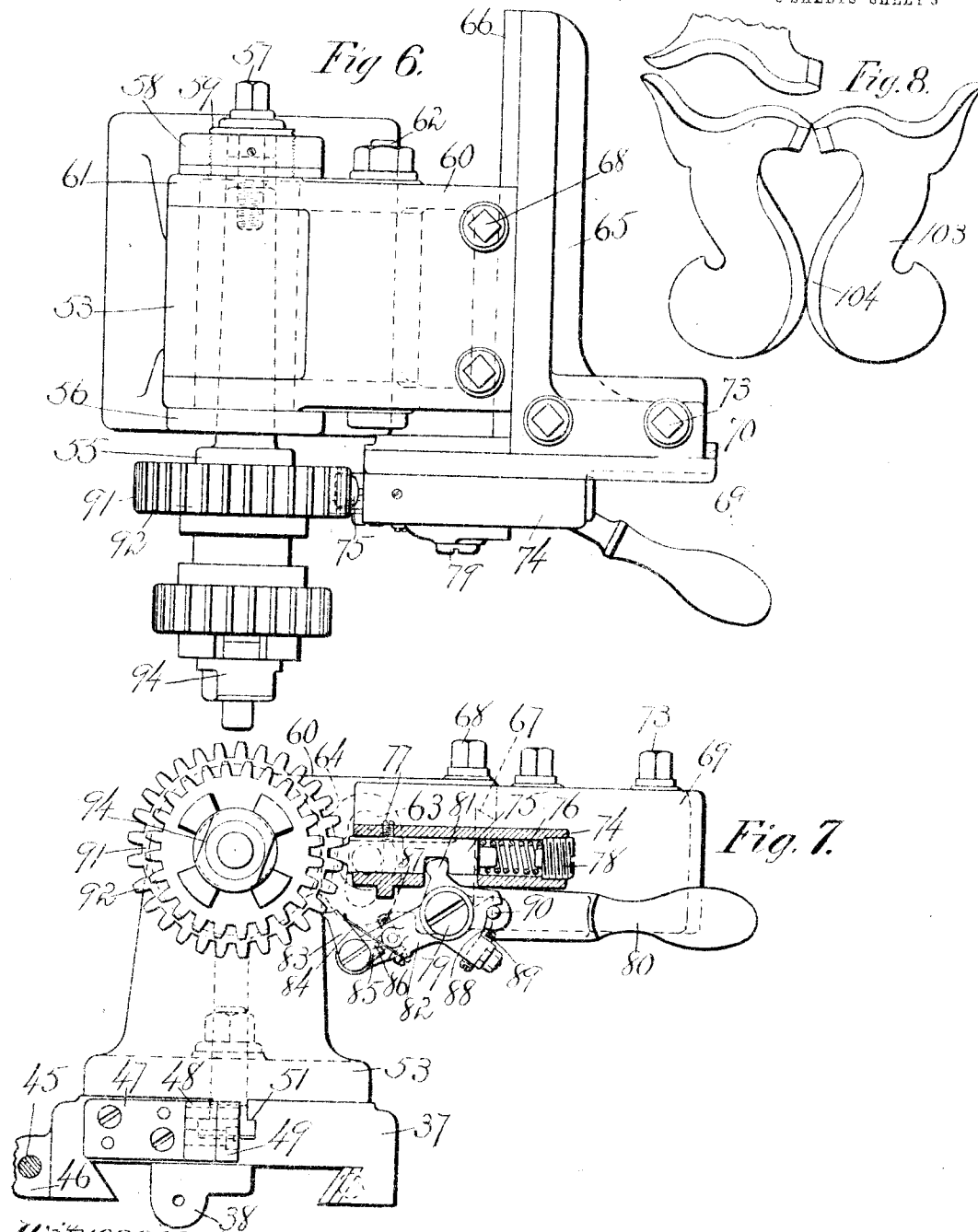
Inventor:

Bengt M. W. Hanson.
By Arthur C. Jenkins,
Attorney.

