Dec. 22, 1942. A. THROP 2,306,092

MACHINE FOR MARKING BEVELED OR CONICAL SURFACES

Filed April 18, 1941 3 Sheets-Sheet 1

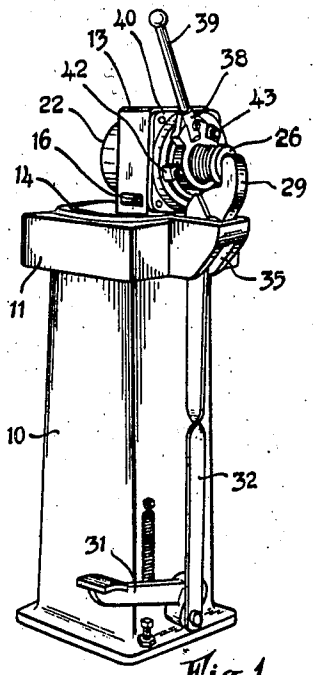


Fig. 1.

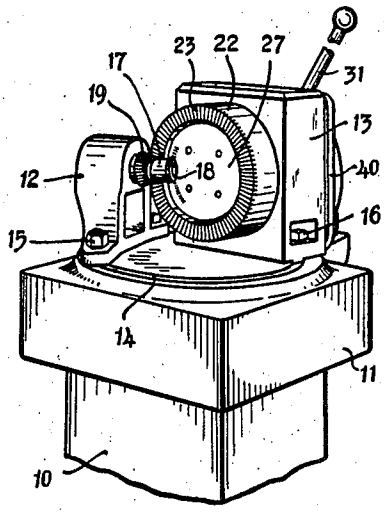


Fig. 2.

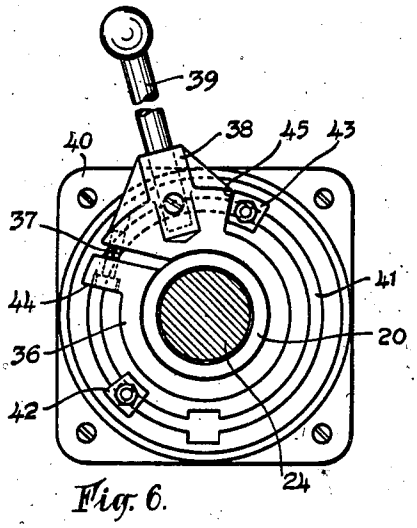


Fig. 6.

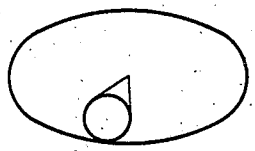


Fig. 3.

INVENTOR:
ARNOLD THROP
BY: Francis C. Boyce
ATTORNEY

Dec. 22, 1942. A. THROP 2,306,092

MACHINE FOR MARKING BEVELED OR CONICAL SURFACES

Filed April 18, 1941 3 Sheets-Sheet 2

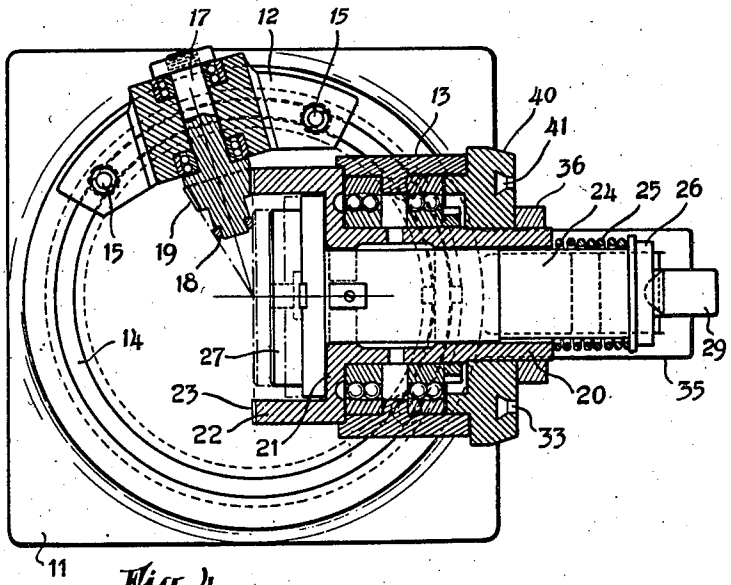


Fig. 4.

