

No. 624,535.

Patented May 9, 1899.

H. W. H. POWEL.

DEVICE FOR GAGING AND POSITIONING TOOLS OF SLIDE REST LATHES.

(Application filed July 29, 1897.)

(No Model.)

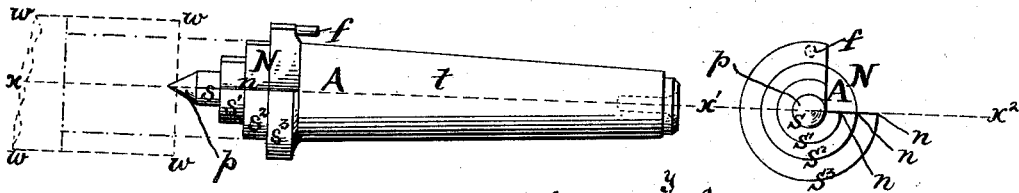


Fig. 1

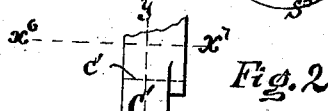


Fig. 2

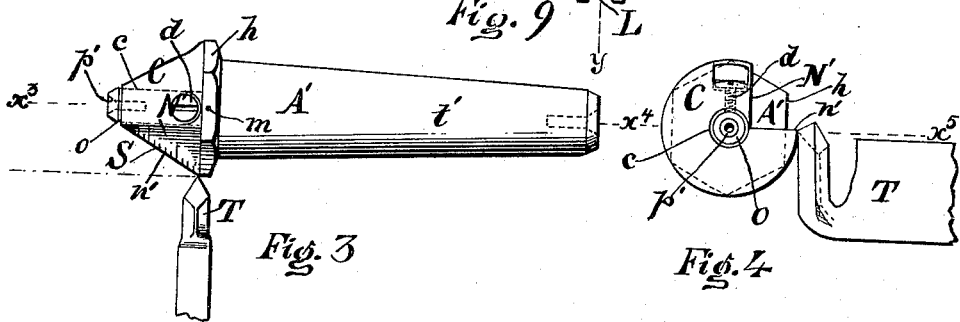


Fig. 3



Fig. 9

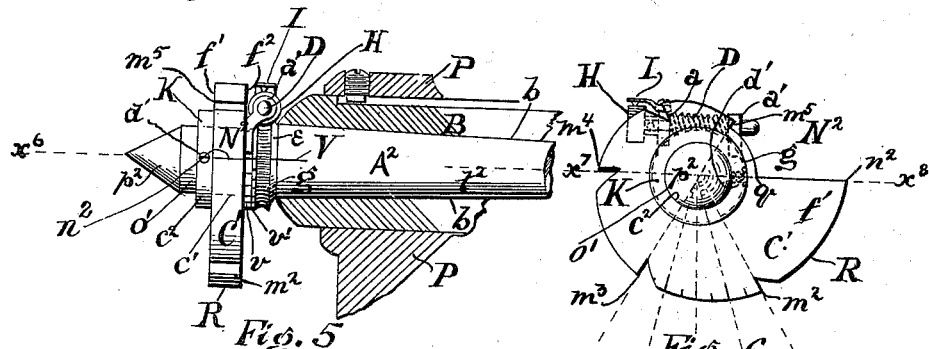


Fig. 5

Fig. 6

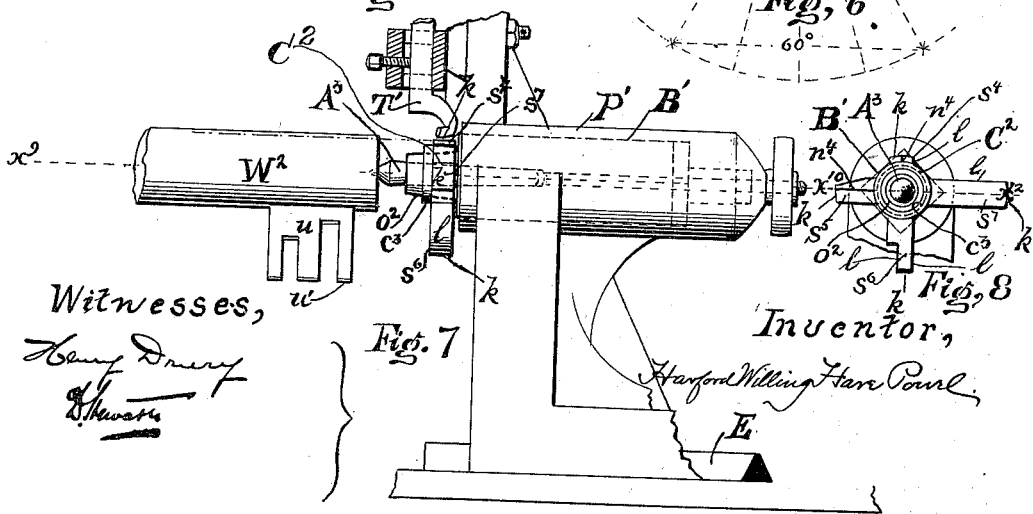


Fig. 7

Fig. 8

Witnesses,
Henry D. Dyer
Shaw

Inventor,
Harford Willing Fane Powell

UNITED STATES PATENT OFFICE.

HARFORD WILLING HARE POWEL, OF NEWPORT, RHODE ISLAND.

DEVICE FOR GAGING AND POSITIONING TOOLS OF SLIDE-REST LATHES.

SPECIFICATION forming part of Letters Patent No. 624,535, dated May 9, 1899.

Application filed July 29, 1897. Serial No. 646,428. (No model.)

To all whom it may concern:

Be it known that I, HARFORD WILLING HARE POWEL, a citizen of the United States of America, residing in the city and county of Newport, in the State of Rhode Island, have invented a certain new and useful Improvement in Devices for Gaging and Positioning the Tools of Slide-Rest Lathes, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

While my invention especially relates to devices for gaging and presenting in definite positions to work, axially supported therein, the tools of slide-rest lathes, it also in its general application relates to like combinations with other machines in which there exists the lathe principle of an axial work-support combined with mechanically guided and controlled tools—as, for example, a circular-shaping machine or key-planer.

The chief object of my invention is to provide the turner or person who controls a machine of the class above indicated with a combined work-support and radius-gage or caliper device, and preferably in combination therewith with a tool-setting device or position-finder, which latter device, despite the fact that the "point" of the lathe's center may be thrust for