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3 SHEETS-SHEET 3



Witnesses:

J. H. Elliott
A. J. Freeman, del.

Inventor:

Bengt M. W. Hanson
Arthur B. Jenkins,
Attorney.

UNITED STATES PATENT OFFICE.

BENGT M. W. HANSON, OF HARTFORD, CONNECTICUT, ASSIGNOR TO PRATT & WHITNEY COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF NEW JERSEY.

FORMING-MACHINE.

1,063,160.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed March 12, 1908. Serial No. 420,594.

To all whom it may concern:

Be it known that I, BENGT M. W. HANSON, a subject of the King of Sweden, and a resident of Hartford, in the county of Hartford and State of Connecticut, have invented a new and Improved Forming-Machine, of which the following is a specification.

My invention relates to the class of machines for giving shape or form to articles 10 by a cutting operation in the process of manufacture, and the object of my invention is to provide a machine of this class that while equally usable for other purposes, may be easily and quickly adapted to the 15 formation of articles by my improved means; and a further object of the invention is to provide novel and improved mechanism for forming articles, which mechanism may be readily and quickly applied 20 to machines adapted for other purposes; and a further object of the invention is to provide means for varying the direction of forming movement of the parts to cause the cutting tool to produce an article of prede- 25 termined shape; and a further object of the invention is to provide a pattern the form of which shall govern the forming movement of the parts to cause the cutting tool to produce an article of predetermined 30 shape; and a still further object of the invention is to provide an indexing and locking mechanism of extreme simplicity in construction and operation; and a still further 35 object of the invention is the production of an indexing and locking mechanism in which the blank being operated upon may be utilized as a part of such indexing and locking means.

A simple form of machine having mechanism embodying my invention and exemplifying the above objects is illustrated in the accompanying drawings, in which—

Figure 1 is a view in side elevation of a machine embodying the invention. Fig. 2 45 is a view on enlarged scale showing a portion of the head of the machine and the means for supporting a blank or article with respect thereto. Fig. 3 is a detail view showing a segment of the rim of a gear illustrating work which may be done upon the 50 machine. Fig. 4 is a detail edge view of the former or pattern base. Fig. 5 is a front view of the same. Fig. 6 is a plan view of the work or article support and index and

locking mechanism, the sliding base being 55 omitted. Fig. 7 is a view in elevation of that end of said mechanism facing the head of the machine, and including the sliding base. Fig. 8 is a view showing articles operated upon by the machine and illustrating 60 still further the character of the work which may be done thereupon.

My invention is not limited to machines constructed especially and solely for carrying it into effect, but may be embodied in 65 such a machine if desired. I have found a satisfactory form of mechanism containing the invention so constructed that it may be readily and quickly attached to or detached from a machine usable for other purposes, 70 and such a machine is illustrated in the drawings herein, in which the numeral 10 denotes a base having a column or standard 11 rising therefrom, and upon the upper 75 end of which is located a head 12. An oil reservoir 13 is supported on the standard. A spindle 14 is suitably mounted in the head, this spindle having a chuck 15 and a driving pulley 16. A frame 17 is located on the head and is provided with clamps 18. A knee 80 guide 19 is formed on the front face of the column or standard 11, this guide being of dove-tail shape in cross-section to fit a recess of corresponding shape in the base of the knee 20. A knee operating shaft 21 is 85 suitably mounted in the standard and so connected to the knee that the latter may be fed along the standard as by means of the operating handle 22. All of the parts thus far specifically described are of known 90 construction and further and detailed description is deemed unnecessary herein, as the construction and operation will be readily understood by those skilled in the art.

While my invention is equally applicable 95 to the formation of articles of wide and varying kinds, shapes and sizes, it is especially applicable for use in pointing gear teeth, and especially teeth of such gears as are used in the transmission mechanism of 100 automobiles, and such an article has therefore been selected by me for the purpose of disclosure of the invention herein.