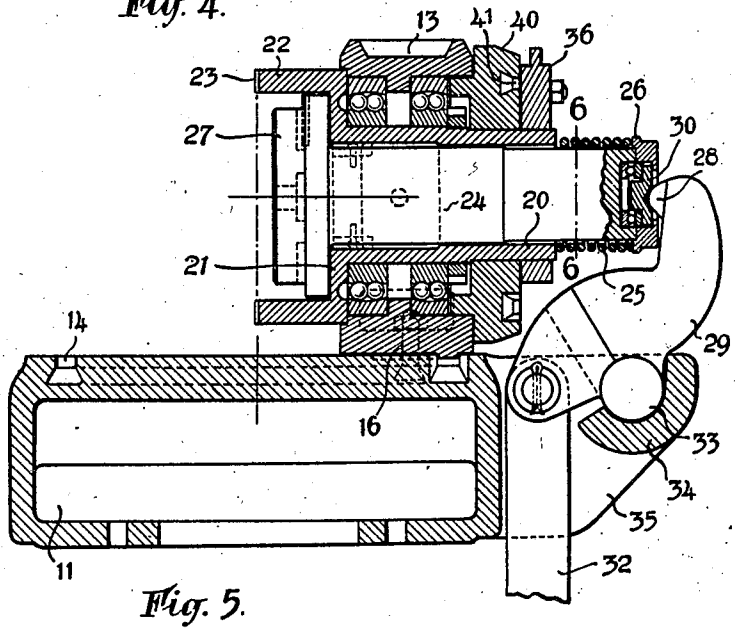


Fig. 5.

INVENTOR
ARNOLD THROP

BY: Francis E. Boyce

ATTORNEY

Dec. 22, 1942. A. THROP 2,306,092

MACHINE FOR MARKING BEVELED OR CONICAL SURFACES

Filed April 18, 1941 3 Sheets-Sheet 3

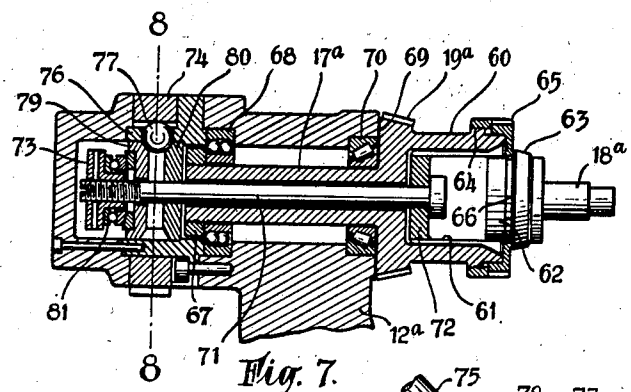


Fig. 7.

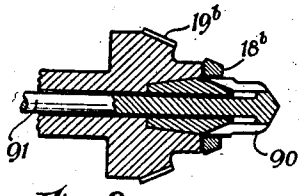


Fig. 9.

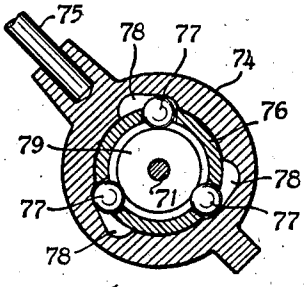


Fig. 8.

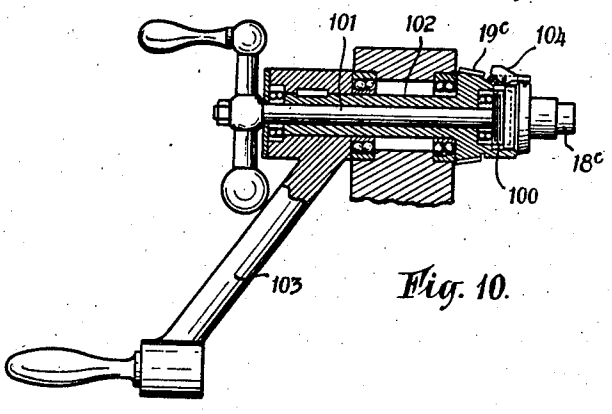


Fig. 10.