a considerable distance within the "center-pit" in the end of the work, shall serve, as hereinafter explained, to tell the plane which connects the work's axis of rotation and the point or deepest-cutting edge of the tool when the latter is correctly placed or form, as it were, a center-plane or level-definer.

A further object is to combine with aforesaid other finders or "faces," &c., upon and by which the tool may be set to other defined positions in relation to both the work's axis and the tool's lines of motion; also such other objects as will be apparent from this specification as a whole.

The new and useful features of my said invention will be found segregated in the concluding claims, and reference now being had to the accompanying drawings, which form part of this specification, they will be found to illustrate the same, as follows:

Figure 1 is a side elevation of a slide-rest lathe's center embodying my said invention

in a simple integral form, the action thereof being indicated diagrammatically by annexed interrupted outlines. Fig. 2 is an end view from the work-supporting or point side of the device shown in Fig. 1. Figs. 3 and 4 are plan and end elevations, respectively, of another modification of my invention. A diamond-point tool is also shown in these figures as if in the act of being positioned "at center." Fig. 5 is a partially-sectioned side elevation of a portion of a slide-rest or engine lathe's puppet-head combining a further and preferred modification of my invention. Fig. 6 is an end view, looking toward the point of support, of the parts of the novel combination of mechanism shown unsectioned in Fig. 5. Fig. 7 is a side elevation of a portion of a key-planer shown at work and equipped with a still further modification of my invention. Fig. 8 is a fragment of the mechanism of Fig. 7 seen from the front or work-supporting side; and Fig. 9 is a fragment, on enlarged scale, showing detail of preferred form aforesaid.