A knee base 23 carries a stop rod support 14 projecting along the side of the standard 101 11. A stop rod 25 secured to the support 24 carries stops 26 adjustably mounted upon the stop rod. These stops are located upon

opposite sides of a stop rod guide 27 and co-operate therewith to limit the movement of the knee 20. A screw threaded adjusting sleeve 28 provides means of adjustment for the rod 25 with respect to the support 24. The rod 25 has a groove 29 tapering to a narrower width at the bottom, and set screws 30 passing through the stops 26 project into this groove and serve to hold the stops in position on the rod.

An arm 31 is supported in the frame 17, this arm having on one end a curved support 32 adapted for use in connection with certain work to which the machine is adapted other than that for which the machine as illustrated herein is arranged, the support 32 in such instances being located adjacent to the chuck 15. To adapt the arm for use in connection with my improved mechanism it is reversed end for end, as shown in Fig. 1, and a tool rest 33 is supported thereon, being adjustably held in position as by means of a clamp bolt 34, the rest being split to enable the bolt to clamp it in place. The arm 31 is adjustable longitudinally and is held in position as by means of the clamps 18. This tool rest 33 holds the tool rigidly up to its work and prevents springing action which would result in uneven and unsatisfactory work.

The cutting tool 35, as shown a milling tool with a tapered end, is secured in the chuck 15. The knee 20 is provided with the usual dove-tail shaped projection 36 on which a sliding base 37 is mounted. A socket piece 38 is secured to the under side of the base 37, preferably removably secured thereto, and a plunger 39 is located in a socket 41 in the socket piece. A spring 40 is located in the socket 41 between the end of the plunger and the bottom of the socket, which spring when compressed forces the base toward the head 12. A screw 42 supported by a plate 43 secured to a cross-bar 44 extending between the side parts of the knee 20, is employed to place the spring 40 under compression. A base stop 45, in the form of a screw supported in an ear 46 projecting from the base, determines the extent of inward movement of the sliding base 37.

A strike base 47 is secured, preferably removably, to the end of the sliding base 37, a projection 48 affording means for removable attachment of a strike 49. This strike is preferably made of hardened steel or other metal capable of withstanding wear, and its upper edge is rounded as at 50.

The sliding base 37 has a shouldered groove 51 in which the head of a stud 52 from a fixture support 53 is located. The support is thus adjustable along the base, a nut 54 in connection with this stud serving to clamp the support in place, said support, together with the parts mounted thereon,

constituting a fixture that may be bodily removed from or attached to the machine at will.

The upper end of the fixture support 53 has a socket for a blank or work support 55. In a satisfactory form of construction the inner end of this blank support is formed as a tapered pin fitting a tapered opening in a headed sleeve 56 located in a socket in the fixture support 53. A retaining screw 57 engages the inner end of the blank support to hold it in place, a collar 58 and a filling piece 59 underlying the head of the locking screw, aiding the latter in holding the blank support and headed sleeve 56 in place.

A pivoted support 60 has branches 61 formed at one end lying on opposite sides of the upper end of the fixture support 53. These branches receive the sleeve 56 upon which the support is pivoted. This support has downward projecting side parts in which slots 63 are formed to receive a locking bolt 62 located in a lug 64 on the fixture support 53. This locking bolt holds the support 60 in any desired position, the side parts springing sufficiently to permit clamping action between the parts.

A bracket 65 is adjustably held by the support 60, as by means of an interengaging tongue 66 and groove 67, clamp bolts 68 holding the bracket in place. An indexing plate 69 is adjustably mounted upon the bracket, as by an intermeshing tongue 70 and groove 71, the bracket being split as at 72 to enable the clamp screws 73 to clamp the plate against movement on the bracket.

A projection 74 is located on the side of the plate 69, this projection having a recess for a locking bolt 75. The end of the locking bolt is shaped to fit between the teeth of the gear blank being operated upon, a spring 76 forcing the bolt into engaging position with said blank. A screw 77 prevents turning movement of the locking bolt, and a closure screw 78 closes the end of the socket and also regulates the tension of the spring. It will be understood that the end of the locking bolt may assume any form to properly engage the blank being operated upon to hold the latter against movement.