INVENTOR:
ARNOLD THROP
BY: Francis E. Boyce
ATTORNEY

Patented Dec. 22, 1942 2,306,092

UNITED STATES PATENT OFFICE

2,306,092

MACHINE FOR MARKING BEVELED OR CONICAL SURFACES

Arnold Throp, Sheffield, England, assignor to Edward Pryor and Son, Limited, Sheffield, England, a British company

Application April 18, 1941, Serial No. 389,152
In Great Britain April 30, 1940

13 Claims. (Cl. 101—7)

This invention relates to machines for marking graduations, numerals or other indices upon the conical surface of a body.

In machines at present employed for marking work-pieces having conical surfaces, such surfaces are marked by a complementary conical die, the work-piece and die being carried by separate spindles which are set in a rigid fashion at the requisite angle to suit a particular work-piece. Consequently, in order that such machines be able to mark other work-pieces having conical surfaces of different angles, new mountings for the machine spindles, likewise rigid, must be provided. As it is vital, for accurate work, that the work-piece and marking die be geared together by means of toothed wheels, two fresh wheels making a proper pair must be included in the new mountings for every change of angle. Such machines therefore lack universality and the changes of work involve expensive alterations to the machines. Moreover, the present state of technical achievement in making marking dies permits of making flat dies much more accurately than dies which are beveled or conical so as to be complementary to a beveled or conical work-piece.

An object of this invention therefore is to provide an improved method of and machines for marking the conical surfaces more expeditiously, efficiently and accurately than hitherto.

A further object of the invention is to provide improvements whereby the conical surface of a body is marked by a mark carried on the flat surface of a marking die.

A further object of the invention is to provide improvements whereby a true rolling action of the conical surface over the flat surface of the marking die will be obtained to produce faithful impressions of a mark.

The invention consists in the construction, arrangement and combination of elements hereinafter described as well as in the method of marking hereinafter set forth, all as set out in the claims and as illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of a machine embodying the principles of my invention, the view showing the machine as seen from the rear side thereof.

Fig. 2 is a fragmentary perspective view, to an enlarged scale, of the machine as seen from the opposite side.

Fig. 3 is a diagrammatic view indicative of a cone rolling upon a flat surface and illustrating the principle of my invention, the cone representing the conical surface of a work-piece and the flat surface representing the flat surface of a marking die.

Fig. 4 is a sectional plan of the machine taken through the centres of the work-piece carrying member and the marking die carrying spindle, the latter, as well as part of the work-piece carrying member, being shown in full.

Fig. 5 is a sectional part elevation of the machine with the work-piece carrying member and housing means therefor being omitted.

Fig. 6 is a sectional end elevation, on line 6—6, Fig. 4, of the marking die housing means.

Fig. 7 is a sectional elevation of a modified form of work-piece carrying member and housing means therefor.

Fig. 8 is a cross section, on the line 8—8, Fig. 7.

Fig. 9 is a fragmentary view of a further modified form of work-piece carrying member.

Fig. 10 is a fragmentary sectional elevation of a further modified form of work-piece carrying member and housing means therefor.

Referring to Figs. 1 to 6 inclusive, the machine comprises a standard 10 carrying a detachable supporting head 11 for a work supporting housing 12 and a marking die supporting housing 13, the two housings each being removably and adjustably secured to the upper face of said head 11 by means of a circular groove 14 and holding down bolts 15 and 16 respectively, whereby the said housings may be positioned relatively to each other within the limits of said circular groove 14.

The work supporting housing 12 rotatably accommodates a horizontal work-piece carrying spindle 17, the axis of which intersects the vertical axis of the circular groove 14. The end of the spindle 17 directed towards the axis of the circular groove 14 projects from the housing 12 and is adapted at its extremity to receive a conically surfaced work-piece 18, and intermediate of the housing and said work-piece, the said spindle is provided with a bevel pinion 19, the arrangement being such that the pitch cone of the bevel pinion and the cone of the conical surface of the work-piece shall coincide in order that their apices will be positioned at a common point in the axis of the circular groove 14.