In detail a simple form of my invention is illustrated in Figs. 1 and 2 by a turner's work-support in the form of a center *A*, having fashioned from that portion of it which ordinarily would be reserved as spare stock for retrueing, &c., a series of concentric cylindrical steps *s*³. These steps merge, on one hand, in a concentric point or work-engaging part *p* and upon the other hand with the likewise concentric taper-shank *t*, which shank, being the ordinary conical sort, serves to engage the whole with corresponding center-sockets in either head of a lathe. The steps *I* also form of diameters desired to be produced in the work. In the illustrated case, Figs. 1 and 2, this is indicated in the step *s*² by a diameter of, say, three-quarters of an inch, although in the adjoining steps *s*, *s*¹, and *s*³, respectively, diameters of one-quarter, one-half of one inch, and inch, desirable in other cases, are also provided. To use my invention thus combined, I seat the taper-shank *t* thereof in, say, the puppet-socket of a self-acting slide-rest lathe, adjust the edge of the tool about to be used by leveling the same at the apex of the point *p*, or to what turners call "at the center," mount the work to be turned, (indicated by broken-line outlines *w*, Fig. 1,) and by ordi-

nary turning reduce the same toward finish size. That size I may then establish and produce without empirical cutting or other calibration than that afforded by contacting the nose or deepest-cutting edge of the tool upon a corresponding step, say s^2 , of the novel combination thus described, for from inspection of Figs. 1 and 2 in connection it will be manifest to those skilled in the art of turning that such use of either the steps s or s^2 establishes the distance from the center or axis at which the mechanically-guided tool of the above-specified sort of lathe will then normally act and in the language of the day "do the rest."

The diagrammatic part of Fig. 1 affords in its dot-and-dash outlines the boundaries of the point-path of the tool and also said tool's action in causing, where said dot-and-dash outlines overlie the work-outline w , a corresponding reduction thereof. Before concluding a description of the device shown in Figs. 1 and 2 it is proper to point out that instead of relying only upon the apex of point p to position the tool at center I have devised and therein shown combined with above-described devices a constantly-accessible tool-setting level-definer, and thereby avoid acts which may occasion inconvenience and loss of time—viz., either positioning the tool before mounting the work or on changing a tool dismantling the work for a similar purpose and then remounting it, &c. Such constant level-definer is illustrated in the edges n of notch N, for these edges n , being in a common plane and parallel to the axis $x x'$ of the center A, are adapted to be brought to and maintained in proper angular position in relation to the guide parts of the specified lathe, as follows: An alining-pin f , fixed in the outer body of said center A and parallel to its axis, is adapted to engage laterally with a corresponding seat. (Not shown, but presumably formed in the walls of said lathe's center-sockets at registering radius and proper angular position for bringing said edges n when it is so engaged to the level of at the center aforesaid, indicated by the line $x' x^2$, Fig. 2.)

In Figs. 3 and 4 a diamond-point tool T appropriate for use in the class of machines to which the invention relates is shown contacting with a modification of said invention, and is thereby given at a single act both a certain radius (told by the scale S) and also the level $p' x^5$, in which this tool must have its point to be at center. However, as the point p' is in this case a hollow or female one without this aid which my said modification conveniently affords it to set a tool at the axis of work rotation (with which said hollow point's axis is in line) would be a pure guess.

The modification illustrated in Figs. 3 and 4 chiefly consists in the separate and removable rather than integral and fixed character of the work-supporting, radius-gaging, and tool-setting devices. The range of the radius-gaging device removably mounted upon the