A headed screw stud 79 has its inner end shouldered and threaded to provide means for secure attachment to the plate 69. A lever handle 80 is pivotally mounted upon this stud and has a finger 81 engaging a recess in the locking bolt 75, the lever handle and finger being rigidly united, and a pawl supporting plate 82 is also mounted upon the stud 79 to have a pivotal movement independently of the lever handle 80. A pawl 83 is pivoted upon the plate 82, a spring 84 holding the heel 85 of the pawl against the stop pin 86. A suitable stop may be provided to limit the upward movement of the

lever handle, in the form shown, however, the bolt striking the teeth in the gear forming such stop. A stop pin 87 adjustably mounted in the pawl supporting plate limits the downward swinging movement of the lever handle, this pin striking against the projection 74. A recess 88 is formed in the edge of the pawl supporting plate, an adjusting screw 89 projecting into this recess. A pin 90 from the lever handle 80 extends into this recess.

By an examination of Fig. 7 of the drawings it will be noted that the parts just described are so adjusted that the locking bolt 75 will engage the space between the gear teeth on a gear 91, and the pawl 83 will be located in position to thrust against one of said teeth when the lever handle 80 is operated.

The gear 91, the ends of the teeth 92 of which are to be pointed as illustrated at 93 in Fig. 3, is located upon and secured to the blank support 55, a nut 94 holding the blank in place. In the form of blank shown one of two gears located at opposite ends of a sleeve is being operated upon, it being noted by references to Fig. 2 that this may be easily accomplished, the tool being located over the smaller gear. A former or pattern base 95 is adjustably secured upon the knee guide 19, the base having a dove-tailed shaped recess as shown in Fig. 4, to fit said guide. A gib 96 held in place by bolts 97 clamps the base securely in position, this gib being of a shape to partially form the dove-tailed shaped recess. Ears 98 project from the base 95 and a former or pattern 99 is pivotally supported upon a pivot 100 secured to the ears. An adjusting screw 101 extending through the former limits its swinging movement toward the base, and a clamping screw 102 prevents swinging movement away from the base.

In Fig. 8 of the drawings there is illustrated an article, as a hammer for a gun, which may be shaped and formed upon my improved machine. It will be noted that these hammers 103 are supported in pairs so that the cutting tool may operate simultaneously upon two of said articles beveling the edges as at 104.

It will be noted that the machine is constructed so that in operation upon the teeth of a gear two teeth are operated upon simultaneously so that in effect a tooth is finished in each operation. The machine has in effect two feeds, what may be termed a "regular" feed to bring the tool and the work into operative relation, and what may be termed a "forming" feed which embodies such relative movement of the blank and the tool, either or both, as determines the shape or form which shall be imparted in the cutting operation.

The regular feed, in the form of device

shown herein, is obtained by means of the handle 22, manually operated, but it is obvious that other means may be employed for imparting this feed. The forming feed is automatic and is governed and controlled by the former or pattern 99. This former may have any desired shape to produce a given form in the article being operated upon, the base 37 being held in contact with the former by means of the spring 40 as the blank is fed up to the work. The former thus determines the direction of relative movement between the blank and cutting tool to cause the latter to shape the blank to a predetermined form, the former thus acting as a pattern to determine the shape which shall be given to the article.

While my invention is not limited to the use of any special shape of cutting and forming tool, a milling tool having its end beveled or pointed, as herein shown, has special advantages in connection with the pointing of gear teeth. The shape given to the teeth is such as to provide the best results in the operation of the gears, not only enabling the gears to readily mesh without striking but also giving to the teeth such form that the gears will be engaged by an action somewhat resembling that between the teeth after they are engaged.

The machine, while usable for other purposes, is quickly and readily adapted for the purpose in hand, and the work may be very rapidly performed thereon.