The housing 13 for the marking die rotatably accommodates a sleeve 20 provided with a radial flange 21. Extending from this radial flange and integral therewith is an axial flange 22, the annular extremity of which is toothed to constitute a crown-wheel 23 meshing with the bevel pinion 19. Rotatable with and slidably accommodated in the sleeve 20, is a marking die carry-

ing spindle 24 which is retained in a normally retracted position, relative to the sleeve, by a coil spring 25 bearing against the rear end of the sleeve 20 and a flanged end cap 26, said end cap being conveniently secured to the spindle 24 by set screws (not shown).

The forward end of the spindle 24 is enlarged for the attachment of a marking die 27 having a flat mark carrying surface which is presented angularly towards but normally distant from, the work-piece 18 so that the axis of said surface intersects the axis of the work-piece where said latter axis intersects the axis of the circular groove 14 of the head 11. As hereinbefore mentioned, the spindle 24 is slidable and consequently the marking die 27 is slidable therewith.

The object of the slidability of the marking die 27 and its spindle 24, is to permit the marking surface of said die, on advance of the spindle 24, to be brought into contact with the conical surface of the work-piece 18, and since the respective locations of the work-piece and marking die are such that their axes intersect each other at the point where they also intersect the axis of the circular groove 14, the result will be that, on contact of the marking surface of the marking die with the conical surface of the work-piece 18, the apex of the cone of said work-piece will lie at the centre of rotation of the surface of the marking die 27.

For advancing the marking die spindle 24 to bring the marking surface of the marking die into contact with the conical surface of the work-piece as aforesaid, the pusher end 28 of a rocker arm 29 maintains contact with a thrust pad 30 housed in the end cap 26 to exert a pressure forwardly upon the marking die spindle 24 when the rocker arm 29 is operated by a spring restrained foot actuated lever 31 to which it is connected by a pull rod 32.

The rocker arm 29 sits with its fulcrum 33 in a cup shaped seating 34 provided in a slotted extension 35 of the head 11.

With the spindle 24 advanced as immediately before described, the conical surface of the work-piece 18 and the flat surface of the marking die 27 contact with each other in accordance with the principle that the apex of said conical surface lies at the centre of rotation of said flat surface as before mentioned, and on rotational movement of either the work-piece 18 or the marking die 27, the conical surface of said work-piece will roll upon the flat surface of said marking die symbolical of a cone rolling thereon in a circular path with its apex positioned at the centre of said flat surface as illustrated by the diagram of Fig. 3.

For effecting the necessary rotational movement of the conical surface and the flat surface of the marking die when brought into contact with each other as before mentioned, the marking die spindle 24 is provided with hand manipulated actuating means for effecting its rotation, such means comprising a split gripping ring 36 tightenable by a set screw 37 and having a handle receiving socketed extension 38 for the manipulating handle 39.

This spindle actuating ring 36 operates adjacent to the rear wall 40 of the housing 13, said rear wall being provided with an annular groove 41 in which stops 42 and 43 for contact by the shoulders 44 and 45 respectively of the ring 36, are adjustably positioned for predetermining the extent of rotational movement of the marking die spindle 24 and consequently of the contacting surfaces of the work-piece and marking die, the said stops 42 and 43 being predeterminedly set to the requisite positions to permit the required amount of rotational movement to be effected according to the length of mark upon the flat surface of the marking die 27.

Fig. 7 illustrates an alternative arrangement of work housing 12a and work-piece carrying spindle 17a for securing a work-piece 18a which, in the example shown for the purpose of illustration is a shell fuse and is secured by being gripped on its outer periphery. The rotatable work-piece carrying spindle 17a is hollow and is formed with an enlarged hollow head 60 slidably accommodating interiorly thereof a split collet 61 which peripherally embraces an end 62 of the work-piece at the rear of the conical surface 63 thereof. Engaging the exteriorly threaded collar 64 of the spindle head 60 is a locating ring 65 for engaging the shoulder 66 formed at the rear of the conical surface of the work-piece 18a, said locating ring serving to locate said work-piece in correct relation to the bevel pinion 19a formed on the head 60, such correct relation being that the cone of the conical surface 63 aligns with the pitch cone of the bevel pinion 19a so as to bring the apices of said cones in coincidence.