center A' is also much more extended than is the case of that shown integral with the center A aforesaid. For instead of a few diameters, as s to s^2 , it gives a whole series of diameters between its greatest and least limits upon the graduated and sloping edge n' of the notched cone-frustum C, which cone-frustum is snugly fitted by concentric cavity c upon concentric projecting neck o of the center A', a set-screw d serving to fix the two parts together at any desired angular position about the neck o . In this modification the conical center-shank t may be seated in its proper machine-sockets without reference to any particular alinement, as above described, and the edge n' , localized by slackening screw d , rotating the said movable part C to desired angle, and locking it there by again screwing fast set-screw d . In some cases, however, it is more convenient to set the center part A' definitely. For this purpose the protruding hexagonal part h (primarily the bearing part for wrenches) affords a sort of visual dial; but for finer adjustments I preferably provide a mark m , Fig. 3, to be set in the act of seating to register with a corresponding mark or datum on the muzzle of said center's proper lathe-sockets. While only one size of the removable part or cone-frustum C is shown in Fig. 3, it is part of my design in and by this sort of modification to provide a number of such conic parts of varying or different slopes or diameters, but of uniform cavities or hollow bearing parts, and so to make them mutually interchangeable upon the neck of their common or standard center, as A'. I thus afford a wide range of radius-gage without giving abrupt slopes to their cones, using undue length of neck to mount them on or offering in their bodies obstructions near the work's ends that are much, if any, in excess of said work's finish diameter, all of which are most material advantages.

In Figs. 5 and 6 there is shown a modification more complex than the preceding, yet one which embodies the preferred form of my invention—viz., a center A² is shown seated in the hollow socket b in slide-bar B of a self-acting slide-lathe's puppet-head, (indicated by the fragment P.) The outer body of this removable center A², which protrudes from socket b , is formed not only with a concentric cylindrical neck o' and the usual male point p^2 , but also with a shoulder e , in which shoulder there is also formed a worm-wheel or ring of screw-teeth g . Upon this neck o' of the center A², I journal the preferred modification of the removable, and in this case controllably-movable, part of my invention—viz., the part C'. Also by a suitable cavity c^2 I mount thereon a retaining-collar K, the latter being held to place on neck o' by a set-screw d' . Upon the inner face f^2 of the movable part C', I form or fix bracket-bearings a or a' , and in them I journal, tangent to and meshing with the worm g aforesaid, thumb-screw D, which screw, having a milled or preferably

scale-divided head H, serves a triple duty—viz: first, at rest of locking the movable part C' to the relatively-fixed part, the center A³; second, when turned of rotating the movable about said fixed part as an axle, and if provided with a scale and an index, as in Fig. 6, the finger I, (fixed to and projecting within range thereof from the shoulder of center A² aforesaid) and, third, of measuring minute portions of said movement or movements. However, as a primary means of reading the relative angular movements of parts C' A², I provide a vernier scale, (shown in Fig. 5,) the one side *v* thereof being marked upon an inner integral flange of the movable part C' and the other side *v'* upon the adjoining relatively-fixed flange or shoulder of worm *g* aforesaid. The snail-like or volute form of the rim R of the movable part C' is also a leading feature of this preferred modification of my invention, for if any desired radius within the limits of said snail-like gaging part be not in the proper plane at the center of the turning-machine to which it may be applied then it is obvious that that part of said snail-rim which does afford such radius can be brought there by a rotary movement. Such rotary movement may be effected either by means of tangent-screw H or by alining in its socket the center A² with which said snail-rim is combined, a fixed mark upon the walls or muzzle of said socket serving as a datum in a way which, already having been described, need not here again be illustrated or described. As a means of reading the various radii thus within convenient range of the tool's edge the periphery of the movable part C' may be conveniently divided and marked. In Figs. 5 and 6 I have illustrated this and also shown the snail-like rim or volute as of constant pitch—viz., of like increment of radius for like angular increment between corresponding radii throughout; and by connecting said volute's greatest and least radii by notch N² and radial plane *g n*² I have made its whole radially-tapering extent available as a radius-gage for contacting lathe-tool edges. Also, as I have above said I prefer to do, I have in this formation combined with radius-gaging and work-supporting devices a tool-positioning device or level-definer—viz., the outer edge *n*² of said connecting-plane; but as it may be inconvenient or take too long to shift back to this I have also illustrated at intervals of sixty degrees on the periphery of the radiate part C' intermediate and secondary level-definers the notch edges *m' m*⁵, which by comparatively small angular displacement of the center A² may be quickly brought to working position; or if it be desired to preserve or often to have the movable part C' with a certain one of its radii presented in the level of the axis of rotation aforesaid a prime mark, as V, on the center-shank *l*² may be seated to line with a mark on its sockets, as above mentioned, and any de-