While the locking and indexing mechanism as herein shown contemplates the use of the blank being operated upon as a part of said mechanism, thus reducing the same to a minimum number of parts, when articles which can not be put to such use are to be formed in the machine other means may be readily provided for indexing and locking.

In the operation of the device the fixture support and the work carried thereby are adjusted to proper position with respect to the tool 35 by the various adjusting devices operated in a well known manner, after which, in operating the indexing mechanism, the handle lever 80 is rocked, the finger 81 withdrawing the locking bolt 75. In this withdrawing operation the pin 90 on the lever handle moves within the recess 88, thus imparting no movement to the pawl supporting plate and pawl until the bolt has been withdrawn from engagement with its cooperating parts. As soon as the bolt has been withdrawn the pin 90 striking the adjusting screw 89 causes the pawl supporting plate and pawl to be moved forward, feeding the blank forward. Upon releasing the handle the latter swings to the position shown in Fig. 7, moving the locking bolt into position to lock the blank against movement. In the mechanism herein shown for

operating upon the gear the pawl imparts a partial movement to the blank, sufficient to enable the bolt to enter the recess between the teeth, and the entrance of the bolt acting upon a beveled surface of a tooth moves the blank partially to the position to be occupied for operation by the cutting tool.

I claim:

1. A machine including a column, a knee movable upon the column and a spindle for holding a cutting tool, means for moving the knee, a sliding base movable upon the knee, said base having a socket piece, a spring located within said socket piece, a spring operated plunger extending within the socket piece to exert pressure upon the sliding base, means for governing the tension of the spring, a fixture support mounted upon the sliding base, means carried by the fixture support for holding a blank, and a former supported by said column and arranged to vary and control the direction of movement of the sliding base to determine the resultant shape of said blank.

2. A machine including a column, a knee movable upon the column and a spindle for holding a cutting tool, means for moving the knee, a sliding base movable upon the knee, said base having a socket piece, a spring located within the socket piece, a plunger extending within the socket piece and seated against the spring, a screw located in said knee, said screw thrusting against the end of said plunger, a fixture support mounted upon the sliding base, means carried by the fixture support for holding a blank, and a former supported by said column and arranged to vary and control the direction of movement of the sliding base to determine the resultant shape of said blank.

3. A machine including a column, a knee movable upon the column and a spindle for holding a cutting tool, means for moving the knee, a sliding base supported on said knee, means for exerting spring pressure upon said sliding base to move it toward said column, means for varying the tension of the spring, a fixture support mounted upon the sliding base, means carried by the fixture

support for holding a blank, and a former secured to said column and arranged to vary and control the direction of movement of the sliding base to determine the resultant shape of the blank.

4. A machine including a knee and a spindle for holding a cutting tool, means for moving the knee, a sliding base supported upon the knee, a fixture support carried by the sliding base, means carried by the fixture support for holding a blank, a bracket secured to the fixture support, an indexing mechanism attached to the fixture support, and means for positioning said bracket with respect to the blank carried by the fixture support.

5. A machine including a knee and a blank support, means for operating the knee, a sliding base mounted on the knee, a fixture support mounted on the sliding base, a bracket adjustably mounted on the fixture support, an indexing plate adjustably mounted on the bracket to support indexing mechanism, and a former arranged to vary and control the direction of movement of the sliding base on the knee to determine the resultant shape of a blank.

6. A machine including a knee, means for operating the knee, a sliding base mounted on the knee, a blank support carried by the sliding base, a fixture support mounted on the sliding base and adjustable thereon, a bracket adjustably mounted on the fixture support, an indexing plate mounted on said bracket and adjustable with respect to the blank support, and an indexing mechanism carried by said plate.

7. A cutting tool with means for operating it, a sliding base, means for feeding said base, a blank support carried by said base, a former base, a former pivotally mounted on the former base and having its surface shaped to direct the forming movement of the sliding base, and means for adjusting said former on its pivot.

BENGT M. W. HANSON.

Witnesses:

W. M. STORRS,

ARTHUR B. JENKINS.