The hollow spindle 17a is screw threaded exteriorly at its inner end to receive a threaded collar 67 abutting the ball bearing 68 whereby in conjunction with a shoulder 69 at the rear of the head 60 abutting the roller bearing 70, the said spindle is locked against axial movement. Passing axially through the spindle and slidable relative thereto is a bolt 71, the head of which engages the inner end wall 72 of the split collet 61 while its other end is screw threaded to receive a nut 73 securing a ball and ratchet device incorporated in the housing 12a and around the bolt 71. This ratchet device comprises a ratchet ring 74 rotatably accommodated in the housing and actuable by an attached handle 75. A ball cage 76 carries balls 77 operating in tapered pockets 78 of the ring 74 and between opposing collars 79 and 80 provided loosely on the bolt 71, the collar 80 being held against movement and the collar 79 having freedom of movement axially and bearing against a thrust bearing 81 located adjacent the nut 73, the arrangement being such that on rotational movement of the ratchet ring 74 in the requisite direction to confine the balls at the smaller ends of the pockets 78, the movable collar 79 will be moved away from the stationary collar 80 and thereby cause retraction of the bolt 71 which in consequence will retract the split collet 61 sufficiently to tighten it upon the periphery of the work-piece 18a for securely holding the latter.

Fig. 9 shows a method of holding a work-piece 18b by gripping it on the inner periphery thereof with an expandible split collet 90 which is adapted to be expanded by axial retraction of an integrally combined bolt 91 by similar means to that in which the bolt 71 of Fig. 7 is retracted.

Fig. 10 illustrates an alternative arrangement in which the work-piece 18c is rotationally operated instead of rotating the marking die 27 of Figs. 1 to 6, for effecting the desired rotational movement of their respective surfaces when in contact with each other. In this arrangement the work-piece 18c is held on its inner screw threaded periphery by the threaded end 100 of a hand rotatable spindle 101 rotatably held in a hollow work-piece carrying spindle 102 which is rotationally operable by a hand lever

103, keyed thereto, for effecting the desired rotational movement of the conical surface of said work-piece and the marking surface of a marking die brought into contact therewith in the manner before described with reference to Figs. 1 to 6.

In the alternative arrangement of Fig. 10 means are incorporated for ensuring that a definite position of the conical surface of the work-piece 18c is located relative to a mark upon the marking surface of a marking die and such means comprises a spring pressed trigger 104 pivoted to the work-piece carrying spindle 102 in front of its bevel pinion 19c, said trigger engaging a hole in the periphery of the work-piece 18c. As a result, the impression made on the work-piece 18c by a mark carried on a marking die will bear a definite relation to the hole in its position upon the conical surface of the work-piece and enable repetitive markings to be made upon successive identical work-pieces in the same position thereon.

What I claim and desire to secure by Letters Patent is:

1. A marking machine comprising an axially movable rotatable marking die and supporting means therefor, a flat mark carrying surface to said marking die, a work holder adapted to rotatably support a conically surfaced work piece, supporting means for, and permitting adjustment of, said work holder whereby said work piece can be positioned with its axis disposed angularly with respect to and intersecting the axis of the marking die, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit the axial advance of said marking die into operative position and to re-act to retract said marking die to its inoperative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface and means for effecting rotational movement of said contacting surfaces.

2. A marking machine comprising an axially movable rotatable marking die and supporting means therefor, a flat mark carrying surface to said marking die, a mark on said surface, a work holder adapted to rotatably support a conically surfaced work-piece, supporting means for, and permitting adjustment of, said work holder whereby said work-piece can be positioned with its axis disposed angularly with respect to and intersecting the axis of the marking die, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit the axial advance of said marking die into operative position and to re-act to retract said marking die to its inoperative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface, means for effecting rotational movement of said contacting surfaces and means for maintaining unison of said rotational movement of said contacting surfaces.

3. A marking machine comprising an axially movable rotatable marking die and supporting means therefor, a flat mark carrying surface to said marking die, a mark on said surface, a work holder adapted to rotatably support a conically surfaced work-piece, supporting means for, and permitting adjustment of, said work holder whereby said work-piece can be positioned with its axis disposed angularly with respect to and intersecting the axis of the marking die, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit the axial advance of said marking die into operative position and to re-act to retract said marking die to its inoperative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work-piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface, means for effecting rotational movement of said contacting surfaces and means on the work holder for locating the work-piece in a predetermined angular position relative to the mark on the flat mark carrying surface of the marking die.