sired angular displacement of the radial part C' effected by tangent-screw H and read by the vernier or micrometer devices aforesaid. Such a reading established, it is easy to mark it permanently, as by scoring a line or special horizon when so adjusted. A number of such lines are illustrated in Fig. 6 by the marginal graduations of the lower sextant of the movable part C'. Said sextant is included within interrupted cord, arc, and angle lines. Moreover, the movable and radially-disposed part C', as illustrated, exposes extended flat faces *f' f*² square to the axis *x*⁶ *x*⁷ of the center or work support, and by contacting on said surfaces affords convenient means for squaring the edges of the "right" and "left" lathe "side tools." The rim R of the volute being parallel to the axis of support also serves (with cylindrical work) to position "square" the edges of flat-nosed "smoothing," "parting," &c., lathe-tools. The sixty-degree V-notch L, Fig. 9, not only shows a further device for setting without independent gages V-thread screw-tools, but also indicates how other tools of special contours may have the profiles of their edges similarly formed in hollow or opposite counterpart upon equivalent portions, and thereby be accurately and quickly positioned.

In Figs. 7 and 8 the range of my invention is indicated in several ways, viz: first, by showing instead of a volute or radial radius-gage of regular pitch a removable and movable radial gage C², formed as a cross or irregular interrupted snail; second, by its relation with a keyway-planer a machine in which reduction of the work is effected by relative reciprocations of the tool T' and work W² instead of by continuous rotation of the work, as in the case of the slide-lathes above alluded to; third, by my invention's application to a machine wherein the "feed" rather than the "drive motion" is circular; fourth, by mounting the gage and tool positioning devices upon some other part of the lathe-head than the immediate work-support or "center" proper, by which modification the center can be removed from its socket, changed for another, or returned without disturbing the gage and tool positioning parts of my novel combinations, and, fifth, such other modifications as will be apparent from this specification as a whole, for from inspection of Figs. 7 and 8 it will be seen that the movable part C² projects arms *s*⁴ *s*⁷ to different distances from its central cavity, yet each arm *s*⁴ *s*⁷ when mounted on an appropriate machine, as the illustrated key-planer, reaches to a desired radius or depth of feed for a tool, as T'; also, that, as above mentioned, the part C² is mounted and fixed at its several operating positions upon the planer-head P' by jamming said part's tapering cavity or eye *c*³ upon a correspondingly-conical nose *o*², formed concentric to the center socket in the axis of prismatic slide-bar B' of the puppet

or typical work-support P' of said planer. The angular position of part C² on said bar is readily determined by squaring from the planer-bed E. Center lines, as $n^4 n^4$, Fig. 8, ruled in the faces of said arms serve to position tools, as T', with their edges in a vertical plane passing through the axes of the work W² and that of the independent center A⁸ when said axes are alined for straight work. Further, the sides l of said arms, being formed as templets and positioned at given dimensions from such central plane, afford surfaces upon which the edges of tools can be positioned in relation to the guides of the machine and also set to act upon such parts of the work as, corresponding in width thereto, are to be left projecting or planed—say flat—rather than like the main body of said work be circularly shaped, or such as in this case is the side u of the “warded” and projecting part of the key W². The outer ends h of said arms, being preferably portions of cylindrical surfaces parallel to the axis of support $x^9 x^{10}$, serve to test the establishment of the planer's tools at the proper angle of relief to the work longitudinally presented by said machine.

Although my invention is hereinbefore chiefly illustrated in connection with puppets or dead-heads, it is intended to be indicated by the dependent illustrations, Figs. 1, 2, 3, and 4, respectively, that it also may be used in or combined with the “live” heads of lathes or even in both “live” and “dead” heads and at the same time; also, by forming the gaging devices hollow instead of solid it can be modified readily for use in setting inside lathe-tools.