4. A marking machine comprising an axially movable rotatable marking die and supporting means therefor, a flat mark carrying surface to said marking die, a mark on said surface, a work holder adapted to rotatably support a conically surfaced work-piece, supporting means for, and permitting adjustment of, said work holder whereby said work-piece can be positioned with its axis disposed angularly with respect to and intersecting the axis of the marking die, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit axial advance of said marking die into an operative position and to re-act to retract said marking die to its inoperative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work-piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface, means for effecting rotational movement of said contacting surfaces and means for maintaining unison of said rotational movement of said contacting surfaces, said means comprising a crown wheel rotatable with the marking die and meshing with a bevel pinion rotatable with the work-piece.

5. A marking machine comprising an axially movable rotatable marking die, a flat mark carrying surface to said marking die, a mark on said surface, a rotatable work-piece carrying member adapted to receive and securely hold a conically surfaced work-piece, separate housing means for said marking die and said member and accommodating said die and said member with their axes intersecting each other, supporting means for and common to both of said housing means permitting adjustment relative to each other of said housing means within a circular path whose axis intersects the axes of the marking die and the work-piece carrying member, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit axial advance of said marking die into an operative position and to re-act to retract said marking die to its inoperative position, means for axially

advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface and means for effecting rotational movement of said contacting surfaces.

6. A marking machine comprising an axially movable rotatable marking die, a flat mark carrying surface to said marking die, a mark on said surface, a rotatable work-piece carrying member adapted to receive and securely hold a conically surfaced work-piece, separate housing means for said marking die and said member and accommodating said die and said member with their axes intersecting each other, supporting means for and common to both of said housing means permitting adjustment relative to each other of said housing means within a circular path whose axis intersects the axes of the marking die and the work-piece carrying member, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit axial advance of said marking die into an operative position and to re-act to retract said marking die to its inoperative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work-piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface, means for effecting rotational movement of said contacting surfaces and means for maintaining unison of said rotational movement of said contacting surfaces

7. A marking machine comprising an axially movable rotatable marking die, a flat mark carrying surface to said marking die, a mark on said surface, a rotatable work piece carrying member adapted to receive and securely hold a conically surfaced work-piece, separate housing means for said marking die and said member and accommodating said die and said member with their axes intersecting each other, supporting means for and common to both of said housing means permitting adjustment relative to each other of said housing means within a circular path whose axis intersects the axes of the marking die and the work-piece carrying member, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit axial advance of said marking die into an operative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work-piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of said conical surface, means for effecting rotational movement of said contacting surfaces, means for maintaining unison of said rotational movement of said contacting surfaces and means for limiting the extent of said rotational movement.

8. A marking machine comprising an axially movable rotatable marking die and supporting means therefor, a flat mark carrying surface to said marking die, a work holder adapted to rotatably support a conically surfaced work-piece, supporting means for, and permitting adjustment of, said work holder whereby said work piece can be positioned with its axis disposed angularly with respect to and intersecting the axis of the marking die, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit the axial advance of said marking die into operative position and to re-act to retract said marking die to its inoperative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work-piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface and means for effecting rotational movement of said contacting surfaces by rotationally operating the marking die.

9. A marking machine comprising an axially movable rotatable marking die and supporting means therefor, a flat mark carrying surface to said marking die, a work holder adapted to rotatably support a conically surfaced work-piece, supporting means for, and permitting adjustment of, said work holder whereby said work-piece can be positioned with its axis disposed angularly with respect to and intersecting the axis of the marking die, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit the axial advance of said marking die into operative position and to re-act to retract said marking die to its inoperative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface, means for effecting rotational movement of said contacting surfaces by rotationally operating the marking die and means for maintaining unison of said rotational movement of said contacting surfaces.

10. A marking machine comprising an axially movable rotatable marking die and supporting means therefor, a flat mark carrying surface to said marking die, a work holder adapted to rotatably support a conically surfaced work-piece, supporting means for, and permitting adjustment of, said work holder whereby said work-piece can be positioned with its axis disposed angularly with respect to and intersecting the axis of the marking die, means for holding the marking die in a normally retracted inoperative position, said means being adapted to yield to permit the axial advance of said marking die into operative position and to re-act to retract said marking die to its inoperative position, means for axially advancing the marking die to said operative position to press the flat mark carrying surface thereof into contact with the conical surface of the work-piece and thereby to locate the centre of rotation of said mark carrying surface coincident with the apex of the cone of said conical surface, means for effecting rotational movement of said contacting surfaces by rotationally operating the work-piece carrying member and means for maintaining unison of said rotational movement of said contacting surfaces.

11. A marking machine comprising a standard, a supporting head on said standard, means removably and adjustably secured to said head housing a rotatable work-piece carrying member, means also removably and adjustably secured to

the head housing a rotatable sleeve, a spindle axially slidable in and rotatable with said sleeve, a marking die carried by said spindle, a flat mark carrying surface to said marking die disposed radially to the axis of said spindle and exposedly of said sleeve, means associated with the sleeve for yieldingly retaining the marking die carrying spindle normally in a retracted position relative to said sleeve, means on the work-piece carrying member for retaining a conically surfaced work-piece on said member, means on the head comprising a circularly grooved face thereto permitting adjustable positioning of both of the housing means thereon whereby to present the conical surface of the work-piece adjacent to but out of contact with the flat mark carrying surface and so that the axis of said conical surface intersects the axis of said flat mark carrying surface, means for axially advancing the marking die carrying spindle relative to the sleeve against the action of the yielding retaining means to press the flat mark carrying surface of the marking die into contact with the conical surface of the work-piece and thereby to bring the centre of said mark carrying surface coincident with the apex of the cone of said conical surface and means for rotationally operating the marking die carrying spindle to cause the said contacting conical and flat mark carrying surfaces to rotationally move together whereby an impression of a mark on said flat mark carrying surface is made upon the conical surface, the yielding retaining means thereafter re-acting for retracting the marking die carrying spindle.

12. A marking machine comprising a standard, a supporting head on said standard, means removably and adjustably secured to said head housing a rotatable work-piece carrying member, means also removable and adjustably secured to the head housing a rotatable sleeve, a spindle axially slidable in and rotatable with said sleeve, a marking die carried by said spindle, a flat mark carrying surface to said marking die disposed radially to the axis of said spindle and exposedly of said sleeve, means associated with the sleeve for yieldingly retaining the marking die carrying spindle normally in a retracted position relative to said sleeve, means on the work-piece carrying member for retaining a conically surfaced work-piece on said member, means on the head comprising a circularly grooved face thereto permitting adjustable positioning of both of the housing means thereon whereby to present the conical surface of the work-piece adjacent to but out of contact with the flat mark carrying surface and so that the axis of said conical surface intersects the axis of said flat mark carrying surface, means for axially advancing the marking die carrying spindle relative to the sleeve against the action of the yielding retaining means to press the flat mark carrying surface of the marking die into contact with the conical surface of the work-piece and thereby to bring the centre of said mark carrying surface coincident with the apex of the cone of said conical surface, means for rotationally operating the marking die carrying spindle to cause the said contacting conical and flat mark carrying surfaces to rotationally move together whereby an impression of a mark on said flat mark carrying surface is made upon the conical surface, the yielding retaining means thereafter re-acting for retracting the marking die carrying spindle and means for ensuring unison of rotational movement of said contacting conical and flat mark carrying surfaces.

13. A marking machine for marking the conical surface of a body comprising a standard, a head to the standard incorporating a supporting face, a rotatable marking die terminating in a flat mark carrying surface perpendicular to the axis thereof, supporting means for the die mounted upon the said face, a rotatable work carrying spindle adapted to carry a conically surfaced work-piece, supporting means for the spindle also mounted upon the said face, said face having a circular track, at least one of said supporting means being adjustable along said track thereby to adjust the two supporting means with respect to one another upon the said face so as to locate the work carrying spindle and the marking die with their axes intersecting each other, the axis of said track intersecting the axes of the work and die at their intersection, and with the flat mark carrying surface in contact with the conical surface of the work-piece whereby the apex of the cone of said conical surface lies at the centre of rotation of the said flat mark carrying surface and means for effecting rotational movement of the said contacting surfaces.

ARNOLD THROP.