The kind of work for which my invention is best suited is of course straight shafts or cylindrical work or work in which a series of cylindrical sections follow progressively, tapering either from end to end or from a maximum middle diameter, thence by progressively less diameters to the ends. My invention is, however, of marked utility in connection with turning cones or cone-frusta, like the shanks $t t'$ of the above-described centers, for whether one of the heads of the lathe be “set over” or a slanting guide be employed to develop the taper (alternative modes familiar to turners for producing this sort of work) my said invention if then used will serve to give either a diameter thereof at some plane intersecting the axis of such tapering work or it will give a diameter formed by a plane intersecting the contour of said cone or cone-frustum produced; also, work which, compared with its end diameters, has reduced inner portions may be produced by the combination of my present invention with the familiar device of a “bank-screw” upon the slide-rest part of the lathe which carries it. The bank-screw, serving the purpose of re-establishing diameters which the gage part of my invention having first determined for the tool's edge, were then retreated from in order

to pass the obstructions of the larger work ends aforesaid.

That the tool-positioning capacity of my invention is unaffected by dislocating the axes of the work and work-support, as above mentioned in the case of taper-turning, is a marked evidence of its extended usefulness.

Taking the modifications illustrated in Figs. 1, 2, 3, and 4 as one group and the modifications illustrated in Figs. 5, 6, 7, and 8 as another group, the first thereof will be seen to exhibit the radius-gage disposed longitudinally or along the axis of support, while in the latter group, which embraces the preferred form, the position thereof is transverse in respect to the said axis, and therefore accomplishes a great saving in space measured between the work's end and that of the lathe-puppet or mediate work-supporting part. Again, taking all the above illustrative modifications of my invention as a group, they will be found to exhibit the common feature of a combination of work-supporting, radius-gaging, and preferably also tool-positioning devices located near the work's end, where, even to the eye, without contacting the tool they warn the turner in the act of commencing a cut against overfeeding his tools; also, as cuts in turning usually originate near the ends of the work, the close combination therewith of my invention solicits its use. Used, it eliminates many pernicious practices and errors, viz: If positioned too high or “above center,” the ordinary lathe-tools have a tendency to nod and chatter or cut too deep. If positioned too low or “beneath center,” the established angles of such tool's acting-faces generally are defeated and they fail either to cut at all, or, at least, not to advantage. In other cases, however, when a position above or below center is desired for the position of a lathe-tool's edge the amount thereof can be estimated or measured much more readily from the near-by datum which my invention offers than hitherto could be done by the ordinary independent devices and practices.

Slight discrepancies between the calibration of the radius-gaging parts of my invention, as above illustratively described, and that of the work produced by lathe-tools thereon contacted may be occasioned by “lost motion” in the jointing of their own or combined lathe parts or by the springing of the work, the character of the material, and the load upon the tool's edge, &c. These difficulties, however, are more seeming than real, but so far as they do exist can be allowed for in practice, and are usually on the safe side—viz., that of having work over finish size rather than too small or under size. In a large percentage of cases from the old method of cutting the width of the tool's edge and then experimentally calipering one finds the chief reason for mutilated and imperfect lathe-work, whereas by my invention such experimental cutting is substantially avoided.

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

1. The combination with the male center of a lathe of a graduated radius-gage on said center, substantially as described.
2. The combination with the center of a lathe or turning-machine of the class indicated of a tool-gaging device adapted to expose in range of the tool-path of said lathe an extended surface of varying radii substantially as and for the purposes described.
3. The combination with the center of a lathe or turning-machine of the class indicated of a tool-gaging device consisting of a plurality of contactive surfaces located at varying radii from the axis of said support substantially as and for the purposes hereinbefore described.
4. The combination with the center of a lathe or turning-machine of the class indicated of a movable gage having a tool-contactive surface or surfaces and means for locking said gage when it exposes said surface or surfaces at the level of the center axis of said lathe and at known radius therefrom, substantially as and for the purposes hereinbefore described.
5. The combination with the center of a lathe or turning-machine of the class indicated of a movable radius-gage, a screw to move and lock said radius-gage, a vernier-scale to read the larger and a micrometer as divided head H and index I to read the smaller movements substantially as and for the purposes hereinbefore described.
6. The combination with the center of a lathe or turning-machine of the class indicated of a movable radius-gage and a screw operative to lock but on occasion to move said radius-gage substantially as and for the purposes hereinbefore described.
7. The combination with the center of a lathe or turning-machine of the class indicated of a movable radius-gage, mechanism to move and on occasion to lock said radius-gage, and a vernier-scale to read the amount of said movements substantially as and for the purposes hereinbefore described.
8. The combination with the center of a lathe or turning-machine of the class indicated of a radius-gage and a center-level mark or equivalent tool-positioning device, substantially as and for the purposes hereinbefore described.
9. The combination with the center or centers of a lathe or turning-machine of the class indicated of a radius-gage, a notch edge n , and an alining device as pin f and said pin's registering socket in said work support or supports substantially as and for the purposes hereinbefore described.
10. The combination with the center of a lathe or machine of the class indicated of a radius-gage, a center-level mark or tool-positioning device and a face or faces as f, f', k , whereon special tools may be positioned sub-

stantially as and for the purposes hereinbefore described.

11. The combination with the center of a lathe or turning-machine of the class indicated said support being provided with a fixed mark or datum, of a radius-gage and a tool-positioning device also provided with a mark or index to register with said datum when the said tool-positioning device is in the plane or at the center of said machine substantially as and for the purposes hereinbefore described.

12. The combination with the axial work-support of a lathe or turning-machine of the class indicated of a radius-gage, a device for positioning tools at center, and a face or faces as f, f', L , whereon special tools may be additionally localized to determine positions, substantially as and for the purposes hereinbefore described.

13. The combination with the center or centers of a lathe or turning-machine of the class indicated, of a radius-gage having a body with a sloping side or sides and a notched edge substantially as and for the purposes hereinbefore described.

14. The combination with the center or centers of a lathe or turning-machine of the class indicated of a radius-gage and tool-positioning device consisting of a body having a sloping side or sides and scale-divided edge or edges substantially as and for the purposes hereinbefore described.

15. The combination with the center or centers of a lathe or turning-machine of the class indicated, of a radius-gage and tool-positioning device consisting of a fixed and a relatively-movable part, said movable part having a sloping and graduated or scale-divided body and means for fixing said fixed and movable parts together so that the said graduated or scale-divided parts may be exposed in the tool-path of said lathe substantially as and for the purposes hereinbefore described.

16. The combination with the center of a lathe or turning-machine of the class indicated of a movable gage said gage having gage parts extending to different distances from the axis of said work-support and adapted to come in turn to a position proper for contacting thereon the tools of said lathe or machine substantially as and for the purposes hereinbefore described.

17. The combination with the center of a lathe or turning-machine of the class indicated of a rotative snail or volute radius-gage, and a center-plane definer the notch edge n^2 , substantially as and for the purposes hereinbefore described.

18. The combination with the removable center or immediate center of a lathe or turning-machine of the class indicated of a rotative volute radius-gage, said gage being provided with a mark to register with a mark V or prime position on the lathe or machine in which it may be seated and means for measuring angular movements of said gage from said

mark, substantially as and for the purposes hereinbefore described.

5 19. The combination with the center of a lathe or turning-machine of the class indicated of a rotative snail-like or volute radius-gage, a screw and worm-wheel operative for alternately rotating and locking said gage, a scale or device for measuring the angular
10 movements of said rotative gage when moved from a relatively-fixed datum, and a tool-positioning device whereby the tools of said lathe or machine may be tested for the accuracy of their position in respect to both radius and horizon substantially as described.

15 20. The combination with the lathe-center

A^2 , having worm-wheel g and neck o' of volute gage C' journaled thereon, and having its rim R notched as $n^2 m^2$, also special tool-profiles as L , flat faces $f' f^2$, and bearings $a a'$; a tangent-screw D , journaled therein to mesh
20 with worm g aforesaid, and provided with an operating divided head H ; index I and vernier-scale $v v'$ distributed upon gage C' and center A^2 , substantially as and for the purposes hereinbefore described.

HARFORD WILLING HARE POWEL.

Witnesses:

JAMES J. ROONEY,
ARTHUR W. GASH.